

УДК 616.711-007.5

## POSTURAL DISORDERS IN BALLET DANCERS

Ayad ABDUSSALAM

*Lviv State University of Physical Culture,  
Lviv, Ukraine, e-mail: fr@ldufk.edu.ua***ПОРУШЕННЯ ПОСТАВИ У ТАНЦЮРИСТІВ БАЛЕТУ. Аяд АБДУСАЛАМ.** *Львівський державний університет фізичної культури, м. Львів, Україна, e-mail: fr@ldufk.edu.ua.***Анотація.** У статті на основі аналізу літературних джерел розглянуто проблему виникнення порушень постави, зокрема сколіозу, у спортсменів. Досліджено зв'язок між спортивними навантаженнями і появою розладів постави, представлено зв'язок між танцями, зокрема танцями балету, й розладами постави з їх подальшим прогресуванням. Показано, наскільки важливо проводити дослідження та аналізувати випадки сколіозу в танцюристів балету як своєрідної форми спортивної активності.**Ключові слова:** порушення постави, сколіоз, спорт, балетні танці, діти.**НАРУШЕНИЕ ОСАНКИ  
У ТАНЦОРОВ БАЛЕТА**

Аяд АБДУСАЛАМ

*Львовский государственный университет  
физической культуры, г. Львов, Украина,  
e-mail: fr@ldufk.edu.ua***Аннотация.** В статье на основе анализа литературных источников рассмотрена проблема возникновения нарушений осанки, в частности, сколиоза, у спортсменов. Исследована связь между спортивными нагрузками и появлением нарушений осанки, представлена связь между танцами, включая танцы балета, и нарушениями осанки с их последующим прогрессированием. Показано, насколько важно проводить исследования и анализировать случаи сколиоза у танцоров балета как своеобразной формы спортивной активности.**Ключевые слова:** нарушение осанки, сколиоз, спорт, балетные танцы, дети.**POSTURAL DISORDERS  
IN BALLET DANCERS**

Ayad ABDUSSALAM

*Lviv State University of Physical Culture,  
Lviv, Ukraine, e-mail: fr@ldufk.edu.ua***Summary:** This paper deals on the basis of literature sources analysis with a problem of postural disorders in particular scoliosis in sportsmen. It investigates the problem of connection between sport loadings and appearance of postural disorders and presents connection between dancing including ballet dancing and postural disorders with their next progression. It discloses how important is to make researches and analyze occurrences of scoliosis in dancers of ballet as a kind of sportive activity.**Keywords:** posture disorders, scoliosis, sport, ballet dancing, children.**Formulation of the problem.** Since the beginning of written history, scoliosis has been a major concern in medical texts. The clinical image of scoliosis very much impressed ancient physicians and treatment remained poor for centuries. Even today, treatment is unsatisfactory since correction of scoliosis is not possible without spinal fusion.

Scoliosis (from the Greek “scolios” – curve) is a serious disease prone to progressing at the age of 7 to 15 years and requiring long-term and active treatment, as structural changes in the vertebrae and intervertebral discs occur, the vertebrae gradually torsion around the vertical axis, which can lead to irreversible defects of the figure, chronic (lifelong) disruption of respiratory, cardiovascular, digestive and other body systems. It is a medical condition in which a person's spine has a sideways curve, as the curve is usually “S”- or “C”-shaped. In some the degree of curve is stable, while in others it increases over time.

It should start to worry if a child asymmetrically placed ears, shoulders, shoulder blades, elbows, waist, dimpled over the sacrum, the “wings” of the pelvis, the fold under the buttocks, hips. Ask the child to reach the floor with the hands, assessing whether there is a deviation of the trunk from the median line when tilted, whether there is not a side of the lumbar vertebrae, a one-sided longitudinal muscular cushion, and in the chest – “bulging” the ribs or scapula on one side.

The insidiousness of scoliosis consists in the fact that it develops gradually without causing pain and other complaints for a long time, and when the pains arise, the treatment is often not very promising because of persistent anatomical defects of the spine.

**Presenting main material.** Health benefits such as increase in cardiovascular health, increased aerobic capacity, increased bone density, improved mental outlook, reduced body fat and increased life expectancy are gained by regular exercise so they are recommended for scoliosis patients in most cases. There is still some reason for concern when it comes to rigorous exercising, especially for adolescents who are still growing and are skeletally immature [4].

While there has been a well-documented genetic connection for scoliosis the average incidence of scoliosis is only around 1.5–2% in the general population. Yet the incidents of scoliosis have been found to be significantly higher in certain sub-populations.

For instance, incidents of scoliosis among gymnasts and especially rhythmic gymnastics are found to be as high as 20% of the total population. Similarly, ballet dancers have been reported to have incidents as high as 24% [16].

Young athletes may have spinal deformities which may be present per se and unrelated to any sports activity, or may be potentially associated with the sport they practice. Due to enormous one-sided loading lasting several years, sport may also have negative implications on the movement system. Potential association between AIS and sports is quite vague. For all these reasons, there are opposing opinions on the issue of scoliosis and sport [18].

There are different reports in the literature on the implications of various sports on the prevalence of postural disorders in children. Researchers have shown that the postural status is much better in high-class gymnasts and rhythmic gymnasts. The postural status of shooters is deteriorated, and in track and field athletes (high-class athletes competing in throwing disciplines) it is good. Several studies point out that certain sports show increased association with spinal deformities, particularly in adolescent girls. Nevertheless, patients with adolescent idiopathic scoliosis are still encouraged to engage in some sports activities [18].

The highly repetitive nature of sport, amenorrhoea, excessive stress on the immature spine in professional athletes in adolescence and joint hypermobility may coexist during adolescence and be associated with increased incidence of AIS. It is reported that it is necessary to avoid sports which engage musculature one-sidedly and asymmetrically, such as: rowing, fencing, tennis and track and field throwing disciplines. Sword (1992) reports that scoliosis is discovered in 80% of athletes with asymmetric loading of trunk and shoulders, such as javelin throwers and tennis players. On the basis of medicine founded on evidence, and in the scope of a systematic review of literature and other authoritative sources and reports, Green et al. (2009) suggested guidelines to health professionals and patients with scoliosis related to participation in physical and sports activities. They report on potential association between elite-level competition in specific sports at an early age and increased prevalence of scoliosis (grade C recommendation).

Rhythmic gymnastics as a sports discipline uses a series of specifically selected exercises which contribute to balanced and harmonic development of the organism as a whole. Symmetrical performance of exercises at practice, which is defined by strict requirements of equal use of both hands in the technique of manipulation of pieces of apparatus, creates a habit of proper body posture in all positions. On the other hand, several investigators report that the incidence of scoliosis is ten times higher in persons who practice rhythmic gymnastics. In a research, Meyer et al. (2008) set the goal to determine the association between the IS type and the physical and sports activity in which they participate. The research included 169 adolescent girls with IS and 100 adolescent girls in the control group, comparable by years of age. They all completed an epidemiological questionnaire which contained information on their school and out-of-school physical and sports activities [18].

**Ballet dance and scoliosis.** Ballet dancing is a perfect symbiosis of sport and art. Not by chance, it is becoming increasingly popular among adults. However, it is the children's age requires a formal and permanent and committed attention of coaches and parents to children posture.

Finding time for training and competitions, it is useful to plan and visits to the doctor, and time for exercises to correct posture and prevent scoliosis. Preventing scoliosis is easier than long, difficult and, often, not too successful treatment.

We cannot disregard the problems of violation of posture in children involved in ballroom dancing, because the more these children are at the doctor's reception, the more afflicted are the cases of serious and irreversible problems with posture, called scoliotic disease. Disorders of posture are easy to identify and correct, if they are associated with muscle imbalance. Visible in the vertical position of the curvature of the spine with a disturbed posture, as a rule, level in the prone position, and disruption of the internal organs is mainly functional and does not lead to serious and fatal consequences.

It is possible to find many ballet dancers with scoliosis of different degrees of severity in different age groups and different dance levels. This is mainly girls embodiments with identical curvatures of the spine – the arc convex thoracic right on this side raised shoulder, head slightly tilted to the right, the right half of the lower left pelvis, scoliosis and muscular roller arc in the lumbar left. A noticeable deviation in the direction of the body, different triangles waist, shoulder blades at different distances from the spine and one speaks more than the other. Exactly the age of juniors is the most dangerous for girls involved in ballroom dancers in developing right-sided thoracic scoliosis, since this is the period of the most intensive growth with an insufficiently formed muscular corset (scoliosis after 16 years is usually more stable and compensated).

As it was said, scoliosis affects about 2–3 % of the population, it can occur in adults but is more commonly diagnosed for the first time in children aged. About 10% of adolescents have some degree of scoliosis, but less than 1 % of them develop scoliosis that requires treatment. Therefore it is so important today to study and research such a type of spine disorders and finding out the optimal methods of the treatment. Also to know the all risk factors and what is making this disorder progress is not less important than the disorder diagnosis itself [7].

Scoliosis may be evident in young athletes, with a prevalence of 2–24 %. The highest rates are observed among dancers, gymnasts, and swimmers. There have also been other isolated reports of a higher risk for scoliosis in young athletes who engage vigorously in sports that put an uneven load on the spine. These include figure skating, dance, tennis, skiing, and javelin throwing, among other sports. In most cases, the scoliosis is minor, and everyday sports do not lead to scoliosis. Exercise has many benefits for people both young and old and may even help patients with scoliosis [13].

Many dance instructors often take credit for diagnosing scoliosis. Dance teachers can usually spot a case of scoliosis early on, because the dancer's body alignment will be out of proportion in some way. It doesn't mean that the dancing cause scoliosis but anyway it affects on it. That is why I have been chosen this topic as a PhD work for it's importance. In this work I will try to find out how exactly the process of dancing affects on those who have scoliosis.

For example, after visiting several city contests and gazing at the dancers' backs, we can unfortunately note that most of them are far from ideal. But we cannot exclude that the assiduous lessons in ballroom dancing with uncorrected violations of posture at this age can provoke the development of the same type of option "standard" scoliosis in the future. In this case, active choreography and the cultivation of excessive flexibility of the spine only aggravate the problem and worsen the prognosis. In this regard, we want to draw the attention of parents and coaches to the need for constant control over the bearing of children, and with the slightest suspicion of the development of scoliosis – prompt medical intervention. Scoliosis is the case when time does not heal.

There are few reports in the literature on the association between scoliosis and the process of growth, between scoliosis and intensive exercises, between scoliosis and morphological characteristics, as well as between scoliosis and injuries in young dancers. A recent study, conducted on a sample of 1.288 non-professional dancers in the 8–16 age range, researched the experience, body structure, anatomical anomalies and injuries which could be associated with scoliosis, and identified the variables that can be used to determine the difference between the dancers with sco-

liosis and without scoliosis at the time of the screening. Scoliosis was diagnosed in 23.8% of the dancers. The dancing experience and body structure were similar in the dancers with and without scoliosis. The dancers with scoliosis had significantly higher presence of genu varum and hallux valgus. Back pain caused by injuries was more common in the dancers with scoliosis in comparison with the dancers who did not have scoliosis. In order to determine the difference in prevalence of AIS in 30 ballerinas in the 9–16 age range, the girls were compared to their peers who are not ballerinas. The research addressed the association between the presence of scoliosis and generalized joint hyper mobility, menarche, BMI and the number of hours of practice per week. Scoliosis was diagnosed in 30% of the ballerinas in comparison with 3% of those in the control group. The results showed that ballerinas have 12.4 times higher probability of occurrence of scoliosis than girls of the same age who do not practice ballet. In the group of ballerinas, a higher degree of hyper mobility was present (70%) in comparison with those who do not practice dancing (3%), but no statistically significant association was found between scoliosis and hyper mobility, menarche, BMI or the number of hours of dancing per week. Considering a higher risk of occurrence of scoliosis, the authors emphasize the need for vigilant screening and improvement of education of dance teachers and parents, which may be of great benefit in early detection and reduction of risk of possible surgical intervention [3].

Dance is focused around alignment, strength and being limber. Keeping the spine and muscles moving allows the vertebra to decompress and takes the pressure off of the muscles attached to the spine.

Ballet in particular focuses on alignment. When standing at the barre, it is important to be standing straight with the coccyx lengthened towards the floor. The rib cage needs to be closed rather than popped open and shoulders need to be relaxed.

Some studies say that dancers with scoliosis need not fret! There's no reason to make your child stop dancing. Some dance movements like repeated back bends can aggravate scoliosis, but avoiding those movements makes more sense than eliminating dance altogether.

To find out more about the association between the ballet dance and scoliosis we need to know more about ballet, its techniques and the exercises which are used during and before the dance, which requires carrying serious researches.

#### **Dangerous Triad for Scoliosis [12]:**

**Ligamentous Laxity** – Gymnast and dancers must have a good degree of flexibility in order to achieve a high level in their discipline. Whether it's because girls with lax ligaments are naturally attracted to a sport that flexibility plays an important part or a tremendous emphasis on stretching causes the girl becomes far more flexible, it doesn't really matter. It is the imbalance between her flexibility and her own muscular stability that can cause a development of her scoliosis curvatures.

**Delayed Maturity** – The rigorous training required to become a world class gymnast or prima ballerina can cause the delay in onset of menses and this can have a profound impact on a scoliosis. It is well known that Estrogen is very important to bone density. While much attention is paid to post-menopausal estrogen levels when it comes to bone density, very little consideration is given to lower levels of estrogen in per-menstrual female and the effects it would have on bony development. A delay in maturity can result in imbalances in the ossification centers in the spine resulting in imbalances vertebral growth.

**Asymmetric Spinal Loading** – Repetitive movements, especially those performed unilaterally, can have a negative impact on spinal development. While intermittent loading of a vertebra can stimulate growth, a constant or repetitive loading of a segment can suppress a growth plate. When this is done on one side of the body more than the other an imbalance in growth can occur from side to side that can lead to a scoliosis. An example of a unilateral repetitive movement pattern would be ballet being taught with student on a bar facing the instructor on the same side of the room while they perform dance movements on one side only, over and over again. A horse back rider practicing roping would be prone to asymmetrically loaded forces to the spine. Another example would be a golfer, who develops a scoliosis after practicing driving all the time without

any attention to performing similar movements in the opposite direction. These type of activity can lead to significant asymmetrical spinal loading that can drive a scoliosis.

Researchers Cann et al found a decrease of 20% to 30% in trabecular bone (aka – spongy bone) mass of the vertebra in pre-menopausal amenorrheic women engaged in vigorous exercise programs and noted that running-related fractures were most frequent in amenorrheic elite runners, so there appears to be a connection between menstrual irregularity and athletic injury [12].

In the pursuit of excellence and self-accomplishment through the physical practice of dance, dancers continually face the danger and challenge of dealing with injuries.

The rigors of dance training lead to many overuse injuries common to dancers, such as chondromalacia patella and Achilles tendinopathy [8].

Causative factors include anatomic structure, heredity, training regime, improper technique, floor surfaces, age, body mass index (BMI), muscle imbalance, nutrition, menstrual function, and dance discipline (eg, hours of practice) [6].

A number of aspects distinguish young dancers from other athletes. First, dancers work *en pointe* (plantar flexion of the ankle and foot joints that puts the dorsum of the forefoot in a direct line with the anterior edge of the tibia) [17] and *demi-pointe* (standing halfway to full point, rising high onto the balls of the feet), which places an extreme load on the joints of the foot. Second, the 5 classical positions require marked turnout of the lower limbs (external rotation at the hip and knee, tibial torsion, and forefoot abduction at the midtarsal joint). Third, the excessive repetitive movements in nonphysiologic positions result in very high loads and strain the muscles and ligaments [14].

Consequently, knee and lower back injuries are more common in dancers compared with athletes active in other sport fields: 36% among dancers versus 13% in gymnasts [1,2].

Other types of injuries and injury sites, however, are very similar for athletes in dancing and most traditional sports [15].

Intense training can lead to hormonal changes that may affect the make up or trabecular of bone [5].

It has been reported in a study that 13 year old dancers who ‘trained > 8.25 hours per week were most likely to have reported sustaining an injury in the previous 12 months ( $p < 0.001$ ) [9].

Scoliosis is also a medical condition commonly reported in dancers & a higher risk of progression presents at pre-adolescent or peri adolescent stages of development. Early identification through screening may allow for treatment options to have an effect on curve progression [10].

Relationships have been reported between the presence of scoliosis and delayed menarche, secondary amenorrhea and stress fracture, demonstrating the importance of screening to identify and address these issues in young dancers [11].

### **Conclusion:**

1. Scoliosis has been and remains now one of major concerns in medical texts. The average incidence of scoliosis is only around 1.5–2% in the general population, but the insidiousness of it consists in the fact that it develops gradually without causing pain and other complaints for a long time and afterwards the treatment is often not very promising because of persistent anatomical defects of the spine. Regular exercise because of their health benefits are recommended for scoliosis patients in most cases, but there is still some reason for concern when it comes to rigorous exercising, especially for adolescents who are still growing and are skeletally immature.

2. Incidents of scoliosis among gymnasts and especially rhythmic gymnastics are found to be as high as 20% of the total population. Similarly, ballet dancers have been reported to have incidents as high as 24%. Specific loadings in ballet could create especially in young dancers the dangerous triad for scoliosis. Causative factors include anatomic structure, heredity, training regime, improper technique, floor surfaces, age, body mass index (BMI), muscle imbalance, nutrition, menstrual function, and dance discipline. That is why it is important to find out more about the association between the ballet dance and scoliosis and to make a serious research dealing with specificity of physical therapy for ballet dancers.

## References

1. Coplan JA. Ballet dancer's turnout and its relationship to self-reported injury. *J Orthop Sports Phys Ther.* 2002;32(11):579–584.
2. Cupisti A, D'Alessandro C, Evangelisti I, et al. Injury survey in competitive sub-elite rhythmic gymnasts: results from a prospective controlled study. *J SportsMedPhysFitness.* 2007;47(2):203–207.
3. *Eur Spine J.* Does anterior shoulder balance in adolescent idiopathic scoliosis correlate with posterior shoulder balance clinically and radiographically? 2012 Oct;21(10):1978–83. doi: 10.1007/s00586–012–2434–5. Epub 2012 Jul 28. [Electronic resource] – <https://www.ncbi.nlm.nih.gov/pubmed/22842954>
4. *Eur Spine J.* Beneficial effects of aerobic training in adolescent patients with moderate idiopathic scoliosis. 2011 August; 20 (suppl 3): 415–419.
5. Guggenheim CL. A survey of elite professional ballet schools regarding the initiation of pointe work in children. *Medical Problems of Performing Artists.* 1994; 9 : 15–17.
6. Hamilton WG, Hamilton LH, Marshall P, Molnar M. A profile of the musculoskeletal characteristics of elite professional ballet dancers. *Am J SportsMed.* 1992;20(3):267–273.
7. HEALTH GUIDES, SCOLIOSIS, A.D.A.M. [Electronic resource] – <http://www.nytimes.com/health/guides/disease/scoliosis/in-depth-report.html>
8. Kadel N. Foot and ankle injuries in dance. *Phys Med RehabilClin N Am.* 2006;17(4):813–826.
9. Kadel N, Teitz C, Kronmal R. Stress fractures in ballet dancers. *AmericanJournalofSports Medicine.* 1992; 20 : 445–449.
10. Koutedakis Y, Jamurtas A. The dancer as a performing athlete: Physiological considerations. *SportsMedicine.* 2004; 34(10) : 651–661.
11. Liederbach M, Spivak J, Rose DJ. Scoliosis in dancers: A method of assessment in quick screen settings. *Journal of Dance Medicine & Science.* 1997; 1(3) : 107–112.
12. Marcus M, Cann C, Maduis et al, Minstrual function and bone mass in elite runners. *Annals of Internal Medicine.*
13. National Scoliosis Foundation. On muscle imbalance and scoliosis”. [Electronic resource] – <http://www.scoliosis.org/forum/printthread.php?t=9028&pp=40&page=1>
14. Nilsson C, Leanderson J, Wykman A, Strender LE. The injury panorama in a Swedish professional ballet company. *Knee Surg Sports Traumatol Arthrosc.* 2001;9(4):242–246.
15. Nilsson C, Leanderson J, Wykman A, Strender LE. The injury panorama in a Swedish professional ballet company. *Knee Surg Sports Traumatol Arthrosc.* 2001;9(4):242–246.
16. Orthopaedic and Rehabilitation treatment of idiopathic scoliosis during growth – SOSORT guidelines: 2011.
17. Ryan AJ, Stephens RE. *Dance Medicine: A Comprehensive Guide.* Chicago, IL : PluribusPress; 1987
18. Slavica Đ. Jandrić SCOLIOSIS AND SPORT, School of medicine, University of Banja Luka, Bosnia and Hrzegovina, *SportLogia.* 2015; 11(1) : 10.

*Стаття надійшла до редколегії 12.09.2017*

*Прийнята до друку 22.09.2017*

*Підписана до друку 31.10.2017*