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Psychological Correlates of Physical Activity in Children and Adolescents: a Cluster Analytical Approach

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Abstract The purpose of the study was to examine the potential differences in factors that control physical activity participation in primary, high school and senior-high school students through a cluster analytic approach, in relation to leisure time physical activity participation and body mass index (BMI). One thousand, one hundred and forty eight (1148) pupils participated in this study, aged 11-18 years. The study was held through questionnaires and all scales had acceptable levels of internal consistency (α>.70). Students were divided according to their BMI, to those with: a) normal BMI, b) overweight children and c) obese children. A clustering-by-cases procedure was used to classify the participants (in proportion of the school level and their BMI) on the basis of their response to the questionnaires and the three cluster solution revealed that there were different student's groups in primary, high school and senior-high school with regard to physical activity participation, body mass index (BMI) and psychological correlates of physical activity. An improved understanding of the factors associated with physical activity in these groups may assist in the design of appropriate interventions to promote physical activity.

Keywords Physical Activity, Cluster Analysis, Psychology

1. Introduction

Targeting children's patterns of physical activity[1] is especially important given the argument that physical activity in childhood serves as the foundation for a lifetime of regular physical activity. Moreover, regular participation in physical activity is associated with numerous physiological, psychological and social health benefits and effects for children[1] such as lower risk of heart disease, lower blood pressure[2], increased social acceptance[3], elevated self-esteem and feelings of well being[4].

However, while the positive effects of regular physical activity participation are well established in children and adolescents, there is evidence to demonstrate that young people in many developed nations do not participate in enough physical activity of the type and intensity associated with health benefits[5]. Research findings continue to indicate that young's people activity level decreases with age and that children and adolescents are choosing to opt out of school physical education programs once the subject becomes elective[6,7].

Many studies report that young people's school and after school physical activity is rapidly diminishing[8-11]. The more children grow up, the less they exercise[2]. In fact, exercise behaviour gradually decreases even during the school years[9,12], as there is typically a decline in physical activity as children move from middle childhood into adolescence. This may result both from increased barriers to physical activity and the increased alternatives available as children mature[14].

As a result, some children participate in physical activity and some other tends to adopt sedentary or inactive behaviours with lower levels of physical activity. Inactivity is closely linked with childhood obesity[3] and overweight[4] [15,16] and with other health related behaviours such as smoking, diet, drug use and sexual activity[1,17].

A variety of theories have been used in physical determinants research to explain and predict the adoption of an active lifestyle and physical activity participation in children, adolescences and adults. These theories investigated the extent to which psychological characterises may predict physical activity participation and which psychological characterises differ between age, gender, socioeconomic status and overweight level. The most important of these theories include: the Theory of Planned Behavior[18], which is an extension of the Theory of Reasoned Action[19], the

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[1] Physical activity has been defined a "and bodily movement produced by skeletal muscles that result in an expenditure of energy'.

[2] Exercise is defined as "planned, structured and repetitive bodily movement done to improve or maintain one or more components of physical fitness".

[3] Obesity is defined as a condition of excess body fat mass, to such an extent that health might be impaired.

[4] Overweight is simply an excess weight for a given height regardless of the composition of the weight (Moore, et al., 1995).

Social Cognitive Theory[20] and the Competence Motivation Theory[21].

The Theory of Reasoned Action[19] is based on the assumption that intention is an immediate determinant of behaviour and that intention in turn is predicted from attitude and subjective norm. Attitude is a function of the beliefs that participation in physical activity will result in certain outcomes, as well as the evaluation or value of these outcomes as having positive or negative consequences. The Theory of Planned behaviour adds the assessment of perceived behavioural control as a direct determinant of the behaviour and as indirect determinant through its influence on intentions. Perceived behavioural control is the perception that one possesses the resources and the opportunity to execute the behaviour.

The Social Cognitive Theory[20] emphasizes the importance of both psychological and environmental variables. In this theory, self-efficacy, or confidence in one's ability to perform a specific behaviour in a particular situation, is thought to be a primary psychological mediator of behaviour, next to outcome expectations, the estimates that a given behaviour will lead to certain outcomes. Competence Motivation Theory[21] posits that children's motivation to participate in physical activity is influenced by their fundamental motor skill proficiency, perceived physical competence, social support and enjoyment of physical education.

According to the above theories attitudes, intentions, perceived physical competence and enjoyment are critical factors in motivating children to be physically active[22]. Children and adolescents who had positive attitudes about physical activity were more likely to plan and maintain physical activity in the future. Promoting positive attitudes towards physical education could influence motivation to participate in physical activity, especially among students who are not active very much[9,23-25].

Enjoyment is an affective factor related to valuing the activity and having fun[22]. Research has found that the most common reason for children and adolescents participating in physical activity is enjoyment[23] as children's motivation to participate in physical activity is influenced by their perception of the activity as being fun and worthwhile or boring or unpleasant[26,27]. Enjoyment has been linked to perceived competence and mastery[28]; children find physical activity fun when they can succeed at experiences they find challenging[27,29].

Perceived competence is a factor that has been found to influence children's decisions to be physically active[22]. Perceived competence is an individual's perception of control over his or her personal behaviour, which may reflected by perceptions of performance success and the attribution the individual makes for a given outcome. Students with high perceived competence opt for challenges and self determination in learning contexts[30]. That is, the more children perceived they were competent in regard to physical activity, the more likely they were to be engaged in this activity[31].

Many studies have investigated these psychological correlates of physical activity in children and adolescents [5,7,32,33] and few studies investigated the extent to which these variables differ in overweight, obese and normal weight children and adolescents[1,11,34-36].

To date, no known research has investigated the above psychological correlates of physical activity through a cluster analytic approach. Cluster analysis has not been used much in sport and exercise research, although examples are available on physical activity and health behaviors[37]. Wang and Biddle (2001)[37] mention that few large-sample studies have identified types of clusters of pupils based on their scores on validated inventories. For example, the purpose of the study carried out by De Bourdeauhuij and Oost (1999)[38] was to investigate, on the basis of cluster analysis, whether healthy behaviors clusters in a healthy or unhealthy way, whether physical activity can discriminate among these variables, and whether groups identified could be characterized by demographic variables. Weiss, Ebbeck and Horn (1997)[39], explored (using cluster analysis) relationships among children's age, individual differences and sources of physical competence information. Wang and Biddle (2001)[37] in their study report the results of a cluster analysis using contemporary approaches to physical activity motivation.

Therefore, the purpose of this study is to examine the potential differences in the factors that control physical activity participation in primary, high school and senior-high school students and in students with different body mass index, on the basis of cluster analysis. It was hypothesized, therefore, that different students groups would exist, with different psychological characteristics and with different physical activity behavior.

2. Material and Methods

Participants

One thousand, one hundred and forty eight (1148) pupils participated in this study. They were distributed as follows: 603 pupils from primary school (273 boys & 330 girls), 282 pupils from high school (162 boys & 120 girls), and 263 pupils from senior high school (104 boys & 159 girls) aged 11-18 years. All of them were living in sub-urban and urban areas of west-northwest Greece.

Measures

Students completed the following scales.

Attitudes: The Planned Behavior Theory Questionnaire[18], adapted to the Greek language from Theodorakis (1994)[40], was used. Students responded in four scales (good-bad, healthy-unhealthy,pleasant-unpleasant, and useful-not useful) assessing their dispositions toward exercise. The responses were indicated on 7-point semantic differentiation scales (1=very bad, 2=bad, 3=rather bad, 4=neither good nor bad, 5=rather good, 6=good, and 7=very good).

Intentions: Students responded to two questions assessing their intentions to exercise. The questions were, *I intend to*

exercise during the next 12 months (impossible=1, *possible*=7) and *I am determined to exercise during the next 12 months* (*absolutely no*=1, *absolutely yes*=7). Similar measures of intention have been used in previous studies in the Greek physical activity context showing sound psychometric properties.

Perceived effort and enjoyment: Two subscales of the Intrinsic Motivation Inventory[41] were used to measure students' perceived effort (e.g. I put all my effort into physical education lesson) and enjoyment (e.g. I enjoy the physical education lesson very much). Students responded to 10 items on a 5-point scale (I absolutely agree=5, I absolutely disagree=1).

Self-perceptions: The "sport competence" and "attractive body" subscales of the Physical Self-Perception Profile[42] were used to measure self-perceptions. The sports competence scale consisted of six items (e.g. I am one of the best when it comes to sport). Students reported on a 5-point scale (exactly as I am =5, I am not at all like this =1). The attractive body scale included six items (e.g. compared with the majority, I have an attractive body). The students indicated their responses on a 5-point scale (certainly yes =5, certainly no =1).

The scores for attitudes, intentions, perceived effort, enjoyment, sport competence and attractive body were calculated as the mean of the responses to each item of the respective subscales.

Physical Activity Levels: The Leisure Time Exercise Questionnaire (LTEQ)[43], were used. LTEQ is a simple questionnaire designed to assess leisure time physical activity over a 7-day period. The participants were asked to indicate the average number of times per week during their free time that they engage in strenuous, moderate and mild exercise for more than 15 minutes. The question is scored by multiplying the number of times per week that the subject indicates he/she has participated in physical activity against corresponding anticipated MET (measurement in exercise testing) value for strenuous (9 METS), moderate (5METS) and mild exercise (3METS). The sum of the three scores is considered the total score for the question (physical activity index).

Although recall of physical activity is a complex cognitive task, especially for children[44,45], some evidence indicates that younger children can report their activities with reasonable accuracy, even over a 7-day period[46]. To help children recall the activities they were engaged, we presented (together with the Leisure Time Exercise Questionnaire) a list of activities in which children of this age (primary, high and senior high school) are commonly engaged. Those activities included running, rope jumping, playing games, and sport activities, such as basketball, football, volleyball and handball. Activities were selected and presented in such a way as to be representative of the age and the culture of the children, and they were asked to identify the activities that were hard enough to make them tired or breathe hard or sweat. Also participants had been presented with examples of the definition of strenuous (e.g. active sports training, practices and competition), moderate (e.g. street play) and mild exercise (e.g. walking to school). It was clear for the children that the questionnaire did not include physical activity that was performed during normal school time. This is because in most European countries, physical education is compulsory and therefore cannot be classified as a leisure activity.

Definition of overweight and obesity

Body Mass Index (BMI) is considered one of the most appropriate measures for the indirect assessment of adiposity in childhood and adolescence[47]. BMI (body mass index) was calculated by dividing weight by height squared (kg/m^2). Regarding classification of the study population into overweight and obese, the age and sex-specific BMI cut-off points proposed by the Childhood Obesity Working Group of the IOTF have been adopted[48]. These cut-off points have been widely used in studies with children and adolescents[49] and there is a broad consensus that BMI is the most suitable adiposity index for children in clinical and field settings[50]. As stressed by Cole et al[48] (2000), this definition is less arbitrary and more international than others, and should encourage direct comparisons of trends in childhood obesity worldwide.

Procedure

Prior to the collection of data, we obtained permission to conduct the study from the Greek Ministry of Education and the children voluntarily chose to participate. Having explained the purpose of the study the investigator visited the schools and administered the questionnaire in the classroom. The students were given verbal instructions with regard how to complete the questionnaire. After the opportunity for clarification and questions, they responded to the measures. Generally, the completion of the questionnaires required 15-20 min. All questionnaires were completed confidentially and each subject was assigned a code number.

Anthropometric measurements

Age (accurate to 1 month) was recorded. Standing height was measured to the nearest 0.5 cm (Seca Stadiometer 208) with shoes removed, feet together, and head in the Frankfort horizontal plane. Body mass was measured to the nearest 0.5 kg (Seca Beam Balance 710) with shoes, sweaters, coats, and jackets removed. Body Mass Index (BMI) was calculated by dividing weight by height squared (kg/m2).

Data analysis

Means and standard deviations were calculated for attitudes, intentions, and effort in physical education lesson, perceived athletic competence, perceived body attractiveness and for their participation in mild, moderate and vigorous physical activity. Post hoc analyses (Tuckey) were conducted to determine differences between each group. Results are presented as means ± SD. Pearson product moment correlations were computed among the scales scores for each of the clusters. Multiple regression procedures were used to determine whether the psychological variables might predict physical activity participation in each of the three

cluster groups, for each school level. The residual gain scores were the criterion measure. The significance level for entry was set at .05. The SPSS (version 15 for windows) statistical package was used, and significance was set at $p<.05$.

A clustering-by-cases procedure was used to classify the participants (in proportion of the school level and their BMI) on the basis of their response to the questionnaires. Cluster analysis is a collective term covering a wide variety of techniques for delineating natural groups or clusters in data sets[51]. The aim of cluster analysis is to identify homogeneous groups or clusters based on their shared characteristics. The inherent validity of cluster analysis is determined by its ability to identify patterns that are consistent with existing research[51].

The clustering algorithms are broadly classified into two namely hierarchical and non-hierarchical algorithms. In the hierarchical procedures, we construct a hierarchy or tree-like structure to see the relationship among entities (observations or individuals). Each observation starts out as its own cluster. Subsequently, new clusters are formed by the combination of the most similar clusters until either all clusters are grouped into one cluster or the researcher considers that a parsimonious solution has been achieved. In the non-hierarchical method a position in the measurement is taken as central place and distance is measured from such central point. Non-hierarchical methods (k-means) assign observations into clusters using nearest centroid sorting and requires the number of clusters to be specified[51]. Since each method has some disadvantages, it is best to combine the two. The number of clusters and the profile of the cluster centers can be established using the hierarchical methods. Following that, the non-hierarchical methods can be used with the cluster centers found in the hierarchical methods. In this way the non-hierarchical methods can verify the results of the hierarchical methods[52].

In order to make a decision about the number of clusters, a hierarchical cluster analysis was carried out following the stages of cluster analysis process[52]. All the variables were standardized using Z scores. Standardization prevents variables measured in larger units contributing more toward the distance than the variables utilizing smaller units. Ward's method selecting the squared Euclidean distance as a similarity measure was chosen. Ward's method minimize the within clusters differences and avoid problems with forming long, snake-line chains found in other methods[53]. This analysis provides a tree model, a dendrogram, based on the distance between the clusters. On the basis of the dentrogram and on theoretical grounds a three-cluster solution was selected to be suitable.

Once the number of the clusters was decided, a Quick Cluster Analysis was used to form the final groups. Solutions from cluster analysis can be unstable; therefore it is advised that additional analyses be used to check the solution obtained[53]. To confirm the clusters, a k-means clustering method was used. First, the centroid values obtained from the hierarchical methods were used as the initial seed points for the k-means clustering. The final centroid values and the cluster size were compared to those obtained from the hierarchical methods, and the profiles obtained from the k-means cluster analysis corresponded well with those obtained from the hierarchical cluster analysis, providing confidence for the three-cluster solution. One-way Anova, and Tuckey post hoc test were used to explore if there were differences between the three groups.

3. Results

Scales and reliabilities

Means and Cronbach alphas for different scales were calculated. Alpha reliability coefficients for all measures were deemed acceptable (Table 1) based on Nunnally's (1978)[54] cut-off criterion of .70 for the psychological domain. The results are in line with the existing literature as the questionnaires assessing attitudes and intentions have been shown to be reliable and valid[9,40,55]. Results also from previous studies in physical education support the validity and reliability of perceived effort, enjoyment and self-perceptions scales[11,55-57].

Table 1. Internal consistency of the scales in all clusters

	α-Cronbach								
	Primary School			High school			Senior-high school		
Variables	Cluster 1	Cluster 2	Cluster3	Cluster 1	Cluster 2	Cluster3	Cluster 1	Cluster 2	Cluster3
Attitudes	.70	.75	.70	.71	.71	.71	.74	.71	.70
Intentions	.87	.80	.90	.77	.73	.81	.88	.84	.92
Lesson satisfaction	.70	.72	.70	.74	.79	.79	.73	.72	.83
Effort in P.E. lesson	.70	.70	.75	.73	.86	.74	.71	.78	.74
Sport competence	.71	.71	.76	.71	.74	.70	.70	.74	.79
Physical appearance	.82	.83	.80	.83	.81	.93	.95	.96	.94

Results from cluster analysis

A cluster analysis by cases to classify the participants on the basis of their response to the questionnaires in relation with the BMI, was carried out. As a result of this analysis, we were able to identify three groups of students in primary school, in high school and in the senior high school separately.

Students' group profiles-primary school.

The first group was labeled "low achieved students with normal BMI" reproducing students with low levels of physical activity, normal BMI and diminished scores in the psychological variables. The first cluster consisted of 165 pupils. Its members showed minor participation in leisure time physical activity, even if, according to their BMI, were categorized as normal weight children and lower exercise attitudes and intentions, perceived sport competence, than members of the second and third cluster. Also, they reported less effort in physical education lesson than the students in the second cluster (Table 2)

The second group was labeled "high achieved students, with normal BMI". This cluster consisted of 291 students. Members of the second cluster expressed more positive attitudes and intentions towards exercise; they felt competence and more satisfaction from their participation in physical education lesson, putting more effort in it. Their perceived sport competence and their physical appearance were higher than the other two groups, and they participate more in all kinds of leisure time physical activity (Table 2).

The third group, comprised of 147 children, was labeled "achieved overweight and obese students". Its members had more positive attitudes and intentions towards exercise, higher score in sport competence and they participated more in all types of leisure time physical activity than the students in the first cluster. However, their perceived physical appearance score was lower than the two other clusters (Table 2).

Students' group profiles-high school.

Table 3 shows the three cluster results for the high school students. The three cluster solution revealed that high school students had similar characteristics with the primary school students. The first cluster, containing the majority of the students (n=150) was labeled "low achieved students with normal BMI", the second cluster (n=75) "high achieved students, with normal BMI" and the third cluster (n=57) "achieved overweight and obese students".

Table 2. Three-cluster solution (means and standard deviations) for the primary school children

		Primary School							
	Variables	Cluster 1 (N=165)		Cluster 2 (N=291)		Cluster 3 (N=147)		F	p
		M	SD	M	SD	M	SD		
1	Attitudes	$6.44_{a,b}$	.03	6.70_{a}	.02	6.73_{b}	.02	32.50	.000
2	Intentions	$5.89_{a,b}$	.06	6.61a	.03	6.46_{b}	.05	63.04	.000
3	Lesson satisfaction	4.47_{a}	.03	$4.61_{a,c}$	.02	4.47_{c}	.03	7.26	.001
4	Effort in P.E. lesson	3.29_{a}	.02	$3.50_{a,c}$	.02	3.27_{c}	.02	30.42	.000
5	Sport competence	$3.53_{a,b}$	.05	$4.03_{a,c}$	.03	$3.75_{b,c}$	.05	28.83	.000
6	Physical appearance	$3.78_{a,b}$	.06	$4.20_{a,c}$	.04	$2.64_{b,c}$	.06	205.92	.000
7	Mild physical activity	$14.23_{a,b}$	.79	$33.03_{a,c}$	.81	$19.59_{b,c}$	1.1	127.17	.000
8	Moderate physical activity	$10.9_{a,b}$	.61	$15.87_{a,c}$	.46	$13.02_{b,c}$	.58	22.15	.000
9	Vigorous physical activity	$4.54_{a,b}$	.37	8.1_{a}	.32	8.46_{b}	.47	28.04	.000
10	Total score in physical activity#	$29.75_{a,b}$	1.00	$57.01_{a,c}$	1.01	$41.08_{b,c}$	1.34	161.16	.000
11	Body mass index	17.95_{b}	.19	18.11_{c}	.14	$22.46_{b,c}$	.21	168.54	.000

Hierarchical Cluster Analysis using Ward's Method

Means with different subscripts are statistically different ar p<.05

aDifferences between 1st and 2nd cluster

bDifferences between 1st and 3rd cluster

cDifferences between 2nd and 3rd cluster

#Leisure Time Exercise Questionnaire

Students' group profiles-high senior school

Table 4 illustrates three-cluster solution for the senior high school children. The attributions of the clusters are in this case different. Cluster one, with the majority of the pupils (n=137), contains students (categorized as normal weight according to their BMI) with diminished scores in all the variables in relation to the second cluster (witch reproducing students also with normal BMI). However students in cluster one scores higher in all variables than the students in cluster three.

The third group, comprised of 35 children, witch, according to their BMI was categorized as overweight and obese. Its members had diminished scores in attitudes and intentions towards exercise, all lower scores in all selected variables in relation to the first and the second cluster.

Relationships between the variables in each cluster and result from regression analysis

Primary school- 1st cluster

The Pearson's product-moment correlation between attitudes and the residual variables was negative. There was a positive correlation between lesson satisfaction and: a) effort in P.E. lesson (r=.32), b) sport competence (r=.29) and c) physical appearance (r=.37). A statistically significant correlations was between sport competence and physical appearance (r=.41) and between physical appearance and total score in LTEQ (r=.22). For the primary school and the 1st cluster, multiple regression procedure revealed that the only predictor of physical activity participation was perceived physical appearance ($F_{1,164}$= 8.51, p=.004) (Table 5).

Table 3. Three-cluster solution (means and standard deviations) for the high school children

		High School							
	Variables	Cluster 1 (N=150)		Cluster 2 (N=75)		Cluster 3 (N=57)		F	p
		M	SD	M	SD	M	SD		
1	Attitudes	$5.83_{a,b}$	.07	$6.76_{a,c}$	.02	$6.48_{b,c}$	.04	132.54	.000
2	Intentions	$5.35_{a,b}$	.08	$6.49_{a,c}$	.04	6.13_{b}	.06	77.98	.000
3	Lesson satisfaction	$3.18_{a,b}$	.10	4.38_{a}	.09	4.21_{b}	.08	69.10	.000
4	Effort in P.E. lesson	$2.91_{a,b}$	.06	4.04_{a}	.05	3.90_{b}	.09	48.83	.000
5	Sport competence	3.26_{a}	.08	$3.64_{a,c}$	.06	3.33_{c}	.08	7.80	.001
6	Physical appearance	$3.07_{a,b}$	.14	$3.89_{a,c}$	.06	$2.18_{b,c}$	.07	111.22	.000
7	Mild physical activity	$9.00_{a,b}$	1.08	$26.46_{a,c}$	1.15	$16.08_{b,c}$	.90	52.06	.000
8	Moderate physical activity	10.26_{a}	.78	13.86_{a}	.58	12.53	.76	5.89	.003
9	Vigorous physical activity	5.58	.51	5.74	.31	6.76	.54	1.74	.178
10	Total score in physical activity#	$24.94_{a,b}$	1.59	$46.06_{a,c}$	1.52	$35.37_{b,c}$	1.53	37.81	.000
11	Body mass index	$19.90_{a,b}$	.29	$19.02_{a,c}$	.15	$22.60_{b,c}$	.31	66.22	.000

Hierarchical Cluster Analysis using Ward's Method

Means with different subscripts are statistically different ar p<.05

aDifferences between 1st and 2nd cluster

bDifferences between 1st and 3rd cluster

cDifferences between 2nd and 3rd cluster

#Leisure Time Exercise Questionnaire

Table 4. Three-cluster solution (means and standard deviations) for the senior high school children

		Senior High School							
	Variables	Cluster 1 (N=137)		Cluster 2 (N=91)		Cluster 3 (N=35)		F	p
		M	SD	M	SD	M	SD		
1	Attitudes	$6.21_{a,b}$	.03	$6.63_{a,c}$	.03	$5.44_{b,c}$	.07	115.41	.000
2	Intentions	$5.13_{a,b}$	.05	$6.00_{a,c}$	.05	$4.57_{b,c}$	.09	92.55	.000
3	Lesson satisfaction	$4.15_{a,b}$	.04	$4.5_{a,c}$	.04	$3.21_{b,c}$	.13	71.57	.000
4	Effort in P.E. lesson	$3.02_{a,b}$	.05	$3.79_{a,c}$	.07	$2.56_{b,c}$	.13	47.53	.000
5	Sport competence	3.15_{b}	.04	3.18_{c}	.07	$2.43_{b,c}$	.12	18.68	.000
6	Physical appearance	3.35_{b}	.11	3.37_{c}	.11	$2.16_{b,c}$	.12	19.17	.000
7	Mild physical activity	5.36_{a}	.55	$17.50_{a,c}$	1.25	2.05_{c}	.83	67.28	.000
8	Moderate physical activity	5.80_{a}	.41	$12.4_{a,c}$	.53	4.42_{c}	.67	61.72	.000
9	Vigorous physical activity	6.78	.33	6.69	.45	5.48	.55	1.55	.213
10	Total score in physical activity#	$17.98_{a,b}$	.86	$36.61_{a,c}$	1.26	$11.97_{b,c}$	1.21	110.34	.000
11	Body mass index	21.39_{b}	.19	21.53_{c}	.26	$24.58_{b,c}$	.68	21.14	.000

Hierarchical Cluster Analysis using Ward's Method

Means with different subscripts are statistically different ar p<.05

aDifferences between 1st and 2nd cluster

bDifferences between 1st and 3rd cluster

cDifferences between 2nd and 3rd cluster

#Leisure Time Exercise Questionnaire

Primary school-2nd cluster

Results from Pearson correlation showed a positive significant correlation between attitudes-intentions and all the residual variables. A positive correlation exists also between lesson satisfaction and: a) effort (r=.37), b) sport competence (r=.38) and among sport competence and body attractiveness (r=. 44). Effort in physical education lesson was emerged as the only predictor of physical activity participation ($F_{1,290}$= 6.16, p=.014) (Table 5).

Primary school-3rd cluster

Pearson correlation implies significant positive correlation among attitudes and: a) intentions (r=.45), b) effort (r=.20), c) sport competence (r=.20). Another positive correlation was between effort and: a) sport competence (r=.21), b) lesson satisfaction (r=.34). Negative correlation was found among physical appearance and: a) lesson satisfaction (r=-.18), b) effort (r=-.22). Multiple regression procedure revealed intentions as the primary predictor of physical activity participation ($F_{1,146}$= 4.85, p=.009). Attitudes also accounting for a proportion on the variance in physical activity participation (Table 5).

High school-1st cluster

There was a positive correlation between intentions and: a) lesson satisfaction (r=.31), b) effort (r=.24), c) body attractiveness (r=.25). Also Pearson correlation implies significant positive correlation among lesson satisfaction and: a) effort (r=39), b) sport competence (r=.40), c) body attractiveness (r=.26), but there were no correlations between the psychological variables and physical activity participation. Attitudes towards exercise was emerged as the only negative predictor of physical activity participation ($F_{1,149}$= 8.58, p=.004).

High school-2nd cluster

Results from Pearson correlation implied positive correlations among physical activity participation and: a) attitudes (r=.35), b) lesson satisfaction (r=.61), c) effort (r=.67) and d) physical appearance (r=.28). Positive correlation exists also between lesson satisfaction and effort (r=57) and among sport competence and physical appearance (r=.28). As shown in Table 5, effort emerged as the primary predictor of physical activity participation ($F_{1,74}$= 59.14, p=.000) adding to the total amount of variance of the order of entry into the regression equation. Lesson satisfaction, physical appearance and intentions also accounted for a significant proportion of the total variance.

High school-3rd cluster

Physical activity participation was positive correlated with physical appearance (r=.50) and sport competence (r=.30). Positive correlation was also among sport competence and: a) physical appearance (r=.30), b) intentions (r=.37) and between lesson satisfaction and effort (r=45). Hierarchical regression analysis revealed that only perceived physical appearance predict a significant amount of variance in students participation in physical education ($F_{1,56}$= 18.01, p=.000) (Table 5).

Senior-high school-1st cluster

Results from Pearson correlation showed a positive significant correlation between physical activity participation and: a) lesson satisfaction (r=.27), b) effort (r=.39). Positive correlations were also exists among lesson satisfaction and effort (r=.45), attitudes and intentions (r=.34). Multiple regression procedure revealed that the only predictor of physical activity participation was effort, accounting 10.8% of the variance (Table 5).

Senior-high school-2nd cluster

Pearson correlation implies significant positive correlation among attitudes and: a) intentions (r=25), b) lesson satisfaction (r=40), c) effort (r=.25). A positive correlation was found among lesson satisfaction and: a) effort (r=.46), b) sport competence (r=.38), c) physical appearance (r=.31). Physical activity participation was positive correlated with sport competence (r=24) and effort (r=21) and there was a statistically significant correlation among sport competence and physical appearance (r=.51). The results from regression analysis indicated that sport competence was the predominant predictor of physical activity participation ($F_{1,90}$= 4.72, p=.032) (Table 5).

Table 5. Results from Hierarchical Stepwise Multiple Regression Analysis

		Variable (order of entry)	Beta	R^2	t	p
Primary school	1st cluster	Physical appearance	.22	.05	2.918	.004
	2nd cluster	Effort	.14	.021	2.481	.014
	3rd cluster	Intentions	.25	.036	3.028	.003
		Attitudes		.017	2.032	.044
High school	1st cluster	Attitudes	.24	.055	-2.930	.004
	2nd cluster	Effort	.67	.449	4.204	.000
		Lesson satisfaction		.075	3.959	.000
		Physical appearance		.029	2.537	.013
		Intentions		.026	2.084	
	3rd cluster	Physical appearance	.50	.248	4.255	.000
Senior-high school	1st cluster	Effort	.33	.108	4.038	.000
	2nd cluster	Sport competence	.23	.050	2.172	.032
	3rd cluster	Lesson satisfaction	.63	.283	3.234	.003
		Effort		.108	2.379	.024

Senior-high school-3rd cluster

Results from Pearson correlation showed a positive significant correlation between physical activity participation and: a) lesson satisfaction (r=40), b) effort (r=.44). Lesson satisfaction was also positively correlated with effort (r=58). In contrast, there was a negative but significant correlation among intentions and: a) sport competence (r=-.58), b) lesson satisfaction (r=-.58), c) physical activity participation (r=-.53). As shown in Table 5, lesson satisfaction emerged as the primary predictor of physical activity participation ($F_{1,34}$= 13.04, p=.001) adding to the total amount of variance of the order of entry into the regression equation. Effort also accounted for a significant proportion of the total variance

4. Discussions

The first purpose of the study was to investigate different students' groups (in each of the three school levels) in relation to psychological correlates of physical activity and BMI. Results showed that there were three student's groups in each of the school level (primary, high school, senior-high school) with almost the same characteristics for the primary and the high school students and a small alteration for the senior-high school: the first group (primary and high school students) was comprised by students with normal BMI. Their participation in leisure time physical activity was low and they had less favorable psychological correlates related to physical activity than the other two groups.

In the second group (primary and high school), students with normal BMI were included. They reported higher levels of physical activity participation, compared to the first and the third group, and they scored higher in the factors that control physical activity participation. The third group (primary and high school) comprised by obese and overweight students. They participated more in leisure time physical activity than the first group and less than the second group, they had positive attitudes and intentions towards exercise, they felt more sport competence and they put more effort in physical education lesson than the first group. However, obese and overweight students had lower scores in perceived physical appearance, than the other two student's groups.

For the senior-high school there was a difference between the three groups. Cluster analysis revealed that the third group (overweight and obese students) exhibited significantly lower levels of leisure time physical activity participation and they had less favorable psychological variables related to physical activity than the other two groups, with the normal weight counterparts.

The study demonstrates that in primary, high and senior-high school there were different student's groups, with different psychological characteristics related to physical activity and exercise, and tried to investigate these differences through a cluster analytic approach. Various previous studies had investigate differences in physical activity in children and adolescents with different degrees of overweight[58], or age-group differences in several psychological variables that predict physical activity participation[30]. These studies revealed that, as children get older and progressed in grade level, they show decreasing scores on effort and enjoyment in physical education lesson, feel less competent, become less task-involved and their exercise frequency decreases[10,14,30,59,60,61].

No study, to our knowledge, had tried to investigate these parameters through a cluster analytic approach, and the results of this study revealed that in the same school level (primary, high, senior-high school) there were different groups of students and in these different groups physical activity participation and the other psychological correlates of physical activity differ in relation to the specific characteristics of each student's group.

The study showed that only in senior-high school obese and overweight students participate less in mild, moderate and vigorous physical activity and have less favourable psychological correlates related to physical activity than their counterparts. Also there was a gradual decrease in psychological variables and in physical activity participation with increasing degree of overweight especially in senior high school students. These results were in line with previous studies. According to Zabinski, Saelens, Stein, Hayden-Wade & Wilfley (2003)[36], various factors such as lack of interest in physical activity, being chosen last for teams, being teased by friends during physical activity and sports were more frequently reported from overweigh and obese children in comparison with their non-overweight counterparts. A recent study in children[62] found that children who are the target of weight criticism during physical activity showed lower sport enjoyment and reported lower physical activity levels. According to Pierce & Wardle (1997)[63] overweight children commonly report being embarrassed doing physical activity and sports and being excluded from games and sports because of their body size.

Compared to other studies that reported lower levels on all potential determinants of physical activity in overweight and obese children and adolescents[35,36], the results of this study (with the three cluster solution) are unambiguous. Only the senior-high school overweighs and obese students (according to the cluster analysis) reported lower levels of physical activity compared to all normal weight students. Primary and high school overweighs and obese students (third cluster) had higher scores in psychological correlates related to physical activity (effort, perceived competence, attitudes and intentions) and higher levels of physical activity participation than students with normal weight who were categorised in the first cluster. For these students, attitudes and intentions are strong predictors of participation in physical activity[58] and their higher perceived competence indicates that these children are more active[64]. These students also scored higher in the enjoyment. Enjoyment of physical activity was found to be the most important predictor of physical activity in many studies[65,66]. Enjoyment of an activity has been linked to perceived compe-

tence[28] and activities that are perceived as fun and worthwhile tend to be motivating[26,27].

The regression analysis revealed that different psychological characteristics predict physical activity participation in the three clusters for each school level. The perceptions of effort, lesson satisfaction and perceived competence as predictors entered in the regression model in the present study for the second cluster for the primary, high school and senior-high school students respectively, were very similar with the psychological correlates or determinants of physical activity in children and adolescents in previous studies[38]. The perception that physical activity is fun, related to more participation in physical activity. Perceptions also of more confidence to continue with sports or physical activity explained engagement in more total physical activity[1,24].

Also, physical appearance seems to be a predictor of physical activity participation in the first cluster of primary school students and in the third cluster of high school students. Physical appearance, that is trying to look better, is an extrinsic motive. When intrinsically motivated, individuals engage in physical activity and exercise for the inherent pleasures that they derive from the activity. When extrinsically motivated, individuals engage in an activity for the external rewards that they attain through the activity. According to the self-determination theory, intrinsic but not extrinsic motives are likely to sustain long-term participation [67].

In retrospect, the study revealed that there were different student's groups in primary, high school and senior-high school with regard to physical activity participation, body mass index(BMI) and psychological correlates of physical activity. This study also showed that overweight and obese primary and high school students differ in physical activity participation and had less favourable variables related to physical activity than their normal weight counterparts but there were also a normal weight group that participated less than obese and overweight students in physical activity and had less favourable psychological correlates related to physical activity.

These results may help physical educators to be able to adapt intervention programs to enhance physical activity participation according to the specific characteristics of each group as these characteristics can influence, promoting or deterring physical activity participation. For example, the activities offered should be fun and enjoyable for all. Students are motivated to pursue an activity if they have successful mastery experiences that are evaluated positively [28]. Such experiences enhance perceived competence and heighten positive emotions associated with the activity[21]. The enjoyment children gain from participation in physical activity depends to a large extent on their perception of ability or self-mastery[32]. Activities also should be made as attractive and challenge for all, should have a high probability of success and should be tailored to the capabilities of overweigh and obese children and adolescents[35].

There were some limitations of the present study. First, the data relied on self-reports of physical activity and psychological variables. Although previous studies showed that the physical activity and the psychological measures had good reliability and acceptance validity, more objective measures of activity such as accelerometer data should have an additional value. The major strength of the present study is the use of a large community sample based upon a random selection of schools and the investigation that there were three student's groups in each school level with different psychological correlates related to physical activity participation. The study contributes to the literature on associations with the physical activity behaviour of children (normal weight or overweight and obese) and may be of assistance to researchers designing experimental trials for school and community settings to increase physical activity in children and adolescents.

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