The Nature and Rate of Injury in Elite Sport Aerobics Athletes

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Abstract

This study investigated the injuries sustained by elite Australian sport aerobic athletes in the 12 months prior to the FISAF world sport aerobics championships in May/June 2004. Data was collected using a retrospective questionnaire developed from published research in similar areas.

The overall prevalence of injury for the 12-month period was 100% in this population. The average number of injuries per athlete was 2.2. Injuries most commonly occurred to the lower limb (52.4%) especially the ankle/foot (29.5%), then the wrist (13.1%) and posterior thigh (13.1%). The percentage of injuries that were reported as ongoing/repetitive was 47.5%.

The surface on which injuries most commonly occurred was the wooden floor (31.5%). The most common activity being performed when an injury occurred was jumps (36.1%) and athletes were more likely to be injured at training (21.3%) than during competition (3.3%).

The percentage of injuries that resulted in training sessions missed was 47.5%. The average number of sessions missed was 5.4. Of all injuries, 65.6% required modification to training. Many injuries (45.9%) were reported as moderately effecting training, injuries that severely effected training were 26.2% and 16.4% of injuries mildly effected training.

On the day prior to competition, 59% of respondents reported to have achieved their full competing potential despite injury. However, 41% believed that they would be competing below their best at the world championships.

This study is important in establishing the prevalence and rate of injury in elite sport aerobic athletes and provides a basis for further research.

Key words: prevalence, injury

Word count: 240

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1. Introduction

Sport aerobics was developed from a series of exercises originally designed to improve cardiovascular fitness and prevent coronary artery disease in the 1960s. The developments since, have produced a sport that combines intricate choreography with strength, jumps and flexibility skills into a heart pumping two-minute routine. Sport aerobic competitions are held around the world with participation from over 40 countries. Although it is not an Olympic sport at present, it is taking gradual steps towards inclusion.

Sport aerobics has a relatively low profile in Australia but receives strong participation throughout. The affiliation with Gymnastics Australia in the past four years has helped its profile and development. Sport aerobics features competition in 5 categories: individual male and female, mixed pairs, trios, and groups (6 athletes). Routines are completed on a 7m x 7m wooden floor, basketball or semi sprung stage floor depending on the event. Research has shown[1] a link between different surfaces and the forces incurred and thus the potential to cause injury. Due to the differing surfaces used by aerobics athletes this is an area of interest.

Unlike gymnastics which requires gymnasts to train from an extremely young age and demands a small frame and build, sport aerobics allows athletes to remain in the sport for a much longer period of time. However, it is the number and severity of injury that has prevented many of Australia's top athletes from achieving their ultimate potential. Many

athletes have been forced to take six months to a year out of competition due to injuries, hindering their progression and more commonly leading to their exit from competition.

Sport aerobics is a high impact sport, with elite athletes training 20-30 hours per week, 4-5 hours per day and up to 12 months of the year. This is due to the combination of national and international events. Training loads of this magnitude, the high impact nature of the sport and the various surfaces for training and competing [2,3] may be contributing factors in the occurrence of injury.

There are no studies available on the incidence of injury in sport aerobics. This may be partially due to its short history, low profile, and lack of therapists at a state and national level. The research into injuries published in gymnastics is extensive both in volume of research and topics covered. All authors agree that the risk of injury is clear[4,5,6]. Although there are many similarities in the skills and training regime of gymnasts and sport aerobics athletes, direct comparisons cannot be made due to the differing training and competition surfaces and different apparatus of gymnasts. Epidemiological data regarding the number and types of injuries in sport aerobics are needed to assess the risk of injury in this sport so that injury prevention strategies can be addressed.

In light of the lack of research in sport aerobics, the aims of this study were to determine:

- The rate, anatomical region, onset, severity, and types of injury incurred by elite sport aerobics athletes.

- The surfaces on which the athlete regularly trains and the surface on which injury most commonly occurred.
- The activity or event perceived by the athlete to have contributed to the injury
- The treatment obtained and the personnel engaged to assess injury.

The definition of injury for this study was "any damaged body part that would interfere with training/competing". This definition was used in earlier investigations of gymnasts[7], and similarly in other sports[7,6,8]. This definition was chosen because it provided information on a wide range of injuries (both minor and severe) that disrupt training or competition. This covers an athlete unable to perform a skill, unable to complete training, unable to complete full routine, unable to train at full capacity, or who required surgery or treatment[7,9].

2. Methodology

A retrospective injury report questionnaire was given to all members of the 2004 FISAF Australian Sport Aerobics team at the World Championships in May 2004 (n=28). These athletes were competing in the individual, trio, pairs and team (6 member) sections, as these are the most similar in training and routine composition. The questionnaire required athletes to report any injuries over the previous 12 months according to the injury definition. The research was conducted with the support of FISAF Australia. The questionnaire was developed by the researchers, and based much of its content on the previously completed at Victoria University of McLaughlin (2002), and the published work of Sands (1993); (Appendix 1).

The questionnaires were distributed at the training venue, prior to competition and completed forms were placed in a box provided at the venue. It was explained to the athletes that the questionnaires were voluntary and anonymous. There was no implied or intended pressure placed on the athletes to complete the injury report form. All athletes were over 18 years of age. No athlete was subjected to unethical testing and participation was not mandatory. No athlete was identifiable from the questionnaire. The Victoria University Human Ethics Committee granted ethics approval for this study. There were 30 athletes that were suitable for the study due to their category of competition and there were 28 surveys returned (93%).

Items on the questionnaire included demographic information, surfaces used for training, frequency and site of injury, the activity being performed when injury occurred and the

surface on which this happened. Injury frequency items included both the number of times the athlete had been injured and the number of injuries at a particular site. In order to gauge the severity of the injury, questions were included on whether treatment was sought and for how long, as well as whether any diagnostic imaging was used, or surgery was required. The ability of the athletes to recover from injury was also investigated with the inclusion of questions regarding number of sessions missed, perceived percentage of recovery since injury and the level of activity resumed.

Statistical analysis was conducted using SPSS and Microsoft Excel, with results being expressed as percentages of total number of respondents or injuries, depending on the variable being tested. The results of greatest interest to the authors were the number and type of injuries and the anatomical location. The surfaces that the athlete used predominantly for training and the surface on which the injury occurred were also analysed. Treatment and personnel engaged to assess injury both primary and secondary opinions were investigated. The severity of the injury was assessed in the third part of the questionnaire by such questions as the degree to which the injury affected training, number of sessions missed, and modification to training required. Due to the retrospective nature of the study it was difficult to assess recovery as each athlete was at a different time period since the injury.

3. Results:

3.1 Athletes Data

Participants were between 18 and 35 years of age, however there were significantly more females than males (m=3) (f=25). The male athletes were not excluded due to the pilot nature of the study. The mean age was 22.25yrs. The athletes trained for between 10 to 30 hours per week with an average of 16.25hrs. This is slightly skewed due to the number of competitors in the team section (6 athletes), who train less hours than individuals or "trio's". (Table 1.)

Table 1. Category of competition versus hours trained per week

Category	<10hrs	10-14hrs	15-19hrs	20-24hrs	25-29hrs	**Total**
Individual	1	1	0	3	1	**6**
Trio	0	5	0	2	0	**7**
Pairs	0	0	0	0	0	**0**
Team (6)	0	8	4	0	0	**12**
Individ + Trio	0	0	1	2	0	**3**
Total	**1**	**14**	**5**	**7**	**1**	**28**

3.2 Injury Site and Contributory Factors

All 28 athletes (100%) had sustained an injury (new or repetitive injuries) in the previous 12 months. There were a total of 61 injuries. The average number of injuries per athlete was 2.2 (Table 2.).

Table 2. Annual prevalence of injuries per athlete

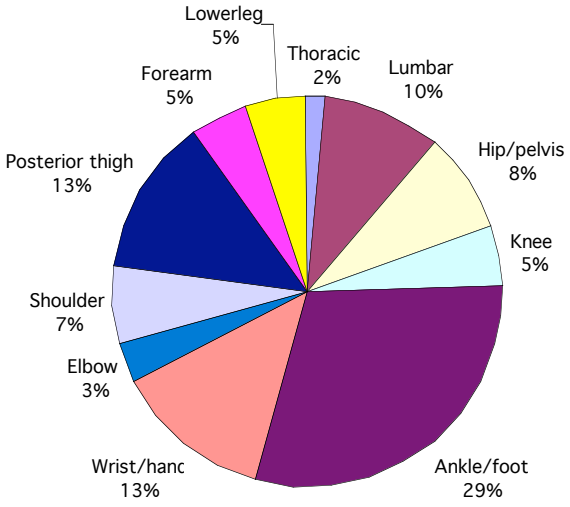
No. of Injuries	Frequency (n)	Percentage
1	9	32.1
2	7	25.0
3	10	35.7
4	2	7.1
Total	28	100

Injuries most commonly occurred to the ankle/foot (29.5%), wrist/hand (13.1%), and posterior thigh (13.1%) (Table 3 and Chart 2.). In the ankle/foot the injuries were predominantly ligament strains (n=11) both in the ankle joint and smaller joints of the foot. Five of the injuries were reported as fractures and two were undiagnosed foot pain. The injuries of the wrist/hand were predominantly joint sprains (n=6), a pinched ganglion (n=1), a stress fracture of the ulna (n=1). Of the injuries to the wrist/hand four athletes reported that they have had a previous injury to the same area. The injuries to the posterior thigh were all reported as hamstring strains (n=8), two of the athletes also suffered lower back, hip/pelvis pain. Injuries to the lumbar spine were mainly joint sprains with one reporting a disc bulge and another a stress fracture. Lower leg injuries were all reported as shin splints (n=3) with a similar injury occurring in the forearm due to push up landings. The percentage of injuries that were reported as having occurred previously or were repetitive was 47.5% (n=29).

Table 3. Site specific injury rate

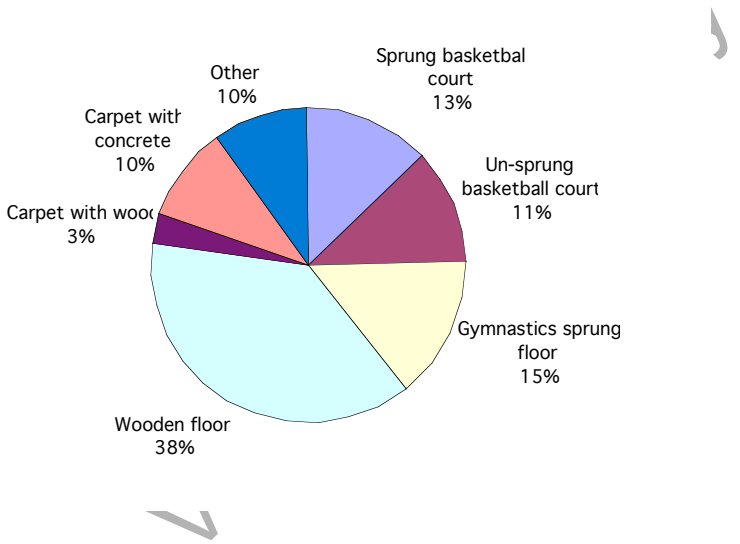
Site	Frequency (n)	Percentage(%)
Thoracic	1	1.6
Lumbar	6	9.8
Hip/pelvis	5	8.2
Knee	3	4.9
Ankle/foot	18	29.5
Wrist/hand	8	13.1
Elbow	2	3.3
Shoulder	4	6.6
Posterior thigh	8	13.1
Forearm	3	4.9
Lower leg	3	4.9
Total	61	100.0

Chart 1. Site specific injury rate



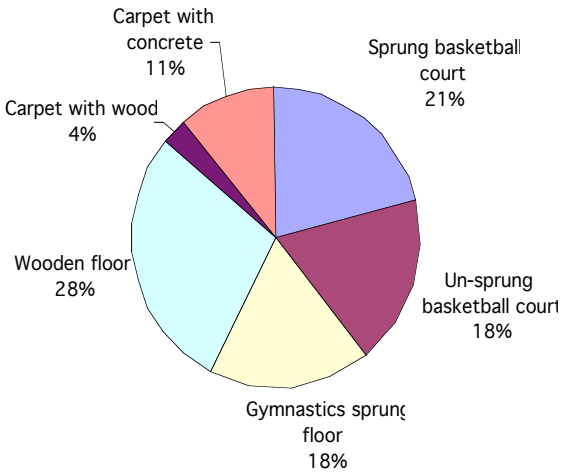
The surface on which injuries most commonly occurred was the wooden floor (31.5%)(Chart 2.). This is the most commonly used surface and therefore it is more likely that injuries occur here. The gymnastics sprung floor was the second surface on which injuries occurred (12.3%) but was not a surface that was most commonly used for training (Chart 3.) The surface used predominantly for training was a wooden floor, such as a dance studio (28%), then a sprung basketball court (21%).

Chart 3. Surface on which Injury Occurred



From this data there was no observable relationship between the surface on which the injury occurred and it contributing more or less to injury occurrence.

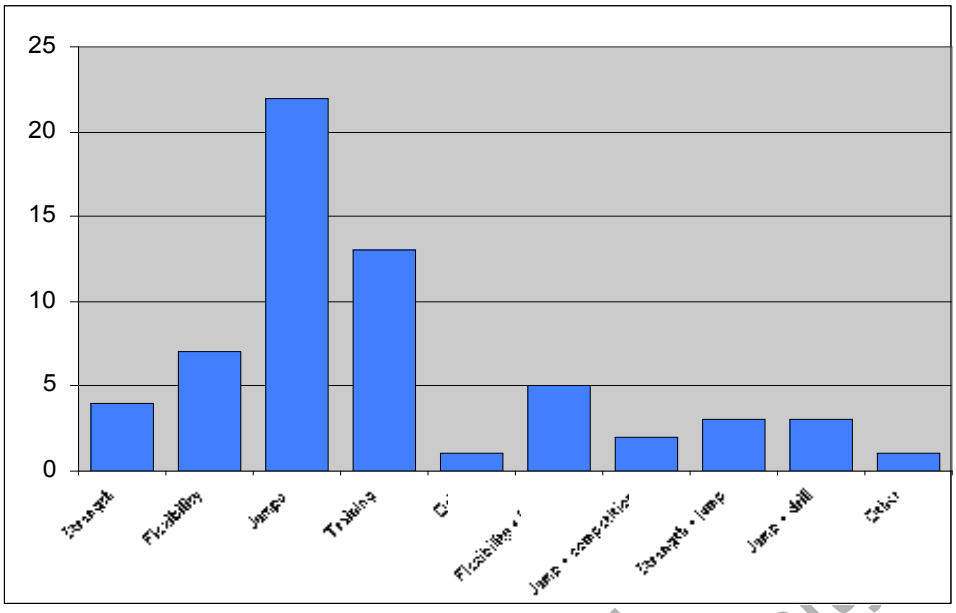
Chart 4. Primary Training Surface



Activity Causing Injury

The most common activity being performed when an injury occurred was jumps (30.1%) (Chart 5). These type of skills require the athlete to jump as high as possible, may include several turns in the air and may require the athlete to land on feet, in splits, or on hands. There were only two injuries that occurred during competition and were both due to jump skills in the routine. Training was reported as the cause for 17.8% of the injuries with no specific activities described. Flexibility skills were reported for 9.6% of the injuries. Flexibility includes stretching, as this is often extreme in an attempt to increase flexibility and symmetry of both sides of the body. Added to this is a further 6.8% of injuries that occurred during a skill combining both jumping and flexibility such as the splits as described previously.

Chart 5. Activity performed when injury occurred



After Care

Treatment was required for 82% of the injuries. This was primarily provided by physiotherapists (41.0%), then osteopaths (16.4%) (Table 4). Many athletes included several different practitioners in their treatment such as chiropractic, acupuncture, massage, sports physicians, and GP's.

Table 4. Injury requiring treatment and primary care personnel

Practitioner	Frequency (n)	Percentage (%)
No treatment	11	18.0
General Practitioner	3	4.9
Physiotherapist	25	41.0
Osteopath	10	16.9
Sports Physician	6	9.8
Chiropractor	5	8.2
Massage therapist	1	1.6
Total	61	100

3.3 Impact of Injury on Athlete

Affect on Training

The third part of the questionnaire referred to the severity of the injury, how it affected training at the time of injury and how the athlete had recovered since. Many injuries (45.9%) were reported as moderately affecting training, with 26.2% of participants reporting severely affected training and 16.4% reporting mildly affected training. Modification to training was required for 65.6% of injuries, such as, removing skill-causing injury, or only performing choreography, depending on which part of the body was injured (Table 5).

Table 5. Perceived effect of injury on ability to train

Perceived effect on training	Frequency (n)	Percentage (%)
Mild	10	16.4
Moderate	28	45.9
Severe	16	26.2
Unable to train	5	8.2
Unable to compete	1	1.6
Severe and unable to train/ compete	1	1.6
Total	61	100

The average number of sessions missed was difficult to determine as this question was sometimes answered in weeks rather than sessions. By using the knowledge of how many hours the athlete trained per week an estimate of the sessions missed was made. A training session may vary from 1.5 hours to 3 hours duration. The average number of sessions missed was 5.6. There was a range from 0 to 66 aerobics training sessions missed. There were 30 injuries that did not require the athlete to miss a session (49.2%), 2 respondents did not answer and 29 injuries required the athlete to miss at least one

session (47.5%). However, modification was required to training in most cases (n=40). Of the injuries that resulted in missed sessions, those totalling less than 1 week were 31%, 1 to 3 weeks 58.6% and greater than 3 weeks 10.3%.

Recovery of Injury

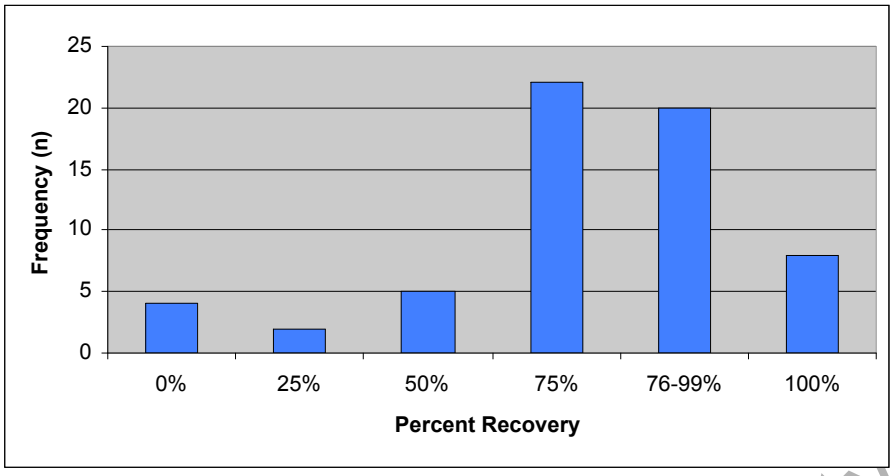
There were 20 (32.8%) injuries that occurred the 2 months prior to the world championships (April/May), which is considered competition season. A further 13 injuries where sustained in February/March of 2004 during pre-competition season. Gradual/ongoing type injuries made up 13.1% (n=8) of all injuries and were not given a particular month in which they began (appendix 2). When asked if the injury still required treatment (regardless of when injury occurred), 44.3% replied yes (n=27) compared to 82% when the injury initially occurred.

At the time of the questionnaire (27/5/04), only 13% of the injuries were 100% recovered. Recovery between 76-99% was achieved in 32.8% of injuries, 36.1% had achieved 75% recovery, 8.2% had 50% recovery, 3.3% had achieved 25% recovery, and 6.6% of the injuries had made 0-25% recovery (Table 6, Chart 6).

Table 6. Percent recovery since injury

Recovery	Frequency (n)	Percentage (%)
0%	4	6.6
25%	2	3.3
50%	5	8.2
75%	22	36.1
76-99%	20	32.8
100%	8	13.1
Total	61	100

Chart 6. Percent recovery since injury



Affect on Competition

Of the 28 members of the Australian team, 27 were competing but one had made 100% recovery yet reported loss of fitness as reason for not competing. There were two other members of the Australian team who were unable to compete due to injury and were not present at the championships. There were three athletes who competed with pain and were still modifying their training due to injury at the time of response.

Athletes were asked if they felt that at this time they had reached their full competing potential. For some this may not have been a complete month since the injury. Overall 59% of the athletes had reached their full potential despite the injury. However, 41% believed that they would be competing below their best at the World Championships due to their injury/s.

4. Discussion

4.1 Overview

Of the 28 athletes in the Australian team in 2004, 100% had sustained an injury in the previous 12 months. An average of 2.2 injuries per athlete was described for this period. Most injuries occurred during training (n=59) compared to competition (n=2). Injuries most commonly occurred in the foot/ankle (29.5%), wrist/hand (13.1%) and posterior thigh (13.1%). In regards to area of the body, the lower extremity was most affected with 52.4% of the injuries then the upper extremity with 27.9%. Most injuries were described as sprain/strains, however fractures were also reported (n=7) due to repetitive stress. Many injuries (45.9%) were reported to moderately affect training/competing with 65.6% of injuries requiring modification to training. The average number of sessions missed due to injury was 5.4 sessions, a significant amount of time from training and indicates the severity of these injuries. The skills that were cited as the cause of injury were jump skills during training (30.1%). Treatment was required for 82% of the injuries and athletes consulted physiotherapists (41%) or osteopath (16.4%) for injury management.

4.2 Rate of injury

This investigation into injury in sport aerobics helps to establish information on the rate of injury in this sport. No other studies on sport aerobics injuries have been published.

The participants in this study appear to have high injury rates. However, this may be due to the aerobics population chosen who are competing at the highest possible level in the sport. A study conducted on injuries in the sport of callisthenics[10] used a similar

definition of injury, yet found that in a 12-month period only 27.8% of participants were injured. In another study which prospectively investigated Australian competitive gymnasts[8], reported that 100% of gymnasts incurred an injury over an 18 month period. Similarly, a prospective study into female intercollegiate gymnastics[11] found an average of 2.1 injuries per athlete per year. This 1993 study had a similar number of participants, however the athletes trained slightly more hours (22hr/week) compared to those in the current study (16.25hrs/week). Previous studies on injury frequency in aerobics classes have reported injury occurrence rates of between 22% and 66%. The figures were higher for instructors and also higher in high impact aerobics classes[2,3]

4.3 Injury Analysis

The sport aerobic athletes reported a high proportion of ankle/foot injuries (29.5% of all injuries) or more broadly the lower extremity (52.4% of all injuries). Earlier studies of gymnasts reported similar findings of between 49% and 58% of all injuries in the lower extremity[4,7,11]. High impact aerobics reported the lower leg (shin), as the most common site of injury for instructors and participants[1,3]. Although sport aerobics uses similar moves to class aerobics: the moves are far more complex and involve multi-directional movement, greater propulsion from the floor and jumps and turns in the air that make landing difficult and with greater impact. This tends to lead to more serious injuries such as fractures and ankle sprains similar to gymnastics.

Athletes in this study perceived jump skills as those that contributed most to injury for all areas of the body. This is because jumps require landings on the feet, hands or both

simultaneously ie. push-up position. These types of skills require repetition to perfect the skill, and increase propulsion and quality of execution. The surface on which injury most commonly occurred was a wooden floor. The significance of this may be for the impact on overuse or repetitive stress injuries as opposed to a particular activity causing an injury, however this requires further research to reach a conclusion. A reduction in the number of repetitions performed on hard surfaces such as this or by reducing the impact with the addition of mats may help reduce the incidence of injury[1].

A high percentage of the injuries were reported to have a gradual onset, be an ongoing injury or repetitive (47.5%). This is slightly higher than reported in gymnastics studies[4,5,11], which ranged from 38% to 43%. This may be attributed to the greater variety in the apparatus of gymnasts.

Participants sought treatment primarily from physiotherapists. This was similar to dancers[12,13] and callisthenics performers[10]. Athletes may present to practitioners that they are accustomed to seeing initially, however many of the sport aerobics athletes used multiple practitioners for treatment, especially when the injury was on going or repetitive.

4.4 Impact of Injury

The severities of the injuries in sport aerobics were considered moderate to severe. Modification to training was required for most athletes (65.6%) following an injury and there was an average of 5.4 sessions missed per injury. Of all injuries over the 12-month period 51% forced the athlete to miss sessions. This is considerably higher than

callisthenics in which 22.6% of total injuries caused missed sessions[6]. In comparison to gymnastics, 46.5% of injuries resulted in greater than one week of time lost, and 20.6% greater than three weeks[4]. Similarly, Wadley and Albright, (1993) found that for 48% of injuries, the gymnast missed fewer than 8 days of full gymnastics participation, but in 34 cases the gymnast was limited for 3 weeks or longer. Of all injuries, 78% required the gymnast to limit gymnastics activity in some way due to injury[11]. The severity of the injuries in sport aerobics appears to be less than those injuries sustained in gymnastics. Literature has shown that a greater number gymnasts are required to modify training due to injury and a greater number sessions are missed per injury[4,7,6].

It was difficult to determine in which part of the training or competition phase the athletes sustained their injury due to the retrospective design of the study. This was also complicated by the fact that the World Championships are held at different times of the year depending on the host country and the national championships are held at different times of the year depending on which federation they are competing in (FISAF, FIG, ANAC). Therefore the injuries that were sustained in the month leading up to the championships were analysed in comparison to those that had occurred at other times of the year or were considered ongoing or gradual. There were considerably more injuries sustained in the month prior to the championships (29%), than in previous months, with 18% reported as gradual/ongoing. The athletes would be participating in competition at this time as well as having an intense training schedule, and may not have adequate time to recover. Although it is difficult to compare to prospective study designs the current study follows similar trends of previous research[7,9,14].

In interpreting the findings of this study the self-report nature of data collection and the retrospective design need to be considered. There are several obvious limitations to this method (eg. possible inaccurate recording of injury type, poor recollection of injury and its severity). Although 82% of all injuries were assessed, the chosen practitioner varied and the athlete was not always sure of the diagnosis for their injury. However, participants were required to include any investigations they had had, which assisted in correctly assessing the type of injury reported.

Limitations that were discovered in this study were mainly due to the design of the questionnaire. Because it was a retrospective design it was difficult to work out how much the athletes were training, each day, week or months of the year. More questions were required in this area. This is important for better assessment of risk of injury due to number of exposures (time spent training/competing). More questions were also required in the recovery from injury section as each athlete had a different amount of time since injury. The site of the injury was well described and diagnosis from practitioners was frequently provided. The activity that the athlete was performing when injury occurred was also well answered with many athletes providing a description to help classification. Further piloting was required to eliminate some of these problems.

The study included only the Australian athletes competing in the 2004 world championships. Given the number of competitive members in the affiliations (FISAF and Gymnastics Australia (800)) as well as the number of non-members that take part at clubs

and schools around Australia, this is a small section of the population, but a large portion of the elite athletes *. Although similar trends may be seen in the younger population further research is required.

* 19 athletes competed in the 2004 Australian Championships (GA)

5. Conclusion

Although comparisons have been made between sport aerobics, gymnastics and class aerobics the skills and training are extremely different. This study aimed to initiate the understanding of these differences and the importance of research into the specific injuries sustained by these athletes. The current study is the first to investigate injuries in sport aerobics. Three particular findings are highlighted.

- The injuries in competitive sport aerobics are moderate to severe. Those injuries occurring to the foot/ankle make up a high proportion of injuries as does repetitive strain/over use injuries. This requires further investigation.
- The surfaces on which the athletes train (in particular the wooden floor) may not be adequate for the activities that are being performed, due to the high impact and repetitive nature of the sport.
- A significant proportion of injuries were sustained whilst performing jumps and this requires further research, to reduce injury and investigate factors such as matting, shoe support, skill preparation, and strength preparation.

Acknowledgements

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16. Appendix 1. Injury Report Questionnaire and Information to participants

Victoria University of Technology
PO Box 14428
MELBOURNE CITY MC VIC 8001
Australia

Telephone:
(03) 9248 1140
Facsimile:
(03) 9248 1030

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School of Health Sciences
4th Floor
301 Flinders Lane
Melbourne VIC 3000

Information to Questionnaire Participants

As a Master's osteopathic student at Victoria University, I am conducting research into injuries sustained by elite Sport Aerobics athletes. You are invited to be part of this research and assist in the development of the sport.

At present there is little documented information available on the incidence of injury in Sport Aerobics. However it is the incidence and prevalence of injury that has prevented many of Australia's top athletes from achieving their ultimate potential.

If you wish to take part in this research you will be required to fill out an injury report questionnaire. The questionnaire will require you to record any injuries sustained over the previous 12 months. The questionnaire does not require you to provide your name or any form of identification. While the questions may deal with potentially sensitive information, your responses will be completely anonymous.

The questionnaire will take approximately 15 minutes to complete. Once you have completed the survey you can place it directly in the sealed box provided at the venue. Completion and return of the survey means that you have given consent. If you have any questions you can e-mail me at jessica.fetterplace@vu.edu.au

Greater knowledge and understanding of the types of injuries sustained by sport aerobic athletes is required. This study proposes to increase this knowledge and ultimately to inform coaches, athletes and medical staff of what activities or training methods may lead to injury and aid in the preparation of appropriate programs and treatment strategies.

Any queries about your participation in this project may be directed to the researcher (jessica.fetterplace@vu.edu.au or telephone 0438518070). If you have any queries or complaints about the way you have been treated, you may contact the Secretary, University Human Research Ethics Committee, Victoria University of Technology, PO Box 14428 MCMC, Melbourne, 8001 (telephone no: 03-9688 4710).

Victoria University
Injury Questionnaire

Please complete this form and place in the box provided.

1. (please tick)

	18-20yrs	21-23yrs	24-26yrs	27-29yrs	30+yrs
Male					
Female					

2. Postcode _____

3. Category of competition (please circle)
   Individual
   Trio
   Pairs
   Team (6)

4. For how many hours do you train per week (please circle)
   a. less than 10
   b. 10-14
   c. 15-19
   d. 20-24
   e. 25-29
   f. 30 +

5. What type of surfaces do you train on (rank from 1-6, with 1 being the surface which you train most on or NA if it does not apply)
   a. Sprung basketball court ____
   b. Un-sprung basketball court ____
   c. Gymnastics sprung floor____
   d. Wooden floor ____
   e. Carpet floor with wood underneath____
   f. Carpet floor with concrete underneath____
   g. other (please specify)_____

The following questions refer to any injuries that you have had in the past 12 months. For the purpose of this study an injury is defined as any damaged area of the body that required modification to training or competing. This includes, unable to perform skills, unable to complete training, unable to complete full routine, unable to train at full capacity, requires surgery or treatment.

6. How many injuries have you had in the last 12 months? _____

Please provide the following information for each injury (up to 5 can be completed on additional forms).

Month of injury_____

6. Nature and mechanism of injury : (ie. what you have done and how you did it)
   _____
   _____
   _____

7. Surface on which injury occurred (please tick)
   a. Sprung basketball court ____
   b. un-sprung basketball court ____
   c. Gymnastics sprung floor____
   d. Wooden floor ____
   e. Carpet floor with wood underneath____
   f. Carpet floor with concrete underneath____
   g. other (please specify)_____

8. Shoes/ no shoes (please circle)

9. What were you doing at the time of injury? (please circle appropriate response/s)

Strength	Training	Other:_____
Flexibility	Competition	Other Sports:_____
Jumps	Drill	

10. Have you previously injured this same area? (Y) (N)
    If Yes, when? _____

11. Has your injury been assessed? If yes, by whom- ie, Doctor, Physio, Specialist
    _____
    _____

12. Have you sought treatment since the injury? (Y) (N)
    If yes, what type of treatment and how many times:_____
    _____
    _____

13. Please add any additional information, eg. Xray results, scan reports etc., or other.

_____
_____
_____
_____

The following questions refer to your recovery from the injury

14. To what degree did the injury affect your training
    a. Mild
    b. Moderately
    c. Severely
    d. Unable to train
    e. Unable to compete

15. Number of sessions missed _____

16. Did you have to modify training due to injury (Y) (N)

17. Are you still requiring treatment (Y) (N)
    If yes, what treatment and how often? _____

18. Are you fully recovered from your injury (Y) (N)
    If you answered "No" above: what percentage of recovery do you feel you have achieved? (please circle)
    0-25% 25% 50% 75% 75-100%

19. Have you resumed:
    a. Full training
    b. Modified training
    c. Competition

20. Do you feel you have returned to your full competing potential (Y) (N)

21. Include any other comments you wish

_____
_____
_____
_____

If you have had more than one injury please complete additional forms attached.

8. Appendix 2. Results Tables

Activity performed when injury occurred

Activity		Frequency	Valid Percent
Valid	strength	4	6.6
	flexibility	7	11.5
	jumps	22	36.1
	training	13	21.3
	drill	1	1.6
	other	1	1.6
	flexibility + jump	5	8.2
	jump + competition	2	3.3
	strength + jump	3	4.9
	jump + drill	3	4.9
	Total	61	100.0

Age category

		Frequency	Valid Percent
Valid	18-20yrs	9	32.1
	21-23yrs	12	42.9
	24-26yrs	4	14.3
	27-29yrs	1	3.6
	30+yrs	2	7.1
	Total	28	100.0

Training hours per week

		Frequency	Valid Percent
Valid	Less than 10hrs	1	3.6
	10-15hrs	14	50.0
	15-20hrs	5	17.9
	20-25hrs	7	25.0
	25-30hrs	1	3.6
	Total	28	100.0

Number of sessions missed

Sessions missed		Frequency	Valid Percent
Valid	0	30	50.8
	1	3	5.1
	2	5	8.5
	3	1	1.7
	4	2	3.4
	5	2	3.4
	6	2	3.4
	8	4	6.8
	11	1	1.7
	12	5	8.5
	22	1	1.7
	33	1	1.7
	60	1	1.7
	66	1	1.7
	Total	59	100.0

No of injuries

Number of injuries		Frequency	Valid Percent
Valid	1	9	32.1
	2	7	25.0
	3	10	35.7
	4	2	7.1
	Total	28	100.0

Training Hours per week Versus No of injuries

		No_of_injuries				Total
		1	2	3	4	
Hours_week	Less than 10hrs	0	0	0	1	1
	10-15hrs	2	5	6	1	14
	15-20hrs	5	0	0	0	5
	20-25hrs	2	1	4	0	7
	25-30hrs	0	1	0	0	1
Total		9	7	10	2	28

Percent Recovery

		Frequency	Valid Percent
Valid	0%	4	6.6
	25%	2	3.3
	50%	5	8.2
	75%	22	36.1
	75-99%	20	32.8
	100%	8	13.1
	Total	61	100.0

Previous injury sustained to body part

		Frequency	Valid Percent
Valid	Yes	29	47.5
	No	32	52.5
	Total	61	100.0

Injury was assessed

		Frequency	Valid Percent
Valid	Yes	49	80.3
	No	12	19.7
	Total	61	100.0

Full potential achieved

		Frequency	Valid Percent
Valid	Yes	36	59.0
	No	25	41.0
	Total	61	100.0

Month of injury versus percent injury recovery

	Percent_recovery						Total
	0%	25%	50%	75%	75-99%	100%	
January 04	0	0	2	1	3	0	6
February 04	0	0	1	2	0	0	3
March 04	1	0	0	3	4	2	10
April 04	0	0	1	7	4	2	14
May 04	0	0	1	4	1	0	6
June 03	0	0	0	1	2	1	4
July 03	0	1	0	2	0	1	4
August 03	0	0	0	1	0	2	3
September 03	0	0	0	0	1	0	1
October 03	0	0	0	0	1	0	1
November 03	0	0	0	0	0	0	0
December 03	0	0	0	0	1	0	1
Onging/repetitive	3	1	0	1	3	0	8
Total	4	2	5	22	20	8	61

Modification required to training

		Frequency	Valid Percent
Valid	yes	40	65.6
	No	21	34.4
	Total	61	100.0

Primary treatment sought

		Frequency	Valid Percent
Valid	No treatment	11	18.0
	GP	3	4.9
	Physio	25	41.0
	Osteo	10	16.4
	Sports doctor	6	9.8
	Chiropractor	5	8.2
	Massage therapist	1	1.6
	Total	61	100.0

Appendix 3. Instructions to Authors

Sports Medicine Australia- Journal for Science and Medicine in Sport

Guidelines for Contributors

The Journal considers for publication original research, review papers, opinion pieces, short reports, methodological/technical notes, topical lectures and letters in the sub-disciplines of clinical medicine, dentistry, physiotherapy, anthropometry, biochemistry, biomechanics, epidemiology, motor behaviour, nutrition, psychology, physiology, podiatry, public health, sociology, and others having an inter-disciplinary perspective with specific applications to sport and exercise and its interaction with health.

Contributors are invited to submit their manuscripts in English to the Editor for critical review. Manuscripts submitted to the Journal must conform to the style and submission instructions outlined here, otherwise they will be returned without review. Manuscripts will also be returned to authors unreviewed if they do not meet the word count limits.

To enable an expeditious process of review, strong preference will be given to manuscripts that are electronically submitted. The Editor and Editorial Board are aware that the integrity of documents submitted must be protected and will do all they can to achieve this objective.

Contents

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The refereeing process will consist of reviews by at least two independent reviewers and an Associate Editor. The Associate Editor will make a recommendation to the Editor regarding the manuscript. The Editor will then inform the authors of editorial decisions based on the referees' comments.

STYLE OF MANUSCRIPT

Original research papers should describe original research, not be more than 4000 words long and contain no more than 20 references.

Short reports and methodological/technical notes should describe pilot study work, small scale studies, new methods, technical procedures or preliminary research findings. Such reports and notes should not be more than 1500 words, contain no more than 2 tables and contain no more than 6 references.

Opinion pieces should be no more than 2000 words and contain no more than 20 references.

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Letters should be no more than 300 words with fewer than 4 references.

Manuscripts must be typed, double spaced with wide margins for A4-size paper. All pages must be numbered.

Papers should usually follow the conventional form: title page, abstract, introduction, methods and procedures, results, discussion and conclusion.

Acknowledgement should be made of any research grant source. Tables and illustrations must be provided on separate pages with an identifier and their respective positions indicated in the text.

The Metric system is preferred and use of ISU units is encouraged. English units alone are not acceptable. Authors are reminded that abbreviations should first be spelt out, followed by the abbreviation in parenthesis. Thereafter, the abbreviation alone will suffice.

Clarity of expression should be an objective of all authors. The whole emphasis of the paper must be on communication with a wide international multi-disciplinary readership.

HEADINGS

Authors should be aware that **all headings** (apart from the first letter) are to be typed as **lower case only in all cases**, to assist with type-setting and disk translation.

TITLE PAGE

This should be a separate cover sheet containing the full title of the article, up to two authors' initials (no degrees or titles), institutional affiliation, mailing address of the principal author and date of submission. The title should be informative and be without unnecessary words (eg, studies in …., analysis of …., etc). The word count (minus the abstract, title page, tables and references) should be given on this page. Up to four keywords/phrases should also be given.

ABSTRACT

A one paragraph informative abstract must accompany each research or review article. It should be typed on a separate sheet of **not more than 250 words**. The abstract must be suitable for use by abstracting journals without rewording and should state what was

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Citations should be in superscript and numbered consecutively where they occur in the text, tables, etc, before the full point in the sentence in which they occur and listed numerically at the end of the paper, under the heading 'References'. All authors should be listed where there are 3 or fewer: where there are more than 3, the expression 'et al' should be added. Book and journal titles should be in italics.
Use no more than 3 references to support a specific point in the text.
Footnotes are unacceptable for publication.
For guidance on abbreviations of journal titles, see Index Medicus at www.nlm.nih.gov/tsd/serials/lji.html

Book Reference

Last name and initials of author, title of book, edition (if applicable), editor, translator (if applicable), place of publication, publisher, year of publication. For example:
Fox EL. *Sports Physiology*. Philadelphia. Saunders College. 1979.

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Last name and initials of principal author followed by last name(s) and initials of co-author(s), title of article (with first word only in capitals), abbreviated and italicised title of journal, year, volume (with issue number in parenthesis if applicable), inclusive pages. For example:
Orchard J. The AFL Penetrometer study: work in progress. *J Sci Med Sport* 2001;24:51-54.

TABLES AND FIGURES

Each table or figure should have a caption which is self explanatory without reference to the text. Tables should not duplicate material in the text or in illustrations and must be relevant to the paper. Vertical lines in tables should be omitted. Tables and figures must not be created in PowerPoint. Tables and figures must not be submitted in separate files.

ILLUSTRATIONS

The number of illustrations, particularly photographs should be kept to a minimum. Refer to illustrations as figures in the text. Good quality line drawings should be provided, preferably at a larger than final size for scanning purposes. Illustrations should not be created in PowerPoint.

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Structural formulae, flow-diagrams and complex mathematical expressions are expensive to print and should be kept to a minimum.
Use a slash (/) for simple fractions rather than a built up fraction.
In statistical analyses, 95% confidence intervals should be used, where appropriate.
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Statistical tests and associated confidence intervals for differences or p-values should also be reported when comparisons are made.

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