

Letter to Editor

Stress fracture prevalence in elite figure skaters

Dear Editor-in-chief,

Figure skating is a physically demanding sport that requires a unique combination of artistic ability, speed, agility, flexibility and power. During the last decades not only the competitive schedule has become tougher, but after introduction of the new judging system in 2003, also more emphasis is put on difficult technical elements, jumps, steps and spins (ISU Rules, 2006).

More studies about possible increasing prevalence of stress fractures in figure skaters and contributing factors are lacking (Dubravcic-Simunjak et al., 2003; Moran, 2000; Pecina et al., 1990). Therefore the aim of this study was to obtain data about the current stress fracture cumulative risk among elite junior and senior figure skaters, as well as possible factors that may contribute to stress fracture incidence.

An anonymous questionnaire, divided into 5 sections, inquired about the prevalence of stress fracture were mailed and distributed to all 62 International Skating Union (ISU) members by the ISU headquarters in Lausanne, Switzerland. The guidelines of the Helsinki declaration 2004 were followed.

From the 644 skaters who received the questionnaire, 412 completed ones were returned from 110 female juniors (78 single skaters, 12 pair skaters and 20 ice dancers) and 135 female seniors (97 single skaters, 16 pair skaters and 22 ice dancers) and from 79 male juniors (47 single skaters, 12 pair skaters and 20 ice dancers) and 88 male seniors (50 single skaters, 16 pair skaters and 22 ice dancers), coming from different ISU members. The response rate was 62% in females and 67% in males. The median age for female skaters was 16 years and for males 18 years (range 12-25 years).

All participants started to skate between 3 and 6 years of age and started to compete in national and inter-

national competitions when they were between 5 and 7 years old. At the time of this analysis, they had been skating between 9 and 20 years.

In females 41 (16.7%), and in males 25 (13.8%) figure skaters reported a stress fracture, which had occurred in the last years of their skating career. The site and the number of stress fractures in female and male junior and senior figure skaters throughout their skating disciplines are shown in Table 1.

From all stress fractures reported, 21 (51%) occurred in females and 12 (48%) in male figure skaters during the competitive season, while 20 (49%) stress fractures in females and 13 (52%) in male figure skaters occurred during summer training. Of the investigated skaters 93% trained almost all year round with a 1-2 month break, after the end of a skating season. There were no differences in training duration between the groups of skaters that did and did not report a stress fracture, but all skaters with stress fractures reported changes to their training routine before the occurrence of stress fractures.

The overall prevalence of stress fractures in the present study was 16.7% in female and 13.8% in male figure skaters with different prevalence among the figure skating disciplines that can be explained by their different training patterns. Single skaters spend most of their training time practicing different difficult jumps and their legs suffer great impact during the whole training session. In pair skaters the female counterpart has higher stress fracture prevalence than the male, which is comparable to ice dancers. This is probably because pair skaters not only do synchronous jumps but also use throw jumps where the female skater is thrown, while the men stays on the ice. Consequently the lower extremity of the female suffers repeated high impact during landing. Pair skaters and ice dancers practice on different kind of team elements, unison and synchrony. Their lower extremities are less

Table 1. The location of stress fractures in junior and senior figure skaters. Per gender the absolute number (percentage) from tested juniors and seniors in the different figure skating disciplines are presented.

	n	Transverse process L5	Navicular bone	Metatarsal	Tibia	Fibula	SUB-TOTAL No (%)	TOTAL No (%)
JUNIOR								
Female								
Singles	78	1 (4.2%)	2 (8.3%)	4 (16.7%)	9 (37.5%)	2 (8.3%)	18 (75%)	24 (100%)
Pairs	12	-	-	-	4 (16.6%)	1 (4.2%)	5 (20.8%)	
Ice Dance	20	-	-	-	1 (4.2%)	-	1 (4.2%)	
Male								
Singles	47	1 (6.7%)	1 (6.7%)	2(13.3%)	6 (40%)	2(13.3%)	12 (80%)	15 (100%)
Pairs	12	-	-	1(6.65%)	1(6.65%)	-	2(13.3%)	
Ice Dance	20	-	-	-	1 (6.7%)	-	1(6.7%)	
SENIOR								
Female								
Singles	97	-	2 (11.8%)	3 (17.6%)	6 (35.3%)	1 (5.9%)	12 (70.6%)	17 (100%)
Pairs	16	-	-	-	3 (17.6%)	1 (5.9%)	4 (23.5%)	
Ice Dance	22	-	-	-	1 (5.9%)	-	1 (5.9%)	
Male								
Singles	50	1 (10%)	-	2 (20%)	4 (40%)	1 (10 %)	8 (80%)	10 (100%)
Pairs	16	-	-	-	1(10%)	-	1(10%)	
Ice Dance	22	-	-	-	1(10%)	-	1(10%)	

exposed to excessive repetitive impacts compared to single figure skaters (Dubravcic-Simunjak et al., 2003; Moran, 2000), as confirmed by James et al, 2006.

Concerning possible contributing factors to stress fractures, all female and male figure skaters reported major changes in their training routine shortly before the occurrence of the stress fracture. In most cases an excessive number of repetitions of jumps and throw jumps, during each training session (up to 30 repetition of each jump), was reported. Galilee-Belfer and Guskiewicz, 2000 also reported that muscular fatigue and sudden changes in training intensity or duration may contribute to stress fracture incidence. In our survey we found that junior skaters, who participate both in junior and senior events, are exposed to greater stress and impacts than juniors who only skate either in junior or senior competitions. Of all senior skaters with stress fractures 5.9% females and 10% males attributed the occurrence to the greater number of competitions and shows, while 20.8% of all female juniors and 33.3% of all male skaters felt that the large number of competitions and shows during one skating season contributed to the occurrence of stress fractures. This is a novel and relevant finding which may have to be taken into account for developing the competition schedule.

In conclusion the data suggest that the cumulative risk of stress fractures is high in figure skating, especially among single figure skaters and female pair skaters. In the light of increasing physiological demands from rigorous training and competitive schedules throughout the skating season, prevention deserves more emphasis. Proper education to athletes and coaches about training regimes, together with early recognition of stress fracture symptoms may help to decrease the stress fracture risks. Because of the large number of competitions and shows in a short period of time, it is recommended to critically review the competitive schedule. In addition, rule changes concerning the ages and skaters possibilities to compete in both senior and junior events may have to be considered.

Sanda Dubravcic-Simunjak¹✉, **Harm Kuipers**²
Jane MORAN³, **Marko PEĆINA**⁴, **Boris ŠIMUNJAK**⁵, **Ruben AMBARTSUMOV**⁶, **Hiroya SAKAI**⁷, **David MITCHEL**⁸ and **Joel SHOBE**⁹

¹ Department of Physical Medicine and Rehabilitation, General Hospital "Sveti Duh", Zagreb, Croatia, ² FHML, PO Box 616, 6200 MD Maastricht, The Netherlands, ³ 870 Victoria Ave., Victoria, B.C. V8S 4N3, Canada, ⁴ Department of Orthopaedic Surgery, School of Medicine University of Zagreb, Salata 7, 10000 ZAGREB, Croatia, ⁵ ENT Department, Sestre Milosrdnice University Hospital, Vinogradska cesta 29, 10000 ZAGREB, Croatia, ⁶ "PSI - UKRAINE" Co LTD., 4, Lapse boulevard, Kiev 03067, Ukraine, ⁷ 1981 Kamodatsujido, Kawagoe, Saitama, 350-8550, JAPAN, ⁸ 36, Princes Gardens, Peterborough PE1 4DP, Great Britain, ⁹ 1555 Northway Drive, St. Cloud, Minnesota 56303 USA

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✉ **Sanda Dubravcic-Simunjak, MD, PhD**

Department of Physical Medicine and Rehabilitation, General Hospital "Sveti Duh", Sveti Duh 64, 10000 ZAGREB, Croatia
E-mail: sanda-dubravcic.simunjak@zg.htnet.hr