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## Relationship of skill related physical fitness variables to academic achievement of high school boys

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### Abstract

The purpose of the present study is to find out the relationship of skill Related Physical Fitness Variables to Academic achievement. To achieve the purpose of the study eight hundred sixty nine Male adolescent students, in grades from 8<sup>th</sup> through 10<sup>th</sup> ranging in age between 13 to 15 years from ten different recognized private schools of Mysore city were selected as subjects. The subjects were Measured for their Performance in Selected skill related fitness variables through respective standard tests, that included Agility (Shuttle Run); Balance, (Bass Stick test); coordination (soft ball throw); Power (Vertical Jump); and reaction time (Nelson Hand Reaction time test). Academic achievement was considered as the academic performance of the subjects measured in terms of percentage of marks obtained in the examinations conducted by the schools, as given in the school records. Data of various measures obtained by the performance of subjects were analysed using product moment correlation and step-wise regression Analysis. Analysis of data revealed that, of the five variables considered, only agility correlated positively and significantly with academic achievement. When the selected variables were regressed on academic achievement, only agility emerged as the major predictor of academic achievement of the subjects. The other variables did not predict academic achievement significantly.

### Background

Physical fitness is an important health marker both in the early years and later in life (Ortega 2008; Ruiz, 2009) [9, 10]. There are numerous benefits of physical fitness for physical health (ie, cardiovascular and metabolic diseases, obesity, and musculoskeletal problems) and mental health. (Brage, Andersen and Stroth, 2010) [4]. In addition, a growing body of evidence suggests that physical fitness also may play a key role in brain health and academic performance in youth. (Chaddock 2012) [5]. It is likely that physical fitness improves cognitive control that involves inhibition, working memory, and cognitive flexibility, aspects that provide the foundation for academic ability (Agostino 2010) [2].

**Keywords:** Physical Fitness, Academic Achievement, High School Boys

### Introduction

Research suggests distinctive characteristics of young adolescents with regard to their physical. Cognitive, moral psychological and social emotional development as well as spiritual development (scales, 2010) [12].

Motor ability is related to better performance in various cognitive abilities, including inhibitory control, working memory, attention, and academic performance. Physical activity programs that include motor training may improve motor ability as well as academic performance.

Motor activity of some kind underlies all behaviors including higher thought processes. In fact behavior can function no better than do the basic motor abilities upon which it is based (Rogers, 1955) [11].

Motor ability skills are fundamentally universal in nature, although they do furnish basis for specialized play and work skills, yet they are simple basic skills that are acquired in childhood and in early youth. Through repeated play and movements these basic skills become generalized and can be used for varied sports and to develop the physical fitness (Barrow, 1988) [3].

The benefits of PA amongst preschool age children extend beyond prevention, it also allows for the development of fundamental gross motor skills. Fundamental gross motor skills could be learned through physical activities such as skipping, climbing, or throwing a ball. These behaviors are mutually reinforced as earlier development of motor skills leads to more active Children (Williams *et al.*, 2008) [17].

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Physical fitness is a physiological state of well being that provides the foundation for the tasks of daily living. Physical fitness is a general state of health and well being and more specifically the ability to perform aspects of sports or occupations. It is a set of attributes or characteristics seen in people which relate to the ability to perform a given set of physical activities.

When the definition of Physical Fitness includes aspects other than cardiovascular fitness, there seems evidence of positive correlations between various measures of psychomotor performance, cognitive abilities and academic achievement. Psychomotor performance shares many common neurological mechanisms with cognitive functions.

Higher fit and physically active children have been found to outperform their lower fit peers on tasks of cognitive control (Hillman *et al.*, 2009; Pontifex *et al.*, 2011; Voss *et al.*, 2011; Chaddock *et al.*, 2012) <sup>[5,7]</sup>.

Multiple articles describe the current state of physical fitness among children in Texas that confirm the associations among school performance levels, academic achievement, and physical fitness (Welk *et al.*, 2010; Zhu *et al.*, 2010) <sup>[17]</sup>.

Evidence supporting the association between physical activity and enhanced academic performance is strengthened by findings that link higher levels of physical fitness with improved academic performance among children and teens. Two national studies, in Australia and South Korea, along with four studies conducted in the United States (Knight, 1993) <sup>[8]</sup> found physical fitness scores to be significantly and positively associated with academic Performance.

Beneath the influence on cognitive performance a few studies investigated the influence of physical activity on motor skill acquisition and found beneficial effects for different age groups (Hillman, Weiss, Hagberg, & Hatfield, 2002; Mierau, Schneider, Abel, Askew, Werner, & Struder, 2009; Richards, 1968) <sup>[7]</sup>. Only a few studies considered the influence of other activities like motor fitness or motor coordination (Budde, Voelcker-Rehage, Pietrabyk-Kendziorra) <sup>[7]</sup>, Ribeiro, & Tidow, 2008; Planinsec, 2002; Voelcker-Rehage, Godde, & Staudinger, 2011) <sup>[12]</sup>. Further studies which concentrated on motor coordination focused on children and young students yielding positive effects of coordinative abilities and coordination training on different cognitive abilities such as attention and reading comprehension skills (Budde, Voelcker-Rehage, Pietrabyk-Kendziorra, Ribeiro, & Tidow, 2008; Planinsec, 2002; Uhrich & Swalm, 2007) <sup>[12]</sup>.

Previous studies have generally confirmed the existence of significant positive correlations between motor and cognitive abilities, which increase with the motor task complexity and decrease with age. Studies including adolescents, and more rarely small children, pointed to the relationship of complex motor tasks and intelligence. However, there are reports on the

correlation of intelligence and speed of simple movements, equilibrium, agility and explosive strength (Kati *et al.*, 1977) <sup>[7]</sup>

The group with high motor proficiency had a greater number who achieved excellent or good ratings in reading, Writing and comprehension than the group with low motor efficiency (G.L. Rarick and Robert). Motor activities were beneficial in developing skills and concepts in reading, mathematics, and science (Bucherb 1983) <sup>[5]</sup>.

Skill-related physical fitness consists of those components of physical fitness that have a relationship with enhanced performance in sports and motor skills. The components are commonly defined as agility(that relates to the ability to rapidly change the position of the entire body in space with speed and accuracy); balance, (that relates to the maintenance of equilibrium while stationary or moving); coordination, (that relates to the ability to use the senses, such as sight and hearing, together with body parts in performing motor tasks smoothly and accurately); power, (that relates to the ability to the rate at which one can perform work); speed, (that relates to the ability to perform a movement within a short period of time); and, reaction time that relates to the time elapsed between stimulation and the beginning of the reaction to it.

Academic achievement is the indicator of the students' level of acquired knowledge or skill, which has been gained as a result of training or experience. Academic achievement has been defined as the level of attainment of proficiency in academic work as evaluated by teacher or through standardized achievement tests (caplin, 1965).

**Methodology:** Subjects for the study were Eight Hundred Sixty Nine Adolescent Boys (N=869), ranging in age between 13 to 15 years from ten different recognized private schools of Mysore city. The schools were recognized by the Karnataka State Board and considered as the best performing schools.

**Procedure:** Subjects were Measured for their Performance in Selected skill related variables through respective standard tests, that included Agility (Shuttle Run); Balance, (Bass Stick) coordination (soft ball throw); Power (Vertical Jump); and Reaction time (Nelson Hand Reaction time test) For the purpose of the present study academic achievement is the academic performance of the subjects measured in terms of percentage of marks obtained in the examinations conducted by the respective schools, as given in the school records.

**Statistical Analysis of Data**

Data of various measures obtained by the performance of subjects were statistically analyzed. Statistical techniques used for data analyses were product moment Correlation and step-wise regression analyses.

**Table 1:** Results of Product Moment Correlation between Skill Related Fitness variables and Academic Achievement

Variable 1	Variable 2	Correlation coefficient	Df	Significance	Interpretation
Agility (Shuttle Run)	Academic performance	.129	869	.000	Significant
Balance, (Bass Stick)	Academic performance	-.002	869	.942	Non-significant
Coordination (soft ball throw)	Academic performance	-.024	869	.486	Non-significant
Reaction time ( Nelson Hand Reaction time test)	Academic performance	-.033	869	.338	Non-significant
Power (Vertical Jump)	Academic performance	.017	869	.612	Non-significant

Out of the five skill related physical fitness variables that were correlated with academic achievement, the scores of performance of the subjects in shuttle run correlated significantly and positively with academic achievement ( $r=0.129$ ;  $p=.000$ ). This indicates that only agility was related significantly and positively with academic performance. The other variables that did not correlate significantly with academic performance, are Balance ( $r=-.002$ ;  $p=.942$ ), coordination ( $r=-.024$ ;  $p=.486$ ), Reaction time ( $r=-.033$ ;  $p=.338$ ) and Power ( $r=-.017$ ;  $p=.612$ ).

**Table 2:** Variables Entered

Model	Variables Entered	Variables Removed	R	R Square	Adjusted R Square
1	Agility (Shuttle Run)	.	.129	.017	.016

Stepwise (Criteria: Probability-of-F-to-enter  $\leq .050$ , Probability-of-F-to-remove  $\geq .100$ ).

When the selected variables of skill related physical fitness were regressed on academic performance, the major dependent variable, using stepwise multiple regression, following results were obtained. Of the five (05) variables entered into the equation, only one variable emerged as the major predictor of academic performance of the students. The only variable to enter into the equation was shuttle run, with squared R value of .017 and variance of .016. In other words, shuttle run predicted the academic performance to an extent of 1.6%. Rest of the variables did not enter into the equation and did not predict the extent of academic performance.

**Table 3:** Coefficients

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	76.950	3.662		21.011	.000
	Agility (Shuttle Run)	1.366	.357	.129	3.827	.000

The beta coefficients obtained for the first variable predicted, i.e. Shuttle run in the first step is .129. Further all the t values obtained for the predicted variables and constants are found to be significant at .000 levels.

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