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THE RELATIONSHIP BETWEEN ANTHROPOMETRIC FEATURES AND DYNAMIC BALANCE IN YOUNG ADULTS- A CROSS SECTIONAL STUDY

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ABSTRACT **Background and objectives** -Dynamic balance is considered as an ability to maintain stable position while performing a task [1]. Dynamic balance is a prerequisite for many sports. Balance ability has significant effect on athletic performance [2]. It is also required in activities of daily life. Balance is maintained by complex integration of the vestibular, visual and somatosensory system. These systems work in a synchronised manner ensuring that the line of gravity falls within the base of support providing stability at all times. Our study is aimed to compare whether there exists any relationship between the limb body ratio, waist hip ratio, mid-thigh circumference, mid-calf circumference and dynamic balance. **Method**-The study was carried out with a total of 84 students at akash institute of medical science and research centre, (both males and females) aged between 18 and 25 years. dynamic balance of the subjects was determined with Y balance test. The limb body ratio, waist hip ratio mid-thigh circumference and calf circumference were measured and compared with dynamic balance. **Result-**our study shows moderate significant moderate positive correlation between MTC and MCC with r=0.71. There was a weak negative significant correlation between LBR and WHR with r=-0.33. There was a weak non -significant positive correlation between LBR and MTC with r=0. 167.There was a weak positive correlation between WHR and MTC with r=0.160. There was no correlation between WHR and MTC with r=0.160. There was weak positive significant correlation between WHR and MCC with r=0.228. **Conclusion-** Our study concludes that stronger the antigravity muscles, better the dynamic balance.

KEYWORDS : Dynamic Balance, Limb Body Ratio(LBR), Waist Hip Ratio(WHR) Mid-Thigh Circumference(MTR) ,Mid Calf Circumference(MCC), Y Balance Test(YBT).

INTRODUCTION –

Playing any sport has a massive positive effect on both the mind and body. It certainly is an excellent tool to keep the body physically fit. In certain sports, balance is one of the most important physical attributes. Your ability to move efficiently requires control of the body's postural alignment. In other words, you need strong balance to perform efficiently in some sports. For example football players have to maintain single leg balance while shooting accurately, dribbling and passing the ball, similarly for a hockey player a well-balanced position is essential in learning to play attack role, to dribble quickly in any direction, pass or shoot the ball in any direction as well as to receive the ball from any direction. Dynamic balance is more challenging than static balance as it requires more muscle energy to maintain equilibrium in positional change. Sensory feedback like proprioception, vision and vestibular are important to maintain static and dynamic balance. Lower limb musculoskeletal injuries in sports are linked with balance abnormalities and altered postural control. One of the tests used for assessing the dynamic balance in athletes both in clinical practice and in research is the Y Balance Test (YBT) as it is easily implemented, time efficient, reliable, and specific.

Having a right physique for right sports is a great starting point. Though many studies have compared various sports with dynamic balance, very less information was given about how anthropometric features in a person will affect the dynamic balance. So, our study is to find whether there exists any relation between limb body ratio, waist hip ratio, mid-thigh circumference, calf circumference and dynamic balance. This study data can be used as a tool to identify suitable and Competent candidates for sports that require more agility and balance.

MATERIALS AND METHODS:

The study was carried out with a total of 84 students both males and females at Akash Institute of Medical Science and Research Centre aged between 18 and 25 years. Limb body ratio (LBR), defined as the ratio of total limb length to total height. Limb length was measured from anterior superior iliac spine to medial malleolus. The LBR was calculated by dividing leg length by total height[3,4] (measured from the base of the heel to the top of the head). Waist hip ratio and Mid-thigh circumference was measured using measuring tape. Waist circumference was obtained midpoint between the lower margin of the last palpable rib and the top of iliac crest. Hip circumference was measured around the widest part of the buttocks [5]. Mid-thigh circumference was measured half distance between greater tuberosity and the lateral condyle of the femur [6], Calf circumference was measured at the level of the widest circumference of the calf[7]. For all measurements tape was held snugly to the limb, without compressing underlying soft tissue.

The Y Balance Test (YBT) was conducted according to a standardized protocol to test the dynamic balance. Bare footed participants started the YBT with practice trials in each direction before they underwent the formal testing. The order of the practice trials was anterior reach , posteromedial reach and posterolateral reach in dominant leg of the subjects. The formal testing trials were performed in the same order as the practice trials, with 3trials performed in each direction. In each trial, the participants were instructed to reach as far as they could by using their reach foot while keeping their reach foot in contact with the reach indicator and then return to the starting point while they maintained their balance on the stance limb. The maximum reach distance was recorded to the nearest 0.5 cm in each reach trial. The maximum reach distance of the 3 formal trials in each direction was used for the analysis. Reach distances recorded in centimeter(cm).[8]

EXCLUSION CRITERIA-

Subjects with any lower-extremity or spinal dysfunction, history of surgery, dizziness or falls, visual or inner ear problems, neurological dysfunctions and altered feet sensation were excluded from studies.

Consent-

All of the participants were explained about the study in detail and signed informed consent was taken before participation.(form attached)

STATISTICAL ANALYSIS-

Eighty-four samples were collected based on convenient sampling method was entered and analysed using Microsoft excel 2013 and SPSS 20 software. Sample size was calculated based on correlation coefficient formula. Continuous values were expressed as mean and standard deviation. Most of the continuous variable followed non normal distribution, thus relationship between anthropometric measures and dynamic imbalance in young adults was done using Pearson's correlation coefficient value. P Value < 0.05 was considered as statistically significant. Anthropometric variables were correlated with dynamic balance variables. The statistical analysis was done removing outliers for all the continuous variables.

RESULTS-

The study included 84 samples using correlation coefficient sample size formula using 95% CI.

Table 1 shows the descriptive statistics with mean and standard deviation of all the variables included in the study.

Table 2 represents the relationship between the anthropometric and dynamic balance in young adults.

There was a negative correlation between YBT and LBR with r=--0.019. There was weak positive correlation between YBT and W_H score with r=0.204. There was a weak negative correlation between YBT and LBR with r= -0.135. There was a weak positive relationship between YBT and MTC with r= -0.118. There was a weak significant positive correlation between YBT and MCC with r=0.157

Table 1

	N	Mean	Std. Deviation
MTC	83	33.90	3.477
MCC	83	45.60	5.964
WHR	79	.76101370	.082868476
LBR	83	.55105392	.013385322
Age	78	19.37	.808
Ybt	84	91.04	10.170

Table 2

		YBT_Score
LBR	Pearson Correlation	-.135
	P value	0.223
W_H ratio	Pearson Correlation	0.204
	P value	0.071
Age	Pearson Correlation	0.049
	P value	0.671
MTC (cm	Pearson Correlation	0.108
	P value	0.333
MCC (cm)	Pearson Correlation	0.157
	P value	0.156

Table 3 represents the intercorrelations among anthropometric and dynamic balance measures.

Correlation analyses indicated that that there was a moderate significant moderate positive correlation between MTC and MCC with r=0.71 . There was a weak negative significant correlation between LBR and WH with r=-0.33. There was a weak non -significant positive correlation between LBR and MTC with r=0. 167.There was a weak positive correlation between WH and MTC with r=0.160. There was no correlation between WH and MTC with r=0.160. There was weak positive significant correlation between WH and MCC with r=0.228.

Table 3

Correlations							
		LBR	W_H ratio	Age	MTC (cm)	MCC (cm)	YBT_score
LBR	Pearson Correlation	1	.33**	-.019	.167	.228*	-.019
	Sig. (2-tailed)		.000	.868	.129	.038	.868
W_H ratio	Pearson Correlation	.017	1	.150	.160	.282*	.204
	Sig. (2-tailed)	.882		.190	.160	.012	.071
Age	Pearson Correlation	-.019	.150	1.000	-.118	-.137	.049
	Sig. (2-tailed)	.868	.190	.	.302	.232	.671
MTC (cm)	Pearson Correlation	.159	.160	-.118	1.000	.71**	.108
	Sig. (2-tailed)	.150	.160	.302	.	.000	.333
MCC (cm)	Pearson Correlation	.228*	.282*	-.137	.693**	1.000	.157
	Sig. (2-tailed)	.038	.012	.232	.000	.	.156
YBT_score	Pearson Correlation	-.135	.204	.049	-.118	.157	1.000
	Sig. (2-tailed)	.223	.071	.671	.302	.156	.
**. Correlation is significant at the 0.05 level (2-tailed).							

DISCUSSION –

Dynamic balance is a complex motor skill that aims to achieve an adequate postural balance from multiple sensorimotor processes in dynamic activities. Maintaining stability during movements in standing and walking and restoring balance following sudden disturbances or stumbles depend on the integration of multiple sources of spatial information, including visual, vestibular, proprioceptive and cutaneous sensations. Our study was to find existance of relation between anthropometric mesurements and dynamic balance. It proves the existence of positive relationship between MTC, MCC and dynamic balance. This is similar to a study conducted by Ragıba Zagyapan et al, who concluded a significant relationship was detected between muscle shortness, waist and thigh circumferences, and postural balance type[12]. Similarly in a study conducted by Nirav P Vaghela , arm length have the strongest relationship with the dynamic balance[13]. A.Khasawneh in his study concluded that Calf circumference and ankle width were most significant in the Dynamic balance[14]. Hossein Berenjeian Tabrizi et al, in his study proved that the athletes' dynamic balance has significant relationship with only the weight, pelvis perimeter, thigh perimeter, shin perimeter, body fat and the BMI variables (P 0.05)[15]. The results of our study also shows there exists no relationship between limb body ratio, waist hip ratio and dynamic balance.

CONCLUSION AND IMPLICATION –

Our study concludes that stronger the antigravity muscles like quadriceps in thigh and gastrocnemius and soleus calf, better the dynamic balance . Thus antigravity muscles of limbs plays an important role in dynamic balance. So persons with better thigh and calf circumference can be trained for specific sports which require more dynamic balance.

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