

# The Nature of Dance Injuries

Gretchen Kerr, Ph.D., Donna Krasnow, B.A., B.A., and Lynda Mainwaring, M.H.K.

**Abstract**—The study investigated the nature of injuries in dance, including the number, severity, and anatomical location of injuries as well as the hypothesized relationship between postural alignment and injuries. The subjects were 39 female university students who were majoring in dance. The study took place over an 8-month period, ranging from preseason to peak season. Injury records were maintained continuously, and posture was assessed four times over the time period. The results indicated a 97% injury rate. Only one dancer remained injury free; the others experienced a mean of 2.4 injuries over the 8 months. The majority of injuries occurred to the lower back, followed in prevalence by knee and foot injuries. Most of the injuries interfered with training for 3 weeks, and 6 dancers sustained injuries that interfered for 4 months or more. The injury rate increased significantly as soon as the season began, and it remained at this level throughout the study. Contrary to the hypothesis, postural alignment worsened at each assessment. Together, these results failed to provide support for the proposed negative relationship between injuries and postural alignment. The results indicate the seriousness of the injury problem in dance and emphasize the need for further research that considers the interrelationships between training and performance demands, injuries, and postural alignment. *Med Probl Perform Art* 7:25–29, 1992

In the pursuit of excellence and self-fulfillment through the physical practices of sport and dance, the athlete or dancer continually faces the challenge of dealing with injuries. Despite the practical and theoretical importance of understanding the injury process and despite the significant amount of research dealing with sport injuries, relatively few studies have examined injuries in dance.

## BACKGROUND LITERATURE

Although dance medicine is an outgrowth of sports medicine,<sup>1,2</sup> and athletes and dancers share much in common, there are unique differences that may influence the nature of the injury process in dance. One such difference is that most dancers will not seek medical attention for their injuries, and yet most of the cited information has been provided by physicians. It has been reported by Bowling that

less than 50% of dancers' injuries are attended to by a physician.<sup>3</sup> Dancers appear to underuse available medical assistance for two reasons: fear of losing their position in a dance company and a belief (by dancers) that most health professionals do not have an adequate understanding of the unique psychological and physical needs of dancers.<sup>4</sup> In addition, Hamilton and Hamilton found that a large portion of dancers perceive serious injury as the inevitable end of their career, not simply a temporary situation.<sup>5</sup> Despite the reported prevalence of injuries in dance, most dancers do not lose time from training or performance.<sup>6</sup> Bowling reports that only one-third of dancers stopped dancing to rest because of an injury.<sup>3</sup> Although dancers persist through training despite an injury, a reported 50% of dancers complained of pain during or after class.<sup>6</sup> Many dancers simply live and work with chronic injuries.

Due to the high incidence of dancers who do not report injuries to medical practitioners, this study defined injury as follows: "any physical harm resulting in pain or discomfort that causes one or more of the following: (1) cessation of activity, (2) negative effects on training or performance, (3) sufficient distraction to interfere with concentration."

Although there are many causes of injuries, for example, faulty technique, misalignment, muscular imbalance, change in training intensity, floor surface, poor nutrition, and psychological factors, this study focused specifically on postural misalignment as a possible cause of dance injuries. The proposed association between alignment and injuries may account for the tendency for injuries to be interrelated. Foot, ankle, and/or knee injuries, for example, are profoundly related to each other and, in turn, are related to back injuries.<sup>7</sup> The research is fairly consistent in advocating that a holistic view be taken with respect to dancers and their injuries.<sup>7</sup> It is interesting that despite a common belief among dance educators that poor postural alignment results in injury, no studies have examined the relationship between whole-body alignment and the occurrence of injury.

## PURPOSES OF THE STUDY

With this background in mind, we pursued a study with two purposes: the first was to gather information on the nature of injuries in dance—the number and severity of injuries incurred—and the anatomical location; the second

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Dr. Kerr is Assistant Professor, Department of Physical and Health Education, University of Toronto, Toronto, Ontario. Ms. Krasnow is Associate Professor, Department of Dance, and Ms. Mainwaring is from the Department of Psychology, York University, North York, Ontario, Canada. Address correspondence to: Gretchen Kerr, Ph.D., Department of Physical and Health Education, University of Toronto, 320 Huron Street, Toronto, Ontario M5S 1A1, Canada.

was to examine the hypothesized relationship between postural alignment and injuries.

## METHOD

### Subjects

The subjects were 39 volunteer third- and fourth-year university students who were majoring in dance. All of the subjects were female and between the ages of 18 and 25 years. These students trained in both classical and modern dance, although most of their rehearsals were in modern repertory.

### Assessment of Injuries

An injury record was designed for the purpose of the study and was maintained by the subjects prospectively throughout the study. Injuries were defined as "any harm resulting in pain or discomfort that causes one of more of the following: (1) cessation of activity, (2) negative effects on training or performance, (3) sufficient distraction to interfere with concentration." The records were kept in calendar form by month, and one form was used for each injury. Therefore, if a dancer experienced two injuries in any one month, two forms were used. The dancers recorded and described each injury as it occurred, noting the date of occurrence, its duration, and any treatment received. The injury data were calculated by assigning one point to every day that the injury interfered with training. If the dancer had more than one injury, these values were added.

### Assessment of Postural Alignment

Postural alignment was assessed by two raters according to a preestablished and tested prototype based on the two raters' practical experiences and the existing literature.<sup>8-13</sup> This literature provided conceptual frameworks for assessing alignment and discussion of common alignment problems.

In order to determine a rating system for evaluating alignment, 129 photographs of a dancer were taken illustrating varying degrees of postural deviation in five body areas and three different stances that are common in modern dance, from two facings. The five body areas were (1) head, neck, shoulders, and cervical spine; (2) rib cage and thoracic spine; (3) lumbar spine, pelvis, and hip joints; (4) knees, lower legs, ankles, and feet; and (5) relationship of the center of weight to the base of support. The three common modern dance stances were legs in parallel position, separated the width of the anterior superior iliac spines; first position, heels together with hips externally rotated; and first position, externally rotated in demi plié. The two facings viewed were sagittal and frontal planes. The varying degrees of deviation were quantified by assigning one of the following values: 0 (no postural deviation), 0.5, 1.0 (minor but noticeable deviation), 1.5, 2.0 (moderate deviation), 2.5, and 3.0 (major deviation). Figures 1 through 4 illustrate postural deviation in the lumbar region (body area

#3) in the sagittal plane. After significant practice with this assessment method, a pretest was conducted that revealed an interrater reliability of .96.

To summarize the method for assessing postural deviation during the actual test sessions, deviations were assessed in the five body areas, in three different stances, in the sagittal and frontal planes. To facilitate the assessments, the subject stood before a grid. This method is comparable to the assessment procedures used by Fitt<sup>14</sup> and Plastino.<sup>15</sup> The scores were added to give a final figure for each subject in each of the four trials. Interrater reliability throughout the four trials ranged from .94 to .98.

## PROCEDURE

Consent to conduct the research was obtained from the University Ethics Review Committee, the chair of the Department of Dance, the dance instructors, and the dancers.

The study took place over an 8-month period ranging from preseason (start of academic year) to peak season (end of academic year). During these 8 months, postural alignment was assessed four times (every other month). In order to prevent conscious attempts to improve posture, preestablished questions designed to stimulate casual conversation were asked of the subjects during each assessment. Included in this semistructured conversation were questions aimed at verifying the dancer's injury records, which were collected at each of the four trials. Each injury value represented the injuries experienced over the previous 2-month period between trials.

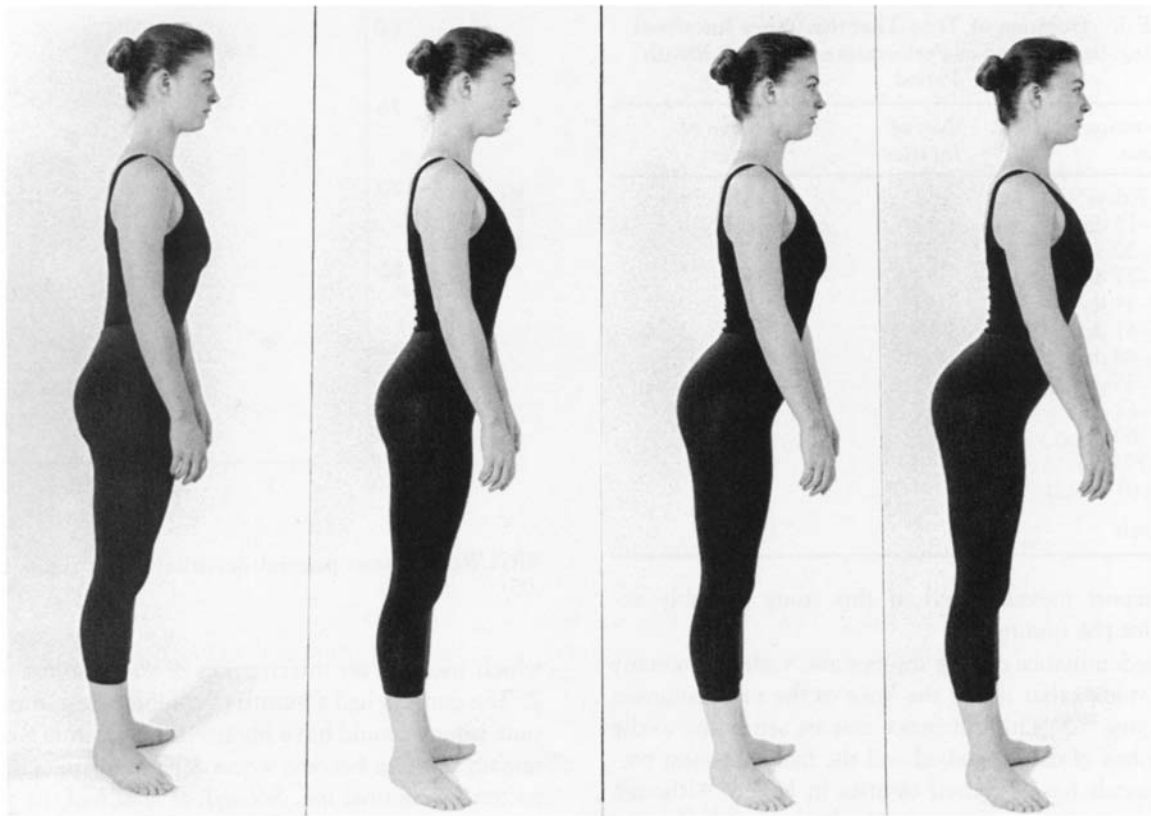
## RESULTS

The results indicated an injury rate of 97%. Only one dancer remained injury free; the other 38 reported at least one injury during the 8-month period. In fact, 92 injuries were incurred by the 39 subjects over the 8 months, indicating a mean injury rate of 2.4 injuries per dancer. Table 1 provides an illustration of the number of injuries incurred.

The majority of injuries occurred to the lower back, followed in prevalence by knee and then foot injuries (Table 2). Most of the injuries interfered with training for 3 weeks, but 6 dancers experienced injuries that interfered for 4 months or more (Table 3).

The results failed to show a significant relationship between postural deviation and injuries; however, this may be due to the observed pattern of injury occurrence.

A repeated measures analysis of variance (ANOVA) revealed a significant difference in the mean number of injuries incurred ( $F = 4.09$ ,  $df = 3, 155$ ,  $p < .008$ ). A Duncan's Multiple Range post hoc test indicated that the mean number of injuries incurred at Trial 1 was significantly lower than those reported at Trials 2, 3, and 4 (Fig. 5). The mean number of injuries incurred increased significantly from a pretest value at Trial 1 of 8.0 to a value of 27.5 at Trial 2. The injury value did not change significantly from Trial 2 ( $\bar{x} = 27.5$ ) to Trial 3 ( $\bar{x} = 26.5$ ) or from Trials 2 or 3 to Trial 4 ( $\bar{x} = 24.1$ ).



**FIGURES 1 to 4.** Postural deviation in the lumbar region in the sagittal plane. 1: No postural deviation. 2: Minor deviation of the lumbar region. 3: Moderate deviation of the lumbar region. 4: Major deviation of the lumbar region. (Photographs by John Dawson)

**TABLE 1.** Number of Injuries Incurred Over 8 Months (n = 39)

No. of Injuries	No. of Dancers	Percentage
0	1	2.5
1	12	31.0
2	10	26.0
3	8	20.0
4	5	13.0
5	2	5.0
6	1	2.5
Totals	39	100.0

A repeated measures ANOVA also revealed significant differences in postural deviation throughout the study ( $F = 10.56$ ,  $df = 3, 155$ ,  $p < .0001$ ). A Duncan's Multiple Range post hoc test indicated significant differences between each comparison. Postural deviation increased significantly from Trial 1 ( $\bar{x} = 60.5$ ) to Trial 2 ( $\bar{x} = 64.6$ ). Significant increases were also observed at Trial 3 ( $\bar{x} = 73.3$ ) and at Trial 4 ( $\bar{x} = 78.8$ ). The significant increases in postural deviation at each trial are illustrated in Figure 6.

## DISCUSSION

The findings show that 97% (38 of 39) of the subjects incurred at least one injury and that 92 injuries were re-

**TABLE 2.** Anatomical Location of Reported Injuries

Anatomical Location	No. of Injuries	Percentage
Back	24	26.0
Knee	16	17.4
Foot	11	11.9
Shoulder	8	8.7
Ankle	7	7.6
Shin splints	4	4.3
Achilles tendon	4	4.3
Quadriceps	3	3.3
Hamstring	3	3.3
Calf muscle	3	3.3
Neck	3	3.3
Groin	2	2.2
Hip	2	2.2
Elbow	1	1.1
Thumb	1	1.1
Totals	92	100.0

ported by the subjects over an 8-month period. These values are higher than previously reported injury rates. The discrepancy is likely a consequence of the way in which an injury was defined, as the injury did not require cessation of activity, nor did it require medical attention in order to be classified as an injury. If the literature is accurate in claiming that most dance injuries are not seen by a physician and yet most injury-rate data are provided by physicians,

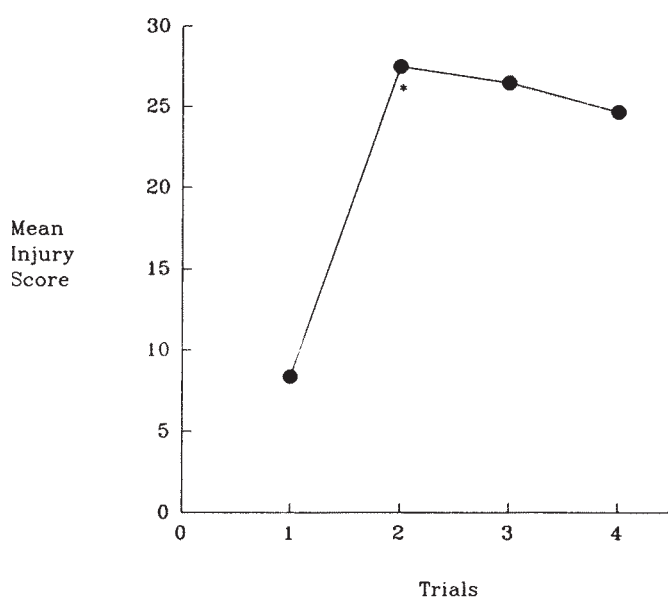
**TABLE 3.** Duration of Time That the Injury Interfered with Regular Training or Performance over an 8-Month Period

Duration of Time	No. of Injuries	Percentage of Injuries
< 7 days	12	13.0
7-13 days	17	18.5
14-20 days	23	25.0
21-27 days	14	15.2
28-34 days	5	5.4
35-41 days	4	4.3
42-48 days	3	3.3
49-55 days	3	3.3
56-62 days	2	2.2
63-69 days	3	3.3
> 70 days (10 weeks)	6	6.5
Totals	92	100.0

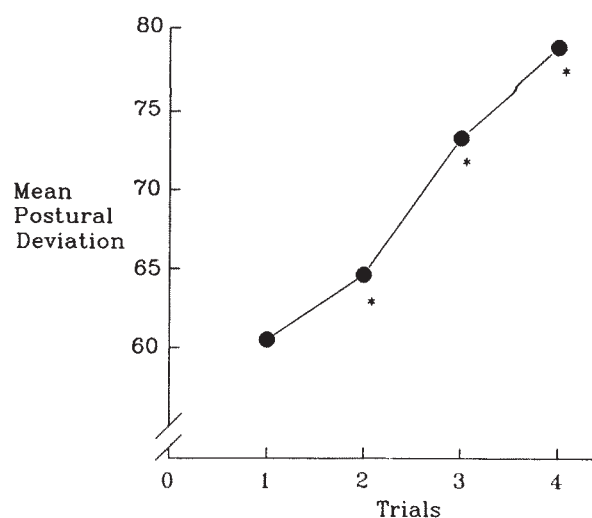
the self-report measure used in this study probably accounted for the findings.

The predominance of back injuries also varies from many previous studies that report the knee as the most common site of injury.<sup>16-18</sup> This difference may be attributed to the various forms of dance studied and the fact that most previous research has addressed injuries in ballet. Although the dancers in this study train in both classical ballet and modern dance, the main portion of their rehearsals is in modern repertory, which probably accounts for the predominance of lower back injuries. In a study by Clanin et al.,<sup>4</sup> foot and knee injuries were found to be most common in ballet dancers, whereas modern dancers most frequently reported having back injuries. Solomon et al.<sup>19</sup> add that researchers should distinguish between the types of dance studied.

There are two possible explanations for the increased postural deviation but stabilized injury pattern, the first of



**FIGURE 5.** Mean injury scores across trials ( $p < .05$ ).



**FIGURE 6.** Mean postural deviation scores across trials ( $p < .05$ ).

which includes an interruption of training just after Trial 2. The dancers had a month of complete rest, during which time injuries could have improved but posture would likely remain static or become worse depending on compensatory patterns in normal life. Second, at least 6 of the 39 dancers were so injured that they discontinued all or most dance activity. Again, injuries would begin to heal, and posture would probably stabilize or worsen, affecting the overall means. Without the month of rest and cessation of activity for the most injured dancers, injury rates might have climbed significantly. These are only two possibilities that would need to be examined further to explain these data fully.

Further, the results indicate that despite the dance educators' attempts to improve alignment, the students' posture worsened throughout the season. It is common for these dancers to train by taking dance classes for approximately 2 hours a day, but many rehearse and perform an additional 4 or 5 hours a day. The significant increase in postural deviation suggests that alignment cannot be effectively altered with this imbalance in activity, that is, many more hours in the rehearsal process than in class, where alignment is consistently addressed.

Although the data are correlational and one cannot draw cause-effect conclusions, it is interesting to speculate on the possibility that having an injury contributes to postural deviation. In other words, if a dancer is training with a sore back, she may compensate by altering her posture in a nonconductive manner. The relationship between posture and injury is usually hypothesized as one in which poor posture is a causative factor in injury occurrence, but our results stimulate thoughts of a relationship with reversed directionality.

## CONCLUSIONS

It is recommended that future research examine the relationship between posture and injury in an experimental,

longitudinal way. The results indicate the seriousness of injuries in this sample of dancers, with 97% of the subjects experiencing at least one injury over the course of 8 months. It is also important to emphasize that despite educators' attempts to promote postural alignment, posture worsened over time. It is crucial that dance educators continue to reflect on the training process and how we might more positively alter alignment problems. It is also imperative that dancers learn to manage their injuries and to seek appropriate medical attention.

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