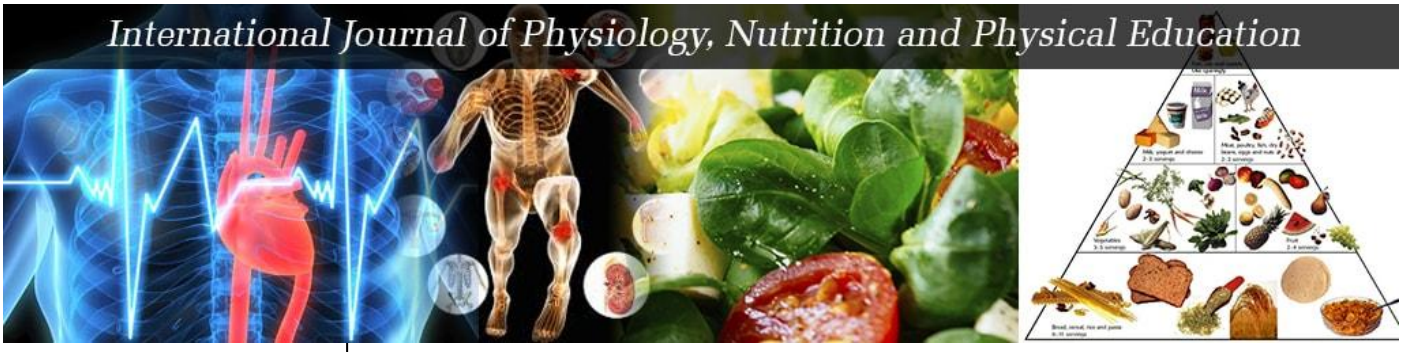

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Relationship between levels of physical activity and health-related quality of life in male university students

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Abstract
More information is needed about the relationship between physical activity level and different dimensions of health related quality of life. The objective of the study was to discover the relationship between levels of physical activity (low, moderate and high) and various dimensions of Health related quality of life (Physical functioning, Role functioning, Role limitation, Fatigue, Emotional wellbeing, Social functioning, Pain and General health). The IPAQ long form was used to assess physical activity level and health related quality of life was determined by SF-36 questionnaire. Data was analysed by applying one-way multivariate analysis of variance (MANOVA). Both independent (physical activity level) and dependent (Health-related quality of life) were significantly related to each other ($p<.05$). Further, physical activity level has significant effect on the variable Social functioning, Pain and General health ($p<.05$).

Keywords: Physical activity, level, health, male, university

Introduction
The importance of Physical activity in the avoidance of prolonged ailments is evidently well stranded (Blair & Morris, 2009) [1]. However, there is paucity of evidence for the association between physical activity and health-related quality of life (HR QoL) (Bize *et al*., 2007) [2], particularly in specific non-clinical people, such as university students in India. "Health related quality of life" is a multifarious paradigm that symbolizes the subjective observation of individual's health (Ware *et al*., 2002) [3]. Various components of life quality and health, such as Physical Functioning, Role Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role Emotional, Mental Health, Sleep Adequacy, Cognitive Functioning, Sexual Functioning and Family Functioning cover the scope of this construct (Ware *et al*., 1998) [4]. Earlier research have confirmed "Health related quality of life" to be a significant pointer of health status (Gold *et al*., 1996) [5] and a strongly explains medical care application (Pu *et al*., 2012) [6]. This is additionally supported by the findings of longitudinal studies that predict lesser mortality-rates in individuals with a greater "Health related quality of life" (Kaplan *et al*., 2007) [8]. The outcomes of preceding studies on the overall adult populations have showed that Physical activity is directly associated to "Health related quality of life" (Bize *et al*., 2007) [2]. A study carried out in the common population of Croatia has showed that "Health related quality of life" is directly correlated to leisure-time Physical activity, but negatively associated to Physical activity in transportation and household domains (Jurakić *et al*., 2010) [8]. This study is an attempt to discover the associations between physical activity levels and different facets of the construct "Health related quality of life".

Methods and procedures
Sample
Sample consisted of 111 male participants of various departments of Guru Nanak Dev University Amritsar, Punjab, India. They were told the objectives and procedures of the study and verbal consent was taken to participate in the study. The participants were given two questionnaires to fill, one for assessment of their physical activity level and another for self-reported health related quality of life.

Measures

Physical Activity Level

Physical activity levels were assessed using International Physical Activity Questionnaire (Long Version, 2002). The instrument comprises of 27 questions regarding physical activity done during last seven days. The questionnaire provides data about the total physical activity levels, intensity-specific scores and domain-specific scores and sedentary behaviour. However, the present study is confined only to total physical activity scores. IPAQ guidelines were used to clean and truncate data (www.ipaq.ki.se). Data were presented in numerical terms as MET (metabolic equivalents of task) values. Energy valuation for a specific activity was done by consulting compendium of physical activity (Ainsworth, 1993) [10].

Health-related quality of life

Health related quality of life was assessed using the 36-item Short-Form Health Survey. Scores in eight spheres/scales of "Health related quality of life" were calculated: Physical Functioning, Role Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role Emotional and Mental Health.

Statistical Analyses

IBM SPSS statistical package version 21 was used to analyze the data. The relationship between independent and dependent variable was tested by running one-way multivariate analyses of variance (MANOVA). Prior to running MANOVA, it was ascertained whether data fulfill the assumptions of applications. The assumption of normality of data was tested using Shapiro-Wilk test. Since the data was accomplishing the key assumptions, the test was run at alpha level of 0.05. Relationship between dependent and independent variables were inferred from Wilk's Lambda scores. Bonferroni post hoc test was applied for multiple comparisons between variables.

Results and Discussion

Table 1: Descriptive Statistics of Health related quality of life with respect to Physical activity level

Variable	PAL	Mean	Std. Deviation	N
Physical Functioning	High	69.60	19.681	25
	Low	80.00	22.804	6
	Moderate	77.38	20.173	80
	Total	75.77	20.296	111
Role Functioning	High	55.00	32.275	25
	Low	66.67	34.157	6
	Moderate	58.75	36.042	80
	Total	58.33	34.924	111
Role Limitation	High	58.6692	35.06536	25
	Low	61.1133	32.77352	6
	Moderate	68.7521	34.10105	80
	Total	66.0683	34.22390	111
Fatigue	High	55.60	33.050	25
	Low	64.17	33.229	6
	Moderate	54.31	36.350	80
	Total	55.14	35.249	111
Emotional Wellbeing	High	66.320	25.7208	25
	Low	77.667	11.2012	6
	Moderate	67.725	18.2770	80
	Total	67.946	19.8933	111
Social Functioning	High	68.000	25.5359	25
	Low	77.083	12.2899	6
	Moderate	79.688	19.0119	80
	Total	76.914	20.7938	111
Bodily Pain	High	61.70	17.135	25
	Low	30.42	10.888	6
	Moderate	48.50	21.501	80
	Total	50.50	21.328	111
General Health	High	71.00	8.593	25
	Low	51.95	9.481	6
	Moderate	63.00	9.543	80
	Total	64.20	10.264	111

Table 2: Relationship between Independent and dependent variables

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta squared
Physical activity level	Wilks' Lambda	.511	5.044	16.000	202.000	0.001*	.285

It can be inferred from results of table 2 ($F (16, 200) = 5.044$ $P<0.05$, Wilk's $\wedge = .511$; partial $\eta^2 = 0.285$) that health related quality of life is significantly dependent on physical activity level.

Table 3: Tests of Between-Subjects Effects

Dependent Variable	Type III Sum of Squares	DF	Mean Square	F	Sig.	Partial Eta Squared
Physical Functioning	1265.160	2	632.580	1.551	.217	.028
Role Functioning	708.333	2	354.167	.287	.751	.005
Role Limitation	2092.211	2	1046.105	.891	.413	.016
Fatigue	548.952	2	274.476	.218	.805	.004
Emotional Wellbeing	636.952	2	318.476	.802	.451	.015
Social Functioning	2602.041	2	1301.021	3.125	.048*	.055
Bodily Pain	5876.039	2	2938.020	7.186	.001*	.117
General Health	2172.308	2	1086.154	12.457	.000*	.187

Table 3 shows the results of tests between-subjects effects. It is evident from the table that physical activity level has significant effect on the variable Social functioning (F (2) = 3.125, $p<.05$; partial η^2 =.055), Bodily Pain (F (2) = 7.186, $p<.05$; partial η^2 =.117) and General health (F(2) = 12.457, $p<.05$; partial η^2 =.187). Conversely, no significant effects were found on the variable Physical functioning, Role functioning, Role limitation, Fatigue, and Emotional wellbeing.

Table 4: Multiple comparisons among variables

Dependent Variable	(I) Physical activity level	(J) Physical activity level	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Physical Functioning	High	Low	-10.40	9.181	.779	-32.73	11.93
		Moderate	-7.78	4.627	.287	-19.03	3.48
	Low	High	10.40	9.181	.779	-11.93	32.73
		Moderate	2.63	8.548	1.000	-18.16	23.41
	Moderate	High	7.78	4.627	.287	-3.48	19.03
		Low	-2.63	8.548	1.000	-23.41	18.16
Role Functioning	High	Low	-11.67	15.981	1.000	-50.53	27.20
		Moderate	-3.75	8.055	1.000	-23.34	15.84
	Low	High	11.67	15.981	1.000	-27.20	50.53
		Moderate	7.92	14.880	1.000	-28.27	44.10
	Moderate	High	3.75	8.055	1.000	-15.84	23.34
		Low	-7.92	14.880	1.000	-44.10	28.27
Role Limitation	High	Low	-2.4441	15.57378	1.000	-40.3171	35.4288
		Moderate	-10.0829	7.84944	.605	-29.1715	9.0057
	Low	High	2.4441	15.57378	1.000	-35.4288	40.3171
		Moderate	-7.6388	14.50065	1.000	-42.9021	27.6245
	Moderate	High	10.0829	7.84944	.605	-9.0057	29.1715
		Low	7.6388	14.50065	1.000	-27.6245	42.9021
Fatigue	High	Low	-8.57	16.140	1.000	-47.82	30.68
		Moderate	1.29	8.135	1.000	-18.49	21.07
	Low	High	8.57	16.140	1.000	-30.68	47.82
		Moderate	9.85	15.027	1.000	-26.69	46.40
	Moderate	High	-1.29	8.135	1.000	-21.07	18.49
		Low	-9.85	15.027	1.000	-46.40	26.69
Emotional Wellbeing	High	Low	-11.347	9.0599	.639	-33.379	10.686
		Moderate	-1.405	4.5664	1.000	-12.510	9.700
	Low	High	11.347	9.0599	.639	-10.686	33.379
		Moderate	9.942	8.4357	.724	-10.572	30.456
	Moderate	High	1.405	4.5664	1.000	-9.700	12.510
		Low	-9.942	8.4357	.724	-30.456	10.572
Social Functioning	High	Low	-9.083	9.2755	.989	-31.640	13.473
		Moderate	-11.688*	4.6750	.042	-23.056	-.319
	Low	High	9.083	9.2755	.989	-13.473	31.640
		Moderate	-2.604	8.6363	1.000	-23.606	18.398
	Moderate	High	11.688*	4.6750	.042	.319	23.056
		Low	2.604	8.6363	1.000	-18.398	23.606
Bodily Pain	High	Low	31.28*	9.193	.003	8.93	53.64
		Moderate	13.20*	4.633	.016	1.93	24.47
	Low	High	-31.28*	9.193	.003	-53.64	-8.93
		Moderate	-18.08	8.559	.111	-38.90	2.73
	Moderate	High	-13.20*	4.633	.016	-24.47	-1.93
		Low	18.08	8.559	.111	-2.73	38.90
General Health	High	Low	19.06*	4.245	.000	8.73	29.38
		Moderate	8.00*	2.140	.001	2.80	13.20
	Low	High	-19.06*	4.245	.000	-29.38	-8.73
		Moderate	-11.06*	3.952	.018	-20.67	-1.44
	Moderate	High	-8.00*	2.140	.001	-13.20	-2.80
		Low	11.06*	3.952	.018	1.44	20.67

Based on observed means.
The error term is Mean Square (Error) = 87.192.
*. The mean difference is significant at the.05 level.

Table 4 depicts the scores of post hoc test for multiple comparisons between physical activity levels and the variables of "Health related quality of life". There were no statistical differences found on the variable Physical functioning, Role functioning, Role limitation, Fatigue, and Emotional wellbeing. However, mean scores for social functioning were statistically significantly different between moderate and high level of physical activity ($p<.05$) but not between low and highly active and low and moderately active participants. On the contrary, the mean scores for the variable bodily pain were statistically significantly different between low and highly active ($p<.05$) and moderately and highly active ($p<.05$) but not between low and moderately active. For General health, between group differences were found among all three categories viz. low vs. moderately active ($p<.05$), low vs. highly active ($p<.05$) and moderately vs. highly active participants ($p<.05$). It was found that moderately active participants possessed more social functioning than the highly active participants. On the other hand, low and moderately active scored poor than highly active participants on the variable bodily pain. Furthermore, highly active participants possessed better general health as compared to their counterparts moderately and low active participants.

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