

Ergonomic programs in the school curriculum: Attitudes of teachers' college students

E. Heyman

Department of Physical Education and Movement, Kibbutzim College of Education, Tel Aviv, Israel
E-mail: Ephrat_Hey@smkb.ac.il

Abstract

This research has been motivated by our belief that ergonomic aspects of proper posture and efficient movement patterns should be acquired as an integral part of the Physical Education (PE) curriculum in the school system. We explored the attitudes of teacher's college students towards the incorporation of ergonomic programs into the school's PE curriculum. In order to clarify the parameters that affect these attitudes we also studied the relation of these attitudes to the participants' knowledge-level in ergonomic-related subjects, and whether these attributes can be improved via ergonomic intervention programs. Two different ergonomic intervention programs were constructed and administered to the experimental populations: A major program for PE majors, who are expected to teach the proposed ergonomic curriculum in the school system, and a minor program for students of other disciplines who are expected, as future teachers to support and promote proper ergonomic behavior in the school. The overall research population was 328. The results fully confirmed the main research hypotheses, that the participants' attitudes toward the incorporation of ergonomic educational programs into the school curriculum are positive and are highly correlated with the participants' knowledge-level in ergonomic-related subjects, and hence can be improved following intervention programs.

Keywords: Children, ergonomic education, ergonomic knowledge-level, ergonomics and physical education

1. Introduction

It is widely accepted by educators today that in order to cope with the rapid changes in the complex modern society, school curricula should be extended to accommodate relevant life-skills. In the context of Physical Education (PE) this implies that the discipline should be redefined in order to cope with the technology-based lifestyle, which is characterised by stasis and passivity [1,2]. Indeed in recent years there is a growing trend to regard PE as an integrative discipline, encompassing both practice and theory of health education subjects [3,4]. Thus, PE should deal

not only with sports and physical activities, but also with broader aspects of life-skills and physical functionality. It should offer a solution to the modern technology-based society where children, from a very early age, as well as adults spend an ever-increasing amount of their time in front of computer and television screens. The cumulative effect of this sedentary lifestyle leads to improper posture, as well as inefficient and harmful movement patterns and loss of basic physical skills. From a broader perspective, these concepts are related to ergonomics.

Ergonomics plays an important role in the modern working society since it has been recognised that the

prevention of work-related injuries not only improves productivity but also affects satisfaction, motivation and creativity [5,6]. Much effort has therefore been invested in recent years in the introduction of ergonomic programs for workers, in order to improve the workers' functionality and to reduce work-related injuries [7,8,9]. Such programs suffer, however, from two inherent difficulties: a) Incorrect movement patterns and habits become firmly entrenched over the years and are unlikely to be altered by short-term programs, due to the fact that learning of proper body function and correct movement patterns is a prolonged process. b) The postural damage is caused by the modern sedentary lifestyle not only at the work place but also in many other daily routines, whereas the existing programs are aimed primarily at the working environment.

As mentioned above, an important aspect that affects the effectiveness of these programs is that inefficient mechanical functioning start at an early age [10] and that back pain and posture problems are already evident in children [11]. Duggleby and Kumar [12] reviewed eleven studies on juvenile back pain and indicated an average cumulative prevalence of 28.7%. According to Burton et al. [13] lower back pain has a relatively high prevalence during school years. The statistics vary from country to country: Finland, 20%; England, 26%; Canada, 33%; United States, 36%; and Switzerland, 51%. The concept of back care for children is mentioned in several small-scale ergonomic programs for training young children in proper body mechanics and back-care [14,15]. There is also a growing awareness of the importance of the suitability of school furniture for the children's needs [16] and several studies show the effect on improved sitting postures and even improvement in certain behavioural variables in the classroom. These studies agree, however, that ergonomic educational programs should accompany the adaptation of furniture [17, 18].

As of now however, no such programs exist. Olsen [19] raised two main difficulties hampering the incorporation of ergonomic subjects in the existing school curricula: 1. There are no teachers qualified to teach these subjects, hence it is necessary to train teachers or to bring other professionals into the school 2. Budgets are limited and little or no funds are available for new projects.

Both difficulties are addressed in the present research. It is argued that ergonomic preventive program should be a continual educational process that accompanies the child from an early age and

throughout his entire formal schooling as an integral part of the PE classes. The child will develop correct posture and movement patterns and awareness to correct environmental design that will be maintained throughout his entire life span. Thus, the discipline of PE should be redefined in order address these challenges.

2. Objectives

An important aspect of the incorporation of ergonomic movement educational programs in the school curriculum is the attitude of the entire spectrum of schoolteachers toward such programs.

The first difficulty that is mentioned by Olsen [19] and by Nuttall [20] is that most teachers are not aware of the significance of such program and consider the subject a low priority. The success of ergonomic educational programs depends on the positive and favourable attitude of all the teachers in the school, since various activities and movement patterns manifest themselves in all aspects of daily activities in the school (the classroom, the computer room, recesses etc.) and in every life-environment.

Hence, the main objective of the present research is to explore, among students in various disciplines, PE and others, at teachers' training college, attitudes towards the incorporation of ergonomic educational programs into the school PE curriculum. The research also explores the participants' knowledge-level in ergonomic-related subjects.

The two main hypotheses were: a) That the participants' attitudes towards the incorporation of ergonomic educational programs into the school curriculum are correlated with the participants' knowledge-level in ergonomic-related subjects; b) That these attributes can be improved following ergonomic intervention programs that also prepare the students to teach these subjects in the school system.

3. Methods

3.1. Research design

The research was conducted at the Kibbutzim College of Education in Tel Aviv, Israel, from March 2000 till June 2001. The overall research population consisted of 328 participants.

The participants were divided into two main categories: one consisted of students from the Physical

Education (PE) discipline, and the other from non-PE academic disciplines such as Early Childhood Education, Creative Education and Elementary Education.

Two different ergonomic intervention programs were carefully constructed and administered to these two populations. An extensive (four months) intervention program was given to the PE students, who would eventually teach the proposed ergonomic-related curriculum in PE classes, while a minor (six weeks) intervention program was designed for the non-PE students who are expected to be able to promote proper ergonomic behaviour in the school. The programs were given only to the experimental groups and the changes in their attitudes and knowledge-level were monitored and compared with those of the control groups who were not exposed to the subject.

Prior to the ergonomic intervention programs, we administered a pre-test questionnaire to examine preliminary attitudes to ergonomic-related subjects and the level of knowledge about them. In order to access a broader view of preliminary attitudes and knowledge-level, the population studied in this phase was comprised not only of the PE and non-PE students mentioned above, but also of experienced teachers who did not participate in the ergonomic intervention programs. They were included in the research in order to examine the effect of life-experience and professional-experience on the attitudes and knowledge-level. Indeed it has been found that these characteristics are more positive among the experienced teachers when compared to the college students prior to the administration of the intervention programs. We shall not dwell further on this subject and will not present here the specific data.

Following the intervention programs, we explored its effect in a post test questionnaire, which was identical to the pre test questionnaire, and the changes in the experimental and in the control groups were monitored and compared.

3.2. Research instruments

Three questionnaires were used in the research. An attitude questionnaire to measure the students' attitudes toward the incorporation of an ergonomic educational program into the school curriculum; A knowledge questionnaire that monitored the students' knowledge about ergonomic-related subjects; and a demographic questionnaire to collect data concerning relevant demographic variables. The questionnaires were developed especially for this research since no similar

questionnaires exist on these specific subjects. In order to develop these questionnaires we developed pilot questionnaires and administered them to 42 students, who had similar characteristics to the two experimental populations of the actual research.

The attitude questionnaire consisted of 28 questions and the knowledge-level questionnaire consisted of 31 questions. The content validity of these questionnaires was determined by expert judgement.

The analysis of the knowledge questionnaire was straightforward. Correct and incorrect answers were given scores of 1 and 0 respectively, and the overall average has been recorded.

The analysis of the attitude questionnaire was more intricate: A factor analysis was conducted to and was followed by a reliability analysis of the entire attitude questionnaire and of each of the resulting factors. The 28 attitudes were thus divided, into five dominant factors (categories): (i) Attitudes toward teaching ergonomic subjects in schools; (ii) Attitudes toward teaching ergonomic subjects in Teachers' colleges; (iii) Attitudes toward teaching ergonomic subjects using both theoretical lectures and practical experiences (as opposed to using other teaching methods); (iv) Attitudes toward teaching ergonomic subjects by PE teachers; and (v) Attitudes toward teaching these subjects by different teachers. Each factor presents a specific aspect of the overall attitude, which was the focus of the main research hypothesis.

Statistical analysis has been performed on each of the above mentioned factors independently, but here we present only the results concerning the "overall" attitude and knowledge level (see Tables 1 and 2). For more detailed results see [21].

4. Results

The statistical analysis of the pre-test results shows that the attitudes of the PE students and the teachers were significantly more positive than the attitudes of the non-PE students and that the knowledge-level of the PE students and the teachers was significantly higher than the knowledge-level of the non-PE students. In the post-test analysis, we discovered significant statistical differences in the overall knowledge-level and in the overall attitudes, both in the PE and the non-PE groups, compared to these characteristics prior to the administration of the intervention programs (see Tables 1 and 2). In the control groups, on the other hand, there were no

significant statistical differences in the attitudes and in the knowledge-level in the pre- and post- tests.

The results of the statistical analysis also show that the attitudes toward the teaching of ergonomic subjects to all age groups in schools and toward the teaching of ergonomic subjects at teacher training colleges became more positive following participation in an ergonomic intervention program.

These results confirm the main research hypothesis that participation in an ergonomic intervention program is valuable in procuring more positive attitudes toward the teaching of ergonomics in schools and in promoting ergonomic knowledge. This is true for all the academic disciplines, both the PE discipline, which is more professionally oriented toward ergonomic subjects and the non-PE disciplines, which have no initial orientation toward these subjects.

Table 1
The mean attitudes and knowledge-level of the PE experimental and control groups before and after the extensive intervention program.

Factor	Experimental		Control	
	Before N=29	After N=20	Before N=47	After N=36
Overall Attitudes	4.16	4.38	4.06	4.11
Overall Knowledge	0.83	0.93	0.76	0.73

Table 2
The mean attitudes and knowledge-level of the non-PE experimental and control groups before and after the minor intervention program.

Factor	Experimental		Control	
	Before N=60	After N=41	Before N=56	After N=43
Overall Attitudes	4.10	4.37	4.15	4.19
Overall Knowledge	0.73	0.93	0.69	0.66

5. Conclusions

UNESCO's annotated bibliography of publications relating to ergonomics in schools, "Ergonomie scolaire et educative", illustrates how much misunderstanding still exists on this subject: "It is essential that a precise

definition be given of what is meant by ergonomics in school and within the educational system" [22]. This research proposes such a precise definition, both for the educational system and for the colleges that train teachers to teach ergonomics in schools.

The rationale of this research is that physical education in schools should deal not only with sport and physical activity but also with broader aspects of motor life-skills and environment-oriented movement behaviour. In order to be effective, these aspects of ergonomic education should accompany the natural processes of motor development from an early age.

One important conclusion emerging from this research is that an ergonomic education should be incorporated into all teachers' training college curricula. It should include extensive courses for PE students in order to qualify them to teach these subjects in schools and basic courses for students from all the other academic disciplines in order to enable them to promote and be involved in the ergonomic education of children in the schools.

Another conclusion is that the majority of participants agree that an ergonomic educational program should be incorporated into the school curriculum, from kindergarten to high school, preferably as a part of the PE curriculum.

6. Recommendations

The incorporation of ergonomic subjects into school curricula depends on two factors: first, determination of which is the most suitable academic discipline to absorb these subjects into its already existing curriculum and second, teaching ergonomic courses in colleges in order to train teachers to teach these subjects.

This research suggests that the PE teacher is capable, following appropriate ergonomic training, to teach the theoretical as well as the practical aspects of ergonomics in schools. In addition, it stresses the importance of incorporating a short, general, ergonomic course into the curricula of all the other academic disciplines. Successful ergonomic educational programs depend on the positive and favourable attitude of all the teachers in the school, as they deal with activities and movement patterns that manifest themselves in all aspects of daily activities in the school and in every life-environment.

Another important aspect of ergonomic education is parental involvement, which has not been addressed

in this research.

The present research examines the awareness and attitudes of teacher training college students and teachers toward the incorporation of such a program in the school PE curriculum. We argue that ergonomics should become a major component of the PE curriculum both in teacher training colleges and throughout the education system from kindergarten to high school. This research is the first step in that direction.

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