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Evaluation and Comparison of the Lower Limb Skeletal Disorders in Female Students of Physical Education compared to Students of other Fields

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ABSTRACT

The current study aimed at evaluating and comparing the lower limb skeletal disorders in female students of physical education with students of other fields. The statistical population included all the students of the Shahr Rey's vocational schools. The cluster sampling method was used for choosing the samples of the study in a way that firstly, two vocational schools were chosen by simple random sampling (one specific for physical education and one non-physical education school) and then, among the students of the two vocational schools, 115 physical education students and 110 non-physical education students were evaluated. For evaluation of the lower disorders, the observation and caliper were used. The sample of five disorders namely genu valgum, bowed legs, flat foot, Cavus foot, and hallux valgus were evaluated. The descriptive statistics were used for expression of statistical data such as mean ad standard deviation. The mean comparison tests such as ANOVA and t-test were used for inferential statistics and they were done by the use of SPSS18 with 95% confidence level. The results indicated that genu valgum, flat foot, and hallux valgus disorders in female non-physical education students are significantly higher than the physical education students however the genu varum is higher in physical education students compared to non-physical education students. There were no significant differences between the two groups in Cavus foot disorder.

Keywords: *lower limb disorders, genu valgum disorder, genu varum disorder, flat foot disorder, cavus foot disorder, hallux valgus disorder*

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1- INTRODUCTION

In recent years, participation in competitive sports in high school and at college levels has been significantly increased. Along with this increase, the incidence of injuries is greater than in the past, so that today, sports injuries and collisions are the main reasons for disability in young athletes (Stephan et al., 2009). As a result, the demand for services provided by pathologists and sports medical specialists is growing. The sports-related injuries constitute a high portion of the total injuries reported in health centers, annually. The research suggests that college athletes, during a competition season, undergo physical harm with a 35% probability (Thomson and Morris, 1994). The Skeletomuscular disorders are among the most important occupational health issues in today world and are highly prevalent in almost all occupations (Smith et al, 2009). Musculoskeletal disorders are defined under complications and injuries to muscles, nerves, tendons, ligaments, joints, cartilage and spinal column (Gengopaday, 2007). Most people, at some stages of their lives, experience musculoskeletal pains (Grish and Anatony, 2003). Also, some studies have shown that the prevalence of pain, location of pain and other symptoms may be influenced by body posture and work habits as well as other demographic factors (Leggat and Smith, 2006). Cumulative trauma disorder occurs when a work is done repeatedly with force and an organ of the body is involved. The disease is most common in working with tools. Indeed, in doing some daily tasks such as playing the piano, using the typing machine, and squeezing the cloths, this disease is common (Abdoli, 1999). Women constitute a large segment of the US population since they leave 7 years longer than men (McClure et al., 2005). Musculoskeletal pains and disorders are among the most important ad central pains in children and adolescents (Aurora et al., 2006) in a way that today, due to lack of physical activity in schools on the one hand and being in stressful situations and conditions resulted from abundant involvements and industrial and automotive life on the other hand, have led to the increase in numerous physical and mental disorders such as musculoskeletal disorders and discomforts associated with it (Shery & Melisson, 2001). The prevalence of musculoskeletal pain in students have been reported about 10 to 20 percent (Goodman et al., 1991). According to research conducted at Columbia University, musculoskeletal pain is the second most common problem (after acne) in young students participating in the study as 5% of these patients had pain in their limbs reason of which was not clear and it was not due to a disease, however musculoskeletal pain in some of these persons was caused by a series of diseases (Richmond, 1993). According to research conducted by Sherry and Melisson, about 16 percent of the students had pain in their limbs and pain and suffered from musculoskeletal disorders. Also, the prevalence of back pain in the spine among students has been reported from

11.5% to 64.2% however this prevalence of back pain has been reported at different times and at different ages in children (Terry William et al., 2006). In a study on 40 11 to 13-year-old students in New Zealand, Whitfield has reported prevalence of musculoskeletal pain and discomfort during a week as 18.5% (Whitefield et al, 2001). In another study, Watson has reported skeletal-muscular disorders, especially the back pain, 1446 students (Watson et al., 2002). A number of studies indicate the disproportionate relationship and inappropriate use of equipment such as desks and chairs for students' bodies and their physical properties (Legg et al., 2003).

Carrying equipment and school bag by students from home to school and vice versa is also the subject of several studies in recent years has been considered by numerous research. These studies have reported that carrying heavy backpacks by the students cause musculoskeletal pain and discomfort including: Back pain, shoulder pain and neck pain. The studies have shown that carrying backpacks heavier than 10 to 15 percent of body weight can lead to disorders in students' body composition (Vieri et al, 1999). Evaluating and comparing the lower limb musculoskeletal disorders in female students of physical education with students of other fields was considered by the current study in order to help the students and the teachers and the relevant authorities to create the conditions that can prevent the problems occurred in the school environment.

This subject was chosen since the ergonomic considerations in the schools have not been considered in Iran and there are no figures addressing the upper/lower limb musculoskeletal disorders of the students. Since the previous studies on this field have indicated that ignorance of ergonomic considerations in the school environment has led to prevalence of musculoskeletal disorders, increase in the lost days due to absenteeism, increased health care costs, disability, and eventually decline in productivity caused by disorders, the current study aimed at evaluating and comparing the lower limb skeletal disorders in female students of physical education with students of other fields so with the results obtained from this study, the managers and planners will be convinced that by the use of ergonomics principles in the designing the targeted plans and raising awareness among students and teachers in this field, substantially prevent the aforementioned damage and productivity harm to students.

2- Methodology

The current study aimed at evaluating and comparing the lower limb skeletal disorders prevalence. In this chapter, we will address the method and variables. Afterwards, the statistical population, sampling procedure, sample size, data collection procedure, instrument, and, measurement method will be elaborated. Finally, the statistical procedures will be noted. The statistical population included all the students of the Shahr Ray's vocational schools. The cluster sampling method was used for choosing the samples of the study in a way that firstly, two vocational schools were chosen by simple random sampling (one specific for physical education and one non-physical education school) and then, among the students of the two vocational schools, 115 physical education students and 110 non-physical education students were evaluated. For evaluation of the lower disorders, the observation and caliper were used. The sample of five disorders namely genu valgum, bowed legs, flat foot, Cavus foot, and hallux valgus were evaluated. The descriptive statistics were used for expression of statistical data such as mean ad standard deviation. The mean comparison tests such as ANOVA and t-test were used for inferential statistics and they were done by the use of SPSS18 with 95% confidence level.

3- Findings

The results indicated that 130 samples were physical education students and only 104 samples were students of other fields of study. The distribution of the studied samples based on the age showed that the mean age of physical education students was 16.56 and it was 16.79 for students of other fields of study. The distribution of the studied samples based on the height, weight, and BMI showed that the mean height of physical education students was 159.11 and it was 156.33 for students of other fields of study. The mean weight of physical education students was 46.10 and it was 49.16 for students of other fields of study. Finally, the mean BMI of physical education students was 19.43 and it was 20.12 for students of other fields of study.

The results of descriptive evaluation of the lower limb disorders in female students of physical education and the students of other fields of study showed that in physical education students, 18 students suffered genu valgum disorder (17.3%), 31 students suffered from parenthesis leg disorder (29.8%), 11 students suffered from flat foot (10.5%), 17 (16.3%) students suffered from cavus foot, and 13 students suffered from hallux valgus disorder (12.5%). The results showed that in students of other fields of study, 43 students suffered genu valgum disorder (33.1%), 22 students suffered from parenthesis leg disorder (16.9%), 38 students suffered from flat foot (29.2%), 24 (18.4%) students suffered from cavus foot, and 19 students suffered from hallux valgus disorder (14.6%).

The Chi Square and 2x2 Crosstabs were used for evaluation of the difference in prevalence of genu valgum in female students of physical education and the students of other fields. The results are provided in table 1.

Table 1: the chi square for evaluation of the genu valgum disorder prevalence in students of physical education and students of other fields of study

Significance level	Degree of freedom	Chi square value
0/006**	1	7/455

<0/05 *P<0/01 ** ،P

Regarding the results of table 1, there is a significant difference between the female students of physical education and the students of other fields of study in terms of genu valgum disorder ($p<0.01$). genu valgum disorder in the students of other fields of study is significantly higher than the students of physical studies. The Chi Square and 2x2 Crosstabs were used for evaluation of the difference in prevalence of genu valgum in female students of physical education and the students of other fields. The results are provided in table 2.

Table 2: the chi square for evaluation of the genu varum disorder prevalence in students of physical education and students of other fields of study

Significance level	Degree of freedom	Chi square value
0/015*	1	5/475

<0/05 *P<0/01 ** ،P

Regarding the results of table 2, there is a significant difference between the female students of physical education and the students of other fields of study in terms of genu varum disorder ($p<0.01$). genu varum disorder in the physical education

students is significantly higher than the students of other fields of study. The Chi Square and 2x2 Crosstabs were used for evaluation of the difference in prevalence of genu varum in female students of physical education and the students of other fields. The results are provided in table 3.

Table 3: the chi square for evaluation of the flat foot disorder prevalence in students of physical education and students of other fields of study

Significance level	Degree of freedom	Chi square value
0/000**	1	12/144

<0/05 *P<0/01 ** ،P

Regarding the results of table 3, there is a significant difference between the female students of physical education and the students of other fields of study in terms of flat foot disorder (p<0.01). Flat foot disorder in the students of other fields of study is significantly higher than the students of physical education. The Chi Square and 2x2 Crosstabs were used for evaluation of the difference in prevalence of flat foot disorder in female students of physical education and the students of other fields. The results are provided in table 4.

Table 4: the chi square for evaluation of the cavus foot disorder prevalence in students of physical education and students of other fields of study

Significance level	Degree of freedom	Chi square value
0/403	1	0/179

<0/05 *P<0/01 ** ،P

Regarding the results of table 4, there is no significant difference between the physical educations students and the students of other fields of study in terms of prevalence of Cavus foot disorder.

The Chi Square and 2x2 Crosstabs were used for evaluation of the difference in prevalence of hallux valgus disorder in female students of physical education and the students of other fields. The results are provided in table 5.

Table 5: the chi square for evaluation of the hallux valgus disorder prevalence in students of physical education and students of other fields of study

Significance level	Degree of freedom	Chi square value
0/012**	1	5/847

<0/05 *P<0/01 ** ،P

Regarding the results of table 5, there is a significant difference between the female students of physical education and the students of other fields of study in terms of hallux valgus disorder (p<0.05). Hallux valgus disorder in the students of other fields of study is significantly higher than the students of physical studies.

4- Discussion and Conclusion

Regarding the results of table 1, there is a significant difference between the female students of physical education and the students of other fields of study in terms of genu valgum disorder (p<0.01). Genu valgum disorder in the students of other fields of study is significantly higher than the students of physical studies.

The results of the current study is in lines with those of Musavi (2005), Mahdavinejad (1993), and Mazlumi (2007).

This phenomenon is common in girls however some studies disagree. In any case, the results showed that physical activity is one of the most important deterrents of valgus deformity and the female students, due to having practical courses that require them to have the physical activity, are not prone to this disorder. Also, this result can lead to a common plan for the students of other fields of study in order to require them to have physical activity, so this disorder that can cause other discomforts such as Kyphosis, scoliosis and lordosis and ... will be prevented.

The results of the current study indicated that there is a significant difference between the female students of physical education and the students of other fields of study in terms of genu varum disorder (p<0.05). Genu varum disorder in the physical education students is significantly higher than the students of other fields of study. These results are in lines with those of Daneshmandi (2009) and Hasanvand (2011), however these results are inconsistent with those of Mahdavinejad (1993) and Mazlumi (2007).

One of the causes of the genu varum is the muscle imbalance in the leg. In fact, in this phenomenon, the internal muscle hamstrings, and quadriceps, and vastus medialis are weak. This poor balance and stirs the natural posture of the person and in the long-term, causes the genu varum. Basically, this phenomenon happens in athletes of a specific field more than other fields. For example, the genu varum is common in football players. As we mentioned before, one of the causes of genu varum is the muscle imbalance in the legs and the athletes of some fields, since they are active in one field, and some muscles are involved more than the other muscles, are prone to this disorder. Therefore the results of the current study that indicate there is a significant difference between the female students of physical education and the students of other fields of study in terms of genu varum disorder, confirms this hypothesis.

The results indicated that there is a significant difference between the female students of physical education and the students of other fields of study in terms of flat foot disorder (p<0.01). Flat foot disorder in the students of other fields of study is significantly higher than the students of physical education. The results of the current study are in lines with those of Naji (2003) and Hasanvand (2011). Flat foot is highly prevalent in students and there is a direct relationship between the increase in weight, height and body mass index with the prevalence of this disorder. It denotes if people ad students do not have physical activity and mobility, they will be prone to increased weight and high BMI, and consequently, suffer from flat foot disorder. The authorities can prevent this phenomenon by taking the necessary actions.

The results indicated that there is no significant difference between the physical educations students and the students of other fields of study in terms of prevalence of Cavus foot disorder. These results are in lines with those of Banayifar et al (2009). It is a disorder in the natural state of the foot in which the longitudinal arch of the foot is extended and it is usually associated with the clawed toes disorder. In terms of pathology, the mentioned disorder can be congenital, acquired, or idiopathic (unknown cause). Also, in terms of corrigibility, we have two types of Cavus foot: soft and hard or deformed. Soft cavus foot respond better to amendment and message however, due to disruption in the hard bony structures of the foot in the hard cavus disorder, there is lesser such ability and other therapies are needed. Among the causes of this disorder, the shortness of soft tissues inside feet due to excessive activity, a

short Achilles tendon, plantar muscle cramps or paralysis due to neuromuscular disorders, and finally, the tibialis anterior muscle weakness, open hallux and muscles between the bones, and the plantar faciitis can be noted of which, the latter can be extended to the results of the current study in that the students of other fields of study who have less physical activity compared to the students of physical education, may have a weakness in the mentioned muscles which can lead to the cavus foot disorder.

The results indicated that there is a significant difference between the female students of physical education and the students of other fields of study in terms of hallux valgus disorder ($p<0.05$). Hallux valgus disorder in the students of other fields of study is significantly higher than the students of physical studies.

When walking, the hallux is the latest body's power transmission pivot, so any deviation in its natural conditions can reduce the walking efficiency. While standing, the first plantar joint of hallux is also one of the three weight-bearing points. The other two points are the heel and the plantar fifth joint of the little toe. In the normal state, the pivot of the long bone of the hallux is deviated outward with a 7 degree angle from the plantar first bone. This angle is called the "hallux angle". When this angle is higher than 10 degrees, the hallux valgus disorder happens. This disorder can be congenital or acquired and also physical activity can prevent its occurrence. As the students' future requires a healthy and flawless body, the need to pay particular attention to the students' physical health and stature can be among the priorities of educational planners and executives since having a healthy force in the future can increase operational efficiency and reduce costs for Medicare and Medicaid Services, which consequently lead to social and national success. The results indicate that the presence of some structural disorders or muscle weakness can lead to adverse effects on physical and psychological health, and therefore the performance and success. So, understanding the physical condition of students and provide possible solutions to overcome these disorders is of particular importance. Therefore, in order to avoid wasting human and financial capital and creating an appropriate atmosphere for the flourishing of talents, the physical activities in the schools and vocational schools of other fields of study can be promoted to reduce the incidence of these disorders and complications.

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