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Analysis of Psychomotor Abilities from Anthropometric and Physical Fitness Variables among Children with Autism Disorder

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Abstract

Background: Children with autism may face difficulties in psychomotor abilities, impacting their engagement and communication skills. Lack of physical fitness is a recognized issue in this population, suggesting that fitness metrics could aid in predicting psychomotor ability. This study aimed to explore the interplay between psychomotor abilities, anthropometric data, physical fitness parameters, and the potential for predicting psychomotor performance through anthropometry and fitness attributes.

Methods: A total of 24 students with autism spectrum disorder aged 13 to 20 years (mean age=15.88 years) participated in this study. The standardised test and tools were used to evaluate psychomotor ability, anthropometry, and physical fitness characteristics. The backward regression approach was employed to do statistical analysis.

Results: There was a significant relationship between psychomotor abilities and anthropometric and physical fitness attributes. The regression equation was statistically significant in anthropometric characteristics.

Keywords: Psychomotor, physical fitness, anthropometric, autism spectrum disorder.

Introduction

Autism spectrum disorder (ASD) is a neurological and developmental disorder that affects how people interact with others, communicate, learn, and behave. Although autism can be diagnosed at any age, it is described as a “developmental disorder” because symptoms generally appear in the first 2 years of life (NIMH). Psychomotor ability is defined as the relative innate potential of an individual to acquire psychomotor skills upon practice. The psychomotor ability exists in an individual from birth and remains virtually unchanged throughout life. It is not substantially affected by training or other interventions (Changiz T *et al.*, 2021) [1]. Physical fitness is a state of health and well-being. It develops your capacity to perform better in sports, your job and day-to-day routine work. This is achieved through moderate/vigorous physical activities, balanced diet, and proper recovery (NCERT).

Anthropometric measurements are noninvasive quantitative measurements of the body. According to the Centers for Disease Control and Prevention, anthropometry provides a valuable assessment of nutritional status in children and adults. Typically, they are used in the pediatric population to evaluate the general health status, nutritional adequacy, and the growth and developmental pattern of the child. Growth measurements and normal growth patterns are the gold standards by which clinicians assess the health and well-being of a child. In adults, body measurements can help to assess health and dietary status and future disease risk. These measurements can also be used to determine body composition in adults to help determine underlying nutritional status and diagnose obesity (Casadei K *et al.*, 2022) [2]

Methods and Materials

To achieve the purpose of the study, N=20 autism spectrum disorder children from Kaumaram Prasanthini academy Coimbatore were included in this study. The subjects were selected from the age ranged from 13 to 22 years. The subjects were given physical fitness training, and their anthropometric variables has been measured. The entire statistical analysis tests were computed at 0.05 was level of significance.

Results and Discussions

Table 1: Descriptive Statistics

Variables	Mean	Std. Deviation	N
Reaction Time	13.5417	2.37705	24
Balance	8.6667	2.92911	
coordination	11.3333	2.82330	
Height	166.5833	7.48864	
Weight	60.0583	18.78757	
Foot length	26.7708	1.50347	
Leg length	89.6250	4.39182	
Arm length	68.2500	4.83870	
Segment length SE	32.9167	2.41223	
Segment length EW	35.4167	2.56933	
Leg strength	0.6437	.40948	

The significance level was fixed at 0.05 level.

Table 2: Pearson Product Moment Correlation.

S. No	Variables	Reaction Time	Balance	Coordination
1.	Height	0.507	0.350	0.079
2.	Weight	0.178	0.052	0.385
3.	Foot length	0.103	0.216	0.273
4.	Leg length	0.462	0.223	0.165
5.	Arm length	0.385	0.294	0.035
6.	Segment length SE	0.357	0.441	0.040
7.	Segment length EW	0.396	0.183	0.004
8.	Leg Strength	0.012	0.391	0.322

Table 3: Model Summery for Reaction Time

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change in statistics				
	R Square Change	F Change	df1	df2	R Square Change	F Change	df1	df2	Sig. F Change
1	0.574(a)	0.329	0.029	2.41114	0.919	8	15	0.527	0.329
2	0.573(b)	0.328	0.034	2.33653	0.025	1	15	0.876	0.001
3	0.570(c)	0.325	0.087	2.27086	0.058	1	16	0.813	0.002
4	0.564(d)	0.318	0.128	2.21956	0.196	1	17	0.664	0.008
5	0.553(e)	0.306	0.160	2.17821	0.299	1	18	0.591	0.011
6	0.543(f)	0.295	0.190	2.13976	0.300	1	19	0.590	0.011
7	0.524(g)	0.275	0.205	2.11882	0.591	1	20	0.451	0.021
8	0.507(h)	0.257	0.223	2.09549	0.518	1	21	0.480	0.018

Table 4: Analysis of variance on Reaction Time

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	33.354	1	33.354	7.596	0.012(h)
	Residual	96.604	22	4.391		
	Total	129.958	23			

Table 5: Residuals Statistics on Reaction Time

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	11.1965	15.5384	13.5417	1.20424	24
Residual	3.21676	2.99942	0.00000	2.04943	24

Std. Predicted Value	1.947	1.658	0.000	1.000	24
Std. Residual	1.535	1.431	0.000	0.978	24

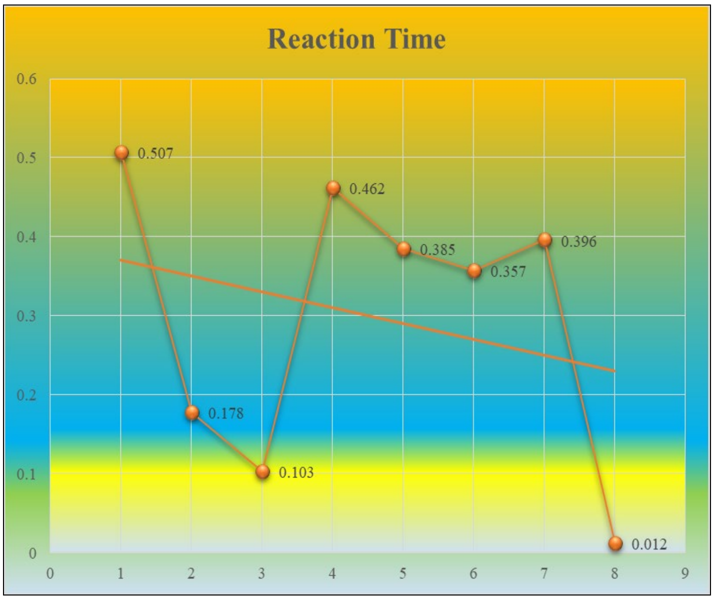

Fig 1: Scatter Plots Diagram on Reaction Time

Table 6: Model Summery for Balance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
	R Square Change	F Change	df1	df2	R Square Change	F Change	df1	df2	Sig F change
1	0.708(a)	0.501	0.235	2.56136	1.885	8	15	0.138	0.501
2	0.705(b)	0.498	0.278	2.48922	0.111	1	15	0.743	0.004
3	0.698(c)	0.488	0.307	2.43841	0.313	1	16	0.584	0.010
4	0.694(d)	0.482	0.338	2.38266	0.186	1	17	0.671	0.006
5	0.677(e)	0.459	0.345	2.37043	0.805	1	18	0.381	0.023
6	0.663(f)	0.440	0.356	2.35137	0.680	1	19	0.420	0.019
7	0.601(g)	0.361	0.300	2.45058	2.809	1	20	0.109	0.079

Table 7: Analysis of variance on Balance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	71.222	2	35.611	5.930	0.009(g)
	Residual	126.112	21	6.005		
	Total	197.333	23			

Table 8: Residuals Statistics on Balance

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	5.1765	12.2139	8.6667	1.75971	24
Residual	3.09752	4.70714	0.00000	2.34161	24
Std. Predicted Value	1.983	2.016	0.000	1.000	24
Std. Residual	1.264	1.921	0.000	0.956	24

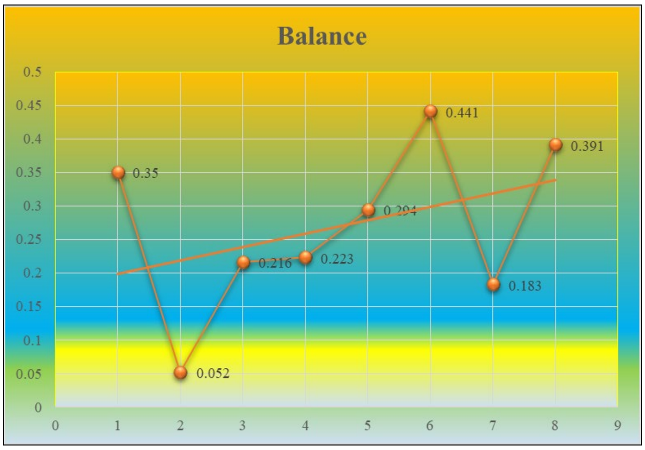

Fig 2: Scatter Plots Diagram on Balance

Table 9: Model Summery for Coordination

ODEL	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
	R Square Change	F Change	df1	df2	R Square Change	F Change	df1	df2	Sig. F Change
1	0.617(a)	0.380	0.050	2.75171	1.152	8	15	0.387	0.380
2	0.607(b)	0.368	0.092	2.69092	0.301	1	15	0.591	0.012
3	0.606(c)	0.367	0.144	2.61233	0.022	1	16	0.885	0.001
4	0.603(d)	0.363	0.186	2.54693	0.110	1	17	0.744	0.004
5	0.557(e)	0.311	0.165	2.57923	1.485	1	18	0.239	0.053
6	0.546(f)	0.299	0.193	2.53563	0.330	1	19	0.573	0.012
7	0.495(g)	0.245	0.173	2.56807	1.541	1	20	0.229	0.054
8	0.385(h)	0.148	0.109	2.66429	2.680	1	21	0.117	0.096

Table 10: Analysis of variance on Coordination

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	27.167	1	27.167	3.827	0.063(h)
	Residual	156.166	22	7.098		
	Total	183.333	23			

Table 11: Residuals Statistics on Coordination

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	9.8664	15.2636	11.3333	1.08683	24
Residual	3.91924	4.58983	0.00000	2.60573	24
Std. Predicted Value	1.350	3.616	0.000	1.000	24
Std. Residual	1.471	1.723	0.000	0.978	24

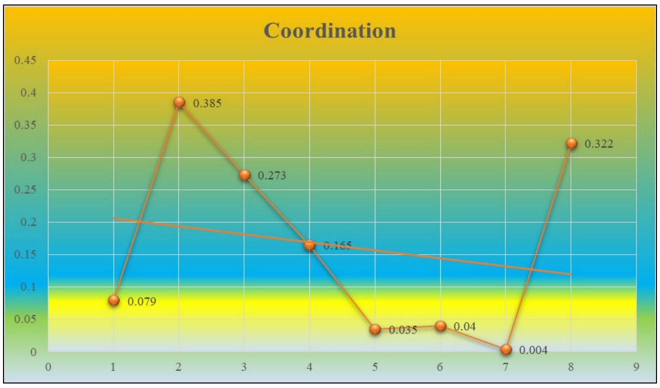

Fig 3: Scatter Plots Diagram on Coordination

Discussion on Findings

The result of this study showed that the psychomotor ability was predicted from the anthropometric variables would be predictors for autism spectrum disorder student's height, weight, foot length, leg length, segment length. Hence the null hypothesis was accepted at 0.05 level of significance. The result of this study showed that the psychomotor ability was predicted from the physical fitness variables. Hence the null hypothesis was rejected, and research hypothesis was accepted at 0.05 level of significance. Anthropometric studies have largely suggested that the choice of large athletes in terms of height, weight, and BMI appears as a criterion of success that can in some ways promote access to the sports' practice among disabled athletes (Temple *et al*., 2010). Linear regression analysis showed that body height and weight affect the selected psychomotor abilities (Sliz, M., Pasko, W., Dziadek, B. *et al*., 2023). The results indicate significant differences among healthy and disabled individuals in anthropometric dimensions and the highest difference was found in the height dimension and access limits (Davoudian Talab A H *et al*., 2017) [10].

Conclusions

The study's findings underscore the pivotal role of anthropometric variables in predicting psychomotor ability among students on the autism spectrum. Height, weight, and segment length emerged as significant predictors, each contributing uniquely to different facets of psychomotor function. Height emerged as a key predictor for reaction time, emphasizing the potential influence of body stature on cognitive processing speed. Segment length demonstrated its predictive power in relation to balance, suggesting that anatomical proportions may impact postural control and stability. Moreover, weight emerged as a predictor for coordination, implying a potential link between body mass and motor skill proficiency. These conclusions highlight the intricate interplay between physical characteristics and psychomotor performance in individuals with autism spectrum disorder. By recognizing the predictive value of anthropometric variables, educators and practitioners can tailor interventions and support strategies that account for individual differences in body composition and motor function, ultimately enhancing the educational and developmental outcomes for students on the autism spectrum.

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