ORIGINAL ARTICLE

Association of physical activity on exercise motivation and body mass index among university students

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

Abstract

Background and Study Aim: Motivation as a psychological feature that arouses and energizes people to action towards physical activity and makes them sustain to a physically active behavior. Motivation leads to increased participation in physical activity. The objective of this study was to determine the association of physical activity to exercise motivation of university students at different levels of body mass index.

Material and Methods: 140 undergraduate students Mean age 19±0.70 years randomly categorized into underweight <18.5 kg/m^2 [n= 37: 26.4%]; normal-weight 18.5-24.9 kg/m^2 [n= 31: 22.1%]; obese ≥30.00 kg/m^2 [n=37: 26.4%] and obese class III ≥40.00 kg/m^2 [n=35: 25%]. Exercise motivation measured through BREQ-2.

Results: ANOVA revealed highly significant difference among BMI categories on intrinsic regulation (p=0.007<.05) and identified regulation (p=0.006<.05). Obese class III students differed on external regulation (p=0.003) and introjected regulations (p=0.011). The association of physical activity to exercise motivation revealed that students who engaged more time in physical activities had significantly higher scores on identified regulation (p < 0.05) and intrinsic regulation (p < 0.01).

Conclusions: The results suggested that university students in all BMI categories were internally motivated. The normal weight students exhibited high intrinsic and identified regulation, which reflected as better autonomous motivation. Physical activity had strong association with intrinsic regulation and identified regulation. Obese class students exhibited higher degree of extrinsic motivation and amotivation. Students who engaged more time in physical activity had better intrinsic motivation.

Keywords: body mass index, exercise motivation, physical activity, intrinsic motivation

Introduction

Motivation is a critical factor in physical activity because increased motivation leads to increased participation in physical activity [1]. Motivation is a psychological feature that arouses and energizes people to action, towards physical activity and makes them sustain to a physically active behavior. Consistent physical activity helps to maintain the physical functioning of the human body, improves mental wellbeing [2]. Clearly, the college years are an important time to promote college and university students' physical activity motivation and behaviors [3]. Enjoyment and satisfaction have been linked more strongly to sport participation than to physical activity, which also supports the association between intrinsic motivation and consistent target oriented physical activity [4].

Roberts [5] defined motivation as the investigation of the energization, direction and regulation of behavior. While there are many theories of motivation many are limited in scope, and there is a lot of conceptual commonality between them. Self-Determination Theory (SDT) [6] is a valuable theoretical framework that has been applied to explain motivational processes in physical education and activity contexts [7]. Self- Determination Theory suggests that motivation lies on the continuum of several regulations of self-determined motivation. The highest degree of self-determined motivational regulation is intrinsic regulation, which is activated in feelings of enjoyment, interest, satisfaction, and pleasure when participating in an activity. Identified regulation is the form of high self-determined motivational regulation to be recognized when engaging in an activity for personal values or benefits such as physical and mental health. Introjected regulation is the form of partially internalized motivation regulated by self-imposed sanctions including pride and self-respect or anxiety when engaging in an activity. External regulation is the form of the least self-determined motivation which is typically controlled by external contingencies such as rewards and praises or pressure when participating in an activity [8-10].

Autonomous motivation represents a form of intrinsic regulation and identified regulation because they involve self-endorsed experiences, such as volition, satisfaction, freedom, and self-directed decision making [9]. According to the results of previous studies conducted in physical activity settings based on SDT [11-13]; autonomous motivation rather than controlled motivation such as external and introjected regulations have a positive effect on physical activity outcomes. Hence, it is reasonable to utilize the two motivational regulations of autonomous motivation to trace a meaningful connection to physical activity behavior in the present study.

Physical activity levels of university students have significantly decreased all over the world in recent years. According to the World Health Organization, most of university students aged 18-23 years in global regions do

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not meet the global recommendation to participate in at least 75 minutes of moderate intensity aerobic physical activity throughout a week [14]. Grasdalsmoen and colleagues revealed that the proportion of overweight is increasing in both genders and across all age groups [15]. Therefore, the students face more serious health problems, such as obesity, coronary heart disease, high blood pressure, and type 2 diabetes than the younger age group. Many of study findings demonstrated that compared to inactive behaviors, active life styles or increased physical activity levels can contribute to less health risks, a healthier body mass, and weight maintenance [16, 17]. Though there are multiple factors to engage in physical activity, previous studies found that motivation is a critical determinant of sports and exercise involvement and recognized as an important prediction in positive changes of physical activity behaviors [18, 19].

The prevalence and level of overweight and obesity is rapidly increasing. According to the key facts reported by WHO, most of the world's population lives in countries where overweight and obesity, kill more people than underweight [20]. Body mass index ≥ 30 kg/m^2 is considered as obesity, major public health issue. Saudi Arabia has become more westernized over the years and prevalence of overweight and obese population is alarmingly increasing [21]. In 2005, Coronary Artery Disease in Saudis Study (CADISS) estimated an overall obesity prevalence of 35.5% in the Kingdom: in other words, one in every three people in the country is obese. Obesity reflects a continued positive energy balance, which is accompanied by unhealthy weight gain and is linked to physical inactivity. According to Forbes magazine reported in 2007, Saudi Arabia with the most overweight people, and was ranked 29th in the world with 68.3% of the population declared as having "an unhealthy weight". Physical inactivity is one of the potential factors in the emergence of obesity [22].

A recent national study revealed that one out of four adult males and one out of three adult females suffer from obesity [23]. The two most contributing factors leading to obesity epidemic in Saudi Arabia are intake of imbalanced diet and lack of regular physical activities [24, 25]. Studies revealed that prevalence of overweight and obesity among male college students in Saudi Arabia is 21.8% and 15.7%, respectively [26]. Another study documented that 49.8% of male undergraduate students were either overweight or obese [27].

The maintenance of adequate levels of physical activity is a critical issue among college students as they learn to cope with a new independent lifestyle. Moreover, fifty percent of the college students report a decrease in physical activity after high school graduation. Even though students generally have access to resources (i.e., equipment and exercise facilities), are well informed about physical activity and have a supportive social network [28, 29]. The decrease in physical activity is mainly attributed to their new campus environment, an independent life away from their parents, coupled with their demanding work-study schedule.

Physical activity is a major contributor to controlling body weight [30]. Overall, physical activity, obesity and motivation for exercise among students present a major challenge. Thus, the objective of this study was to determine the association of physical activity to exercise motivation of university students at different levels of body mass index.

Material and Methods

Participants

The study included 140 undergraduate students voluntarily recruited from the King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia. The sample categorized into underweight 37 (26.4%), normal-weight 31 (22.1%), obese 37 (26.4%) and the remaining 35 (25%) were in obese-III students. The age of the students was ranging from 17-21 years with mean (SD) 19.00 (0.70) years. On the basis of BMI, four categories were formed as underweight <18.5 kg/m^2, normal weight 18.5-24.9 kg/m^2, obese ≥30.00 kg/m^2 and obese class III ≥40.00 kg/m^2.

Research Design.

Collection of Data

Information about the project was discussed in the classroom and students who expressed interest were asked to provide their general individual information like (age, course of study, height, weight, duration and frequency of physical activity per week). The students were categorized randomly according to their body mass index. Exclusion criteria (1) participants who were not residing in the campus (2) participants not involved in any form of physical activities regularly during last six months (3) those who were on prescribed medication (4) those having cardiovascular diseases. The approval was obtained from the research committee, Deanship of Scientific Research, KFUPM. The test procedures were explained prior to the enrolment, confidentiality was ensured and participants provided their written informed consent. Data collected through a valid questionnaire in the classroom settings.

Measures

Exercise motivation was determined by using Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2) [31]. It comprised of 19-item questionnaire that used a 5- item Likert-type rating scale to determine the underlying reasons for people to engage, or not engage in physical exercise, and was developed to measure the continuum of behavioral regulation in an exercise. It measures amotivation, external, introjected, identified, and intrinsic regulation of exercise behavior.

The reversed items on perceived self-description questionnaires (BREQ-2) were re-coded for the analysis so that higher scores on all items indicating higher perceived competence and more positive self-concept. Domain-specific score for the exercise motivation questionnaire were calculated as the mean score of corresponding items in a domain. A composite index of self-determined motivation, the relative autonomy index (RAI), was calculated using the individual scale average scores as

follows: Relative autonomy index (RAI) = +3(intrinsic motivation) +2(identified regulation) – 1(introjected regulation) −2(external regulation) – 3(amotivation). RAI index scores range from −24 (strongly not self-determined) to 20 (highly self-determined). A reliability analysis revealed that the internal consistency values (Cronbach's alpha coefficient) ranged from .70 to .88 for the different regulations for males and females.

Statistical Analysis

Categorical data were summarized using frequency, number and percentage and continuous data were summarized using mean and Standard Deviation (SD). To determine the differences in BREQ-2 domains among BMI categories, analysis of variance (ANOVA) and Kruskal-Wallis test (depends on the normality of the data) was calculated. To find out the association between physical activity and exercise motivation two sample independent t-test (Mann-Whitney test) was used to compare quantitative variables between two groups. The criterion for statistical difference was set at .05 level of confidence. The data were analyzed with the IBM SPSS Statistics 24.0.

Results

Table 1described the physical characteristics of the sample. One-hundred and forty students, aged between 17 to 21 years with mean (SD) of 19 (0.70) years participated in this study. The sample categorized into underweight 37 (26.4%), normal-weight 31 (22.1%), obese 37 (26.4%) and the remaining 35 (25%) were in obese-III students. The BMI of each category was 17.26 kg/m2, 21.51 kg/m2, 36.35 kg/m2 and 43.86 kg/m2 respectively. The physical activity data revealed that normal weight students engaged more hours in physical activity and very few obese students are engaged in physical activity (PA) more than 120 min.

Table 2 expressed ANOVA highly significant difference among BMI categories on intrinsic regulation (p=0.007<.05), identified regulation (p=0.006<.05) where normal weight students expressed highest

Table 1. Description of Physical Characteristics of Participants

Variables	Under-weight (N=37)	Normal (N=31)	Obese (N=37)	Obese-III (N=35)	p-value
Age (years)	19 (1.00)	19 (1.00)	18 (1.00)	19 (1.00)	0.001
Weight(kgs)	51.78 (4.46)	64.84 (12.25)	111.59 (12.00)	131.14 (14.31)	<0.001
Height (cms)	173 (7.00)	173 (8.00)	175 (8.00)	173 (8.00)	0.582
BMI (kg/m^2)	17.26 (0.87)	21.51 (3.05)	36.35 (2.02)	43.86 (3.38)	<0.001
Physical Activity (PA) per Week (in minutes)[+]					
60 min.	17 (45.9%)	2 (6.5%)	19 (51.4%)	17 (48.6%)	<0.001
90 min.	11 (29.7%)	8 (25.8%)	8 (21.6%)	8 (22.9%)	
120 min.	4 (10.8%)	9 (29%)	6 (16.2%)	8 (22.9%)	
150 min.	5 (13.5%)	12 (38.7%)	4 (10.8%)	2 (5.7%)	

[+]Reported as number (% within each BMI levels)

Table 2. Mean (SD) Score and ANOVA of Exercise Motivation Domains

Exercise Motivation Domains	Under-weight	Normal	Obese	Obese-III	p-value
Amotivation	0.71 (0.99)	0.52 (0.58)	0.53 (0.67)	0.41 (0.52)	0.799[+]
External Regulation	0.74 (0.73)	0.82 (0.72)	1.16 (0.80)	1.26 (0.86)	<0.011
Introjected Regulation	1.77 (1.03)	2.26 (0.92)	2.15 (0.95)	2.63 (0.88)	<0.003
Identified Regulation	2.51 (0.83)	3.02 (0.69)	2.73 (0.74)	3.04 (0.6)	<0.006
Intrinsic Regulation	2.57 (0.95)	3.18 (0.80)	2.5 (0.81)	2.76 (0.84)	<0.007
Relative autonomy index (RAI)	7.35 (6.60)	10.1 (4.28)	6.88 (5.05)	7.98 (4.96)	0.166[+]

[+]Kruskal-Wallis test used to compare the score; otherwise ANOVA was used. Significant at 0.05 level

(M±SD=3.18±.0.8) and (M±SD=3.02±.0.69) respectively. Whereas, obese class III students significant differed on external regulation (p=0.003) and introjected regulations (p=0.011). No significant difference was observed on amotivation as the p-values were higher than .05 levels. Though a high average relative autonomy index (RAI) score was observed among normal weight participants compared to other BMI categories, the difference was not statistically significant (p- value =0.166).

Figure 1 shows the graphical representation of the domain scores of exercise motivation among students at different BMI levels.

Table 3 reports means and standard deviations of motivation level in all the BREQ domains by duration physical activity per week. The results indicated that the students who are engaged in physical activities more than 90 minutes had significantly higher scores on the subscales identified regulation ($p < 0.05$) and intrinsic regulation ($p < 0.01$) compared to the other groups doing physical activity less than 90 minutes.

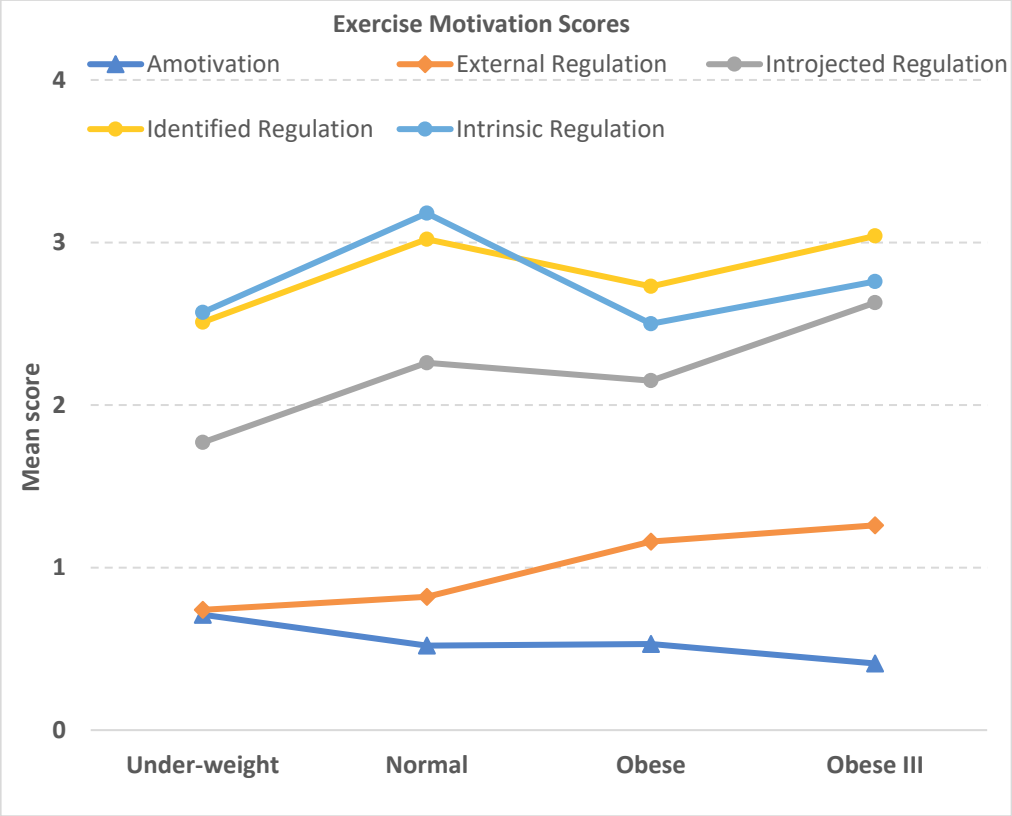

Figure 1. Mean score of Exercise Motivation at Different Levels of Body Mass Index

Table 3. Domains of Exercise Motivation by Duration of Physical Activity per Week

Motivation Domains	Duration of physical activity per week		
	<90 min	>90 min	p-value
Amotivation	0.66 (0.80)	0.36 (0.50)	>0.05 +
External Regulation	1.09 (0.81)	0.84 (0.77)	>0.05 +
Introjected Regulation	2.09 (1.01)	2.38 (0.94)	>0.05
Identified Regulation	2.7 (0.76)	3.03 (0.68)	0.011
Intrinsic Regulation	2.55 (0.90)	3.07 (0.75)	0.001
Relative autonomy index	6.8 (5.56)	10.15 (4.43)	0.008 +

+Mann-Whitney test used; otherwise independent t test used

Discussion

It is widely accepted that adolescent obesity is becoming increasingly prevalent in many countries, including Saudi Arabia. The current study offers revelations to better understanding of how the university students with different BMI categories showed their motivation towards physical activity. The objective of the study was to study was to compare and determine the association of physical activity to exercise motivation of university students at different levels of body mass index.

The results of the study suggested that highest mean scores of normal weight students on intrinsic and identified regulation is reflected on their better autonomous motivation or self-determined motivation. Obese class III showed higher degree of amotivation. The findings are consistent with self-determination theory (SDT) that explains, motivation behavior is viewed on a continuum ranges from amotivation (lack of motivation) - to extrinsic motivation (externally controlled motivation) - to intrinsic motivation. High scores of intrinsic regulation and identified regulation exhibit higher intrinsic motivation [6]. According to Power and colleagues' [32] adolescents who were intrinsically motivated for physical activity were more fit and thereby less likely to be obese. Internal regulation was more significant for physical activity in normal weight adolescent [33].

Self-determination theory identifies important variables explaining motivation for physical activity. In self-determination theory, motivation behavior viewed on a continuum that ranges from amotivation – extrinsic motivation - intrinsic motivation [6, 34]. The highest level on the continuum of behavioral regulation is intrinsic motivation, when participation in the action is for enjoyment, and for the action itself [6]. As participation increases, external motivation decreases and intrinsic motivation increases; therefore, engagement, effort and persistence of physical activity increase to optimum level [35-37]. To the extent that the behaviors and activities fulfil the goals to satisfy those needs, individuals will experience higher forms of autonomous motives, which results in greater positive outcomes such as enjoyment [38] and intention to participate in physical activity [39].

Collected data showed that very few obese students are engaged in physical activity of 150 minutes/ per week. Of course, there is a strong association between the duration of physical activity and body mass index. It is one of the reasons for obesity and the immediate risks of obesity for physical health is well established which reduce the overall quality of life. Regular exercise has physiological and psychological benefits that include easier weight control, lowered risk of high blood pressure, improved sleep, stronger bones, greater muscle mass, and improved quality of life [40]. The intermediate physical activity may prevent the occurrence of cardiovascular diseases, obesity and increase life satisfaction by regulating the mood [41].

Conclusion

Based on the findings it was concluded that university students in all weight categories were internally motivated. The high scores of intrinsic regulation, identified regulation and introjected regulation closely linked to high intrinsic motivation. The normal weight students exhibited high intrinsic and identified regulation, which reflected as better autonomous motivation or self-determined motivation. Obese class students exhibited higher degree of extrinsic motivation and amotivation (lack of motivation) maybe due to their lack of physical activity. Physical activity has strong association with intrinsic regulation and identified regulation. Students who engaged more time in physical activity had better intrinsic motivation.

Limitations and Implications

The current findings call attention to possible exercise motivational factors of KFUPM students towards physical activity with respect to their body mass index. As in any study that relies on self-report, there are questions of possible bias, including the possibility of the students' overestimating or underestimating specific behaviors associated with participation in physical activities and body weight. A qualitative research method could also be used to understand how the participants perceived the meaning of physical activity. The sample of this study is undergraduate students from just one university in the eastern province of Saudi Arabia, thus the results may not be generalizable to Saudi population. To tackle and motivate the obesity and its related problems at university campus we proposed to start separate "obese clubs" for obese category students. We also recommend special programs on weight management and nutrition management for these obese students to improve their quality of life.

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Conflict of interests

The authors have no conflict of interests to declare.

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