

# **SAFE DANCE III**

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## **REPORT**

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**1999**

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A report on the occurrence of  
injury in the Australian  
professional dance population

Debra Crookshanks

Editor: Hilary Trotter



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## THE AUTHOR

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Debra Crookshanks is an Australian-trained manipulative physiotherapist with ten years' experience in the areas of dance education and the assessment and treatment of dance related injuries.

As well as working with dancers in a clinical setting, Debra lectures at both secondary and tertiary levels, has presented papers at numerous conferences and has published a number of dance-related articles.

Debra is a guest lecturer for the Australian Institute of Classical Dance (NSW), a member of the Anatomy faculty of the Royal Academy of Dancing (NSW), a lecturer in the Dance Department of the School of Theatre, Film & Dance, University of New South Wales, and is currently completing a Master of Science degree in Dance Medicine at the University of Sydney, Department of Physiotherapy.

Debra has written an occasional paper entitled 'The Importance of Pelvic Stability in Dance' for Ausdance NSW and a Higher School Certificate study guide titled 'Anatomy for Dancers' for the Australian Institute of Classical Dance (NSW).

Debra is the convenor of the Safe Dance sub-committee for Ausdance NSW and works in a physiotherapy private practice in Mosman, NSW.



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I wish to thank:

- Tony Geeves for his initial work, without which this project would not have been possible;
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- my physiotherapy colleagues Jennifer Finnie and Jann Armstrong for comments on selected sections of the text;
- the artistic directors and assistants to the artistic directors of the companies involved for tolerating incursions into company time;
- finally and most importantly, my thanks to the dancers who took the time to complete the surveys, making this report possible. Your contribution has been most valuable both to Australian dancers and to the international dance community.



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## FOREWORD

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The *Safe Dance Project Report* on dance injury prevention and management in the Australian dance profession — now commonly known in the industry as 'Safe Dance I' — was launched nearly ten years ago. This was followed by an education campaign and in 1997 *Safe Dance II* was published to reveal the health and lifestyle of Australian adolescents in pre-professional dance training.

This retrospective survey by Debra Crookshanks replicates and expands the original 1990 survey and reveals the impact on the dance industry of this continuing campaign.

It is really exciting to witness the continuing investigation into the prospect of the healthier dancer and realise that it is still regarded as important to the dance community. The fact that Debra is a dance physiotherapist adds the voice of that section of the dance community, producing further evidence of the urgency and validity of this quest.

I am proud to be part of this investigative team, which revolves around Ausdance and maintains its vision while continuing to develop action plans.

TONY GEEVES

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Having initiated the Safe Dance project during my term as Ausdance (then AADE) joint national co-ordinator, and been heavily involved as editor with the production of all three reports, I was very pleased to be invited to contribute a foreword for *Safe Dance III*.

This report continues the theme of Tony Geeves's original milestone report of 1990 and updates our knowledge of the injury situation for Australian professional dancers.

In the period between 'Safe Dance I' and *Safe Dance III* much attention has been focused on implementing the original recommendations. The section of this volume entitled 'After Safe Dance I' (p.72) lists both the accomplished and the continuing implementation work and makes welcome reading. The dance and health communities are to be congratulated on these valuable and significant contributions to the field encompassed by the words 'Safe Dance'.

Unfortunately in this same period Australia has experienced a decline in the number of full-time positions for dancers. This is particularly evident in the lowered percentage of contemporary/modern respondents to the survey. We have lost several small contemporary companies and their dancers have in many cases become independent free-lance artists, making them ineligible for the survey. On the other hand it is notable that two national companies employing contemporary dancers did not take part in the current project, making some impact on the figures, as the author observes.

Nevertheless, *Safe Dance III* is a major step forward. The author, in her comparison between the two studies, (p.61) is able to conclude that:

*The overall picture is one of improved dancers' health. This includes a decrease in prevalence (%) of injury both chronic and acute, an improved understanding of the importance of appropriate, early management of injuries, dancers caring for themselves with a better diet, and companies providing increased support for their employees.*

In dance, as in any athletic endeavour, there will always be injuries. But this study shows that improvements in injury prevention and management can be, and are being made. It also pinpoints areas that need further research. The dance and health professions will welcome this further contribution to the Safe Dance series.

HILARY TROTTER



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## **SAFE DANCE III — PART ONE**

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A report on the occurrence of  
injury in the Australian  
professional dance population

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## **ABSTRACT**

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The aim of this report is to:

- investigate the frequency, site and type of injuries occurring in Australia's current professional dance population,
- compare the findings with those of the original Safe Dance Report (Geeves 1990),
- make recommendations to assist in limiting injury at all stages of a dancer's career,
- use the information as a basis for development of future strategies for injury management and prevention,
- contribute to the current body of knowledge nationally and internationally in the field of dance medicine,
- identify priorities for future research in the field of dance medicine.

Questionnaires were sent to 193 of Australia's full time professional dancers and returned by 139 dancers (72% response rate). Of the sample population 61% were female and 39% male. Classical companies accounted for 54% of all surveys returned, contemporary/modern 27% and commercial companies 19%.

79% of the sample was aged 30 years or younger.

It was found that of the 139 dancers responding to the survey, 48% had sustained a recent or acute injury defined as occurring in the six months immediately prior to the survey, and 50% had sustained a chronic injury defined as an injury that continues to affect their dancing in some way.

Results of the current survey show that 36% of all chronic injuries have occurred by 18 years of age. This figure increases to 87% by 25 years of age. This suggests a large portion of chronic injuries are

sustained when the dancer joins a company and hours spent in training increase.

The most common sites for chronic injury were ankle (41%), low back (33%) and knee (19%). The most common sites for acute (recent) injury were ankle (24%), foot (13%), low back (11%), knee (10%) and hip (10%). A high proportion of low back injuries and ankle injuries dominated both the acute and chronic injury categories.

Dancers considered warming up to be the most important factor in preventing an injury (25%) along with correct technique and knowledge of one's limitations (14%), a good diet and relative rest (12%).

Female dancers continue to be below average for Body Mass Index (BMI) averaging a BMI of 18.75 in comparison to the normal range of 20–25, and are continuing to experience intermittent cessation of menstrual cycle for three months or longer (secondary amenorrhoea 29%) and irregular menstrual cycle (oligomenorrhoea 60%) in larger numbers than the general female population (2%–5%).

Dancers were aware of the deleterious effects injury could have on their careers and also of possible contributing factors to a dance-related injury (fatigue, overwork, repetition 33%; new choreography 30%; and faulty technique 19%). They were aware of the need for adequate rest and appropriate early intervention and management and expressed opinions on preferred practitioners to consult for treatment once an injury had occurred (physiotherapist 63%; massage therapist 47%; osteopath 28% and general practitioner 27%).

Results of the report are encouraging with less injury — both acute and chronic — occurring in the professional dance population over the last ten years. This suggests that there have been some positive effects from the education strategies introduced after the *Safe Dance Project Report* (Geeves 1990) was published.

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## INTRODUCTION

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Dance injury is one of the most frequent causes of a dancer's early retirement from his or her chosen career.

Injuries are a part of all elite sport and dancers may be considered elite athletes with both physical and aesthetic demands made of them. Some incidence of injury is inevitable.

Dance requires intensive physical training in order to achieve peak performance, resulting in injuries often unique to each dance style (Solomon & Micheli 1986).

Early studies helped to establish the unique nature of dance injuries and demonstrated a pattern of injury including site and incidence (Washington 1978; Ende & Wickstrom 1982; Quirk 1983; Geeves 1990). Studies then attempted to establish the cause of dance-related injuries, including cardiopulmonary status (Mostardi, Porterfield, Greenberg, Goldberg & Lea 1983) and dance style (Solomon & Micheli 1986).

Most recent studies have attempted to address the consequences of the aesthetics of dance (Hamilton, Hamilton, Marshall & Molnar 1992) along with attempts to determine standards for injury prevention and appropriate treatment (Chmelar, Schultz, Ruhling, Shepherd, Zupan & Fitt 1998). Unique dance populations have also been studied, including theatrical dancers (Washington 1978), Broadway show dancers and actors (Evans, Evans, Carvajal & Perry 1996) and classical ballet dancers (Bowling 1989; Hamilton et al. 1992; Garrick & Requa 1993; Ramel & Moritz 1994; Khan, Brown et al 1995).

The focus of dance medicine is shifting from merely treating injuries when they occur to addressing the causes of these injuries, with the eventual goal of a reduced injury rate for all dancers.

In order for those involved in teaching dancers and for the dancers themselves to begin this shift, current information relating to injuries must be made available. This information should include the frequency with which injuries are occurring, the site at which they most frequently occur and the type of injury along with the style of dance involved. It should also include under what circumstances injuries are occurring. Strategies to manage these injuries can then more accurately be implemented.

Research such as the Safe Dance series of reports provides this information.

Studies have been conducted all over the world for many years on the incidence and nature of dance injuries (Washington 1978; Ende & Wickstrom 1982; Quirk 1983; Solomon & Micheli 1986; Evans et al. 1996; Brinson & Dick 1996). However, due to a lack of uniformity in methods of data collection and data analysis, these studies cannot be compared directly with one another, prohibiting the development of a clear dance injury profile.

This is the value of the original *Safe Dance Project Report* (Geeves 1990) and the current *Safe Dance III Report* (Crookshanks 1999), which have surveyed Australia's professional dance population using similar methods of data collection, analysis and reporting. An accurate comparison of information can now be made, conclusions drawn on the effectiveness of intervention strategies over the ten-year period and inferences made with some confidence about the population in general .

As the body of objective evidence relating to dance injuries grows, those who have accepted the challenge to care for and advise Australia's dancers must be aware of the risks dancers are exposed to and be well informed regarding strategies for dealing with these risks.

It is with this in mind that the results of *The Safe Dance III Report* are analysed, interpreted and presented to the dance community for consideration, discussion and positive reaction.



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## METHODS

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The information was collected using the questionnaire employed for the original *Safe Dance Project Report* (Geeves 1990), expanded to obtain extra detail.

The questionnaire was designed to gain data concerning incidence, site, type and prevalence of dancers' injuries. It was also designed to gain information concerning perceived causes of injuries, dancers' opinions on practitioner of choice for treatment of injuries, their knowledge of treatments available and perceived effectiveness of these treatments.

Information was also gained concerning age and gender of dancers participating in the survey, together with data concerning dietary and lifestyle practices and, for female dancers, menstrual patterns.

All dance companies in Australia employing full-time professional dancers for a period of six months or longer at the time of the survey (December 1997–December 1998), were approached to participate.

Selection criteria for inclusion in the survey stipulated that the dancer must have been employed full-time with the same dance company for the preceding six months.

To minimise problems with recalling injuries over time, dancers were asked to describe incidence of injury over the previous six-month period only.

When the surveys were forwarded to dancers, an information sheet explaining the nature and purpose of the study was provided. Consent to participate in the research was obtained verbally prior to inclusion into the study. Dancers were advised that the questionnaire should take no longer than 10–20 minutes to complete. The survey was approved by the Ethics Review Committee of the University of Sydney.

The information gathered was based on the dancers' self reporting of an injury and was not validated by checking against medical records owing to assurances of confidentiality.

### **Sample and Response Rate**

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193 questionnaires were distributed nationally with 139 returned (72% response rate). Of the 139 dancers who responded to the survey, 85 (61%) were female and 54 (39%) were male.

In Australia at the time of the survey there were three major classical companies (together employing approximately 95 dancers), two large contemporary companies (together employing approximately 25 dancers), a number of smaller, mainly contemporary companies, each employing 3–8 dancers (approximately 70 dancers altogether), and a number of commercial companies employing dancers on a contractual basis (approximately 60 dancers). The non-commercial companies contacted were listed by the Ausdance National Secretariat as 'Australian Dance and Dance/Theatre Companies' at September 1996. The commercial companies contacted were all performing seasons in Australia at the time. Numbers were obtained when companies were contacted to participate in the research.

Based on this, the total number of full-time professional dancers in companies for at least six months prior to the survey, including touring commercial companies, was approximately 250. This current sample of 139 therefore represents 56% of all full-time dancers performing in Australian companies at the time the survey was conducted (December 1997–December 1998).

The 1996 Australian National Census and an Australian Bureau of Statistics Survey conducted in March 1997, list 291 males and 736 females who state their occupation as dancer/choreographer. This probably includes many who trained as dancers but who perform outside company

structures, and thus did not meet the criteria for the sample selected for this study at the time.

Neither the gender distribution nor injury rate of those dancers who did not respond to the survey is known, therefore no conclusions or inferences can be made as to their influence on final survey results.

Descriptive statistics were compiled on qualitative and quantitative data for interpretation and reporting.

## **RESULTS**

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### **Sample**

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This survey of Australian professional dancers took place between December 1997 and December 1998. It is estimated there were 250 professional dancers who met the criteria for inclusion in the study performing in Australia at the time of the survey. 193 surveys were sent to dancers with 139 surveys returned (72% response rate). It is therefore estimated the sample (n=139) represents 56% of all professional dancers performing full time with the same company for a period of six months or longer prior to participation in the survey. This is considered a satisfactory sample.

The list of dance companies participating in the survey can be found at the end of the report.

The surveys were collated and statistics compiled with the assistance of Mr Tim Mallyon BBus (USQ).

### **Responses**

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The response rate to the survey was 72% (139 dancers). Of these responses 61% (85) were from female dancers and 39% (54) were from male dancers.

54% (75) were from classical companies, 27% (37) from contemporary/modern companies and 19% (27) from commercial companies.

79% of those responding were aged 30 years or younger. 5% of respondents were over 35 years of age.

### **Injuries**

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#### **General**

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89% (124) of respondents reported having sustained an injury at some time during their dance

careers that was sufficient to affect their dancing in some way.

#### Chronic injury

A total of 50% of all Australian professional dancers who responded to the survey reported suffering from a chronic injury; i.e., one which gives the dancer continuing problems (57% female, 43% male).

Of these, 58% were with classical companies, 26% were with contemporary/modern companies and 16% were in commercial work.

53% of all classical dancers responding reported suffering from a chronic injury.

49% of all contemporary/modern dancers responding reported suffering from a chronic injury.

41% of all commercial dancers responding reported suffering from a chronic injury.

*Table 1: Site of chronic injuries in Australian professional dancers responding to the survey*

SITE	PREVALENCE %
ankle	41%
lumbar spine (low back)	33%
knee	19%
hip	13%
foot	12%
cervical spine (neck)	7%
shoulder	4%
stress fracture	4%
shin	3%
thoracic spine (mid back)	3%
hamstrings	1.5%
elbow	1.5%
Number of respondents	N=69

*(Respondents were able to list up to 3 chronic injury sites)*

The most prevalent chronic injury sites were ankle (41%), the lumbar spine/low back (33%) and the knee (19%). *See Table 1 for the complete list of chronic injury sites.*

36% of Australian dancers who reported having a chronic injury are suffering from them by 18 years of age. This figure increases to 87% by age 25.

#### Recent injury

48% of dancers responding reported having sustained a recent (or acute) injury, i.e., one sustained in the six months prior to completing the survey (57% females, 43% males). Coincidentally, these gender percentages are similar to those for prevalence of chronic injury in the sample.

#### Technique

Of these 55% were using classical technique, 22.5% were using contemporary/modern technique and 22.5% were using tap and jazz technique in commercial work. There were no respondents to the survey from companies using other techniques.

56% of all commercial dancers responding reported having sustained a recent injury.

49% of all classical dancers responding reported having sustained a recent injury.

41% of all contemporary/modern dancers responding reported having sustained a recent injury.

#### Site of recent injury

The most prevalent sites for reported recent injury were ankle (24%), foot (13%), lumbar spine/low back (11%), knee (10%) and hip (10%). *See Table 2 for the complete list of recent injury sites*

**Table 2: Site of acute injuries in Australian professional dancers**

SITE	PREVALENCE %
ankle	24%
foot	13%
lumbar spine	11%
hip	10%
knee	10%
cervical spine (neck)	8%
shoulder	6%
shin	6%
hamstrings	6%
thoracic spine (mid back)	3%
elbow	1.5%
wrist	1.5%
stress fracture	—
<b>Total</b>	<b>100%</b>
<b>Number of respondents (N)</b>	<b>N=67</b>
<i>Dancers were able to list one acute injury site only</i>	

**Table 3: Type of recent injury**

TYPE OF INJURY	PREVALENCE
sprain	18%
inflammation	17%
muscle	17%
ligament	14%
spinal	9%
tendonitis	8%
cartilage	6%
stress fracture	4%
joint	3%
shin splint	3%
bone fracture	1%
<b>Total</b>	<b>100%</b>
<b>Number of respondents (N)</b>	<b>N = 66</b>

#### Type of recent injury

The most frequently reported types of recent injury included sprain (18%), inflammation (17%), muscle injury (17%), ligament (14%) and spinal injury (9%). See Table 3 for recent injury types.

39% of all recent injuries reportedly occurred during performance (20% commercial companies, 12% classical companies, 7% contemporary/modern companies).

25% of all recent injuries were reported as occurring over time or were accumulative (22% classical, 3% contemporary/modern, nil commercial).

24% of recent injuries occurred in rehearsal for which the dancers believed they were sufficiently warmed up (10.5% classical, 10.5% contemporary/modern, 3% commercial).

10% of all recent injuries reportedly occurred during class (9% classical, 1% contemporary/modern, nil commercial).

2% of recent injuries occurred during rehearsal for which the dancers felt they were not sufficiently warmed up.

22% of injuries occurred within three weeks of a break from dancing (12% classical, 9% contemporary/modern, 1% commercial).

94% of dancers reported being used to the technique they were using when injured.

92% of dancers reported having had the usual rehearsal for the role they were performing when injured.

#### On tour

36% of dancers were on tour at the time of the recent injury.



The average time spent away on tour was eight weeks.

Personal opinions on causes of injuries

33% of dancers cited fatigue, overwork and repetition as the cause of their most recent injury.

30% cited new technique, high risk steps, difficult choreography.

19% cited poor technique.

*See Table 4 for the complete list of perceived causes of recent injuries.*

*Table 4: Dancers' perceived causes of recent injury*

PERCEIVED CAUSE OF INJURY	%
fatigue, overwork, repetition	33%
new/difficult technique	30%
poor technique	19%
increase in workload	13%
overwork/lack of warm up	12%
own fault/body structure	9%
difficult costume	10%
floor	10%
start back too quickly	9%
over enthusiasm	4%
lighting	3%
Number of respondents (N)	N = 67

*Dancers were able to list up to 5 contributing factors*

6% of injured dancers reported not being used to the particular technique required at the time of injury.

8% reported not having had adequate rehearsal at the time of injury.

### After injury

28% of dancers stopped and rested immediately following the injury occurring (12% commercial, 10% classical, 6% contemporary/modern).

The average period over which dancers stopped and rested was 10 days, with a range of 1–42 days.

70% of dancers carried on as best they could immediately following injury (48% classical, 17% contemporary/modern, 10% commercial).

47% of dancers reported receiving treatment on the spot following an injury.

This treatment consisted of ice (57%), a professional opinion (18%) (most likely from the company's resident practitioner), heat (11%), massage (7%), anti-inflammatory cream (4%) and rest (3%).

50% of dancers sought treatment within one day of the injury occurring.

20% of dancers waited 2–3 days before seeking treatment. *See Table 5.*

25% (16) of dancers who had sustained an injury waited more than five days before seeking treatment for their injury citing various reasons for the delay.

*Table 5: Number of days before treatment was sought for a recent injury.*

DAYS ELAPSED	% OF DANCERS
one	50%
two	10%
three	10%
four	2%
five	3%
more than five	25%
Total %	100%
Number of respondents (N)	N = 62

Six dancers had their own reasons (unspecified) for the delay in seeking treatment.

Three dancers could not get an appointment with the practitioner of their choice as they were on tour at the time, and chose not to consult anyone else.

Seven dancers cited other reasons, including being unaware of the severity of the injury at the time the injury occurred and not realising treatment was necessary. Some thought the injury would resolve spontaneously and did not seek treatment immediately. For others the injury gradually worsened over the week causing the dancer to eventually seek treatment.

#### Practitioner of choice

96% of dancers consulted a professional or other practitioner regarding their recent injury.

63% of dancers sought treatment from a physiotherapist.

47% sought treatment from a massage therapist.

28% sought treatment from an osteopath.

27% sought treatment from a general practitioner.  
*See Table 6.*

*Table 6: Health professionals consulted*

PROFESSIONAL	% OF DANCERS
physiotherapist	63%
massage therapist	47%
osteopath	28%
general practitioner	27%
specialist doctor	16%
acupuncturist	14%
chiropractor	13%
other	9%
Number of respondents (N)	N = 67

*Respondents were able to list more than one practitioner*

Three dancers (4%) did not seek any treatment for their injury for varying reasons including: the dancer was too busy to consult anyone; the dancer chose self-management of the injury; the injury resolved spontaneously and did not require treatment.

#### Treatment

In 86% of cases dancers' injury costs were covered by workers compensation insurance held by their employers.

In 9% of cases injury costs were covered by the dancer's own private medical insurance.

5% of dancers used the Medicare system to cover medical costs related to their injuries.

*Table 7: Type of treatment received for management of a recent injury (dancer's own description)*

FORM OF TREATMENT OFFERED	% OF DANCERS
massage	75%
anti-inflammatory medication	52%
stretches	45%
exercises	42%
manipulation — deep tissue	38%
manipulation — joint	36%
ultrasound	28%
strapping	28%
manipulation — spinal	17%
acupuncture	14%
heat	6%
laser/interferential	6%
ice	5%
rest	2%
other	5%
Number of respondents (N)	N = 64
<i>Respondents were able to list all treatments offered/accepted</i>	

95% of injured dancers were offered some form of treatment for their injuries following consultation with a professional. *See Table 7.*

75% were offered or chose massage.

52% were offered or chose anti-inflammatory medication.

45% were offered or chose stretches.

42% were offered or chose exercise.

5% chose or were offered other treatments including orthotics, surgery and self management.

81% of dancers found the treatment offered helpful.

10% were uncertain whether the treatment was helpful.

8% found the treatment they received was not helpful.

43% of injuries were reported to have healed following treatment.

25% of injuries had not healed at the time of completing the survey and dancers were not sure if they would.

22% anticipated complete recovery eventually.

8% did not anticipate recovery from the injury. The reason given was that the injury was recurrent and was not expected to ever resolve completely.

#### Information

18% of dancers felt they were not given as much information about their injuries as they would have liked.

Respondents wanted to be provided with a diagnosis of the exact nature of the injury; to be offered a second opinion if the injury did not resolve with initial treatment; to be offered specific advice

on injury management; and to have a national list of dance practitioners made available to companies so that dance-specific assessment and treatment can be obtained when touring.

When dancers were asked who they felt had provided them with the most useful advice on dealing with and managing their injury:

42% specified that physiotherapists had provided them with satisfactory advice;

23% specified that doctors provided them with satisfactory advice. *See Table 8.*

*Table 8: Practitioners consulted for advice concerning management of recent injury*

SOURCE OF INFORMED ADVICE	LEVEL OF SATISFACTION WITH ADVICE GIVEN
physiotherapist	42%
doctor	23%
company physio & doctor	17%
osteopath	12%
acupuncturist	2%
chiropractor	–
masseur	–
Did not seek advice	4%
Total %	100%
Number of respondents (N)	N = 64

### Prevention

25% of dancers believed warm up was important in preventing injury.

14% believed a combination of warm up, good technique and knowledge of the body's limitations was important in preventing injury.

12% believed a combination of warm up, technique, knowledge of the body's limits, diet, and rest was important. *See Table 9.*

*Table 9: Factors considered important in preventing a dance-related injury (dancers' own perceptions)*

FACTORS	% OF RESPONSES
warm-up	25%
warm-up + good technique + knowledge of the body and its limits	14%
knowledge of the body and its limits	12%
warm-up + good technique + good diet + knowledge of the body and its limits + rest	12%
warm-up + good facilities	8%
education	6%
good technique + alignment	5%
good diet + warm-up	5%
good facilities + management	5%
strength training	4%
no pressure + a positive attitude	4%
massage	-
Total %	100%
Number of respondents (N)	N = 130

4% of dancers felt they did not know what to do when an injury occurred.

When asked their opinion on what injury dancers felt would be most difficult to deal with:

34% felt **any** injury was difficult to deal with;

23% felt a spinal injury was most difficult to deal with;

10% felt injury to the knee was the most difficult to deal with;

9% felt a chronic injury was most difficult to deal with. *See Table 10.*

*Table 10: Dancers' own perceptions of the most difficult injury to deal with.*

INJURY	% OF DANCERS
any injury	34%
low back/spinal injury	23%
knee	10%
chronic injury	9%
stress fracture	8%
tendonitis	3%
injury to lower limb	3%
foot/ankle injury	3%
ligament	2%
joint	2%
broken bone	2%
sprain	1%
Total %	100%
Number of respondents (N)	N = 134

*Table 11: Treatment methods felt by dancers to be effective in managing difficult injuries.*

TREATMENT METHODS	% EFFECTIVE
Professional opinion/advice	50%
rest	45%
massage	26%
ice	17%
exercises	14%
acupuncture	9%
pilates	5%
stretches	4%
strapping	3.5%
anti-inflammatory medication	3.5%
manipulation — spinal	2%
manipulation — soft tissue	1%
Number of respondents (N)	N = 117
<i>Respondents were able to list up to three treatment methods</i>	



When asked their opinion on which treatment methods dancers regarded as best to help manage an injury:

50% of dancers felt seeking a professional opinion was important in managing an injury effectively;

45% felt rest was important in management of injury;

26% suggested massage as important in injury management. *See Table 11.*

#### Time Loss

Dancers are returning to full workload on an average of 14 days after injury.

There were however six 'extreme' injuries incurred by dancers in the six months prior to completing the survey with loss of time ranging from 6–12 weeks away from work .

If time lost through these extreme injuries is removed from the calculation, dancers are returning to a full workload on an average of seven days after injury.

The survey question relating to time for a dancer to return to 'partial' workload was mostly left unanswered so no accurate inference can be made regarding this.

#### Touring & Performing

94% of all dancers responding to the survey had performed in capital cities in the previous six months.

31% had performed in country towns.

20% had performed overseas.

6% had performed in the outback.

Dancers averaged 4.85 performances per week .

59% of dancers were performing five shows or fewer per week with a range of 1–9 performances per week. *See Table 12.*

*Table 12: Average number of performances per week in the six months prior to completing the survey.*

AVERAGE NUMBER OF PERFORMANCES PER WEEK	% OF DANCERS
five	59%
six	22%
seven	6%
eight	12%
nine	1%
ten or more	—
Total %	100%
Number of respondents (N)	N = 91

Change in eating patterns was recorded as the most negative effect of touring, followed by change in sleeping patterns.

Living and working in new places was recorded as the most positive effect of touring, followed by change in climate and change in exercise patterns.

### **Diet & lifestyle**

81% of all dancers reported eating a balanced diet, which was defined as three meals per day made up from the five basic food groups (46% female, 35% male).

6% of dancers reported eating a vegetarian diet.

4% of dancers supplement their diet with chocolate (all female dancers).

No dancers reported regularly eating takeaway food.

60% of dancers do not smoke, while 9% regularly smoke a lot.

2% (two dancers) reported taking appetite suppressants, one of whom was male.  
See Table 13.

Table 13: Diet and lifestyle information for all respondents.

ITEM TAKEN	NEVER	SOMETIMES	A LITTLE REGULARLY	A LOT REGULARLY
tea/coffee	13%	12%	51%	23%
soft drinks	20%	43%	27%	10%
diet drinks	67%	16%	9%	7%
alcohol	3%	46%	42%	9%
tobacco	60%	17%	14%	9%
extra vitamins	14%	47%	22%	17%
health supplements	39%	36%	17%	8%
medications	47%	57%	7%	4%
appetite suppressants	98%	1%	—	1%

A total of 21 different non-prescription preparations were reported to be used by 55% of respondents.  
See Table 14.

42% regularly take multivitamins.

16% take echinacea.

13% take Nurofen (an over-the-counter anti-inflammatory medication to control pain and swelling).

A total of five different prescription medications are used regularly by 34% of respondents.  
See Table 15.

51% are using a prescribed anti-inflammatory medication.

18% of female dancers use a contraceptive pill.

17% are using asthma medication.

*Table 14: Non-prescription medications or preparations taken by respondents*

NON-PRESCRIPTION MEDICATION	% USE
multi-vitamins	42%
echinacea	16%
vitamins B & C	13%
Nurofen (anti-inflammatory)	12%
homeopathic/herbal remedies	12%
calcium/magnesium	9%
Panadol (analgesic)	8%
Iron supplement	6%
aspirin	5%
antihistamine	4%
protein supplement	4%
garlic	3%
ginseng	3%
berocca	3%
Panadeline	3%
Amica (anti-inflammatory)	3%
anti-oxidant	3%
spirulina	3%
quarina	1%
evening primrose oil	1%
endura	1%
Number of respondents (N)	N = 77

*Table 15: Prescription medications taken by respondents*

PRESCRIPTION MEDICATION	% USE
anti-inflammatory	51%
contraceptive pill	18%
asthma medication	17%
antibiotics	10%
thyroxin	4%
Total %	100%
Number of respondents (N)	N = 47

### Profile — General

The average age for commencing intensive training for both males and females combined was 14.7 years of age. Hours spent in training increased dramatically between the ages of 14 and 15 years. See Table 16.

Table 16: Average number of hours spent training per week for age.

AGE (years)	MALE + FEMALE (hours)	MALES ONLY (hours)	FEMALES ONLY (hours)
13	10	11	10
14	13	14	12
15	20	19	20
16	25	23	26
17	29	28	30

### Profile — The male dancer

Males are 15 years and six months on average when they commence intensive training. Hours of training increase dramatically between 14 and 15 years of age (14 hours per week to 19 hours per week for this sample). See Table 16.

Table 17: Body Mass Index (BMI) figures for male respondents.

BMI (normal range 20.0–25.0)	MALE DANCERS
under 20.0	8%
20.0–25.0	90%
over 25.0	2%
Total %	100%
Number of responses (N)	N = 49

The Body Mass Index (BMI) is an accepted measure of 'healthy weight for height' range, with the mean values for Body Mass Index for the general population between 20.0 and 25.0.

Male dancers recorded an average BMI of 22.11, placing them well within normal limits for height and weight. See Table 17.

### Profile — The female dancer

Females are 15 years and two months old when they commence intensive training. Hours spent training increase dramatically between 14 and 15 years of age (12 hours per week to 20 hours per week for this sample). See Table 16.

The average BMI for female dancers is 18.76, with 84% of all female dancers rating less than 20.0 on the BMI scale. See Table 18.

The breakdown of figures for BMI for females is presented in Table 19.

Table 18: Body Mass Index (BMI) figures for female dancers

BMI (normal range 20.0–25.0)	FEMALE RESPONDENTS
under 20.0	84%
20.0—25.0	16%
over 25.0	—
Total %	100%
Number of responses (N)	N = 80

60% of female dancers reported experiencing an irregular menstrual cycle during their dancing careers (oligomenorrhoea).

29% of female dancers reported having experienced a cessation of menstruation for a period of three (3) consecutive months or longer (secondary amenorrhoea).

As this sample surveyed professional dancers no question was asked concerning primary amenorrhoea (delayed onset of menstruation, not commenced by 16 years of age). See *Safe Dance II* (Geeves 1997) for discussion regarding the female student.

Dancers' own perception of the causes for this interruption to the menstrual cycle include low body weight (29%), increased work load (22%) and stress (17%). See Table 20.

*Table 19: Breakdown figures for Body Mass Index (BMI) range for female dancers*

BMI (normal range 20.0–25.0)	Female Respondents
under 17.0	7%
17.0–18.0	30%
18.0–19.0	24%
19.0–20.0	23%
20.0–25.0	16%
over 25.0	—
Total %	100%

*Table 20: Perceived causes of menstrual irregularity (dancers' own perceptions)*

PERCEIVED CAUSES OF MENSTRUAL DISTURBANCE	% RESPONSES
low body weight	29%
increased work load	22%
stress	17%
increased training	14%
increased activity	10%
poor eating habits	2%
anorexia	2%
vegetarian diet	2%
age commenced training	2%
Total %	100%
Number of respondents (N)	N = 42

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## DISCUSSION

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### The sample

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The sample is considered to represent 56% of all Australian professional dancers performing in Australia at the time of the survey (139/250). This figure of 250 was calculated by summing all dancers performing full time in companies in Australia for six months or longer between December 1997 and December 1998.

The aim was to contact 200 dancers (Geeves 1990). However only 193 dancers agreed to participate, with 139 surveys returned. One small ethnic company (five dancers) agreed to participate, however when the company disbanded the surveys were lost. This is unfortunate for final survey numbers as well as for the valuable ethnic input.

### Chronic injury

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General injury figures suggest 89% of all dancers responding to the survey had at some time in their career sustained one or more injuries sufficient to affect their dancing in some way (average of three injuries). However only 50% of dancers reported having a chronic injury that gives them ongoing problems. This suggests that while injuries are occurring they can be successfully managed with no recurrence or ongoing problems.

Considering the number of female dancers (61%) responding to the survey, compared with males (39%), the prevalence of chronic injury (females 57%, males 49%) suggests there is no gender bias.

There is not a great deal of difference between classical and contemporary/modern companies with respect to chronic injury (53% and 49% respectively). However commercial dancers responding reported a lower (41%) prevalence of chronic injury. This may in part be due to the contractual nature of commercial work, with injured dancers not being hired, or to the reluctance of



dancers to admit to a pre-existing injury while on contract, regardless of assurances of anonymity.

Chronic injury sites of ankle (41%), lumbar spine/low back (33%) and knee (19%), are not surprising, considering that dancers are always using the lower limbs and low back. When lifting and partnering, the lumbar spine is more vulnerable to injury than, for example, the cervical spine (neck), shoulder or elbow. This is reflected in the low prevalence figures for chronic injuries in these latter areas, e.g. cervical spine (7%), shoulder (4%) and elbow (1.5%).

Effective treatment for ankle injury is well established, including muscle strengthening, strapping and proprioception (balance) work using a wobble board, so it is surprising that the ankle is the site of highest prevalence of chronic injury (41%). This may suggest dancers are not taking what may be perceived as a 'simple' injury such as a sprained ankle seriously and are not undertaking appropriate rehabilitation.

36% of all chronic injuries have been sustained by 18 years of age. This increases to 87% (an increase of 51%) by age 25. This time between 18 and 25 years old is when dancers enter a company with increased hours, increased intensity of training, diversity of work load and variable choreography, all of which may predispose the dancer to injury. Self-imposed pressure to work hard and perform well may also predispose the dancer to injury. Dancers may not be taking the time needed to fully recover from an injury at this time.

### **Recent injury**

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48% of dancers reported having sustained an injury in the six months prior to completing the survey. Again the prevalence of recent injuries is relatively even between the genders (females 57%, males 43%).

56% of dancers in commercial companies reported having sustained a recent injury, compared to 49% of classical dancers and 41% of dancers in

contemporary/modern companies. Considering that commercial companies spend more time touring and consistently perform a greater number of shows per week, fatigue, overwork and repetition would all be factors predisposing those dancers to injury. In addition, many commercial productions use large performance spaces, with dancers having to exaggerate their movements for better effect.

Sites of recent injury — ankle (24%), foot (13%), lumbar spine (11%), knee (10%) and hip (10%) are not dissimilar to those for chronic injury.

Information relating to recent injury type, i.e., sprain (18%), inflammation (17%) etc., may be erroneous, as it relies on the dancer's understanding and recall of any diagnosis made. However by improving the education of dancers and their knowledge of body tissues involved in an injury, and by educating professionals consulted to explain the diagnosis to the dancer, this understanding will improve. Cross-checking with medical records would confirm this information; however this was not attempted due to an assurance of anonymity of returns.

The highest proportion of recent injuries occurred during performance (39%). Breakdown figures show 20% of performance-related injuries occurred in commercial companies, 12% in classical companies and 7% in contemporary/modern companies. This may relate to the high numbers of performances by dancers in commercial companies, who are sustaining the highest proportion of recent injuries. Other factors may include crowded backstage areas during performance, poor lighting at the stage entrance/exit areas, difficult or unusual costuming, nervousness or fatigue.

Only 10% of injuries are reported to have occurred in class. The class environment, where faulty technique is corrected, is more structured and controlled, and dancers may break occasionally to rest. While there is a great deal of time spent in class it is likely to provide a less frenetic environment than performance.

Dancers continue to sustain injuries within three weeks of returning from a break (22%). Of these 12% occur in classical companies, 9% in contemporary/modern companies and 1% in commercial companies. This is a period when peak flexibility may not have been regained, cardiovascular condition may have been lost, and dancers may not yet be totally focused on their work.

#### Causes of recent injury

Dancers attributed 33% of recent injuries to fatigue, overwork and repetition; 30% to new technique, high risk steps or difficult choreography and 19% to their own faulty technique. With careful programming by the ballet masters/mistresses and rehearsal directors along with the dancer's own awareness of technique, the opportunity exists to improve this situation.

#### After injury

70% of dancers carried on as best they could after sustaining an injury. If the injury is minor this may be an acceptable situation with no further injury occurring.

However, 50% of dancers sought treatment for their injury within one day and 20% of dancers sought treatment within 2-3 days. This is a total of 70% of dancers receiving treatment for their injuries within three days. Early appropriate management for an injury will mean a quicker resolution of the injury, less time lost from work and less risk of it becoming problematic long-term (chronic).

28% stopped and rested, with 47% of these receiving treatment for the injuries on the spot. This treatment included ice (57%), and a professional opinion (18%). Ice is an appropriate choice of treatment for an acute injury as it controls bleeding and bruising, reduces muscle spasm and reduces pain, facilitating healing. *See Appendix 1.* An early, dance-specific diagnosis will also ensure appropriate treatment begins immediately.

Heat was applied in 11% of cases. This is surprising, as heat is well known to increase any bleeding or bruising and delay healing if used in the first 72 hours after soft tissue injury. However the exact nature of the injuries for which heat was used is not known. *See Appendix 2.*

#### Treatment

A pleasing 96% of dancers sought advice regarding management and treatment of their recent injury, 63% of whom consulted a physiotherapist. This suggests a high level of confidence in physiotherapists and the services they are providing to Australian dancers.

Certain practitioners are associated with various companies, and this may be reflected in the dancers' choice of practitioner, e.g. 63% chose physiotherapists, 47% chose a massage therapist and 28% consulted an osteopath (all of whom are often associated with a company).

Dancers were happy with the results of treatment (81%) and at the time of completing the survey 43% of all injuries sustained had healed. This suggests treatments being given are appropriate and effective.

Some dancers (18%) felt they were not given as much information about their injury as they would have liked. More information concerning specific structures injured and how the injury would affect other parts of the body was sought; also advice on how long to rest an injury, and injury-specific rehabilitation programs; the offering of a second opinion when an injury fails to respond to the initial treatment; and location of dance-specific practitioners when touring.

#### Prevention

25% of dancers believed warm-up was important in preventing injury. A further 26% believed warm-up, along with good technique, knowledge of the body and its limits, diet and adequate rest was important in injury prevention. With so many dancers

believing in warm-up, teachers must be aware of what constitutes an appropriate warm-up, educate the dancers and then encourage them to perform their own warm-up when necessary. This can be achieved with ongoing teacher education based on current information. *See Appendix 3.* The importance of cool-down and its benefits is also well accepted now in dance medicine and must be taught to both teachers and dancers.

*See Appendix 4.*

There is still a small percentage of dancers (six dancers — 4%) who do not believe they know what to do when an injury occurs. This is surprising considering the widespread awareness and acceptance of the R.I.C.E.D. principles for managing an acute soft tissue injury, (*Appendix 1*) and access to dance-specific practitioners.

Six 'extreme' injuries were recorded by individual dancers in the six months prior to completing the survey, resulting in a large amount of time lost from dancing. Two dancers each spent 12 weeks off work — one with a fractured wrist, the other with a stress fracture of the shin. A further two dancers lost eight weeks each from work — one with tendonitis of the hip, the other with anterior compartment syndrome (shin splints). A torn hamstring kept another dancer off work for seven weeks, while a torn knee cartilage requiring surgery cost another dancer six weeks in time lost. Cost to the dancer in personal terms and to the company in time lost is high when injuries such as this occur.

### **Diet and lifestyle**

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Most dancers (81%) report eating a balanced diet (46% females, 35% males), described as three meals per day, from the basic food groups. No dancers reported eating takeaway food, and only 4% reported supplementing a balanced diet with chocolate.

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### **Medications — non-prescription**

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55% of dancers reported regularly taking non-prescription medication. There were 21 different preparations reported, with most dancers taking a multivitamin (42%), echinacea (16%) or an anti-inflammatory medication (13%).

Multivitamins are preferable to specific vitamin or mineral supplements as the risk of overdose is reduced; echinacea is well accepted now as assisting in relieving the symptoms of colds and allergies, and a mild anti-inflammatory medication is effective in relieving the pain of soft tissue or inflammatory injuries.

Care must be exercised when advising a dancer to take an anti-inflammatory preparation. Asthmatics must first check with their doctors as anti-inflammatory preparations carry a warning concerning acute asthma attacks. Dancers with a suspected ulcer must also check with their doctors to avoid irritation of or bleeding from the ulcer.

### **Body Mass Index (BMI)**

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BMI is a widely accepted index of a healthy weight for height range (weight (kgs) divided by height (metres) squared). Normal BMI range is 20.0–25.0.

Male dancers were within the normal range with an average BMI of 22.11.

Female dancers' mean values were below normal figures with an average BMI of 18.76.

### **The female dancer**

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84% of female dancers have a BMI of less than 20.0. A BMI between 15.0 and 20.0 is considered 'underweight for height', while a BMI of less than 15.0 is 'undernourished' (Dietitians Association of Australia 1999). No Australian female dancer in this survey had a BMI of less than 15.0.

Low body weight and high levels of exercise predispose all elite female athletes, including the female dancer, to menstrual irregularities with resultant low bone mineral density. This has come to be termed 'the Female Athlete Triad'. See *Section 3*.

The Australian dance population is not exempt, with 60% of female dancers in the survey reporting disruption to their menstrual cycle and irregular periods (oligomenorrhoea), and 29% of dancers reporting complete cessation of their periods for three months or longer (secondary amenorrhoea).

Dancers report perceived causes for their menstrual irregularity as increased workload (22%), increased activity (10%) and increased training (14%) a total of 46%, as well as low body weight (29%) and stress (17%).

Research suggests the situation is reversible when body weight moves into the normal BMI range or the dancer ceases elite level exercise (Williams 1998). Recent Australian research also suggests that dancers may not be predisposed to osteoporosis in later years due to the protective mechanism of weight bearing exercise while dancing (Khan et al. 1996). All good news for the Australian female professional dancer.

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## SUMMARY

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Following on from the *Safe Dance Project Report* (Geeves, 1990), this second comprehensive report deals with the current health and lifestyle of Australian professional dancers in 1998/1999.

It provides information regarding occurrence of chronic injury and acute injury in the professional dance population, along with the site of injury and injury type. It describes dancers' own perceptions and beliefs related to injury, and notes diet and lifestyle information together with information specific to the female dancer.

As a result the study makes a significant contribution to the current body of knowledge in the field of dance medicine both in Australia and internationally.

Since the manner in which data were collected and analysed has been standardised, these findings may be considered in conjunction with the similar study in Australia (Geeves 1990), providing the opportunity for a direct comparison of results as well as an opportunity to assess the outcome of intervention strategies proposed and adopted following the 1990 report.

The information obtained allows us to assess persisting problem areas for dancers and make further recommendations for implementation of injury prevention and management strategies based on current information rather than on anecdote.

With a decrease in the incidence of both chronic and acute injury evident, we can confidently infer that there has been positive change in both injury prevention and management of injuries since the last report. We may therefore propose that the education strategies implemented over the last decade have been successful in preventing injury in this population. *See p. 72 — After Safe Dance I.*



Information from the report also allows areas for future research to be more clearly defined. For example the high incidence of ankle injury and lumbar spine injury in both the chronic and acute injury populations requires further specific investigation.

The goal of all Safe Dance research is to identify risk factors and implement strategies to prevent injury. If risk factors are identified they can be minimised or avoided with fewer injuries sustained. Any intervention must be relevant and applicable to the dancer and introduced with due caution and with an open mind regarding outcome.

We are at an early stage in dance medicine research, however this report moves Australia closer towards accepted practice in epidemiology and research, providing current information for the benefit of all dancers and teachers.

## APPENDIX 1: R.I.C.E.D.

Immediate treatment recommended for an acute soft tissue injury (0–72 hours).

Healing is facilitated.

<b>R</b>	Rest	'Relative rest' within pain. Rest the injured tissues to allow healing to take place
<b>I</b>	Ice	10 minutes frequently to control bleeding, bruising and pain
<b>C</b>	Compression	Firm bandage to minimise swelling
<b>E</b>	Elevation	Elevate the injured part to assist the circulation and control swelling
<b>D</b>	Diagnosis	A correct diagnosis will allow early appropriate treatment to begin

### Sources:

1. Smart Dance Video: available from Ausdance NSW.
2. *Physiotherapy & Sports Injuries* brochure. Available through the Australian Physiotherapy Association and local physiotherapists.

NB: The *Australian Guidelines for Dance Teachers* also suggests C.E.R.I. — Compression Elevation Rest Ice — as recommended by the Australian Red Cross (1997).

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## APPENDIX 2: H.A.R.M.

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The factors which should be avoided when treating an acute soft tissue injury in the first 0–72 hours, as healing is delayed.

<b>H</b>	Heat	Heat increases bleeding by dilating blood vessels (vasodilation)
<b>A</b>	Alcohol	Increases swelling due to vasodilation
<b>R</b>	Running/ exercising too soon	Can make the injury worse by damaging other areas
<b>M</b>	Massage	In first 24 hours increases swelling and bleeding due to stimulation of increased circulation

Source:

*Physiotherapy & Sports Injuries* brochure. Published by the Australian Physiotherapy Association. Available from physiotherapists.

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## **APPENDIX 3: WARM-UP**

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Warm-up is necessary to prepare the body for all dance movement, with the desired effects of warm-up linked to the elevation of body temperature.

This temperature elevation is associated with an increase in metabolic rate, enzyme activity in the muscle, blood flow to the muscle and oxygen reaching the muscle for work.

Warm-up should be style specific, consist of a minimum of 10–15 minutes continuous movement and should precede the class by no more than 15 minutes. All beneficial effects of warm-up are lost after 45 minutes of rest.

Warm-up has the following effects:

- increased flexibility of tendons and ligaments
- increased joint range
- increased muscle elasticity
- increased speed of transmission of nerve impulses
- decreased muscle viscosity
- decreased contraction and relaxation times of the muscle
- greater speed and force of muscle contraction
- allows adequate blood flow to the heart

(Clippinger-Robertson 1988)

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## **APPENDIX 4: COOL-DOWN**

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After vigorous exercise the dancer should continue moving for 5–10 minutes until the heart rate drops to approximately 100 beats/minute.

Continuous light use of involved muscle groups:

- returns the blood to the heart
- allows the effective removal of muscle metabolic waste products to occur more rapidly
- assists in reducing post-exercise muscle soreness
- is an appropriate time to stretch safely further into range with less risk of injury

(Clippinger-Robertson 1988)

Cool-down can include movements from the technique just practised, with a reduction in tempo and range of movement. It is easy to add on at the conclusion of a class or rehearsal.

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## RECOMMENDATIONS

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### General

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1. Continue the ongoing development of audio-visual resources of current information in the areas of dance medicine and science for use as teaching aids, and for teachers and students in remote areas.
2. Continue the professional dancers' injury survey at realistic intervals for the dance industry. This interval may best be established in consultation with those companies that regularly participate in the research, thus making the survey an accepted part of the dance industry. This would also provide ongoing appraisal of the intervention strategies that have been implemented.
3. Develop visual resources for display in studios, including RICED; stretching; anatomy charts etc.
4. Instruct dance teachers in the benefits of simple rehabilitation equipment that may be safely used in the studio, e.g. wobbleboard; resistance bands and tubing (theraband etc); mini-trampoline; light weights, etc.

### Education and training

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1. Encourage those at the forefront of research in the field of dance to disseminate this information on a regular basis in the way of lectures, occasional papers, dance based internet sites, etc.
2. Continue the provision of dance-based education at secondary level by maintaining the subjects such as those currently available to NSW Higher School Certificate students, e.g., Classical Ballet and Dance.
3. Through liaison with studio teachers, provide lectures on topics such as anatomy, technique analysis, injury prevention and nutrition to those students studying dance recreationally along with pre-professional students.

4. Ensure continuing high standards of injury prevention and management strategies in tertiary dance courses.

5. Encourage dance teaching and syllabus organisations to provide continuing education for their members through lectures, classes, newsletters etc., so that all areas of the dance industry are in receipt of the latest developments in dance medicine.

### **Health professionals**

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1. Dance-based professionals must continue research into identified areas of greatest risk to dancers. Those areas identified in *Safe Dance III* include the ankle and the lumbar spine (low back) specifically, along with the knee and foot.

2. Provide training programs for those who are working with dancers to ensure accurate assessment, diagnosis and treatment of dance related injuries.

3. Health professionals who are treating injured dancers have a duty of care to ensure the treatment methods used are ethical, beneficial and are understood by dancers.

4. Compile a register of dance practitioners in each state. This will allow touring dancers to access dance-specific assessment and treatment.

5. Devote a portion of major scientific conferences to dance-based research. This will encourage quality research and provide further current information in the relatively new field of dance medicine and science.

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## COMPANIES PARTICIPATING 1999

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The Australian Ballet

*The Boy from OZ*

Buzz Dance Theatre (formerly 2 Dance Plus)

*Chicago*

Chunky Move

*Crazy for You*

Dance North

Dance Works

Expressions

Fieldworks

*Grease!*

Leigh Warren and Dancers

Opera Australia Ballet

Paige Gordon and Performance Group

The Queensland Ballet

Sydney Dance Company

TasDance

West Australian Ballet



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## REFERENCES

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Australian Bureau of Statistics (1996): Cultural Minister's Council. Statistics Working Party. *Australia's Culture* — No. 7. Employment. Department of Communications & the Arts.

*Australian Guidelines for Dance Teachers.* (1997): Australian Dance Council — Ausdance.

Bowling A (1989): Injuries to Dancers: prevalence, treatment and perception of causes. *British Medical Journal.* Vol. 298: 731–734.

Brinson P & Dick F (1996): *Fit to Dance? A report of the national inquiry into dancers' health and injury.* Calouste Gulbenkian Foundation (UK).

Chmelar RD, Schultz BB, Ruhling RO, Shepherd TA, Zupan MF and Fitt SS (1988): A Physiological Profile Comparing Levels and Styles of Female Dancers. *The Physician & Sports Medicine.* Vol. 16: No. 7: 87–96.

Clippinger-Robertson K (1988): Principles of Dance Training. In *Science of Dance Training.* Clarkson P & Skrinar M (eds). Human Kinetic Books 77–79.

Ende LS and Wickstrom J (1982): Ballet Injuries. *The Physician & Sports Medicine.* Vol. 10, No. 7, 101–118.

Evans RW, Evans RI, Carvajal S and Perry S (1996): A survey of injuries among Broadway performers. *American Journal of Public Health.* Vol. 86, No. 1, 77–80.

Garrick JG and Requa RK (1993): Ballet Injuries. An analysis of epidemiology and financial outcome. *The American Journal of Sports Medicine.* Vol. 21 No. 4, 586–590.

Geeves T (1990): *Safe Dance Project Report — A report on dance injury prevention and management in Australia.* Australian Dance Council — Ausdance (formerly AADE).

Geeves T (1997): *Safe Dance Report II: National injury and lifestyle survey of Australian adolescents in pre-professional dance training*. Australian Dance Council — Ausdance.

Hamilton WG, Hamilton LH, Marshall P and Molnar M (1992): Profile of the musculoskeletal characteristics of elite professional ballet dancers. *American Journal of Sports Medicine*. Vol. 20, No. 3, 267–273.

Khan K, Brown J, Way S, Vass N, Crichton K, Alexander R, Baxter A, Butler M and Wark J (1995): Overuse injuries in Classical Ballet. *Sports Medicine*. 19 (5): 341–357.

Khan K, Green RM, Soul A, Bennett KL, Crichton KJ, Hopper JL, & Wark JD (1996): Retired elite female ballet dancers and non-athletic controls have similar bone mineral density at weight bearing sites. *Journal of Bone & Mineral Research*. 11 (10): 1566–1574.

Mostardi RA, Porterfield JA, Greenberg B, Goldberg D and Lea M (1983): Musculoskeletal and cardiopulmonary characteristics of the professional Ballet dancer. *The Physician & Sports Medicine*. Vol. 11, No. 12, 53–61.

Quirk R (1983): Ballet Injuries: The Australian Experience. *Clinics in Sports Medicine*. 2 (3): 507–514.

Ramel E and Moritz U (1994): Self reported musculoskeletal pain and discomfort in professional ballet dancers in Sweden. *Scandinavian Journal of Rehabilitation Medicine*. 26: 11–16.

*Smart Dance Video & Poster* (1993): A documentary on injury prevention and innovative approaches to safe dance practices. Australian Dance Council — Ausdance NSW Inc.

Solomon RL and Micheli LJ (1986): Technique as a consideration in Modern Dance Injuries. *The Physician & Sports Medicine*. Vol. 14, No. 8, 83–90.

Washington EL (1978): Musculoskeletal injuries in Theatrical dancers: site, frequency and severity. *American Journal of Sports Medicine*. Vol. 6, No. 2, 75-98.

Williams N (1998): Reproductive function and low energy availability in exercising females. A review of clinical and hormonal effects. *Journal of Dance Medicine and Science*. Vol. 2, No.1, 19-31.



## **SAFE DANCE III — PART TWO**

### **THE REPORT IN CONTEXT**

Comparison with the *Safe Dance Project Report* (Safe Dance I)

After Safe Dance I:  
Recommendations Adopted



## COMPARISON OF FINDINGS

*Safe Dance III Report*  
(Crookshanks 1999)

*Safe Dance Project Report*  
(Geeves 1990)

	CROOKSHANKS 1999	GEEVES 1990
Response rate	72% (n = 139/193)	86% (n = 172/200)
% returns by gender:		
male	39% (n = 54)	43% (n = 74)
female	61% (n = 85)	57% (n = 98)
% returns by company		
classical	54% (n = 75)	43% (n = 75)
contemporary/modern	27% (n = 37)	35% (n = 61)
commercial	19% (n = 27)	20% (n = 38)
Age:		
under 30 years	79%	86%
30-35 years	16%	9%
over 35 years	5%	5%
Sustained an injury ever:	89% (n = 124)	89% (n = 153)
have a chronic injury	50% (n = 69)	65% (n = 107)
% prevalence		
male	43% (n = 30)	42% (n = 45)
female	57% (n = 39)	58% (n = 62)
Dance style:		
% of classical dancers with a chronic injury	53%	60%
contemporary/ modern	49%	70%
commercial	41%	64%
Site of primary chronic injury	1. All spinal (29%) (lumbar) (25%) 2. Ankle (28%) 3. Knee (12%)	1. All spinal (34%) 2. Ankle (29%) 3. Knee (15%)
% of all chronic injury sustained:		
by age 18 years	36%	52%
by age 25 years	87%	75%

	CROOKSHANKS 1999	GEEVES 1990
Recent injury: % prevalence	48% (n = 67)	56% (n = 92)
male	43% (n = 29)	not available
female	57% (n = 38)	not available
Recent injury: site (in order of prevalence)	1. Ankle (24%) 2. Foot (13%) 3. Lumbar spine (11%) (all spinal 23%) 4. Knee (10%) 5. Hip (10%)	1. All spinal (34%) 2. Ankle (23%) 3. Knee (13%) 4. Foot (12%) 5. Hip (7%)
type (in order of prevalence)	1. Muscle/tendon (25%) 2. Ligament (14%) 3. Spinal joint (9%) 4. Stress fracture (4%)	1. Muscle/tendon (33%) 2. Ligament (25%) 3. Stress fracture (12%) 4. Spinal joint (10%)
Where the injury occurred:		
performance	39%	29%
rehearsal (warmed up)	24%	42%
class	10%	15%
over time	25%	10%
% injured within three (3) weeks of a break	22%	14%
Dancers' own opinions on causes of recent injury:		
fatigue, overwork, repetition	33%	26%
new technique, high risk step, difficult choreography	30%	21%
poor technique	19%	15%
% not used to working in the particular technique at time of injury	6%	15%
% not had adequate rehearsal at time of injury	8%	15%
After injury:		
carried on as best they could	70%	57%
stopped and rested	28%	35%
given treatment at time of injury	47%	not available
consulted someone within 4 days of injury	72%	80%



	CROOKSHANKS 1999	GEEVES 1990
<b>Practitioners consulted:</b>		
physiotherapist	63%	68%
massage therapist	47%	48%
osteopath	28%	26%
GP	27%	31%
specialist doctor	16%	22%
acupuncturist	14%	13%
chiropractor	13%	3%
<b>Treatments given/chosen</b>		
massage	76%	72%
anti-inflammatory	52%	31%
stretches	42%	not available
exercises	42%	41%
% not given as much information as they would have liked	18%	23%
Treatment costs covered by worker's compensation	88%	67%
<b>Practitioners who provided satisfactory advice:</b>		
physiotherapist	42%	37%
GP	23%	24%
osteopath	12%	not available
chiropractor	nil	not available
masseur	nil	not available
<b>Factors considered important in preventing an injury:</b>		
warm-up	25%	30%
warm-up, good technique, knowledge of the body, diet, rest, good facilities	38%	45%
did not know what to do if they sustained an injury	4%	10%
Time taken to return to full workload (days)	14	16

	CROOKSHANKS 1999		GEEVES 1990	
Training hours and age (years)	Male	female	Male	female
13	11	10	5	9
14	14	12	6	12
15	19	20	11	22
16	23	26	15	22
17	28	30	17	24
Diet:				
balanced		81%		37%
three meals/day		6%		17%
		total: 87%		total: 54%
vegetarian		6%		9%
takeaway/snacks		nil		13%
balanced + chocolate		4%		13%
BMI (normal range 20.0–25.0)				
male average		22.11		Not calculated
female average		18.76		Not calculated
BMI range (males)				
under 20.0		8%		10%
20.0–25.0		90%		81%
over 25.0		2%		9%
BMI range (females)				
under 20.0		84%		67%
20.0–25.0		16%		33%
over 25.0		nil		nil
Female dancers only; prevalence of amenorrhoea				
2° amenorrhoea (periods ceased for three months or longer)		29%		34%
oligomenorrhoea (irregular periods)		60%		70%

	CROOKSHANKS 1999	GEEVES 1990
<b>Perceived causes of disruption to the menstrual cycle:</b>		
low body weight	29%	10%
increased activity, workload and training	22%	8%
both of the above	—	33%
	<b>total: 51%</b>	<b>total: 51%</b>
stress	17%	30%
poor diet	2%	10%
other:		
vegetarian diet (2%)		
anorexia (2%)		
age commenced training (2%) (1999)	6%	8%

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## DISCUSSION: Comparison of Findings

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The findings of the *Safe Dance III Report* (Crookshanks 1999) and the *Safe Dance Project Report*, or 'Safe Dance I' (Geeves 1990) may be accurately compared due to the similar design of the research, which includes populations sampled, methodology and definitions of acute and chronic injury.

The ability to accurately compare both sets of data allows inferences to be made concerning the effectiveness and benefit to dancers of the intervention strategies that have been implemented following Safe Dance I.

The ability to assess the benefits gained to date allows us to identify areas still requiring attention and to implement further intervention strategies in specific areas of need. Because we can more accurately identify risk factors, the intervention undertaken can be better targeted.

The information is presented in table form to allow easier comparison of the information across the two reports.

The difference in sample size is thought to reflect the fact that in 1997–98 many of the smaller contemporary/modern companies were no longer full-time due to cuts in their funding, and therefore did not meet the criteria for inclusion into the Safe Dance III survey. This is evident in the percentage of returns from the different companies when compared with those of 1990. The author acknowledges the possibility of some influence on outcome due to differences in sample sizes.

There are fewer responses from male dancers to the 1999 survey, which may also reflect the decrease in numbers from contemporary/modern companies.

Respondents are generally older in 1999, with 19% of all dancers aged 30–35 years compared with 9% in 1990. This suggests that dancers are staying in

the profession longer, which has long been the goal of research in the field of dance medicine. The number of dancers over 35 years of age remains stable at 5%.

The percentage of dancers who report having sustained an injury sufficient to affect their dancing in some way is high at 89%, as it was in 1990. However the prevalence of chronic injury in both studies is much less than this. This would suggest that many injuries are being successfully managed with little or no long term sequelae for dancers.

Prevalence of chronic injury is significantly less (50%) in 1999, compared with 65% in 1990. There is however a remarkable gender similarity between the studies for prevalence of chronic injury, i.e., males 43%, females 57% (1999), males 42%, females 58% (1990).

There are significantly fewer dancers with a chronic injury by 18 years of age in 1999 — 36% compared with 52% in 1990. However by 25 years of age this figure has risen to 87% of all chronic injuries sustained, compared with 75% in 1990. This suggests that a critical time for injury is when dancers are entering companies and experiencing increased hours and workload. The responsibility for injury prevention therefore lies with the new company member and with the ballet master/mistress respectively, to ensure that technique is executed correctly and that the initial workload is appropriate.

The site of the primary (most troublesome) **chronic** injury is similar across the studies, with a high prevalence of ankle, lumbar spine and knee injuries.

Classical dance accounted for 18% of all primary chronic ankle injuries reported in 1999, while contemporary/modern dance accounted for 10%. There were no reports of primary chronic ankle injury from commercial dancers.

For lumbar spine, classical dance accounted for 13% of primary chronic injury reported in 1999,

contemporary/modern dance 6% and commercial dance 6%, while for chronic knee injury, classical dance accounted for 6%, contemporary/modern 4% and commercial dance 2%. It should be noted however that a greater number of classical dancers responded to the survey (75) compared with contemporary/modern (37) and commercial (27).

The incidence of recent injury is also lower in 1999, 48% compared with 56% in 1990. Recent injury sites are similar, however injury to the hip has increased 3% to 10% in 1999 compared with 7% in 1990. Recent injury type also remains remarkably similar between studies.

Prevalence of injury to the spine was presented in 1990 as a tally of all spinal areas including lumbar spine/low back, cervical spine/neck and thoracic spine (34%). In 1999 a distinction has been made between areas to better determine if one area is more at risk than another. The figures show that the lumbar spine/low back area is most at risk (11%), followed by cervical spine/neck (8%) and thoracic spine (3%).

There has been a 10% increase in recent injury occurring during performance (39% compared with 29% in 1990). This is occurring mostly in commercial companies where 20% of dancers sustaining a recent injury are doing so during performance, while 12% are occurring in classical companies and 7% in contemporary/modern companies.

While injury during rehearsal has dropped significantly from 42% to 24%, dancers may be reporting their injuries more accurately as occurring over time (25% in 1999, 10% in 1990) rather than occurring in rehearsal where they are more likely to notice a nagging, overuse type injury.

The number of dancers injured within three weeks of returning from a break has increased from 14% in 1990 to 22%. At first thought to be related to commercial companies with busy schedules and short lead-up times, it was actually found to be occurring in classical companies (12%), followed by

contemporary/modern (9%) and commercial companies (1%).

Dancers' opinions of causes of recent injury remain similar to 1990, related to fatigue, overwork and repetition; new technique, high risk steps and difficult choreography; and poor technique.

After sustaining an injury 70% of dancers carried on as best they could in 1999 compared to 57% in 1990, while only 28% stopped and rested in 1999 compared with 35% in 1990. However 50% of all dancers injured had consulted someone for management of their injury within one day of sustaining it. This rose to 72% by four days after the event. This suggests dancers are not letting their injuries go unassessed, regardless of whether the dancer found it necessary to stop and rest at the time of the injury. An injury may be minor and the dancer may be able to continue without further damage in some cases, providing the injury is assessed and treated soon after.

Dancers continue to demonstrate a confidence in physiotherapists, consulting them 63% of the time for treatment and advice compared with 58% in 1990. This is a responsibility the physiotherapy profession must take seriously in order to provide the high standard of care expected. The rate at which dancers are choosing massage therapists, 47% in 1999 compared with 48%, and osteopaths 28% in 1999 compared with 26% in 1990, remains steady.

The number of dancers who feel they were not given as much information as they would have liked has fallen 5% to 18%, compared with 23% in 1990. This would suggest that those practitioners consulted for treatment and advice are meeting the needs of dancers and more adequately explaining diagnosis and treatment options to them.

There has been an increase in provision of worker's compensation coverage for dancers' injuries. This has increased 19% to 86% in 1999 compared with 67% in 1990. This is good news for the dancer's eventual recovery from injury. With companies

offering their employees a supportive environment dancers are more likely to receive early appropriate treatment for their injury and recover fully, allowing their contribution to the company specifically and the dance profession generally to continue.

Factors considered by dancers to be important in injury prevention remain unchanged, with warm-up, good technique, knowledge of the body and its limits, diet and rest still seen as most important.

Hours per week spent in training have increased considerably for male dancers across all age groups, with a small increase evident for females from 15 years onward.

Dancers' diets appear to have improved since the last survey, with 87% of dancers now reporting eating a balanced diet or three meals a day, compared with just 54% in 1990. There are no dancers eating takeaway and snacks on a regular basis, compared with 13% of dancers in 1990, and only 4% of dancers now supplement their balanced diet with regular chocolate compared with 13% in 1990.

Males continue to be within the normal Body Mass Index (BMI) weight for height range of 20–25, averaging 22.11.

Females, however, continue to be below normal range with an average BMI of 18.76. Only 16% of female dancers were within normal limits in 1999 compared with 33% in 1990. However these dancers are not experiencing an increase in disruption to menstrual function as a result of these low BMI figures. Indeed the opposite is apparent with figures for both secondary amenorrhoea and oligomenorrhoea lower in 1999 than 1990. Possibly the improvement in diet has lessened the impact of the effects of intensive training and lower BMI on female dancers. 19% of female dancers report regularly taking the contraceptive pill (1999).

Perceived causes of disruption to the menstrual cycle appear well understood by the dancers and



are similar in 1999 to 1990, i.e., low body weight and increased training predominantly.

The overall picture is one of improved dancers' health. This includes a decrease in prevalence (%) of injury both chronic and acute, an improved understanding of the importance of appropriate, early management of injuries, dancers caring for themselves with a better diet, and companies providing increased support for their employees.

Strategies implemented following Safe Dance I have been adopted with positive results and rewards for the dance community as a whole. The continuing challenge is to further identify risk areas and implement intervention strategies accurately and effectively. The goal of further reduction of the prevalence and incidence of injury figures for Australia's professional dance population is realistic and must continue to be pursued with enthusiasm and rigorous scientific research.

## AFTER SAFE DANCE I Recommendations Adopted

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The purpose of the Safe Dance Project from the outset was:

*To make accessible to dance movement specialists the advances in scientific understanding of the body now being made in the realms of sports medicine, injury prevention, nutrition and exercise physiology.*

Following the original *Safe Dance Project Report* (Geeves 1990) —now referred to as 'Safe Dance I', recommendations were made to ensure ongoing research and dissemination of information. These recommendations continue to be adopted with positive effect.

### Recommendations — general

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**1990 recommendation 1:** *Establish a program of further research in dance (in association with A.A.D.E., N.A.I.T.C. and other relevant organisations) to pursue the recommendations below.*

1. Further research continues to be supported by the Australian Dance Council — Ausdance and CREATE Australia (formerly N.A.I.T.C.), e.g.,

- *Australian Guidelines for Dance Teachers;*
- *Interim National Competency Standards for Dance Teachers;*
- *Safe Dance II Report* (Geeves 1997) on adolescents in pre-professional dance training;
- *Safe Dance III Report* (Crookshanks 1999) on professional dancers.

**1990 recommendation 2:** *Develop (in consultation with a multi-disciplined advisory panel) a series of graded study modules in injury prevention and management, to formulate an Australian curriculum for distribution to dance practitioners throughout Australia.*

2. Steps towards accreditation within the dance industry have been taken, e.g.,

- A pilot curriculum entitled *Safety Issues for Studio Teachers* was developed by a Tasmanian partnership between Ausdance Tas and the Tasmanian Arts Industry Training Board in 1992.
- *Australian Guidelines for Dance Teachers* (1997);
- *Interim National Competency Standards for Dance Teachers* (1998).

***1990 recommendation 3: Establish a pilot project for evaluation of the core curriculum.***

3. The project has been completed.

- *Safety Issues for Studio Teachers* was piloted in Tasmania, evaluated and made available throughout the TAFE system in Australia, and later adopted by Box Hill Institute as part of its Diploma of Dance Teaching and Management course.

***1990 recommendation 4: Establish an accreditation scheme for course participants.***

4. Two tertiary institutions have done so, i.e.,

- Box Hill Institute and Queensland University of Technology have both developed courses specific to dance teaching which offer formal accreditation.

***1990 recommendation 5: Produce dance-orientated audio-visual resources relating to Injury prevention and management for use in the courses and for the assistance of teachers working in isolated areas.***

5. Dance orientated audio-visual resources have been developed relating to injury prevention and management, e.g.,

- Smart Dance Video — a documentary on injury prevention and innovative approaches to safe dance practices (Ausdance NSW);
- Smart Dance poster to accompany the video.

**1990 recommendation 6:** Produce (or adapt existing) visual resources for display in studios, such as charts and diagrams for: (i) recommendation for a physical checkup before increasing work loads, (ii) injury prevention information, (iii) injury management information, (iv) stretching techniques, (v) heart rate charts, (vi) anatomy charts, (vii) nutrition charts, etc.

6. Individual tertiary dance courses and some major studios now use visual resources in their studios to convey information about injury prevention and management. There has been no centralised development of these resources as yet.

**1990 recommendation 7:** Continue and develop the professional dancers' injury survey at intervals of approximately five years in order to monitor the effects of improved education in injury prevention and management.

7. The effects of improved education in injury prevention and management in the professional dance population have been monitored, i.e.,

- *Safe Dance III Report.*

**1990 recommendation 8:** Make available in all studios a first aid kit which is fully stocked and includes instructions for the procedures referred to as R.I.C.E.D.

8. There has been increased awareness of the importance of the R.I.C.E.D. procedure in dance studios, e.g.,

- All tertiary dance departments and many studios now provide fully stocked first aid kits.
- This requirement is included in the *Australian Guidelines for Dance Teachers* and in the *Interim National Competency Standards for Dance Teachers*.

**1990 recommendation 9:** Define and make available in all studios simple rehabilitation tools which may benefit prevention of injury, e.g. a wobble board (BAPS) for the feet and ankles.

9. General understanding of the importance of simple rehabilitation tools which can be safely used in dance studios has been improved, e.g.,

- many studios now have a wobbleboard available to students, with explanation of its use and benefits;
- many studios now supply students with lengths of Theraband or similar resistive band for progressive resistance exercise.

**1990 recommendation 10:** Encourage the display of available information on anatomy, injury prevention and management.

10. Individual tertiary dance courses and some major studios now use visual resources in their studios to convey information about injury prevention and management.

#### **Recommendations — education and training**

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**1990 recommendation 11:** Undertake a comprehensive survey relating to injury in adolescents in training.

11. A comprehensive survey relating to injury in adolescents in training has been completed and published by Ausdance, i.e.,

- *Safe Dance II* (Geeves 1997).

**1990 recommendation 12:** Undertake a pre-professional dancers' survey every three years, in two groups, (a) up to 13 years and (b) 13-18 years.

12. Ausdance is pursuing resources for the continuation of this project.

**1990 recommendation 13:** Investigate the diversification of supplementary training for dancers, based on the concept of 'relative rest'.

13. Investigation into supplementary training for dancers is being undertaken, e.g.,

- Cross Training for Dancers (see article by Tony Geeves in Section 3 of this report).
- All Tertiary Dance Council of Australia (TDCA) courses now incorporate supplementary training for dancers. It is also recommended in the Guidelines and Interim Competency Standards documents.

### **Recommendations — the workplace**

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**1990 recommendation 14:** *Establish a pilot 20 hours introductory course covering injury prevention and management (including nutrition and substance abuse) for pre-professional students.*

14. Some tertiary dance courses have adopted (or adapted) this procedure.

**1990 recommendation 15:** *Establish a pilot course for studio teachers (at a training institution) covering areas of injury prevention and management, and follow-up evaluation of this course.*

15. QUT and Box Hill Institute both run special accredited courses for studio teachers.

**1990 recommendation 16:** *Encourage research in dance science, particularly dance psychology.*

16. Ausdance publishes articles of interest to dance psychologists, mainly in *Dance Forum*.

**1990 recommendation 17:** *Identify and review selection/audition practices for admission to pre-professional training.*

17. This has been on the TDCA agenda for several years, and tertiary dance institutions are now moving toward standardising these procedures.

**1990 recommendation 18:** *Encourage companies to review rehearsal management practices in the workplace — especially regarding specificity of training.*

18. Teachers and teaching societies are reviewing training practices, e.g.,

- gradual increase in workload following a break is more understood and accepted in studios as important in injury prevention;
- the concept of 'specificity of training' and its role in injury prevention may be better understood now with some choreographers tailoring a warm-up or rehearsal to the movement to be performed in the class or performance for that day.

### **Recommendations — health professions**

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*1990 recommendation 19: Research the life management practices of dancers. Investigate existing strategies for coping with injury and rehabilitation.*

19. See *Safe Dance II* and *Safe Dance III*.

*1990 recommendation 20. Provide occupational health and safety programs for staff, dancers and choreographers.*

20. Most large companies and tertiary dance courses now have a physiotherapist or other rehabilitation specialist on staff or on call.

*1990 recommendation 21: Undertake further studies into the injurious aspects of dance, including dance training and fatigue, body composition, nutritional aspects, psychological aspects, initial selection of professional dancers, environmental factors, choreography and its relationship to injury.*

21. The challenge to undertake further research into the injurious aspects of dance has been accepted, with research now being undertaken in a number of areas by physiotherapists and others with a background in dance.

The international dance medicine community has also taken up the challenge, and meets regularly

through the International Association for Dance Medicine and Science (IADMS) (*See Part 4*) and other societies to share and publish research findings.

***1990 recommendation 22: Undertake research into methods of more efficient rehabilitation.***

22. See comment under 21.

***1990 recommendation 23: Undertake further research into adolescent injury with special attention focused on overuse and overtraining.***

23. See *Safe Dance II*.



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## SAFE DANCE III — PART THREE

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### Original articles

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The Female Athlete Triad:  
what it means to dancers  
*by Debra Crookshanks*

Core Stability  
*by Craig Phillips*

Cross-training for Dancers  
*by Tony Geeves*

Pilates:  
the dancer's way  
*by Nicole Vass*



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## **The Female Athlete Triad: what it means to dancers**

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'The Female Athlete Triad' refers to the interaction of three related occurrences experienced by female athletes, including dancers, who consume low calorie diets yet continue to participate in high levels of physical activity. The components of the triad are: firstly, restricted eating practices, a low calorie diet and low body weight; secondly, the resulting disruption to the female athlete's menstrual (reproductive) cycle; and thirdly, the subsequent interference with the mechanism by which the body stores calcium in the bones.

Elite female dancers consume low calorie diets in order to maintain the lean physique necessary for the physical and aesthetic demands of dance, even though their energy expenditure requires many more calories (Bale 1994).

This restriction of calories results in an imbalance between energy intake and energy expenditure creating a state of 'low energy availability'.

This state of low energy availability, coupled with persistent high levels of exercise, is perceived by the body as potentially harmful and protective mechanisms are instigated.

The suppression of reproductive function during these periods of low energy availability is one such adaptive response by the body to conserve energy (Williams 1998).

A direct effect on reproductive function is the inhibition of the release of the hormone GnRH (gonadotrophin-releasing hormone) from an area of the brain known as the hypothalamus. Decreased

levels of this hormone cause inhibition of ovulation, disrupting menstruation (Robson 1998).

Along with hormonal changes, low energy availability has also been directly related to the activation of metabolic adaptations to conserve energy.

One of the most consistent endocrine findings linking reproductive status and energy availability is the change in circulating levels of thyroid hormone T3 — triiodothyronine (Williams 1998). Levels of T3 accurately reflect overall energy balance and are low in athletes with altered or ceased menstrual function.

Therefore with altered or disordered hormonal and endocrine function, female athlete menstruation is delayed or interrupted (amenorrhoea).

It is recognised that this combination of a restrictive eating pattern with excessive training and decreased body weight may all predispose a female athlete to amenorrhoea. (Reeder, Dick, Atkins, Pribis & Martinez 1996).

This suppression of reproductive function is termed primary amenorrhoea when onset of menstruation is delayed and has not commenced by age 16; secondary amenorrhoea when there is the absence of three or more consecutive menstrual cycles; and oligomenorrhoea or irregular menstruation with cycles occurring at irregular intervals of 30–90 days. Eumenorrhoea is the term used for a normal reproductive cycle.

If this exercise-associated amenorrhoea is prolonged, levels of the reproductive hormone oestrogen are greatly reduced (hypoestrogenism). (Warren, Brooks-Gunn, Hamilton, Fisk Warren & Hamilton 1986); (Williams 1998).

This hypoestrogenism has been reported to lead to detrimental changes in bone and to reduced bone density. This in turn is associated with an increased risk of stress fractures in the amenorrhoeic dancer.

(Kadel, Teitz & Kronmal 1992) (Warren, Brooks-Gunn et al. 1986).

Oestrogen is essential for optimal calcium balance. With reduced oestrogen and reduced bone mineralisation there is an increased susceptibility to injury and the potential for premature osteoporosis in the long term (Reeder et al. 1996).

The prevalence of amenorrhoea in female athletes has variously been reported to be up to 66% (Reeder et al. 1996) and 19%–24% (Williams 1998) compared with that of the general female population — between 2% and 5%. Australian figures for professional dancers of 29% occurrence of secondary amenorrhoea and 60% of oligomenorrhoea (Crookshanks 1999) along with 34% occurrence of secondary amenorrhoea (Geeves 1990) have also been reported.

However, recent research findings suggest exercise-related amenorrhoea in dancers may not necessarily result in osteoporosis, due to the positive effects of exercise, particularly on weight bearing regions such as the hip and low back (Khan, Green, Saul, Bennell, Crichton, Hopper & Wark 1996).

How can the dancer improve this situation?

The suppression of reproductive function that occurs with a prolonged state of low energy availability appears to be reversible when energy availability (calorie intake) is increased or excessive levels of exercise are decreased (Williams 1998).

Dancers can increase their energy availability through their diet to ensure an adequate energy intake while still maintaining a lean physique.

The major components of any diet are macronutrients, micronutrients and fluid (Clarkson 1998).

The macronutrients are carbohydrates, fat and protein; micronutrients are vitamins and minerals;

while water is vital for nutrient transport and the body's cooling mechanism.

With a very low calorie intake comes low intake of macronutrients, along with low intake of micronutrients.

Of the macronutrients, carbohydrate provides the fuel (muscle glycogen) for energy production (cereals, fruit, pasta); fat is necessary for healthy cell membranes and nerves (low fat milk, cheese); while protein is needed to repair muscle (chicken, turkey, tofu, beans, rice).

Of the micronutrient vitamins, B is needed for energy production and red blood cell formation; C and E are important antioxidants and are necessary for muscle repair, while D is vital for bone formation. These are best gained from a diet which includes whole grains (bread and cereal) along with five serves of fruit and vegetable per day.

Of the micronutrient minerals, calcium is necessary for bone formation (low fat milk, cheese, yoghurt); iron is needed to carry oxygen in the blood, and is used for energy production in cells (lean red meat, whole grains), while zinc plays a role in energy production and in red blood cell production (red meat, fish, poultry, oysters, spinach, asparagus). A zinc deficit may result in prolonged or poor healing of tissue.

Vitamin and mineral supplements are taken by many professional dancers, 86% (Crookshanks 1999), 82% (Geeves 1990). While it is preferable that micronutrients come from natural sources in the diet, if dietary supplements are taken, it is suggested a multivitamin containing 100% or less of the recommended daily allowance (RDA) be chosen to provide a balance of micronutrients in amounts that would not be harmful or toxic. Care must be taken with selective supplementing of micronutrients, e.g. excessive zinc could interfere with the absorption of iron; excessive doses of vitamin A can result in headache, vomiting and liver damage (Clarkson 1998). If necessary nutritional advice may be obtained from a dietitian.

Adequate fluid intake is vital. Water, as evaporation of sweat from the skin, is used to cool the body after increased workload. If exercise is excessive and/or fluid intake is inadequate dehydration will occur, resulting in impaired mental function, impaired performance, fatigue and possible injury.

In summary, restrictive eating behaviour and low energy availability can be directly related to amenorrhoea and low bone mass in the elite female athlete (Otis, Drinkwater et al. 1997).

In extreme circumstances, these restrictive eating behaviours go beyond calorie restriction to include the use of diet pills or laxatives, diuretics, purging and the psychiatric behaviours of anorexia nervosa and bulimia nervosa (Robson 1998).

Therefore all dancers and those dealing with dancers should have an awareness of the relationship of the three components of the 'Triad' so that, with education and understanding of the situation, intervention and management strategies can be more effective.

#### REFERENCES

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Bale P (1994): Body Composition and Menstrual Irregularities of Female Athletes. *Sports Medicine* 17 (6): 347-352.

Clarkson P. (1998): An Overview of Nutrition for Female Dancers. *Journal of Dance Medicine & Science* Vol. 2, No.1, 32-39.

Crookshanks D. (1999): *Safe Dance III Report. A Report on the Occurrence of Injury in the Australian Professional Dance Population.* Australian Dance Council — Ausdance.

Geeves T. (1990): *Safe Dance Project Report. A Report on Dance Injury Prevention and Management in Australia.* Australian Dance Council — Ausdance (formerly AADE).

Kadel N, Teitz C and Kronmal R. (1992): Stress Fractures in Ballet Dancers. *American Journal of Sports Medicine*, Vol. 20, No. 4, 445-448.

Khan KM, Green RM, Saul A, Bennell KL, Crichton KJ, Hopper JL & Wark JD (1996): Retired Elite Female Ballet Dancers and Nonathletic Controls Have Similar Bone Mineral Density at Weightbearing Sites. *Journal of Bone & Mineral Research* 11(10): 1566-1574.

Otis CL, Drinkwater BL, Johnson M, Loucks AB, Wilmore JH (1998): American College of Sports Medicine position stand: *The Female Athlete Triad*. *Medicine & Science in Sports and Exercise* 29 (5): i-ix.

Reeder MT, Dick BH, Atkins JK, Pribis AB & Martinez JM (1996): Stress Fractures — Current Concepts of Diagnosis and Treatment. *Sports Medicine* 22 (3): 198-212, September.

Robson BE (1998): The Female Athlete Triad. *Journal of Dance Medicine & Science*. Vol. 2, No. 1, 42-44.

Warren MP, Brooks-Gunn J, Hamilton LH, Fiske Warren L, Hamilton W (1986): Scoliosis and Stress Fractures in Young Ballet Dancers. Relation to Delayed Menarche and Secondary Amenorrhea. *The New England Journal of Medicine* Vol. 314, No. 21, 1348-1353.

Williams N (1998): Reproductive Function and Low Energy Availability in Exercising Females. A Review of Clinical and Hormonal Effects. *Journal of Dance Medicine & Science* Vol. 2, No. 1, 19-31.



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## **Core Stability**

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Over the last ten years the Safe Dance series of reports has provided the medical and particularly the dance medicine world with one of the most comprehensive epidemiological series outlining injury type and distribution in both the professional and student dancer. (Geeves 1990, 1997), (Crookshanks 1999).

To be effective the dance medicine world requires studies such as these to identify and help prioritise the problems that dancers experience. Only then can we go about devising programs and strategies that will address those problems in a pro-active manner at the level that they are occurring.

The work of the Safe Dance researchers has identified a high incidence of spine-related problems in the dance population. (Geeves 1990, 1997) (Crookshanks 1999). It also identifies the fact that many of these problems are occurring before the age of 18, which presents us with a clear map of what the problems are and at what age we need to begin addressing them. Puberty is the time when dancers will experience a rapid increase in problems so often associated with the major growth years, hence placing a great deal of responsibility on dance teachers. This is where correct information and education on how to manage the child through those years and ensure that technical demands are both appropriate and safe is of vital importance.

Fortunately there has been a large body of research developing over the last ten years, in both the industrial medicine and sports medicine worlds, which looks at addressing the issue of pelvic stabilisation and muscular control of the trunk for the management of back injuries and improving

movement efficiency. (Vleeming et al. 1998, Richardson et al. 1995,1999). This information is at the cutting edge and can be applied directly to dancers on two fronts, managing and preventing spinal injuries and improving technique through those all important growth years.

Dance training has traditionally been orientated towards the periphery. Arms, legs, feet, wrists and hands all receive priority over the centre, which although regarded as important is an area that is poorly understood. Studies on adolescent growth indicate that, during those growing years, not only do rapid changes to the length of limbs make them harder to control (often resulting in deteriorating technique) but also these alterations to the biomechanics result in greater stress being placed on the spine (Ackland 1994, Blimkie 1989). The message that we feel is most important is that, during those growing years, technique training should be orientated towards central control of the spine and trunk and not to end-of-range movement of the periphery (Phillips1997).

The current trend towards increasingly flexible dancers may be a significant factor in injury rates. Excessive stretching regimes can be detrimental to spinal stability and motor function and the long term legacy for students will be spinal problems that will carry on into their adult life (Shacklock 1995).

A dancer's 'centre or pull up' consists of the ability to control both the shoulder and pelvic girdle during the execution of peripheral movement. This begins with the activation of the deepest abdominal stabilising muscle group, transversus abdominis which forms an encircling muscular corset between the ribcage and pelvis (Richardson et al. 1994). More superficial are the internal and external oblique abdominal muscles that cross diagonally at the front and sides. Posteriorly, interest is focussing on the deep lumbar extensors, particularly the deep multifidus and superficially the latissimus dorsi which shares the thoracodorsal fascia common to transversus abdominis. Electromyographic studies have shown that rectus abdominis activity or the 'sit up/six pack' muscle is not desirable, as its activity is

to posteriorly tilt the pelvis ('tucking under'), and its action, especially at high speed, such as in sit ups, inhibits activity of transversus (Wolfhart 1994, Richardson et al. 1995, Comerford 1997). Neither does it have the attachments to provide a stability role. 'Tucking under' flexes the lumbar spine and the intervertebral discs, resulting in increased intradiscal loading and greater potential of disc injury. To maintain the preferable neutral pelvis, multifidus activity needs to be trained along with that of transversus to control anterior/posterior tilt in standing. Most importantly these muscles need to be trained for control, not strength, in order to act in a stability role, with submaximal activity between 30% and 60% maximum voluntary contraction (MVC) being seen as the desired level (Richardson et al. 1989). This way we see the benefits of muscular control of the trunk, rather than high level strength providing a secure controlled 'core' around which the limbs move. The benefits are numerous:

- It provides a focus for training during those growing years when proprioception and strength development lag behind increasing height. (Froberg 1996). Pelvic control work will be an achievable goal when control of arms and legs is not.
- It provides better control of the trunk to improve balance for the difficult combination of increasing height and going *en pointe*. Ankle strengthening should be a secondary consideration.
- It protects the growing spine from the increased loads of longer arms and legs and increases the inherent stability of the often hypermobile adolescent.

By incorporating techniques that facilitate the correct low level muscle control and introducing it as an integral part of a student's warm-up at an early age we should achieve a marked change in the type of injuries currently being seen and an improvement in the very basics of training.

Such information is already being accepted by major teaching organisations, providing the type of

information that will see the knowledge and credibility of the dance teacher enhanced (Phillips & Rist 1999). Embracing this knowledge as it becomes available will see that the vast numbers of children learning dance will enjoy and benefit from the experience with minimal risk of injury.

The Safe Dance reports have already been a major influence on how that work is being organised and we look forward to future studies that will indicate how effective education has been and be a further guide to the future of dance medicine research.

#### **REFERENCES**

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Ackland T, Blansky BA, & Bloomfield J: Physical Growth and Motor performance of adolescent males. In: Blanksby et al. (eds): *Athletics, Growth and Development*, Harwood Academic Press, Chur, Switzerland, 1994, pp.200–255.

Blimkie CJR: Age & Sex associated variation in strength during childhood: anthropometric, morphologic, neurologic, biomechanical, endocrinologic, genetic, and physical activity correlates. In: CV Gisolfi & DR Lamb (eds) *Perspectives in Exercise Science and Sports Medicine*, Vol. 2. Indiana, PA: Benchmark Press 1989 pp 99–163.

Comerford M: Dynamic Stability & Muscle Balance, Course Notes 1997.

Crookshanks D: Safe Dance III Report. Australia. Australian Dance Council — Ausdance 1999.

Froberg K & Lammert O: Development of Muscle strength during Childhood. In: O Bar-Or (ed.): *Child & Adolescent Athlete*. London: Blackwell Science 1996, pp. 25–41.

Geeves T: Safe Dance Project Report. Australia: Australian Dance Council — Ausdance 1990.

Geeves T: *Safe Dance II Report*. Australia, Australian Dance Council — Ausdance 1997.

Phillips C : 'Pull up' and its importance in training the adolescent dancer In: The Seventh Annual Meeting of the International Association for Dance Medicine & Science Tring, England 1997 — Conference Proceedings.

Phillips C & Rist R : Royal Academy of Dancing : London — Examiners Education Programme 1999.

Richardson CA & Jull GA : Concepts of assessment and rehabilitation for active lumbar stability. In: JD Boyling & N Palastanga (eds) *Grievous Modern Manual Therapy – 2nd Edition* Edinburgh: Churchill Livingstone. pp 705–720 1994 .

Richardson CA, Jull GA, Hodges P & Hides J : *Therapeutic exercise for spinal segmental stabilisation in Low Back Pain — Scientific basis & Clinical Approach*. Edinburgh: Churchill Livingstone. 1999 .

Richardson CA & Jull GA: An Historical perspective on the development of clinical techniques to evaluate and treat the active stabilising system of the lumbar spine. *Aust. J.Physio. Monograph No..1* 1995 pp 5–14.

Shacklock M: Clinical applications of neurodynamics In: *Moving in on Pain – Adelaide, Sth Australia 1995 — Conference Proceedings* pp 123–132.

Vleeming A et al.: 3rd Interdisciplinary World Congress on Low Back & Pelvic Pain Vienna, Austria, Nov 1998 — Conference Proceedings.

Wolfhart D: The relationship between the dynamic & static function of abdominal muscles In: *Aust. J.Physio. Monograph No..1* 1995 pp 21–26.

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## Cross-training for the dancer

**Tony Geeves**  
**MA (NYU), DTR, Dip.Tch., BA (Stockholm)**

Since the publication of *The Safe Dance Project Report* (Geeves 1990) dance teachers and dancers have begun to reappraise traditional training methods and scrutinise some of the folklore and myths that were an accepted part of the lives of previous generations.

One of the most powerful myths of my training years was that all non-dance activity was inherently damaging to the dancers. NO horse riding, running, skiing — the list was seemingly endless. At that period in history there may have been some justification for these views as there was very little known about the techniques or values of cardiovascular conditioning, stretching, strengthening or active rest, and the bodies of students presented to the dance teacher were different from those seen today. We also now know that these components of conditioning are not necessarily to be found in the dance class.

In an environment with no food additives, simpler, less fatty diets, clean air, safer streets and fewer cars — so that children walked almost everywhere and developed strong lean bodies in the process — graduated workload was not an issue to bodies constantly in use. Warm-up occurred while walking or riding to class. The dance teacher's prime concern was to teach dance!

Today's dance students need to prepare their bodies, preferably before dance training and often to accommodate the technique of their choice. 'Cross-training' is a way to accomplish this.

Cross-training for the dancer is a relatively new concept, referred to in *The Safe Dance Project Report* (Geeves 1990) as alternative or adjunctive training.

The term 'cross-training' is defined by Moran (1994) as using another sport, activity, or training technique to help improve performance in the primary sport or activity.

The history of cross-training in sport as a concept is relatively modern and is the subject of ongoing debate between sports scientists (Russell et al., 1990) despite the fact that similar methods were already used by Greek athletes 2000 years ago.

*Tanaka (1994) writes 'cross-training is a widely used approach for structuring a training program to improve competitive performance in a specific sport by training in a variety of sports. Despite numerous anecdotal reports claiming benefits for cross-training, very few scientific studies have investigated this particular type of training. It appears that some transfer of training effects on maximum oxygen uptake (VO<sub>2</sub>max) exists from one mode to another. The non-specific training effects seem to be more noticeable when running is performed as a cross-training mode. Swim training, however, may result in minimum transfer of training effects on VO<sub>2</sub>max. Cross-training effects never exceed those induced by the sport-specific training mode. The principles of specificity of training tend to have greater significance, especially for highly trained athletes. For the general population, cross-training may be highly beneficial in terms of overall fitness. Similarly, cross-training may be an appropriate supplement during rehabilitation periods from physical injury and during periods of over training or psychological fatigue'.*

'Specificity of training' is the key phrase here. There is some agreement that exercises specific to the activity in question are beneficial and do transfer back to the original focus of the dancer/athlete. For example a jazz dancer who wishes to improve isolation and rhythm may take up *capoeira* (a Brazilian martial art that emphasises these qualities). The positive effects are particularly transferable when the dancer/athlete is not in technique training, that is to say, during a break in training due to injury, a holiday or a change of training routine. Naturally both the type of training

and the type of body being trained must be taken into consideration.

### **Body types / somatotyping**

Firstly it is important to identify what body type you are dealing with.

One method of identifying body types is called somatotyping. Developed by Sheldon in 1954 and revised by Carter in 1972, this system now divides body types into three basic categories. These groups are called ectomorph, mesomorph and endomorph. Many people are a combination of two of these basic types with an emphasis on one or the other. Each one of these groups has its particular strengths and challenges (for more detail refer to Fitt 1988:271-276).

When entering a dance studio on any given day you may remember seeing a group of students sitting on the floor in splits or performing extreme leg stretches, chatting and remarking on how very tight they feel today. This group **mainly** consists of ectomorphs. They will usually have long legs, will be quite thin and very flexible.

Members of this particular group would be better advised to do strength training as a warm-up in order to protect their often unstable joints. This is where their potential for injury lies, and this aspect of their physiology should also influence their choice of cross-training in conjunction with the genre that is their specialty. For example, a body therapy such as Pilates would be most suitable for this population although they would still need some form of cardiovascular activity to complete an overall fitness program.

Another group you may have noticed is the one that consists of students who have walked briskly, cycled or run to class and are now doing push-ups, skipping or jogging on the spot remarking on how out of condition they are feeling. This group will be the mesomorphs, often broad-shouldered, slim-hipped and with excellent cardiovascular fitness.



Their challenge is flexibility, and they should be stretching at every opportunity available (especially after massage or a period in a float tank) to avoid potential injury from their limited range of movement.

The third group may well be sitting in a corner nibbling on a snack or discussing nutrition, recipes or diets. This group will be the endomorphs. They will often look more like the general population in body shape than the others. However they are usually quite flexible and have good cardiovascular fitness. Their challenge is the low rate at which they metabolise food. They often eat less than others but adipose tissue (fat) accumulates. Aerobic low-impact cardiovascular exercise specific to their genre is the answer for them when choosing cross-training, for example running in water with a buoyancy vest for support.

Widely held beliefs are not necessarily correct and while there has been much focus on warm-up — and particularly stretching — as injury prevention strategies, more recent research by Pope et al., (1996) does not support these claims. On the other hand they discovered that aerobic fitness was a strong indicator for avoiding the risk of potential injury.

It seems to be endemic to human nature that, when training, many avoid or ignore challenges and tend to practise to the point of indulgence whatever is easy and pleasant.

### **Dance Classes**

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Dance classes are by tradition collective. Therefore whoever is giving the class needs to have an awareness of body types (their own as well as those of their students) in order to vary the content within the traditional structure.

Professional dancers spend many years understanding their physical needs and challenges. Therefore they often acquire a great deal of introspection and egocentricity. One of the

challenges to the professional dancer who gives classes without the benefit of further teacher education is to be aware of others' needs and to acquire the information to enable fulfilment of those needs.

For example, a system of review with limited parameters could be created. The dance teacher decides that the reviewer (an education specialist and not necessarily a dance person) will access certain elements of the class. These elements could be the teacher's verbal interaction with students, the content (positive and negative), where and when they take place. The education specialists will limit their comment to these particular elements of the class. Initially this could be unsettling for the teacher, however it could be of enormous support in creating new approaches to teaching practices and an awareness of personal learning processes.

#### **Components of conditioning**

It is important to identify the components of conditioning, their relevance to each individual's needs and the genre for which the cross-training is being considered.

There is a general consensus in sport and dance when it comes to the components of conditioning. They are:

- strength
- power
- muscular endurance
- flexibility
- neuromuscular co-ordination
- cardiovascular endurance.

For a more complete description of these components please refer to Fitt (1988:321).

#### **Genre or type of dancers' training**

Last, but not least, it is important to identify the genre for which cross-training is being designed. It

is of vital importance that the exercises are specific to the type of dance training practised if they are to be of any benefit.

Be creative with your cross-training so that you derive maximum benefit and pleasure from the activities that you choose.

For example:

GENRE	SKILL	ACTIVITY
Ballet	Balance	Blades (roller)
Belly dancing	Pelvic rotation	Hula hoops
Contemporary	Ankle proprioception	Skate boarding
Tap dancing	Ankle strength & flexibility	Swimming with kickboard
Jazz	Isolation and rhythm	<i>Capoeira</i> (Brazilian martial art form)

### **Conclusion**

Make sure that all of your cross-training includes some form of aerobic fitness. Pope et al. (1996) reported that aerobic fitness assessed by the 20m Shuttle Run Test, was a strong indicator on injury risk. While there has been much focus on warm-up and stretching as injury prevention strategies, it is in conjunction with aerobic fitness that they can be effective.

Body therapies are also a form of cross-training and the same parameters apply. Identify the body types, consider the components of conditioning lacking in your dance-training program and choose cross-training specific to the genre.

Choose the form of cross-training you need to enhance your potential rather than to continue demonstrating what you excel at. Extend your possibilities and be the best performer you can be at any given time.

Cross-training could be the key to surviving the rigours of vocational dance training with the minimal risk of injury, allowing you to maximise your potential while enjoying the euphoria of dance.

## REFERENCES

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Geeves T. *The Safe Dance Project Report*  
Australian Dance Council —Ausdance 1990

Fitt S. *Dance Kinesiology*. Schirner Books New  
York 1988:321

Pope RD, Herbert RD, Kirwan JD, Graham BJ.  
Proceedings of the National Physiotherapy  
Congress 1996:193

Tanaka, H. Cross-Training for Sport *Sports-*  
*medicine* (Auckland, N.Z.); 18 (5), Nov 1994,

Moran G and McGlynn G. Cross-Training for  
Sports. *Human Kinetics* 1994:5

Russell B and Pyke F. *Training for Sport and*  
*Fitness*. MacMillan Company of Australia 1990:  
256-265

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## **Pilates — the dancer's way**

**By Nicole Vass BPhy M.A.P.A.  
Physiotherapist  
and Pilates Instructor**

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Dancers are always searching for ways to enhance their performance — something that will help them maximise the efficiency of their bodies, maximise the precision of their movements, and help them find the missing links in the challenge for a better outcome. Pilates provides the path to enhancement of performance.

Pilates is different because it will teach you to:

- focus and pre-set the body in anticipation of movement;
- understand how to stabilise the joints to establish a good foundation through the pelvic and trunk areas;
- learn to initiate movement correctly and efficiently.

The resulting movement will be the best combination of all the qualities required.

The Pilates Method is now well established as the ideal adjunct to the traditional training that dancers have always known. It is ideally suited to help dancers produce the best physical outcome, to equip the body to avoid injury, and to provide a nurturing environment in which to maintain good dance-specific conditioning and a constructive attitude when injured.

Pilates is about understanding *how* to move, not just improving the fitness components of movement. It teaches functional strength and functional flexibility which will carry over into your class, rehearsal and performance situations.

### **Why is it different?**

#### **The principles of the method**

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Pilates is not just about getting you stronger and longer! Your program will always be based around the following principles:

Firstly, you will be developing your Body Awareness. You will always be fine tuning your sense of how your body should feel to do a movement correctly. Without this, you cannot go on to develop balance and symmetry throughout your body. All styles of dance will create certain muscle imbalances and we now have an exercise program to rectify these.

In working towards efficient movement as your outcome, you will focus on the principles of Concentration, Centering, and Control. Your Pilates workout requires you to concentrate on the intent of each exercise and on isolating the relevant muscle group. Developing a strong 'centre' — also known as 'core control' — is a primary aim, so that freedom of movement can be achieved. This involves developing good strength and endurance in the muscles that stabilise the pelvic and shoulder girdles. Control of movement is achieved once the dancer can maintain good background posture under changing load and speed situations.

The dancer must learn the appropriate combination of strength, flexibility, co-ordination etc. specific to each movement pattern. The exercises are always designed and sequenced to challenge dancers to reach their potential but are always within their control.

Precision ensures that the correct muscles are recruited to achieve the benefits of each exercise. This also ties in with the concepts of pre-setting and stabilising before initiating and moving. Flow is emphasised throughout to reduce any tension in the movement, provide quality and eliminate jarring of joints at the end of range. Special attention is given to breathing throughout. This helps to integrate the muscular work, to reduce unwanted tension, and to initiate and assist the exercise.

The end result is quality and efficiency of movement.

### **What will Pilates do for you?**

Many dancers train hard, but not enough train 'smart'. If you can do both you are more likely to make greater gains in the areas you are working on, work your body more efficiently (not just working hard for the sake of working hard), and decrease your risk of overuse injuries. The end result then is to be experiencing your best performance when you want to, i.e. with predictability.

Pilates fills the bill beautifully because it is about the quality of what you are doing, not quantity. To get the best outcome, you need to understand the physical demands of the style of dance you are doing so that you are not wasting time training in an aspect of fitness that you do not require. Obviously, your Pilates instructor needs to have an even better knowledge of these demands, so that your program can be planned to specifically target the areas of physical training that will have the greatest impact on your performance.

In conjunction with this, the instructor needs to have good observation skills so that the dancer's strengths and weaknesses can be quickly pinpointed. The aim is then to balance these out so that the body works at maximum efficiency to produce the best results.

Good technique is a prerequisite to performing well. To train intelligently, you need to be able to recognise what good technique is, and how to break it down into the fitness components that are required. This refers to correct technique in a dance sense, as well as good technique in the performance of each Pilates exercise. Pilates is able to specifically train the components which make up good technique in the dancer and promote the long, lean body shape which is essential.

### **Useful abdominals**

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All dancers are aware of wanting flat abdominals but are not necessarily aware of what they need their abdominals for. Many of the overuse injuries suffered by dancers can be traced back to a lack of abdominal/pelvic control. The abdominals also provide crucial stability and mobility to the spine and this is certainly an area subjected to great strain in the dancer.

One of the main features of the Pilates Method has always been the strong focus on the correct use of the abdominals as stabilisers and mobilisers. Joseph Pilates started developing his work back in the 1920s and has always emphasised a drawing-in action to provide a strong 'core' or centre. Interestingly, this pattern of drawing in would seem to reinforce the very subtle work of the transverse abdominal muscle, which we now know to be vitally important in the management of back pain. Unnecessary tension does not allow for freedom and control of movement.

The method aims to fine tune dancers' muscular control and therefore their movement and technique. With respect to the abdominals, we can now define them as an inner layer, the transverse abdominals, and an outer layer, the internal and external obliques and the rectus abdominis. Merely strengthening the outer layer will give you fabulous looking, rippling abdominals but will provide no functional stability. This means you get no useful protection for the movements you are asking your body to perform on a regular basis.

We must also be able to isolate and execute the correct sliding pattern of movement of the inner layer, as its main purpose is to provide stability to the vertebrae in the lumbar spine. This is very subtle muscle work and needs to be done separately from strengthening work for the outer layers. This is important to prevent back pain and is especially important when someone has a back injury as the deeper layer gets switched off and doesn't automatically regain its normal activity.



The inner layer work needs to be mastered before other abdominal work is added into the Pilates program if the dancer has back pain. This can be incorporated appropriately into the dancer's initial Pilates workouts, if needed. The Pilates work itself then provides the next valuable link by strengthening the abdominals as a group functionally and specifically to suit the dancer's needs.

The Pilates approach to abdominals is to teach the dancer initially to understand how to correctly pattern the abdominals to support the spine in neutral. The neutral spine position is where the pelvis is held in neutral and the appropriate curves are maintained in the spine to allow for maximum shock absorption and mobility. Once this foundation is established, the abdominals are then trained to initiate and support spinal movement in all directions and under varying loads. This is obviously a crucial element for all dancers, to prevent back injuries and to give them the best support base from which freedom of movement can occur. It has always been a primary focus of the method.

### **Bulk versus long lean muscles**

Dancers are forever conscious of needing not only to be strong enough to cope with any choreographic demands, but also to be aesthetically aware of creating the right 'line' with their bodies. This means maintaining strong, long, lean muscles not short bulky muscles.

The Pilates Method is about developing a strong, lean, flexible body by balancing strength work with flexibility throughout the workout. Muscles are worked through their full range so that as flexibility improves they are also strengthening through their new range. Flexibility without the strength to control it is not particularly useful. This is often the problem with many dancers as they are often too flexible and lack the muscular strength and endurance to protect their joints.

The method is based on such sound principles that it has endured and progressed along with current research and knowledge. The beneficial qualities of the work have been recognised and acknowledged by the dance world in Australia for at least the last ten years. The medical community also supports Pilates as a very safe, effective way of rehabilitating from an injury and not losing your dance-specific conditioning.

Pilates provides an integrated approach to achieving the best from your body and therefore the most satisfaction from your dancing. It ideally compliments any style of dance training. Enjoy the challenge and celebrate the benefits.

#### **REFERENCES**

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Robinson L and Thomson G (1997): *Body Control The Pilates Way*. London: Boxtree.

Hodge K, Sleivert G, McKenzie A, editors (1996): *Smart training for peak performance. A complete sport training guide for athletes*. Auckland: Reed Books

Hodges P and Richardson C (1996): Inefficient muscular stabilisation of the lumbar spine associated with low back pain: A motor control evaluation of transversus abdominis. *Spine* 21: 2640–2650.

Hodges P, Richardson C and Jull G (1996): Evaluation of the relationship between laboratory and clinical tests of transversus abdominis function. *Physiotherapy Research International*. 1:30–40.

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## **SAFE DANCE III — PART FOUR**

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### **Additional Information**

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Alternative Health Services

- Pilates
- Feldenkrais
- Alexander Technique
- Ideokinesis

International Association for  
Dance Medicine and Science  
(IADMS) — Mission Statement

Reference List — dance-related  
texts and articles

Sample of questionnaire

*Australian Guidelines for Dance  
Teachers 1997 (Summary)*

*Australian Standards for Dance  
Teachers — the Interim National  
Competency Standards 1998  
(Summary)*



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## ALTERNATIVE HEALTH SERVICES

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### THE PILATES METHOD

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The Pilates Method of exercise offers a total body conditioning program which improves strength, co-ordination, posture and stamina.

One of the main focuses of the Method is in creating a strong 'centre' via the appropriate use of the abdominal muscles. This will give the dancer greater control and strength as well as protect the spine from possible injury. Muscles are worked through their full range of movement and in a variety of combinations resulting in long lean muscles with greater strength through their entire range. Emphasis is given to balancing out each individual's strengths and weaknesses, thereby helping to prevent injury.

Pilates is also valuable in preventing the deconditioning which occurs during the healing process or during a holiday period. Pilates is an exercise method that requires focus and attention to detail. It is ideal for the dancer, as it can be tailored to the needs of the individual and addresses a vast array of issues.

*(Information provided by Ingrid Shaw, ARAD, BA, Pilates Instructor, Vass & Shaw Pilates, Neutral Bay, NSW 2089)*

### THE FELDENKRAIS METHOD®

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The Feldenkrais Method® is a unique approach to teaching movement. It is used with dancers who want to improve their dance technique or performance quality, as well as with those recovering from injury, assisting them to find new ways of moving that enable them to dance at their best. A Feldenkrais lesson involves establishing what the dancer wishes to improve, analysing how the dancer is moving, exploring how that relates to the limitation he/she is experiencing and discovering how the dancer could move differently so that the limitation does not continue.

Lessons are presented in two ways: individually and in groups. Both are based on the idea of teaching dancers to be aware of how they are moving, how they could be moving and how they can increase their options and comfort. In the group lessons the dancers are talked through a sequence of movements. In individual lessons the Feldenkrais teacher uses touch and precise handling to move the dancer. The hands-on work is gentle.

The Feldenkrais Method® is an educational approach. It's about dancers learning how to move differently so that they experience ease and ability in their movement rather than difficulty and limitation. It's about dancers moving 'smarter', learning to use their nervous systems' natural capacity to regulate and co-ordinate movement. By developing our ability to consciously feel or sense our movements and by applying that ability to systematically exploring new movement options, we discover ways around the habits that limit us.

*(Information provided by Zoran Kovich MSc (Cog.Sc), BA (Soc.Sc), BA (Dance). Feldenkrais Method® movement teacher (1991).*

#### THE ALEXANDER TECHNIQUE

The problems of a dancer have many causes and many possible solutions, however the most important aspect of the life of all dancers remains not what is done to them, but what they do to themselves. The Alexander Technique offers a diagnosis as well as a remedy based on this assumption. The founder, Frederick Matthias Alexander, was born in Wynyard, Tasmania in 1869 and died in London in 1955. His teachings involve re-educating the individual in what he called 'the Use of the Self'. Alexander saw the individual as a whole and talked not of 'the body' but of 'the self'; not of 'posture' but of 'use'. The aim of his technique is not to teach you to do what is right, but to help you stop doing what is wrong. Sessions are preventative, rehabilitative and have stress and pain management benefits. This unique teaching

not only enhances performance ability but also aids in preventing injury and breakdown.

A faulty dance technique that is founded on poor body mechanics will predispose the dancer to injury and interfere with performance ability. The Alexander Technique's unique teaching addresses the problem of poor body mechanics and faulty kinaesthesia. It is the experiential nature of Alexander sessions that allows the dancer to experience at first hand a refined kinaesthetic sense based on balance and fine co-ordination. This comes about in a course of sessions as the dancer learns, with the help of the Alexander teacher, to stop habits of poor use and poor co-ordination. The specific focus is on the balance of the head in relation to the neck, and the neck in relation to the spinal column and torso. This way of working on one's self is what Alexander called creative, constructive, conscious control of the individual, which can lead to a freedom in thought and action which can allow true spontaneity of movement.

*(from an article provided by Diana Devitt-Dawson M.STAT, ISSTIP (London), AUSTAT. Teacher of the F.M. Alexander Technique.)*

### IDEOKINESIS

Developed by Mabel Todd in the 1920s, Ideokinesis is an educational approach to facilitating movement. The word 'Ideokinesis' means 'idea in motion', and Ideokinetic practice involves imagining movement taking place within the body. Generally, Ideokinetic imagery is anatomically based and designed to promote specific changes in the dynamic standing alignment of the dancer's skeleton. As unnecessary muscular tension around the joints releases, articulation of the joints becomes freer and movement potential increases.

Ideokinetic practice is based on the premise that the nervous system unconsciously organises all movement. Consciously imposed changes in posture and movement tend to last only as long as

the dancer continues to think about them. Effectively changing existing movement habits therefore requires re-co-ordinating the neuro-muscular patterns underlying those habits. In Ideokinesis the dancer learns how to clearly and precisely focus on a movement image, while allowing the nervous system to find the most efficient way of co-ordinating the movement.

Ideokinetic sessions are done individually or in groups. In group sessions dancers are guided through an imagery process followed by a simple movement sequence or dance improvisation. In individual sessions touch is used to assist the imagery process. Dancers find Ideokinetic practice gentle and meditative and very effective in creating greater ease and freedom in their movement and ability in their dancing.

*(Information provided by Zoran Kovich MSc (Cog.Sc), BA (Soc.Sc), BA (Dance). Lecturer in Somatics and Embodied Anatomy)*



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## **The International Association for Dance Medicine and Science**

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The International Association for Dance Medicine and Science (IADMS) is an international body dedicated to the health care of dancers.

Created to serve as a forum for education, promotion of research and public service in the field of dance medicine and science, the organisation is committed to providing continuing education for the dance and medical communities as well as the public.

It is important that knowledge regarding appropriate training for dancers, correct physical conditioning to prevent illness and injury resulting from dance activity, proper nutrition and appropriate treatment and rehabilitation for dance-related injuries is continually updated.

This education is expanding in the form of meetings, publications, audio-visual resources and other appropriate media aiming to standardise dance medicine information to the worldwide community and provide a network for the dance community.

Communication and co-operation between dancers and those persons concerned with their physical and psychological welfare in the fields of medicine, science and education are encouraged and developed, with the organisation working to enhance the visibility of the dance medicine/science specialist within the dance community and the general public and to establish qualifications for certification within the field.

The Safe Dance Reports have already been a major influence on organising the areas that IADMS needs to address, and we look forward to future studies that will indicate how effective education has been and provide a further guide to the future of dance medicine research.

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## IADMS

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## FURTHER REFERENCES

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### General reading

Brinson P & Dick F (1996): *Fit to Dance? A report of the national Inquiry into dancers health and injury*. Calouste Gulbenkian Foundation (UK).

*Dance Australia*. Yaffa Publishing Group.

Geeves T (1990): *Safe Dance Project Report: A report on dance Injury prevention and management in Australia*. Australian Dance Council — Ausdance (formerly AADE).

Geeves T (1997): *Safe Dance Report II: National injury and lifestyle survey of Australian adolescents in pre-professional dance training*. Australian Dance Council (Ausdance).

Greig V (1994): *Inside Ballet Technique: separating fact from fiction in the ballet class*. A Dance Horizons Book. Princeton Book Co.

Howse J & Hancock S (1992): *Dance Technique and Injury Prevention*. A&C Black, London.

*Journal of Dance Medicine & Science*. Karen S Clippinger & Scott Brown (Editors in Chief). J Michael Ryan Publishing Inc.

Ryan AJ & Stephens RE (eds) (1989): *The Healthy Dancer — Dance Medicine for Dancers*. Dance Books. Cecil Court. London.

*Smart Dance Video & Poster* (1993): A documentary on injury prevention and innovative approaches to safe dance practices. Australian Dance Council — Ausdance NSW Inc.

Solomon R, Minton SC & Solomon J (eds) (1990): *Preventing Dance Injuries: an interdisciplinary perspective*. AAHPERD. Reston, Va. USA.

Spurgeon D (1998): *Dance Till You Drop*. Random House. Australia.

*Textbook of Performing Arts Medicine* (1991): Sataloff RT, Brandfondbrener AG & Lederman RJ (eds). Raven Press. New York.

*Transitions (1989): Papers and Proceedings AADE National Biennial Conference Adelaide*. Trotter H (ed.) Australian Dance Council — Ausdance (formerly AADE).

### **Dance injury**

---

Bowling A (1989): Injuries to dancers: prevalence, treatment and perception of causes. *British Medical Journal* Vol. 298: 731–734.

Chmelar RD, Schultz BB, Ruhling RO, Shepherd TA, Zupan MF and Fitt SS (1988): A physiological profile comparing levels and styles of female dancers. *The Physician & Sports Medicine* Vol. 16, No. 7;: 87–96.

Ende LS and Wickstrom J (1982): Ballet Injuries. *The Physician & Sports Medicine* Vol. 10, No. 7, 101–118.

Evans RW, Evans RI, Carvajal S and Perry S (1996): A survey of injuries among Broadway performers. *American Journal of Public Health* Vol. 86, No. 1, 77–80.

Garrick JG and Requa RK (1993): Ballet Injuries. An analysis of epidemiology and financial outcome. *The American Journal of Sports Medicine* Vol. 21, No. 4, 586–590.

Hamilton WG, Hamilton LH, Marshall P and Molnar M (1992): Profile of the musculoskeletal characteristics of elite professional ballet dancers. *American Journal of Sports Medicine* Vol. 20, No. 3, 267–273.

Garrick J (1988): Age and injury in ballet. *Advanced Sports Medicine and Fitness*. 1: 217–224.

Khan K, Brown J, Way S, Vass N, Crichton K, Alexander R, Baxter A, Butler M and Wark J (1995): Overuse injuries in classical ballet. *Sports Medicine* 19 (5): 341–357.

Kirkendall DT, Bergfeld JA, Calabrese L, Lombardo JA, Street G and Weiker GG (1984): Isokinetic characteristics of ballet dancers and the response to a season of ballet training. *Journal of Orthopaedic & Sports Physical Therapy*. Vol. 5, No. 4, 207–211.

Koceja DM, Burke JR, Kamen G (1991): Organization of segmental reflexes in trained dancers. *International Journal of Sports Medicine*. 12: 285–289.

Milan RK (1994): Injury in ballet: A review of relevant topics for the physical therapist. *Journal of Sports Physical Therapy*. Vol. 19, No. 2, 121–129.

Mostardi RA, Porterfield JA, Greenberg B, Goldberg D and Lea M (1983): Musculoskeletal and cardiopulmonary characteristics of the professional ballet dancer. *The Physician & Sports Medicine*. Vol. 11, No. 12, 53–61.

O'Neill DB & Micheli LJ (1988): Overuse injuries in the young athlete. *Clinics in Sports Medicine*. Vol. 7, No. 3, 591–610.

Quirk R (1983): Ballet Injuries: the Australian experience. *Clinics in Sports Medicine*. 2 (3): 507–514.

Ramel E and Moritz U (1994): Self reported musculoskeletal pain and discomfort in professional ballet dancers in Sweden. *Scandinavian Journal of Rehabilitation Medicine*. 26: 11–16.

Reid DC (1987): Preventing injuries to the young ballet dancer. *Physiotherapy Canada*. Vol. 39, No. 4, 231–236.

Russell B (1989): Proprioceptive rehabilitation in dancers injuries. *Kinesiology and Medicine for Dance*. Vol. 14, Pt 2, 27–38.

Sohl P & Bowling A (1990): Injuries to dancers. Prevalence, treatment and prevention. *Sports Medicine*. 9(5): 317–322

Solomon RL and Micheli LJ (1986): Technique as a consideration in Modern Dance Injuries. *The Physician & Sports Medicine*. Vol. 14, No. 8, 83–90.

Washington EL (1978): Musculoskeletal injuries in theatrical dancers: site, frequency and severity. *American Journal of Sports Medicine*. Vol. 6, No. 2, 75–98.

White SM & Witten CM (1993): Long thoracic nerve palsy in a professional ballet dancer. *The American Journal of Sports Medicine*. Vol. 21, No. 4, 626–628.

#### Injury prevention

Lysens RJ, Weerdts W & Nieuwboer A (1991): Factors associated with injury proneness. *Sports Medicine*. 12 (5): 281–289.

Schon LC, Biddinger KR & Greenwood P (1994): Dance screen programmes and development of dance clinics. *Clinics in Sports Medicine*. Vol. 13, No. 4, 865–882.

Safran MR, Seaber AV & Garrett WE (1989): Warm-up and muscular injury prevention: an update. *Sports Medicine*. 8(4): 239–249.

Weaver J, Moore CK & Howe WB (1996): Injury Prevention. In *Epidemiology of Sports Injuries*. Caine DJ, Caine CG, Lidner KJ (eds). Human Kinetics. Champaign, IL. 439–447.

### **Lumbar spine**

---

Bogduk N (1992): The causes of low back pain — a discussion. *Medical Journal of Australia*. Vol. 156, 151–153.

DeMann LE (1997): Sacroiliac dysfunction in dancers with low back pain. *Manual Therapy*. 2 (1) 2–10.

Fehlandt AF & Micheli LJ (1993): Lumbar facet stress fracture in a ballet dancer. *Spine*. Vol. 18, No. 16, 2537–2539.

Gelabert R (1986): Dancers spinal syndromes. *Journal of Orthopaedic & Sports Physical Therapy*. Vol. 7, No. 4, 180–191.

Maffey-Ward L, Jull G & Wellington L (1996): Toward a test of lumbar spine kinesthesia. *Journal of Sports & Physical Therapy*. Vol. 24, No. 6, 354–358.

Parkhurst TM & Burnett CN (1994): Injury and proprioception in the lower back. *Journal of Sports and Physical Therapy*. Vol. 19, No. 5, 282–295.

Richardson CA & Jull GA (1995): Muscle control — pain control. What exercises would you prescribe? *Manual Therapy*. 1: 2–10.

Stinson JT (1993): Spondylolysis and spondylolisthesis in the athlete. *Clinics in Sports Medicine*. Vol. 12, No. 3, 517–528.

### **Hip and knee**

---

Brukner P & Khan K (1993): Shin pain: in *Clinical Sports Medicine*. McGraw-Hill, 404–415.

Reid DC, Burnham RS, Saboe LA & Kushner SF (1987): Lower extremity flexibility patterns in classical ballet dancers and their correlation to lateral hip and knee injuries. *The American Journal of Sports Medicine*. Vol. 15, No. 4, 347–352.

Gans A (1985): The relationship of heel contact in ascent and descent from jumps to the incidence of shin splints in ballet dancers. *Physical Therapy*. Vol. 65, No. 8, 1192–1196.

Reid DC (1988): Prevention of hip and knee injuries in ballet dancers. *Sports Medicine*. 6: 295–307.

#### **Foot and ankle**

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Quirk R (1998): The ballerina's foot. *The Journal of Clinical Medicine. Modern Medicine*. Vol. 41, No. 8, 20–26.

Fond D (1984): Flexor hallucis longus tendonitis: a case of mistaken identity and Posterior Impingement Syndrome in dancers: evaluation and management. *The Journal of Orthopaedic & Sports Physical Therapy*. Vol. 5, No. 4, 204–206.

Harrington T, Crichton KJ & Anderson IF (1993): Overuse ballet injury of the base of the second metatarsal. *The American Journal of Sports Medicine*. Vol. 21, No. 4, 591–598.

Leanderson J, Eriksson E, Nilsson C & Wykman A (1996): Proprioception in classical ballet dancers. A prospective study of the influence of an ankle sprain on proprioception in the ankle joint. *The American Journal of Sports Medicine*. Vol. 24, No. 3, 370–374.

Malone TR & Hardaker WT (1990): Rehabilitation of foot and ankle injuries in ballet dancers. *The Journal of Orthopaedic & Sports Physical Therapy*. 11: (8) 355–361.

Micheli LJ, Sohn RS & Solomon R (1985): Stress fractures of the second metatarsal involving Lisfranc's joint in ballet dancers. *Journal of Bone & Joint Surgery*. Vol. 67–A, No. 9, 1372–1375.

Marshall P & Hamilton WG (1992): Cuboid subluxation in ballet dancers. *The American Journal of Sports Medicine*. Vol. 20, No. 2, 169–175.



Sammarco GJ (1991): Foot and ankle in dance. In *Textbook of Performing Arts Medicine*. Sataloff RT, Brandfondbrener A & Lederman R (eds). Raven Press Ltd New York, 367–401.

### **Stress fractures and bone density**

Bale P (1994): Body composition & menstrual irregularities of female athletes. *Sports Medicine*. 17 (6): 347–352.

Clarkson P (1998): An Overview of nutrition for female dancers. *Journal of Dance Medicine & Science*. Vol. 2, No.1, 32–39.

Kadel N, Teitz C & Kronmal R (1992): Stress fractures in ballet dancers. *American Journal of Sports Medicine*. Vol. 20, No. 4, 445–448.

Karlsson MK, Johnell O & Obrant KJ (1993): Bone mineral density in professional ballet dancers. *Bone & Mineral Research*. 21: 163–169.

Khan KM, Green RM, Saul A, Bennell KL, Crichton KJ, Hopper JL & Wark JD (1996): Retired elite female ballet dancers and nonathletic controls have similar bone mineral density at weightbearing sites. *Journal of Bone & Mineral Research* 11 (10): 1566–1574.

Liederbach M, Gleim GW & Nicholas JA (1992): Monitoring training status in professional ballet dancers. *The Journal of Sports Medicine and Physical Fitness*. Vol. 32, No. 2, 187–195.

Reeder MT, Dick BH, Atkins JK, Pribis AB & Martinez JM (1996): Stress Fractures — Current concepts of diagnosis and treatment. *Sports Medicine*. 22 (3): 198–212, September.

Robson, BE (1998): The Female Athlete Triad. *Journal of Dance Medicine & Science*. Vol. 2, No. 1, 42–44.

Schneider HJ, King AY, Bronson JL & Miller EH (1974): Stress injuries and developmental change of lower extremities in ballet dancers. *Diagnostic Radiology*. 113: 627–632.

Warren MP, Brooks-Gunn J, Hamilton LH, Fiske Warren L, Hamilton W (1986): Scoliosis and stress fractures in young ballet dancers. Relation to delayed menarche and secondary amenorrhoea. *The New England Journal of Medicine*. Vol. 314, No. 21, 1348–1353.

Williams N (1998): Reproductive function and low energy availability in exercising females. A review of clinical and hormonal effects. *Journal of Dance Medicine & Science*. Vol. 2, No. 1, 19–31.

#### Future research

Caine CG & Garrick JG (1996): Dance. In *Epidemiology of Sports Injuries*. Caine DJ, Caine CG & Lindner KJ (eds). Human Kinetics Publishers Inc. 124–160.

Caine CG, Caine DJ & Lindner KJ (1996): The epidemiological approach to sports injuries. In *Epidemiology of Sports Injuries*. Caine DJ, Caine CG & Lindner KJ (eds). Human Kinetics Publishers Inc. 1–13.

Hart L (1996): Guidelines for evaluating future research in the epidemiology of sports injuries. In *Epidemiology of Sports Injuries*. Caine DJ, Caine CG & Lindner KJ (eds). Human Kinetics Publishers Inc. 448–453.

Katz RT, Campagnolo DI, Goldberg G, Parker JC, Pine ZM & Whyte J (1995): Critical evaluation of clinical research. *Archives of Physical Medicine & Rehabilitation*. Vol. 76, 82–93.

CONFIDENTIAL

# AUSDANCE / University Of Sydney

## DANCE INJURIES SURVEY 1998

PLEASE CIRCLE THE APPROPRIATE REPLIES OR WRITE YOUR ANSWERS WHERE ASKED.  
PLEASE DO NOT WRITE IN THE MARGIN.

- 1 (a) Have you ever sustained any injuries which were sufficient to affect your dancing in any way? YES/NO

Please give the number sustained, if possible: \_\_\_\_\_

- (b) Do you have any chronic (old) injuries which give you continuing problems? YES/NO

Please give the number, if possible: \_\_\_\_\_

What type of injuries were they? \_\_\_\_\_

\_\_\_\_\_

About how old were you the first time each one happened?

\_\_\_\_\_

\_\_\_\_\_

- (c) Have you sustained any injuries in the last six months which were sufficient to affect your dancing in any way? YES/NO

IF YOU ANSWERED NO TO THE LAST QUESTION (1c), PLEASE TURN TO QUESTION 12.  
QUESTIONS 2-11 RELATE ONLY TO YOUR MOST RECENT INJURY WITHIN THE LAST SIX MONTHS

**DETAILS OF MOST RECENT INJURY SUSTAINED IN LAST SIX MONTHS**

- 2 (a) How long ago was your most recent injury?  
(number of weeks or days) \_\_\_\_\_
- (b) Where was the site of the injury?  
(eg hamstring, low back, neck etc) \_\_\_\_\_
- (c) What sort of injury was it?  
(pulled muscle, sprain etc) \_\_\_\_\_

This survey is based on a similar survey designed by AUSDANCE in 1989 and is used with that body's permission.

19 (d) What medications or remedies do you take most often?

Non-prescription \_\_\_\_\_  
\_\_\_\_\_

Prescription \_\_\_\_\_  
\_\_\_\_\_

20 If female, have there been times during your dancing career when your menstrual periods have been irregular? YES/NO

Have they ever ceased for more than three (3) consecutive months, apart from cases of pregnancy? YES/NO

If you answered yes to either or both of the above, what do you think was the cause? \_\_\_\_\_  
\_\_\_\_\_

21 Do you have any personal comments to add? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Thank you for your co-operation. The information gathered in this survey will assist in delivering eventual long-term benefits to all Australian dancers. Please return the survey to Debra Crookshanks.

3 Did the injury take place:

- During class
- During rehearsal  If during rehearsal, were you warmed up?  
YES/NO
- During a performance
- Elsewhere

If elsewhere, please specify where: \_\_\_\_\_

Did the injury occur over time? \_\_\_\_\_

Were you on tour at the time? YES/NO

If on tour, how long had you been away from home? \_\_\_\_\_

Did the injury occur within three weeks of resuming work after a break?  
YES/NO

4 If the injury occurred during a rehearsal or performance:

(a) What style/technique was involved? \_\_\_\_\_

(b) Were you used to working in this style/technique? YES/NO

(c) Had you had the usual amount of rehearsal for the role? YES/NO

5 What, in your opinion, was the cause of the injury? ( If you feel there were several factors contributing, list as many as you can think of, and tick those you consider to be most important).

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6 What did you do when you were first injured?

Stopped dancing and rested

Carried on as best you could

Other

If other, please specify \_\_\_\_\_

If you stopped and rested, for what period? \_\_\_\_\_ hrs \_\_\_\_\_ days

Was any treatment given on the spot? YES/NO

If yes, please specify \_\_\_\_\_

7 Did you consult any of these professionals over the injury?  
(If you consulted with more than one, number the boxes in the order  
you approached them.)

Osteopath  Massage therapist

Physiotherapist  General practitioner

Acupuncturist  Specialist

Chiropractor  Other

If other, please specify \_\_\_\_\_

If you consulted a medical doctor or specialist, was this privately,  
workers compensation/company funded or under Medicare?

Privately  If privately, are you covered by an  
insurance scheme to help meet these costs? YES/NO

Workcover  If work related was treatment company  
provided? YES/NO

Medicare

8 If help was sought (Question 7 above), how long after the injury was  
sustained/noticed did you see someone?

Number of days \_\_\_\_\_

If more than five days later, was this delay:

For your own reasons

Because you could not get an appointment sooner

Other

If other, please specify \_\_\_\_\_

9 (a) If help was sought, were you offered any treatment? YES/NO

(b) What form of treatment was offered?

Ultrasound	<input type="checkbox"/>	Strapping	<input type="checkbox"/>
Laser	<input type="checkbox"/>	Massage	<input type="checkbox"/>
Infra-red	<input type="checkbox"/>	Exercises	<input type="checkbox"/>
Acupuncture	<input type="checkbox"/>	Stretches	<input type="checkbox"/>
Anti-inflammatory drugs or injections	<input type="checkbox"/>	Manipulation- spinal	<input type="checkbox"/>
		- joint	<input type="checkbox"/>
		- deep tissue	<input type="checkbox"/>
Other	<input type="checkbox"/>		

If other please specify \_\_\_\_\_

(c) Did you take the treatment offered? YES/NO

If yes, was it helpful? YES/NO/TOO EARLY TO SAY

10 If treatment has been completed:

Has the site of injury completely healed? YES/NO

If no, do you anticipate complete recovery? YES/NO/UNCERTAIN

11 (a) Were you given as much information about your injury as you wanted? YES/NO

If no, what would you have liked to know more about?

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- 18 (a) In the last six months, have you performed in: The outback   
Country Towns   
Capital Cities   
Overseas

If you toured in the last six months, what was your longest consecutive period away from home? \_\_\_\_\_

How many performances did you give in the above specific period? \_\_\_\_\_

- (b) During the longest consecutive period on tour, did any of the following affect you mentally or physically? (Mark the boxes with a tick for good affect, a cross for bad effect, a nought for no effect either way. Leave box blank if not applicable.)

	PHYSICAL	MENTAL		PHYSICAL	MENTAL
Change in sleeping patterns	<input type="checkbox"/>	<input type="checkbox"/>	Extra jobs apart from dancing	<input type="checkbox"/>	<input type="checkbox"/>
Change in eating patterns	<input type="checkbox"/>	<input type="checkbox"/>	Required social duties	<input type="checkbox"/>	<input type="checkbox"/>
Change in exercise patterns	<input type="checkbox"/>	<input type="checkbox"/>	Working in new places	<input type="checkbox"/>	<input type="checkbox"/>
Change in digestive patterns	<input type="checkbox"/>	<input type="checkbox"/>	Living in new places	<input type="checkbox"/>	<input type="checkbox"/>
Change in climate	<input type="checkbox"/>	<input type="checkbox"/>	Covering more roles than usual	<input type="checkbox"/>	<input type="checkbox"/>
Periods of travel	<input type="checkbox"/>	<input type="checkbox"/>	Other	<input type="checkbox"/>	<input type="checkbox"/>

If other, please specify \_\_\_\_\_

- 19 Please describe your regular diet \_\_\_\_\_

(a) Do you drink:	NEVER	SOMETIMES	A LITTLE REGULARLY	A LOT REGULARLY
Tea/coffee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Soft drinks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diet drinks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alcohol	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(b) Do you smoke:

(c) Do you take:

Extra vitamins	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Health supplements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diet Suppressants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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## *Australian Guidelines for Dance Teachers 1997*

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The *Australian Guidelines for Dance Teachers* support the Code of Ethics developed by the teaching profession in 1986 and 1987 and the *Safe Dance Project Report 1990* (Geeves) and *Safe Dance II* (Geeves 1997), which increased community awareness of the need for dance teachers to maintain and upgrade their qualifications in injury prevention and management.

The *Guidelines* outline codes of ethical and professional behaviour and emphasise the importance of safe dance practice and teaching methodology. They have been designed to assist teachers and students of dance by providing minimum standards, and by suggesting ways in which teachers may maintain and/or upgrade their teaching skills. Parents will find the *Guidelines* useful in helping to choose a reputable dancing school or group for their children.

The document concentrates on the core activities of dance teaching, i.e. teaching methodology, health and safety issues, business principles and ethical behaviour.

The *Guidelines* represented Stage One in developing national dance industry competency standards, a process which will eventually provide accreditation for dance teachers, with recognition given to prior learning and qualifications. In the meantime this document is being used by teachers to self-assess their expertise and training needs. The *Australian Guidelines for Dance Teachers* were published by Ausdance National and Arts Training ACT, in consultation with the Australian dance teaching profession.

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## *Australian Standards for Dance Teachers — Interim National Competency Standards 1998*

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The *Interim National Competency Standards* are based on the *Australian Guidelines for Dance Teachers* (1997), which remain the major reference for dance teachers; this handbook is intended as a companion volume, to be used by training organisations and assessors.

The competencies have been devised and approved by the dance teaching profession as the industry standards for course curriculum writers who wish to provide competency-based accreditation for dance teachers. They are also intended for those who wish to undertake self-assessment prior to formal recognition of their skills.

This handbook is based on draft competency standards developed in 1994–95 by Arts Training ACT and Ausdance ACT in response to community demand. The original draft competencies were revised for publication in 1997 as *The Australian Guidelines for Dance Teachers* by the dance teaching profession, with assistance from CREATE Australia and the Australian Dance Council —Ausdance.

The competency standards concentrate on the core activities of dance teaching, i.e. teaching methodology, health and safety issues, business principles and ethical behaviour. Further activities associated with the operation of a dance studio, e.g. managing, marketing and production skills, are not directly addressed here.

Artistic expression and dance as an art form are also issues which are not directly addressed in either the *Guidelines* or the *Interim Competency Standards*. However, the teaching profession emphasises the importance of instilling in students a love of dance and an awareness of dance as an art form, both as a powerful means of self-expression and as a way of interpreting their world.

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