Original Article

Dance aerobic instructors' injuries in relation to external risk factors, part II

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ABSTRACT

Malliou, P., Rokka, S.T., Tsiganos, G., Mavromoustakos, S., Godolias, G. (2013). Dance aerobic instructors' injuries in relation to external risk factors, part II. *J Hum Sport Exerc.,* 8(3), pp.813-819. Dance aerobic instructors guide, organize and entertain all aerobics classes suffering, thus, from a number of frequently appearing injuries. The purpose of this study was to examine the musculoskeletal injuries in professional female dance aerobic instructors in relation to external factors such as frequency of participation per day or week, intensity of exercise, the type of aerobic dance, the footwear or the equipment used generally. The sample constituted of 273 female aerobic instructors who were educated in public and state colleges of physical education and sports in Greece. The most important external factors that influence injury appearance were the excessive working hours per day and per week, the mixed and high intensity classes, the different dance aerobic styles, the resilient floor and the inadequate shoes. In conclusion, the present study, in order to eliminate the external injury factors, suggests that dance aerobic instructor should not work for more than three hours a day or more than six hours a week, not participate in a variety of different dance styles, use proper footwear and work on a wooden floor. Finally, further research is needed to monitor all these innovations and the incidence and nature of injuries that are associated with them and to inform instructors of injury prevention developments. **Key words**: HOURS A DAY, INTENSITY, DANCE STYLE, EQUIPMENT, DANCE AEROBIC INSTRUCTORS.

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INTRODUCTION

Aerobic instructors are likely the only trainers who are personally involved in the implementation of the aerobic dance program, resulting that their physical characteristics are comparable to other aerobically trained athletes such as runners and joggers (Kravitz et al., 1994). Unfortunately, a number of researchers have recorded a significant high injury rate in dance aerobic instructors (Du Toit and Smith, 2001; Komura et al., 1992).

Various researchers have tried to elicit different risk factors related to dance injuries, classifying them to external and internal risk factors. External factors are defined as factors "from without", such as participation frequency, exercise duration and intensity, aerobic dance type and equipment in use, such us footwear or floor conditions, while internal factors are defined as biomechanics, conditioning, maturational stage and participants somatotype (Byhring and Bo, 2002).

An inordinate amount of attention has been paid on the role played by external factors in the occurrence of aerobic dance injuries, when one considers the paucity of scientific data associated with these variables. Specifically, the number of dance classes which involved aerobic instructor is an objective variable and a potential factor of injuries (Scarff-Olson et al., 1999; Baitch, 1987). Intensity of aerobic exercise, on the other hand, is subjective and varies depending on the level of fitness of the participant (Garrick and Requa, 1988), while the literature is unclear as to whether low or high impact classes are detrimental (Koszuta, 1986). Although today a variety of aerobic dance styles such as Dance, Step, Aqua, Kickboxing, Tae-Bo, Spinning, Body Pump, and types of oriental meditation exercises as Yoga and Tai chi were added on the different types of dance aerobic exercise's list, there is lack of injury data connected with them.

The belief that preventing is preferable to treating was the inspiration for the present study, whose purpose was to examine the musculoskeletal injuries in female dance aerobic instructors in relation to external factors such as frequency of participation per day or week, intensity of exercise, the type of aerobic dance, the footwear or the equipment used generally.

METHODS

A retrospective survey was conducted by interviewing instructors during national aerobic seminars and events in the country. Additionally, a 3-year prospective injury research was carried out (2006-2009) for those professional aerobic instructors who sought medical attention. Procedures were in accordance with ethical standards of the Committee on Human Experimentation and with the Helsinki Declaration of 1975.

Study population - Data collection (Retrospective research (phase I): (6 months-recording period of information with professional aerobic instructors and selection of the sample).

Retrospective information (phase I) was collected during an interview based on a standard form. It included questions about personal data, anthropometrical parameters, education level, new trends and information on aerobic dance programs. In order to control internal injury factors, any instructors with diagnosed physical defects, or instructors who were not fit (e.g. they abstained from classes for months, they suffered from previous injuries, they were not in a good psychological mood or they were over 35 years old) were excluded from the sample. Therefore, of the 376 female dance aerobic instructors who participated in the aerobic seminars and events, 316 consented to take part in the present research. Finally, 273 instructors completed the research schedule.

Data collection - Definition of injury (Prospective research (phase II)-(3 year recording period of injuries in professional female dance aerobic instructors. The participants were observed for three years and any injury that occurred was recorded).

Injury was defined as "any mishap occurring during scheduled classes that made an instructor miss 2 or more days of practice sessions and was diagnosed as such, by a health care professional". Therefore, for each injury an instructor sustained, the following information was collected: 1) type of activity that the injured instructor usually participated, 2) information about the work environment (floor surface, ventilation, lighting etc), 3) information about the exercise equipment (shoes, clothing etc) and the working hours per day and week in terms of different types of aerobic exercise. In addition, exposure time for each aerobic instructor was recorded prospectively for each year, week and day in relation to the type of aerobic dance participation.

Analysis: For the statistical analysis of the data, the method used was the analysis of frequencies and the non-parametric test X^2 (Chi square distribution) from the SPSS statistical package, in order to determine whether any of the previously mentioned factors were related to the rate of injury. The level of statistical significance was set at $p< .05$.

RESULTS

Personal Data

The demographic and the anthropometrical data parameters of the female participants were presented in the previous article (part I).

Working profile of injured instructor

273 cases were analysed, in terms of injury occurrence and maximum working hours per day. Table 1 shows that the injured female dance aerobic instructors who worked four or more than five hours per day were significantly more than those who worked less than four hours (X (3) 2 = 118.2, p <. 05). Also, injured instructors who worked more than 7 hours per week (Table 2) presented a statistically higher rate of injuries than those who worked up to 6 hours per week (X (1) 2 = 78.69, p <. 05). According to X 2 analysis, the injured instructors who participated in aerobic classes of high and mixed intensity reported a statistically significant higher injury rate (X (3) 2 = 100.3, p <. 05) (Table 3) than those who participated in classes of low and moderate intensity. In addition, the injured instructors who participated in step classes or in more than one different classes were significantly more than the injured instructors who participated in one of the other kinds of aerobics (X (4) 2 = 373.231, p <. 05).

Table 1. *Working hours per day in relation to injured and non injured instructors.*

	Injured		**Non injured**		**Total**	
Hours per day	A	%	A	%	A	%
≥ 2	2	1.3	11	9.4	13	4.8
3	21	13.5	66	56.4	87	31.9

4	93	59.6	30	25.6	123	45.1
≤ 5	40	25.6	10	8.5	50	18.3
Total	156	100.0	117	100.0	273	100.0

*(A= absolute values, % = percentage),
**Statistical significant (X (3) 2 = 118.2, p <. 05).

Table 2. *Working hours per week in relation to injured and non injured instructors.*

	Injured		**Non injured**		**Total**	
Hours per week	A	%	A	%	A	%
until 6	51	32.7	101	86.3*	152	55.7
7 and more	105	67.3*	16	13.7	121	44.3
Total	156	100.0	117	100.0	273	100.0

* (A= absolute values, % = percentage),
*** Statistical significant (X (1) 2 = 78.69, p <. 05).

Table 3. *Intensity of working hours and type of aerobic programs in relation to injured instructors.*

Intensity of working hours			**Types of aerobic programs**		
	A	%		A	%
Low	5	3.2	Dance	5	3.2
Moderate	11	7.1	Step**	50	32.1
High*	75	48.1	Kickboxing	6	3.8
Mix*	65	41.7	Body-pump	6	3.8
			More than two kinds**	89	57.0
Total	156	100.0	**Total**	156	100.0

* (A= absolute values, % = percentage)
* Statistical significant (X (3) 2 = 100.3, p <. 05)
** Statistical significant (X (4) 2 = 373.231, p <. 05).

Table 4. *Floor condition and the use of aerobic shoes in aerobic classes in relation to injured and non injured instructors.*

	Injured		Non injured		Total	
Floor	A	%	A	%	A	%
Plastic	39	25.0	36	30.8	75	27.4
Wooden floor	85	54.5	70	59.8	155	56.8
Resilient*	32	20.5	11	9.4	43	15.8
Total	156	100.0	117	100.0	273	100.0
Shoes	A	%	A	%	A	%
With aerobic shoes	74	47.4	88**	75.2	162	59.3
Without aerobic shoes	82	52.6	29	24.8	111	40.7
Total	156	100.0	117	100.0	273	100.0

** (A= absolute values, % = percentage)*
**Statistical significant (X (2) 2 = 10.56, p <. 05),*
***Statistical significant (X (1) 2 = 21.38, p <. 05).*

The majority of the instructors who worked on resilient floor were injured (X (2) 2 = 10.56, p <. 05). Also, 75.2% (n=88) of the non-injured aerobic instructors worked with special aerobic shoes (X (1) 2 = 21.38, p <. 05) (Table 4).

DISCUSSION

The present study investigated the musculoskeletal injury profile in female dance aerobic instructors in relation to recorded external risk factors such us the daily and the weekly class hour participation, the dance aerobic exercise intensity and type and the used equipment such us footwear and floor conditions.

The current study noted that female dance aerobic instructors who work up to three hours a day revealed low rate of injuries, in contrast with those who worked at least four to five hours a day, who showed higher rate of injuries, which is in accordance with Janis (1990) results. Also, Toit, Gilleard and Smith (1999), recorded that seriously injured instructors conducted classes for at least four hours a day and at least 10 hours a week. Similarly Potter's findings (1996) supported that instructors with 8.3 aerobic class hours a week revealed high rate of injuries.

In addition, the exercise intensity and aerobic dance type are two more parameters that seem to affect the injury rate. According to the results of this study, the instructors involved in mixed or high intensity classes presented a higher injury rate in comparison to those who conducted low or moderate intensity classes,

which are in agreement with Janis (1990), and Harnischfeger, Raymond and Hagerman (1988). An innovation of the present study is the examining the musculoskeletal injuries in relation to different aerobic styles. Thus, the injured instructors who participated in step classes or in more than one different dance aerobic styles were significantly more than the injured instructors who participated in one aerobic style exercise. Additionally, Farrington and Dyson (1995) supported that step aerobic cannot be of low impact and as a result, to reduce injury risk, instructors should decrease their hours of participation per day or per week. A limitation of the present study is the subjective evaluation of the exercise intensity depending on the condition level of the instructor, although an experienced instructor can understand it.

Early studies, concerned with floor condition and footwear in relation to injury rate proposed footwear with increasing shoe sole thickness and wooden floors in order to prevent injuries. Although it is difficult to draw firm conclusions about the general effect of artificial exercising surfaces on injury rates due to confounding variables such as the temperature, the footwear etc (Dragoo and Braun, 2010), the present study suggests that the above elements enhance the injury rate. Consequently, the instructors of the sample who worked on a resilient floor reported more injuries than the others who worked on a wooden or a plastic floor. In a similar research (Potter, 1996) dancers who practiced on a wooden floor reported fewer injuries than those who practiced on a resilient floor or on a concrete floor covered with carpet.

The results of the present study showed that there is an important relation between injuries and footwear. The instructors using special aerobics shoes suffered fewer injuries. Similarly, Douglas, Kelso and Bellvei (1985) reported that instructors wearing non-aerobic footwear presented a higher rate of injuries than those wearing special aerobics shoes. On the other hand, although aerobic shoes (fashion footwear with thicker sole) provide shock absorption, they are likely to increase the risk of lateral ligament injury of the ankle, following sudden foot inversion (Ramanathan et al., 2008). In addition, Rowson et al. (2010), offer valuable insight that footwear can affect Achilles tendon loading during dorsiflexion. Also, today's footwear technology aims to reduce excessive movements of the rear foot during running activities in order to reduce possible link between anterior knee pain and footwear (Cheung et al., 2006). Considering that chronic injuries such as Achilles tendonitis, anterior knee pain and ankle sprains are common injuries in aerobic dance instructors according to the present results, further research is needed to explore a possible link between footwear and chronic injuries so as to shed light on whether proper selection of shoes may be an adjunct therapeutic consideration in the management of patients with overuse syndromes.

In conclusion, the present study, in order to eliminate the external injury factors, suggests that dance aerobic instructors should not work for more than three hours a day or more than six hours a week, they should not participate in a variety of different dance styles and they should use proper footwear and work on a wooden floor. Finally, further research is needed to monitor all these innovations and the incidence and nature of injuries that are associated with them and to inform instructors of injury prevention developments.

REFERENCES

1. Baitch, S.P. (1987). Aerobic dance injuries: A Biomechanical Approach. *JOPERD, May / June.* 57-58.
2. Byhring, S. & Bo, K. (2002). Muscular skeletal injuries in the Norwegian National Ballet, Scand J. *Med. Sci Sports*. *12*, pp.365-370.
3. Cheung, R., Gabriel, Y. & Chen, B. (2006). Review Article: Association of Footwear with Patellofemoral Pain Syndrome in Runners. *Sports Med*, *36*(3), pp.199-205.

4. Du Toit, V. & Smith, R. (2001). Survey of Aerobic Dance injuries to the lower extremity in aerobic instructors. *Journal of the American Podiatry Medicine Association*, *91*(10), pp.528-532.
5. Du Toit, V., Gilleard, W. & Smith, R. (1999). Lower extremity injuries in aerobic dance: Is low impact less harmful than high impact? (Abstract). *5th 10C World Congress on Sport Sciences with the Annual Conference of Science and Medicine in Sport*, Sidney.
6. Douglas, R., Kelso, S. & Bellvei, P. (1985). Aerobic dance injuries: A retrospective study of instructors and participants. *Physician Sportsmed*, *13*(2), pp.130-140.
7. Dragoo, J.L. & Braun, H.J. (2010). The Effect of Playing Surface on Injury Rate: A Review of the Current Literature [Review]. *Sports Med*, November, *40*(11), pp.981-990.
8. Farrington, T. & Dyson, R.J. (1995). Ground reaction forces during step aerobics. *J Hum Movement Stud*, *29*, pp.89-98.
9. Garrick, J.G. & Requa, R.K. (1988). Aerobic Dance: A Review. *Sports Med*, *6*, pp.169-179.
10. Harnischfeger, H., Raymond, C. & Hagerman, C. (1988). Incidence of injury following high and low impact aerobics versus running. *Med Sci Sport Exer*, *20*(2 Suppl.), pp.88S.
11. Janis, L.R. (1990). Aerobic Dance Survey: a study of high-impact versus low-impact injuries. *Journal of the American Podiatric Medical Association*, *80*(8), pp.419- 423.
12. Komura, Y., Inaba, R., Fujita, S., Mirbod, S.M., Yoshida, H. & Nagata, C. (1992). Health condition of female aerobic dance instructors: Subjective symptoms and related factors. *Japanese Journal of Industrial Health*, *34*(4), pp.326- 334.
13. Koszuta, L.F. (1986). Low - impact aerobics: better than traditional aerobics dance? *The Physician and Sports Medicine*, *14*, pp.156-161.
14. Kravitz, L., Wilmerding, V., Stolarczyk, L. & Heyward, V. (1994). Physiological Profile of Step aerobic Instructors. *J Strength Cond Res*, *8*(4), pp.255-258.
15. Ramanathan, A.K., John, M.C., Arnold, G.P., Cochrane, L.A. & Abboud, R.J. (2008). Off-the-shelf in-shoe heel inserts: does cost matter? *Br J Sports Med*, *42*, pp.750-752.
16. Rowson, S., McNally, C. & Duma, S. (2010). Can Footwear Affect Achilles tendon loading? Clinical *Journal of Sport Medicine*, *20*(5), pp.344-349.
17. Scarff-Olson, M.R., Williford, H.N. & Brown, J.A. (1999). Injuries associated with dance - exercise practices. *Journal of Dance Medicine and Science*, *3*(4), pp.144-150.
18. Potter, H. (1996). Lower limb injuries in aerobics participants in Western Australia: An incidence study. *Aust J Physiother*, *42*, pp.111-119.