International Journal of Human Movement and Sports Sciences 10(2): 351-360, 2022 http://www.hrpub.org
DOI: 10.13189/saj.2022.100228

Sports Participation and Well-being of Adolescents: Are They Related?

Alisha Khan[1,2,*], Meenu Dhingra[2], N. K. Mungreiphy[1]

[1]Amity Institute of Anthropology, Amity University, Noida (U.P.), India
[2]Human Performance Lab, Sports Authority of India, New Delhi, India

Received November 9, 2021; Revised February 8, 2022; Accepted April 15, 2022

Cite This Paper in the following Citation Styles

(a): *[1] Alisha Khan, Meenu Dhingra, N. K. Mungreiphy , "Sports Participation and Well-being of Adolescents: Are They Related?," International Journal of Human Movement and Sports Sciences, Vol. 10, No. 2, pp. 351 - 360, 2022. DOI: 10.13189/saj.2022.100228.*

(b): *Alisha Khan, Meenu Dhingra, N. K. Mungreiphy (2022). Sports Participation and Well-being of Adolescents: Are They Related?. International Journal of Human Movement and Sports Sciences, 10(2), 351 - 360. DOI: 10.13189/saj.2022.100228.*

Abstract **Background**: Participation in sports helps an individual to achieve recommended levels of daily moderate to vigorous physical activity (MVPA). MVPA plays a vital role in bringing about positive psychological and physiological changes contributing to both physical and emotional well-being. **Aims**: There is a scarcity of data to understand the role of regular participation in sports in promoting the overall physical activity in Indian adolescents. Our objective was to evaluate the sports participation as a means of enhancing physical and psychological health of children and youth by helping them to achieve daily physical activity requirements. **Methods**: A cross-sectional study was conducted on a sample of 509 [n=259, athletic adolescents (AA) and n=250, non-athletic adolescents (NAA)]. Ryff's Psychological well-being questionnaire was used to assess their mental well-being state. Physical well-being VO_2max and anthropometric parameters were assessed. Data were analysed using IBM SPSS version 20. **Results**: In the findings of the study, majority of NAA were found to be practicing low physical activity levels while in contrast, majority of AA were able to achieve moderate to vigorous levels of physical activity. AA were found with significantly better scores for personal growth, positive relations with others, purpose in life, self-acceptance and total psychological well-being. Prevalence of overweight adolescents was higher in NAA than AA, while VO_2max of AA was higher than NAA. **Conclusion**: MVPA is favourably associated with overall well-being of adolescents. Sports participation has a positive impact on both physical and mental health and should be encouraged since childhood years.

Keywords Adolescence, Obesity, Athletic, Mental Health, Physical Activity

1. Introduction

Physical activity (PA) has been found to be an important tool to fight mental stress and illness and to promote positive emotions in individuals [1]. According to WHO, physical activity is defined as any bodily movement produced by contraction of skeletal muscles that require energy expenditure. It can range from much lower levels of PA in everyday life as in making active choices (such as walking to and from school instead of taking a transport or choosing the stairs over escalators) to high-intensity and high-volume physical training that athletes undergo to reach peak fitness in their respective sports. There are well documented health benefits of PA in adolescents and range from achieving healthy weight, cardiorespiratory fitness and muscle strength to cognitive development and social behaviour [2].

Participation in organized sports can serve as a pathway to help growing children achieve their daily PA requirements. It is a popular type of activity among children since ages and is practiced in various cultures as a part of the tradition all around the globe [3]. Yet

participation in organized sports is not widely used as an interventional strategy to improve physical activity level (PAL) of growing children. As per the current guidelines children should accrue 60 minutes of moderate to vigorous physical activity (MVPA) daily for their health and well-being [4]. Additionally, being physically active during childhood translates into active lifestyle in adulthood [5].

The study was conducted with an aim to assess the associations of physical activity levels with physical and psychological well-being among adolescents of Delhi, India. Physical activity levels were categorized as low physical activity (LPA), moderate physical activity (MPA) and vigorous physical activity (VPA) to evaluate its impact on health and well-being of adolescents.

2. Methodology

2.1. Participants and Study Design

The population under study was a sample of 509, comprising of two physical activity categories (PACs), athletic adolescents (AA, n=259) and non-athletic adolescents (NAA, n=250). According to [6], Athletic adolescents (AA) can be described as adolescents who participate in sports at least 2-3 times a week and belong to some sports club or organization. In this study they belonged to state, national and international level players from Sports Authority of India (SAI), Delhi. Similarly, Non-athletic adolescents can be described as adolescents who do sports once a week or never and belonged to participants from school and residential areas of Delhi/NCR, India. The study was cross-sectional in nature and random sampling was used for collection of the data.

2.2. Variables

PAL was assessed using APARQ (Adolescent physical activity recall questionnaire, 2002) [7]. PA has been expressed in terms of multiples of METs (metabolic equivalent) where 1 MET can be defined as the energy spent during rest and is roughly equal to 3.5 mL oxygen/kg body weight/ min. PA of <3 METs have been assigned as LPA. While activities ranging from 3-5.9 METs have been classified as MPA and ≥6 have been classified as VPA [8].

Physical fitness has been assessed through anthropometric parameters height, weight, BMI and VO_2max as an indicator of cardiorespiratory fitness. Height and weight were measured using standardised anthropometric equipment and protocol and were further used for the calculation of BMI. For VO_2max, field-based test called beep test or 20m multistage shuttle run was conducted [9]. The subject has to continuously run between two points 20 m apart. The pace of running is to be synchronized with a pre-recorded tape which plays beep sound at set intervals. As the test progresses, the time gap between each successive beep keeps on decreasing, forcing the subject to increase their speed over the course of the time during the test. The highest level attained before it is impossible to keep in sync with the recording is recorded as the score for that test. The score is then used to predict maximal oxygen uptake (VO_2max) (Y, ml kg - 1 min - 1) from the speed (X, km h - 1) corresponding to that stage. Where, speed = 8 + 0.5 highest no. of level attained.) and age (A, year):

$$Y=31.025 + 3.238\ X\ -\ 3.248A + 0.1536.AX$$

Ryff's Six-factor Model of Psychological Well-being (PWB) was used to assess well-being, which is composed of six sub-scales, self-acceptance, positive relation with others, autonomy, purpose in life, environmental mastery and personal growth [10].

2.3. Statistical Analysis

All group results were expressed as mean standard deviation. Cross tabulation was used to evaluate the number of children belonging to various PALs in both AA group and NAA group. Chi-square test was used to study the association of PAL (LPA, MPA and VPA) with PAC (athletic and non-athletic). Data were then subjected to multivariate analyses of variance (MANOVA) and Wilk's lambda (ʎ) criteria using GLM procedures. After observing significant main effects, univariate post-hoc procedure was used to check significant difference for each dependent variable. The level of significance was set as $p<0.05$ for all statistical analyses. For association among PA, anthropometric parameters, cardiorespiratory fitness and PWB, Pearson's correlation was used.

3. Result

The descriptive statistics for various PALs and PAC have been shown in tables 1, 2 and 3. Athletic adolescents (n=259) consisted of 117 males and 142 females with mean age 15.05±2.66 and 14.96±2.39 years respectively. Non-athletic adolescents (n=250) consisted of 136 males and 114 females with mean age 14.74±2.34 and 14.54±2.45 years respectively (table.1.). Out of 259 AA only 23 belonged to LPA group followed by 45 in MPA and 191 in VPA. On the other hand, majority of adolescents from NAA group were undergoing LPA level (n=179) followed by 66 in MPA and only 5 of them were in VPA level. Out of total participants, percentage of females in LPA and VPA was higher than males i.e., 52% and 48% respectively. In NAA group, percentage of females was higher in LPA (51.4%), while greater number of males participated in MPA (69.7%) and VPA (60%) as compared to females. In contrast the number of females was higher in all the three groups, LPA (56.5%), MPA (60%) and VPA (53.4%) in AA. There was a significant association between PAL and PAC [$X^2(2) = 300.893$, $p < .001$].

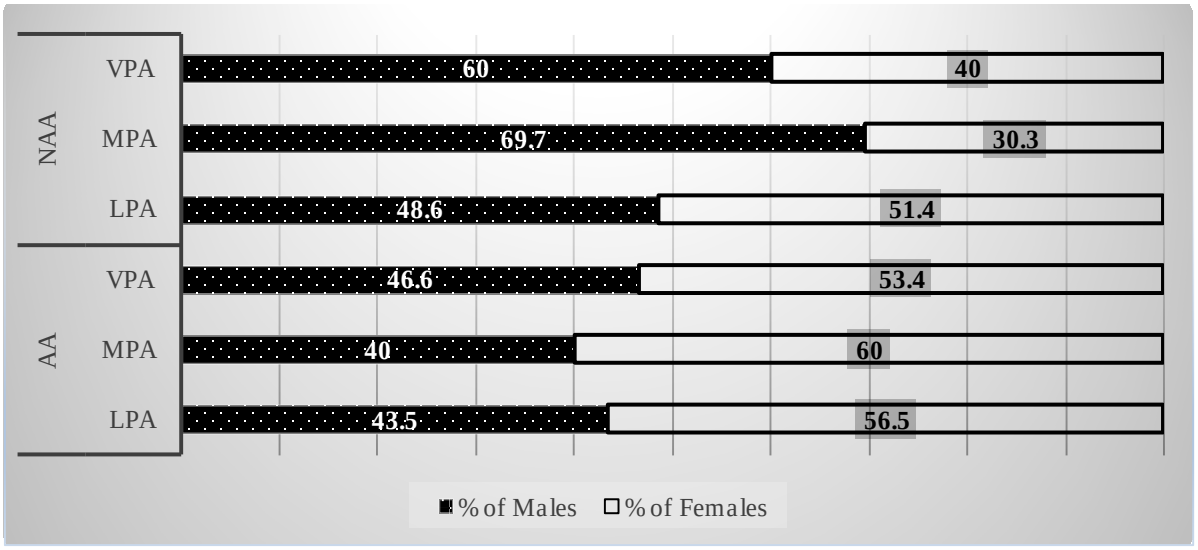

Figure 1. Distribution of males and females in various physical activity levels in athletic and non-athletic categories

Table 1. Mean and standard deviation of physical and psychological well-being parameters athletic adolescents (AA) and non-athletic adolescents (NAA)

Variables	ATHLETIC (n=259)		NON-ATHLETIC (n=250)	
Physical fitness parameters				
Age (years)	15.05±2.66	14.96±2.39	14.74±2.34	14.54±2.45
Physical activity (METs)	7.6±2.8	7.6±2.96	1.84±1.92	1.42±1.74
Height (cm)	167.61±12.2	160.33±8.82	163.37±11.74	157±10.43
Weight (Kg)	62.71±19.28	55.18±12.5	59.84±11.65	53.99±10.19
BMI (Kg/m^2)	22.02±5.16	21.24±3.06	22.29±2.85	21.83±3.1
VO_2max (ml/Kg/min)	48.97±11.39	45.11±11.12	37.77±10.02	37.49±9.48
Psychological well-being parameters				
Autonomy (out of 42)	28.49±5.34	28.3±5.28	27.97±5.06	28.09±5.69
Environmental mastery (out of 42)	29.43±4.99	29.39±4.06	28.88±4.31	29.49±4.64
Personal growth (out of 42)	31.19±4.51	32.16±4.85	30.95±4.53	30.7±5.11
Positive relation with others (out of 42)	30.05±4.96	30.71±5.21	29.5±5.31	28.73±4.7
Purpose in life (out of 42)	31.25±5.14	31.9±4.85	29.94±4.40	30.26±5.45
Self-acceptance (out of 42)	30.93±4.93	31.32±4.34	27.87±4.79	29.69±4.94
Total PWB (out of 252)	181.35±13.82	183.8±13.65	175.14±13.46	177.2±14.4

Table 2. Mean and standard deviation of physical and psychological well-being parameters for low physical activity (LPA), moderate physical activity (MPA) and vigorous physical activity (VPA) in athletic adolescents (AA)

Variables	LPA (n=23)		MPA (n=45)		VPA (n=191)	
	Males(n=10)	Females(n=13)	Males(n=18)	Females(n=27)	Males(n=89)	Females(n=102)
Physical fitness parameters						
Age (years)	18.3±1.06	18.08±1.04	14.11±2.22	13.04±2.81	14.88±2.62	15.07±2.19
Physical activity (METs)	2.5±0.0	2.5±0.0	3.72±0.82	3.93±0.97	8.96±1.52	9.22±1.55
Height (cm)	173.43±9.79	160.2±5.4	165.4±12.06	157.45±10.1	167.41±12.39	161.11±8.72
Weight (Kg)	72.68±11.13	56.44±11.3	55.1±7.97	47.16±9.84	63.13±21.02	57.14±12.52
BMI (Kg/m^2)	24.09±2.53	21.83±3.14	20.10±1.73	18.88±2.87	22.18±5.72	21.79±2.82
VO_2max (ml/Kg/min)	44.4±8.73	47.5±7.60	49.11±10.24	39.7±10.28	49.45±11.85	46.23±11.35
Psychological well-being parameters						
Autonomy (out of 42)	29.7±5.1	26.53±8.67	29.5±5.72	28.74±5.45	28.15±5.3	28.41±4.67
Environmental mastery (out of 42)	24.8±3.85	27.76±4.53	30.33±2.86	30.11±3.96	29.76±5.20	29.41±4.01
Personal growth (out of 42)	28.6±2.5	31.38±3.66	32.22±4.9	31.22±4.77	31.27±4.53	32.5±5
Positive relation with others (out of 42)	28.5±4.69	29±5.03	31.38±5.16	31.29±4.7	29.95±4.94	30.77±5.36
Purpose in life (out of 42)	33.1±3.51	32.23±4.45	29.94±6.56	29.85±5.13	31.3±4.95	32.41±4.72
Self-acceptance (out of 42)	31.1±5.62	32.3±6.21	32±6.21	31.25±4.39	30.7±4.6	31.21±4.07
Total PWB (out of 252)	175.8±7.8	179.23±11.12	185.38±17.23	182.48±16.01	181.16±13.46	184.73±13.24

Table 3. Mean and standard deviation of physical and psychological well-being parameters for low physical activity (LPA), moderate physical activity (MPA) and vigorous physical activity (VPA) in non-athletic adolescents (NAA)

Variables	LPA(n=179)		MPA(n=66)		VPA(n=5)	
	Males (n=87)	Females (n=92)	Males (n=46)	Females(n=20)	Males (n=3)	Females (n=2)
Physical fitness parameters						
Age (years)	14.89±2.49	14.57±2.61	14.57±2.1	14.20±1.6	13.33±0.57	16.5±0.7
Physical activity (METs)	0.60±0.89	0.75±0.95	3.78±0.55	3.85±0.87	8±0.00	8±0.00
Height (cm)	163.09±12.75	156.59±10.74	164.18±10.02	156.85±5.52	159±1.73	177.5±19.09
Weight (Kg)	60.47±12.4	54.03±10.91	59.33±10.03	52.25±4.16	49.66±9.86	69.5±6.36
BMI (Kg/m^2)	22.58±3	21.95±3.37	21.91±2.39	21.24±1.5	19.68±4.17	22.22±2.74
VO_2max (ml/Kg/min)	37.12±10.35	37.54±8.84	38.09±8.84	35.25±10.35	51.66±10.01	57.5±10.6
Psychological well-being parameters						
Autonomy (out of 42)	27.92±4.64	28.37±5.46	27.94±5.82	27±5.2	30.03±5.51	26±19.79
Environmental Mastery (out of 42)	29.55±4.18	29.88±4.52	27.62±4.32	27.11±4.34	28.66±4.93	35.5±3.53
Personal growth (out of 42)	30.88±4.80	30.82±5.29	31.15±4.01	29.9±4.39	30.03±5.35	33.5±0.7
Positive relation with others (out of 42)	29.95±5.61	28.61±4.49	28.56±4.79	28.7±5.55	30.66±2.51	34.5±3.53
Purpose in life (out of 42)	30.2±4.56	30.23±5.5	29.49±4.13	29.8±4.95	29.27±4.83	36.5±7.77
Self-acceptance (out of 42)	27.83±4.49	30.05±4.79	27.91±5.38	28.05±5.24	28.66±4.93	29.5±9.19
Total PWB (out of 252)	176.37±13.96	178.24±12.79	172.69±12.65	170.58±17.29	177.34±6.64	195.5±36.06

Results of Multivariate analysis of variance (MANOVA) indicated that there were statistically significant effects by **Physical Activity Level,** F (28, 968) = 21.83, p=0.000, Wilk's lambda (ʎ)=0.376, **Physical Activity Category,** F (14, 484) = 2.731, p=0.001, Wilk's lambda (ʎ)= 0.927and by **Gender,** F (14, 484) = 4.227, p=0.000, Wilk's lambda (ʎ)= 0.891with effect size, partial eta squared (ηp) =0.387 for PAL, (ηp) = 0.073 for PAC and (ηp) = 0.109 for gender respectively. The mean difference for each variable between athletic and non-athletic adolescents and males versus females was analyzed using independent samples t-test, and estimated marginal means was used as post-hoc test for analyzing mean difference in variables among LPA, MPA and VPA groups. In the same way the mean difference between variables due to statistically significant interaction effects between **PAL** and **PAC** on combined dependent variables, F (28, 968) =4.882, p=0.000, Wilk's lambda (ʎ)=0.768 was analyzed using estimated marginal means (Table 7).

The results of estimated marginal means show that age of participants in LPA was significantly higher than those in MPA (p=0.000, mean difference= 2.48) and VPA (p=0.005, mean difference= 1.65) and their weight (p=0.001, mean difference=6.56) and BMI (p=0.021, mean difference=1.67) were also significantly higher than MPA. VO_2max was significantly higher in VPA group as compared to LPA (p=0.001, mean difference=9.11) and MPA (p=0.000, mean difference=10.52).

Due to the significant effects by PAL and gender, the data was divided into four groups namely athletic males (AM), athletic females (AF), non-athletic males (NAM) and non-athletic females (NAF) to study the association between physical fitness and PWB parameters with the help of Pearson's correlation (tables 5 and 6).

Table 4. Showing significant mean difference in variables for physical fitness and psychological well-being parameters between AA and NAA and Adolescent Males and Females

	Independent Samples Test for comparison between Athletic and Non-athletic adolescents					
	t	**df**	**Sig. (2-tailed)**	**Mean Difference**	**95% Confidence Interval of the Difference**	
					Lower	**Upper**
METDAY	27.763	441.95	0	5.95	5.53	6.37
HEIGHT (cm)	3.14	503.75	0.002	3.15	1.18	5.13
VO_2MAX (ml/Kg/min)	9.805	500.05	0	9.2	7.36	11.05
PERSONAL GROWTH (/42)	2.085	505.66	0.038	0.879	0.05	1.7
POSITIVE REALTIONS WITH OTHERS (/42)	2.8	506.66	0.005	1.26	0.37	2.14
PURPOSE IN LIFE (/42)	3.464	506.81	0.001	1.51	0.65	2.37
SELF ACCEPTANCE (/42)	5.757	501.78	0	2.44	1.6	3.27
TOTAL (/252)	5.387	505.85	0	6.61	4.2	9.02
	Independent Samples Test for comparison between Adolescent Males and Females					
HEIGHT (cm)	6.656	481.27	0	6.48	4.56	8.39
WEIGHT (kg)	5.339	462.53	0	6.52	4.12	8.92
BMI	2.07	469.33	0.039	0.66	0.03	1.29
SELF ACCEPTANCE (/42)	-3.016	502.53	0.003	-1.3	-2.15	-0.45
TOTAL PWB (/252)	-2.265	506.85	0.024	-2.84	-5.3	-0.37

Table 5. Pearson's correlation showing relationship among physical parameters

	Physical activity (METs)				**BMI (Kg/m^2)**				**VO_2max (ml/Kg/min)**			
	ATHLETIC		**NON-ATHLETIC**		**ATHLETIC**		**NON-ATHLETIC**		**ATHLETIC**		**NON-ATHLETIC**	
	M	F	M	F	M	F	M	F	M	F	M	F
Age (years)	-0.7	0.068	-0.081	-0.183	0.408*	0.396**	-0.023	-0.065	0.473**	0.631**	0.250**	0.516**
Physical activity (METs)	1	1	1	1	0.299	-0.276**	-0.212*	-0.235*	0.191*	0.139	0.264**	0.102
BMI (Kg/m^2)	0.299	-0.276**	-0.212*	-0.235	1	1	1	1	0.351	-0.289**	-0.298**	-0.172

Table 6. Pearson's correlation for non-athletic females showing relationship among physical and psychological well-being parameters

	AUTONOMY (out of 42)				**ENVIRONMENTAL MASTERY (out of 42)**				**PERSONAL GROWTH (out of42)**				**POSITIVE REALTION SWITH OTHERS (out of 42)**				**PURPOSEIN LIFE (out of 42)**				**SELF ACCEPTANCE (out of 42)**				**TOTAL PWB (out of 252)**			
	ATHLETIC		NON-ATHLETIC		ATHLETIC		NON-A THLETIC		ATHLETIC		NON-ATHLETIC		ATHLETIC		NON-ATHLETIC		ATHLETIC		NON-ATHLETIC		ATHLETIC		NON-ATHLETIC		ATHLETIC		NON-ATHLETIC	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Age (years)	-0.88	-0.236*	-0.104	0.262**	-0.154	-0.207*	-0.129	-0.114	-0.011	0.140	-0.094	0.096	-0.067	0.041	-0.050	0.075	0.290**	0.334**	0.113	0.325**	0.132	0.108	-0.062	0.197*	0.037	0.065	-0.117	0.301**
BMI (Kg/m^2)	0.565	-0.119	0.019	-0.103	0.113	-0.077	0.126	0.057	0.834	-0.195*	-0.063	-0.007	0.741	0.061	0.009	-0.013	0.363	0.160	0.746	-0.053	0.86	-0.160	0.109	-0.181	0.749	-0.030	0.082	-0.130

Table 6. Continued

Self-Acceptance out of 42)	Purpose In Life (out of 42)	Positive Relation withOthers (out of 42)	Personal Growth (out of 42)	Environmental Mastery (out of 42)	Autonomy (out of 42)	VO_2max(ml/ Kg/min)
0.029	0.052	0.116	0.019	-0.061	1	0.088
0.129	-0.081	0.056	0.098	0.023	1	-0.055
0.094	-0.106	0.015	-0.042	0.125	1	0.055
0.136	-0.011	-0.030	0.055	-0.015	1	0.237*
0.15	0	0.005	0.012	1	-0.061	0.033
-0.073	-0.015	-0.165	0.054	1	0.023	-0.024
0.094	-0.106	0.015	-0.042	1	0.125	-0.111
-0.017	0.084	0.171	0.241*	1	-0.015	0.088
-0.003	0.034	0.088	1	0.012	0.019	0.217*
0.134	0.319*	-0.065	1	0.054	0.098	0.336**
0.154	0.159	0.034	1	-0.072	0.406**	0.235**
-0.017	0.272*	0.043	1	0.241**	0.055	0.103
0.104	0.225*	1	0.088	0.005	0.116	0.222*
0.150	0.293*	1	-0.065	-0.165	0.056	0.009
0.154	0.159	1	0.034	0.136	0.015	0
0.099	-0.010	1	0.043	0.171	0.754	0.217*
0.065	1	0.224*		0	0.052	0.317**
-0.167*	1	0.293**	0.319**	-0.015	-0.081	0.330**
0.064	1	0.112	0.159	-0.010	-0.106	-0.004
-0.048	1	-0.010	0.272**	0.084	-0.011	0.316**
1	0.065	0.104	0.003	0.15	0.029	0.257**
1	0.167*	0.150	0.134	-0.073	0.129	0.178*
1	0.064	0.157	0.154	0.191*	0.094	0.056
1	-0.048	0.099	0.157	-0.017	0.136	0.198*
0.484**	0.507**	0.555**	0.382**	0.397**	0.442**	0.350**
0.510**	0.598**	0.483*	0.541**	0.235**	0.462**	0.269**
0.587**	0.405**	0.550**	0.418**	0.464**	0.406**	0.083
0.430**	0.459**	0.407**	0.617**	0.494**	0.432**	0.411**

Table 7. Estimated marginal means to study the significant difference as an interaction effect between **PAL** and **PAC** on combined dependent variables

Dependent Variable	Type III Sum of Squares	df	Mean square	F	Sig.	Partial Eta Squared
AGE (yrs)	229.532	2	114.766	21.239	0	0.078
METDAY	36.728	2	18.364	13.784	0	0.052
HEIGHT (cm)	735.872	2	367.936	2.886	0.057	0.011
WEIGHT (kg)	2065.609	2	1032.805	5.352	0.005	0.021
BMI	121.413	2	60.706	4.801	0.009	0.019
VO_2max (ml/kg/min)	895.267	2	447.634	4.082	0.017	0.016
AUTONOMY (out of 42)	33.604	2	16.802	0.59	0.555	0.002
ENVIRONMENTAL MASTERY (out of 42)	430.55	2	215.275	11.163	0	0.043
PERSONAL GROWTH (out of 42)	27.421	2	13.711	0.604	0.547	0.002
POSITIVE REALTIONS WITH OTHERS (out of 42)	163.165	2	81.582	3.18	0.042	0.012
PURPOSE IN LIFE (out of 42)	59.934	2	29.967	1.236	0.291	0.005
SELF ACCEPTANCE (out of 42)	14.575	2	7.288	0.319	0.727	0.001
TOTAL PWB (out of 252)	1750.829	2	875.415	4.646	0.01	0.018

4. Discussion

4.1. Role of Organized Sports Participation in Recommended Daily PALs

Children of ages 6-17 years of age are advised to practice moderate to vigorous level of physical exercise daily for about 60 minutes, specially focused upon a minimum three days of vigorous physical activity per week [11]. Also, time spent in moderate to vigorous physical activity (MVPA) has been found to have associations with multiple cardiometabolic risk factors independent of other confounding factors including sedentary behavior [12]. In our study, significant negative association exists between PA in METs and BMI. Regarding the role of sports participation, it has been found that competitive sports participation helps the children and youth to comply with the recommended daily PALs [13]. The fact can be backed up by the results of our study too, as AA adolescents were found to be significantly higher mean values for METs than non-athletic adolescents. However, the same can vary depending upon the frequency, intensity and duration as per various sporting disciplines. In the findings of the study conducted on adolescents from Delhi/NCR, it was found that majority of NAA were undergoing LPA followed by MPA and only five of them were undergoing VPA. The trend is in contrast with the daily recommended guidelines. The outcomes of the study conducted suggest that participation in organized sports can be encouraged as an interventional strategy as the data from AA clearly shows that in majority of them, the PALs belonged to VPA followed by relatively lesser no. in MPA and LPA. When comparison between males and females is talked about regarding the PALs, it was seen that no. of females in LPA were comparatively higher than males in NAA group, while distribution in LPA, MPA and VPA was similar both for males and females in AA group. Also, an evident association has been reported between PAL and PAC which elucidates the fact that being athletic or non-athletic is related to level of the physical activities performed.

A significantly higher age was reported for those in LPA than that of MPA and VPA suggesting a decrease in PAL with increasing age in adolescents of Delhi/NCR. There was a significant difference reported in terms of age, PA, weight, BMI, VO_2max, environmental mastery, positive relations with others and total PWB as an interaction effect between PAL and PAC explaining the difference in physical and psychological parameters in various PALs among AA and NAA.

4.2. Obesity in Global and Indian Context

Obesity is increasing globally in an epidemic proportion. Previously well-known problem of western world, it has now been reflected in few conducted studies in developing countries too [14]. A rapid 8% of increase has been reported in New Delhi adolescents itself from the year 2002 to 2006-2007 [14]. In a similar study published in 2011, the combined prevalence of being overweight and obese among 12-18 years of youth was found to be 16.6% which is now at par with that of the developed world [15], [16]. While in another study on school going children of Delhi, 9.5% were overweight and 11.5% were obese [17]. In our study, out of total adolescents participated, 31.6% belonged to overweight category and 3.5% were obese. On segregating the data in AA and NAA, 13.1% of AA were found to be overweight and only 1.5% were obese owing to their nature of sports which particularly were judo, boxing

and shooting. On contrary, 18.4% of NAA were overweight and 1.96% were obese as per Asian classification of BMI. It can be emphasized that our study reports an increase in prevalence of overweight adolescents in Delhi along with a decreasing trend in obesity in recent times. Also, prevalence of overweight children and youth in NAA population is higher than AA while weight and BMI of LPA group was significantly higher than MPA.

4.3. Physical Activity and Psychological Well-Being

Physical activity can act as a medium for preventing mental illness, fostering positive emotions and acts as a buffer against daily stress levels [1]. Also, if performed at higher intensities like that in competitive sports, would lead to more extensive, stronger and sustained neurobiological changes [18]. Following the similar trend in our study, AA were found with significantly better scores for personal growth, positive relations with others, purpose in life, self-acceptance and total psychological well-being. There is a paucity of data exploring the effects of obesity on mental health of children. Available literature suggests that obesity leads to altered and undesirable behavioral changes in obese children [19]. Our data presents a significant negative relationship of BMI with that of personal growth. In context of CRF, a positive significant association was reported between VO_2max and scores for autonomy in NAF, personal growth in AM, AF and NAM, positive relations with others in AM and NAF, purpose in life in AM, AF and NAF, self-acceptance in AM, AF and NAF and for total PWB in AM, AF and NAF.

4.4. Physical Activity and Cardiorespiratory Fitness

CRF has been found to be associated with clustering of risk factors responsible for cardiovascular disease (CVD) following a trajectory from adolescence through adulthood [13]. Physical activity and moderate to vigorous levels of exercise are supposed to bring about favorable changes in CRF and CVD risk factors [13]. In our study, those practicing VPA possessed higher VO_2max than MPA and LPA. Moreover, children and youngsters who participate in sports represent better CRF than their non-participant peers as the former group is able to accomplish the required PAL and energy expenditure [13]. The findings of our study also suggests that AA were having significantly better VO_2max than NAA. Also, Physical activity has been found to have significant positive association with VO_2max in AM and NAM.

5. Conclusion

Physical activity at moderate to vigorous levels is required as a holistic approach towards enhanced mental health and well-being. The inculcation of the lifestyle of a sportsperson by the adolescents specially situated in urban areas like that of national capital, Delhi would get them rid of the poor eating habits and would enhance their physical activity allowing lesser screen time. Moreover, being involved in sports assures of a more consistent adherence to an active day to day behavior. In a long run regular participation in sports during growing years lays the foundation for a mentally and physically sound adulthood. Sports participation can play the role of a treatment modality for managing the wide range of psychological problems in the growing children**.**

Acknowledgements

I want to acknowledge the contribution of each and every person/organization involved in carrying out the research. I am thankful to all the athletes of Sports Authority of India and their coaches to extend their full support in data collection. I am thankful to all the non-athletic participants and their guardians/parents for their immense cooperation in carrying out the research. I want to acknowledge Head of the Department, Amity Institute of Anthropology, Amity University (Uttar Pradesh) for providing me the guidance and resources to carry out the research. In the end I would like to thank my family and friends for their constant support without which this research was not possible.

REFERENCES

[1] J. E. Maddux and S. J. Lopez. Deconstructing the Illness Ideology and Constructing an Ideology of Human Strengths and Potential in Clinical Psychology. 2015.

[2] R. Guthold, G. A. Stevens, L. M. Riley, and F. C. Bull. Global trends in insufficient physical activity among adolescents: a pooled analysis of 298 population-based surveys with 1·6 million participants, Lancet Child Adolesc. Heal., vol. 4, no. 1, pp. 23–35, 2020, doi: 10.1016/S2352-4642(19)30323-2.

[3] M. S. Tremblay *et al.*, Global matrix 2.0: Report card grades on the physical activity of children and youth comparing 38 countries, J. Phys. Act. Heal., vol. 13, no. 11, pp. S343–S366, 2016, doi: 10.1123/jpah.2016-0594.

[4] T. Carlton *et al.* Objective Assessment of Physical Activity and Associated Contexts During High School Sport Practices, Front. Sport. Act. Living, vol. 3, no. July, pp. 1–10, 2021, doi: 10.3389/fspor.2021.548516.

[5] E. Ekblom-Bak, Ö. Ekblom, G. Andersson, P. Wallin, and B. Ekblom. Physical education and leisure-Time physical activity in youth are both important for adulthood activity, physical performance, and health, J. Phys. Act. Heal., vol. 15, no. 9, pp. 661–670, 2018, doi: 10.1123/jpah.2017-0083.

[6] C. Ferron, F. Narring, M. Cauderay, and P. A. Michaud. Sport activity in adolescence: Associations with health perceptions and experimental behaviours, Health Educ.

Res., vol. 14, no. 2, pp. 225–233, 1999, doi: 10.1093/her/14.2.225.

[7] A. D. Okely. The Adolescent Physical Activity and Recall Questionnaire (APARQ), Obes. Res., pp. 2–7, 2006.

[8] B. E. Ainsworth *et al.*, 2011 compendium of physical activities: A second update of codes and MET values, Med. Sci. Sports Exerc., vol. 43, no. 8, pp. 1575–1581, 2011, doi: 10.1249/MSS.0b013e31821ece12.

[9] L. A. Léger, D. Mercier, C. Gadoury, and J. Lambert. The multistage 20 metre shuttle run test for aerobic fitness, J. Sports Sci., vol. 6, no. 2, pp. 93–101, 1988, doi: 10.1080/02640418808729800.

[10] D. van Dierendonck, D. Díaz, R. Rodríguez-Carvajal. A. Blanco, and B. Moreno-Jiménez, Ryff's six-factor model of psychological well-being, a Spanish exploration, Soc. Indic. Res., vol. 87, no. 3, pp. 473–479, 2008, doi: 10.1007/s11205-007-9174-7.

[11] B. W. Landry and S. W. Driscoll. Physical activity in children and adolescents, PM R, vol. 4, no. 11, pp. 826–832, 2012, doi: 10.1016/j.pmrj.2012.09.585.

[12] U. Ekelund, J. Luan, L. B. Sherar, D. W. Esliger, P. Griew, and A. Cooper. Moderate to vigorous physical activity and sedentary time and cardiometabolic risk factors in children and adolescents, JAMA - J. Am. Med. Assoc., vol. 307, no. 7, pp. 704–712, 2012, doi: 10.1001/jama.2012.156.

[13] G. Silva, L. B. Andersen, L. Aires, J. Mota, J. Oliveira, and J. C. Ribeiro. Associations between sports participation, levels of moderate to vigorous physical activity and cardiorespiratory fitness in childrenand adolescents, J. Sports Sci., vol. 31, no. 12, pp. 1359–1367, 2013, doi: 10.1080/02640414.2013.781666.

[14] S. Bhardwaj, A. Misra, L. Khurana, S. Gulati, P. Shah, and N. K. Vikram. Childhood obesity in Asian Indians: A burgeoning cause of insulin resistance, diabetes and sub-clinical inflammation, Asia Pac. J. Clin. Nutr., vol. 17, no. SUPPL. 1, pp. 172–175, 2008.

[15] M. H. Stigler, M. Arora, P. Dhavan, R. Shrivastav, K. S. Reddy, and C. L. Perry. Weight-related concerns and weight-control behaviors among overweight adolescents in Delhi, India: A cross-sectional study, Int. J. Behav. Nutr. Phys. Act., vol. 8, pp. 4–9, 2011, doi: 10.1186/1479-5868-8-9.

[16] M. Arora, G. P. Nazar, V. K. Gupta, C. L. Perry, K. S. Reddy, and M. H. Stigler. Association of breakfast intake with obesity, dietary and physical activity behavior among urban school-aged adolescents in Delhi, India: Results of a cross-sectional study. BMC Public Health [Internet]. 2012;12(1):1. Available from: BMC Public Health

[17] G. M. George, K. K. Sharma, S. Ramakrishnan, S.K. Gupta. A study of cardiovascular risk factors and its knowledge among school children of Delhi. Indian Heart J [Internet]. 2014;66(3):263–71. Available from: http://dx.doi.org/10.1016/j.ihj.2014.03.003

[18] T. Nakagawa, I. Koan, C. Chen, T. Matsubara, K. Hagiwara, H. Lei, et al. Regular moderate- to vigorous-intensity physical activity rather than walking is associated with enhanced cognitive functions and mental health in young adults. Int J Environ Res Public Health. 2020;17(2).

[19] R. Sagar, T. GuptA, Psychological Aspects of Obesity in Children and Adolescents. Indian J Pediatr. 2018;85(7):554–9.