Psychological Intervention Programs for Reduction of Injury in Ballet Dancers

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Online Publication Date: 01 January 2007
To cite this Article: Noh, Young-Eun, Morris, Tony and Andersen, Mark B. (2007) 'Psychological Intervention Programs for Reduction of Injury in Ballet Dancers', Research in Sports Medicine, 15:1, 13 - 32

To link to this article: DOI: 10.1080/15438620600987064
URL: http://dx.doi.org/10.1080/15438620600987064

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PSYCHOLOGICAL INTERVENTION PROGRAMS FOR REDUCTION OF INJURY IN BALLET DANCERS

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The purpose of this study was to examine the effects of two psychological interventions designed to reduce injury among dancers by enhancing coping skills. Participants were 35 ballet dancers. They were assigned to three conditions: control (n=12), autogenic training (n=12), and a broad-based coping skills condition, including autogenic training, imagery, and self-talk (n=11). The 12-week interventions were designed on the basis of results from previous studies. For the 12 weeks following the intervention, participants were asked to practice their respective interventions three times a week. During the 24-week period (12 weeks training plus 12 weeks practice), training staff at the dance academies recorded injuries on a record sheet each day. Participants wrote injury records by themselves for another 24 weeks. Multivariate analysis of variance (MANOVA) and univariate tests for each dependent variable showed that the broad-based coping skills condition enhanced coping skills, in particular, peaking under pressure, coping with adversity, having confidence and achievement motivation, and concentrating. Separate analyses of covariance (ANCOVA), one using preintervention injury frequency as the covariate.

Received 28 March 2006; accepted 12 August 2006.
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and one using preintervention injury duration as the covariate, revealed that participants in the broad-based coping skills condition spent less time injured than participants in the control condition.

Keywords: imagery, self-talk, coping skills, dance injury

Over the past three decades, researchers have studied psychosocial variables influencing sport and exercise injuries. Andersen and Williams (1988) proposed a stress-injury model and suggested that psychosocial factors, such as personality, history of stressors, and coping resources, influence the stress response and, thus, the likelihood of injury occurrence. They revised the model slightly in 1998 (Williams and Andersen 1998). The vast majority of research has supported the model, especially with respect to the roles of history of stressors, such as life event stress (Petrie 1993; Thompson and Morris 1994), and daily hassles (Fawkner, McMurray and Summers 1999). The involvement of coping resources, such as coping skills and social support, has been shown to moderate the effects of stress on sport injuries (Smith, Smoll and Ptacek 1990). In view of the training and performance parallels between sport and dance, it is likely that psychosocial factors also could be related to dance injuries.

The stress-injury model proposed by Williams and Andersen (1998) has provided a framework for intervention to reduce the incidence of sports injuries. Williams and Andersen proposed that a range of personality variables, such as trait anxiety and locus of control, are likely to affect stress responsivity, as is a person’s history of stressors, including major and minor sources of stress and previous injuries. They also argued that coping resources affect the stress response. These include social support and coping skills. Williams and Andersen proposed that the stressors perceived on the basis of cognitive appraisal of these variables affect the probability of injury through attentional deficits and increased muscle tension. Further, they suggested that a range of interventions, such as relaxation, stress management, seeking social support, or developing coping skills, could be applied to reduce the impact of the psychosocial variables or to directly reduce muscle tension and attentional deficits.

A substantial body of research has supported many of the propositions in the model (e.g., Petrie and Perna 2004), but relatively little research has examined psychological intervention programs for preventing sports injuries. De Witt (1980) found that minor injuries decreased in American basketball and football players who participated in a stress reduction training program. Davis (1991) also reported a 52% reduction in injuries for swimmers and a 33% reduction in injuries for football players, when they used relaxation and imagery skills. Kerr and Goss (1996) found that Meichenbaum’s (1985) stress inoculation training reduced injury incidence,
and, most recently, Johnson, Ekengren, and Andersen (2005) found that a stress management program dramatically reduced injuries in Swedish soccer players. Further, Bhum, Morris, and Andersen (1998) found that 8 weeks of autogenic training reduced stress levels and moderated decrements in central and peripheral vision that were related to a combination of physical and psychological stressors. These results are consistent with Williams and Andersen’s (1998) proposition that stress causes narrowing of attention, which makes the individual more prone to injury. There was, however, no examination of injury incidence in the study by Bhum et al. (1998). In dance, no research has been conducted examining psychological interventions for injury reduction.

Most dancers invest a great deal of effort in their preparation, and often they experience injuries both in practice and during performance. Researchers interested in dance have studied aspects of injuries, including their frequency, along with the physical causes, and the effects of dance styles, such as ballet, modern, folk, and aerobic dance (e.g., Arnheim 1980; Sohl and Bowling 1990). Despite the emphasis on proper physical conditioning and techniques, dance injuries have continued to increase (Hamilton 1999; Kerr, Krasnow and Mainwaring 1992; Liederbach and Compagno 2001).

Several studies have reported on psychosocial factors and injuries in dance. Patterson, Smith, Everett, and Ptacek (1998) found that psychosocial factors, such as life stress and social support, were associated with injuries in ballet dancers. Particularly, they revealed that high levels of social support moderated the stress–injury relationship, with a significant stress–injury relationship found for dancers who reported low social support in their lives. Patterson et al. suggested that their findings were due to moderation of stress by social support, and not due to a direct effect of social support on injury. They stated that dancers, like athletes, often seem to experience injuries as much connected with psychological factors as physical causes. Mainwaring, Kerr, and Krasnow (1993) also reported a significant correlation between psychological stress and total time loss due to injuries for dancers. Like Patterson et al., Mainwaring et al. emphasized that psychological factors should be considered in connection with the injury process in dance.

Recently, two studies have applied the stress–injury model to Korean ballet dancers. Based on the model developed and studied in sport (Williams and Andersen 1998), Noh, Morris, and Andersen (2005) examined whether psychosocial factors (i.e., life and dance stress, anxiety, coping skills, social support) predicted dance injuries (frequency and duration). Using a prospective research design, Noh et al. found that coping skills were associated with frequency and duration of injury, with dancers who had low levels of coping skills being injured more often and for longer periods of time than those with substantial coping skills.
The same authors (Noh, Morris, and Andersen 2002), in a qualitative study, found that the physical demands of being a professional ballet dancer and fear of injury, competition for roles, especially against dancers who were friends and training partners, and dance directors’ criticisms, were major sources of stress. Furthermore, 65% of dancers used a range of dysfunctional behaviors to cope with stress, such as overeating or drinking alcohol. Thus, the dancers interviewed by Noh et al. reportedly experienced substantial stress and many of them had limited coping skills to help them manage the demands placed upon them.

The evidence from the two studies conducted by Noh et al. (Noh, Morris and Andersen 2002, 2005) suggested that the development of coping skills could be an important area for intervention with Korean ballet dancers. Many dancers displayed low levels of coping skills and reported experiencing distress from a number of sources. The way in which these two studies provided both general and specific information for the development of interventions to enhance coping skills in Korean ballet dancers was described in detail by Noh and Morris (2004). The results of the studies by Noh et al. support the evidence from other research (e.g., Patterson et al. 1998; Smith, Ptacek and Patterson 2000) that, at high levels, dance is as competitive and as stressful as sport in any arena. The negative emotions resulting from these stressors may lead to more muscle tension, narrowing of attention, and greater distractibility, all of which may increase the probability of injury. Contrary to previous research with Western ballet dancers, which identified life stress and social support as principal antecedents of injury (Patterson et al. 1998), Noh et al. found that lack of coping skills was the most prominent factor associated with injury in Korean ballet dancers. This pattern emerged in the correlational research and the interview study reported by Noh et al. Interventions that enhance dancers’ capacity to cope with the demands of training and performance should reduce stress, leading to a decrease in the probability of the dancers sustaining acute injuries. The stress–injury model refers to acute injuries. It is acknowledged that dancers experience a substantial number of overuse injuries, but acute injuries are also common. In addition, some overuse injuries occur when dancers, who have acute injuries, do not stop dancing, because of the pressure to continue when injured and the intense scrutiny they are under in training and performance (Hamilton 1997).

This study had two purposes. First, the study examined the effects of two interventions designed to enhance coping skills of ballet dancers who reported low levels of coping skills. Second, and more importantly, the study investigated the impact of the interventions on the frequency and duration of injury. One intervention, autogenic training (AT) is a self-hypnosis technique, which was used here to increase relaxation. The other intervention, broad-based training, included AT as a relaxation technique, along with
imagery and self-talk addressing specific stressors reported by dancers in Noh et al. (2002). Specifically, it was hypothesized that dancers in the AT and the broad-based coping skills intervention conditions would improve their peaking-under-pressure coping skills more than dancers in the control condition, and that there would be no difference in improvement of peaking under pressure among the two intervention conditions. Further, it was hypothesized that dancers in the broad-based coping skills condition would improve the other four coping skills areas (i.e., coachability, coping with adversity, confidence and achievement motivation, and concentration) and reduce injury rates more than dancers in the AT and control groups. Examining these interventions also represents a further test of aspects of the stress–injury model and may provide information that is useful for practitioners.

**METHOD**

**Participants**

Participants were 45 female dancers chosen from an original pool of 170 dancers (see Procedure section below), aged 14 to 19 years (M age=16.77, SD=1.37), who specialized in ballet. They trained at the two dance institutes in Korea. Ten participants did not complete the full study, so their data were not included in any of the analyses. Attrition was relatively evenly spread across the three conditions, with three dancers dropping out of the AT and control conditions, and four not completing the broad-based coping intervention program. Participants were assigned to one of three conditions: AT (n=12; M age=17.50, SD=1.00), broad-based coping skills (n=11; M age=16.36, SD=1.57), and a control condition (n=12; M age=16.42, SD=1.31). On average, participants had trained in ballet for about 4 years (M training period=4.11, SD=2.42). Specifically, the participants in the autogenic training condition had a mean training duration of 4.00 years (SD=3.44); those in the broad-based coping skills condition had a mean ballet training duration of 4.45 years (SD=2.11); and the dancers in the control condition had a mean ballet training of 3.92 years (SD=1.44). All the dancers participated in regular practice, which means that they practiced at least 2 hours a day 6 days a week. We selected participants with relatively low levels of coping skills, based on ACSI-28 pretest scores, representing those in the lowest quartile of coping skills scores from descriptive data gathered in the previous study with a similar sample (Noh, Morris and Andersen 2005). Dancers with low levels of coping skills were chosen because they have more to gain from such interventions. In practice, coping skills interventions would target dancers at risk of experiencing high levels of stress due to
their lack of coping skills. Selecting individuals at risk can also increase the power of a study to find effects (Johnson, Ekengren, and Andersen 2005; Maddison and Prapavessis 2005) and it has economic advantages in relation to the cost/benefits of interventions. Participants were also free from injury at the start of the study.

**Measures**

**Athletic Coping Skills Inventory-28 (ACSI-28; Smith, Schutz, Smoll and Ptacek 1995).** The ACSI is a measure of coping skills and contains 28 items representing seven subscales: (a) coping with adversity, (b) peaking under pressure, (c) goal setting/mental preparation, (d) concentration, (e) freedom from worry, (f) confidence and achievement motivation, and (g) coachability. The response scale ranges from 0 (almost never) to 3 (almost always). Each subscale contains four items, so the range of scores is 0 to 12, for any subscale. Smith et al. (1995) reported that Cronbach’s alpha coefficients ranged from .62 (concentration) to .78 (peaking under pressure). A total (personal coping resources) scale alpha of .86 was reported. One-week test–retest reliability coefficients ranged from .47 (coachability) to .87 (peaking under pressure). The median test–retest reliability coefficient was .82. Convergent validity was supported in that total scores on the ACSI-28 were positively correlated with scores on the Rosenberg Self-Control Schedule (Rosenbaum 1980), a measure of cognitive behavioral skills. Freedom from worry also correlated negatively (−.59) with the worry factor of the sport anxiety scale (Smith, Smoll and Schutz 1990). To apply the ACSI-28 in dance, this questionnaire was modified to refer to dance practice and performance. We translated the modified ACSI-28 into Korean. Cronbach alpha coefficients for the Korean version of the ACSI-28 ranged from .40 (peaking under pressure) to .65 (coachability), in a previous study with ballet dancers, who had similar backgrounds (Noh, Morris and Andersen 2005). In the small sample we employed in the present study (N=35), Cronbach alpha coefficients ranged from .42 to .64. This translated version of the ACSI-28 had relatively low internal consistency; thus the results should be interpreted with caution.

**History of Injury**

We used an injury survey translated into Korean that had been used effectively in a previous study (Noh, Morris and Andersen 2005). The survey asked participants about the details of their injury experiences within the past 12 months, such as whether they had any injuries, how often injuries occurred (frequency), whether they had recovered from their injuries, and how many days of practice were missed or had to be modified because of injury (duration). An injury was defined as any medical problem resulting
from dance participation that restricted subsequent practice and performance for at least one day beyond the day the injury occurred.

**Injury**
Training staff in the two dance institutes recorded injury frequency (how many times a person got injured) and duration (how long each injury lasted) of all participants every day, using an injury report form that was developed for this study. We briefed staff about the definition of an injury and instructed them on completion of the report form. They recorded the date, nature of injury, and whether the dancer practiced normally, undertook modified practice, or did not practice.

**Adherence Diary**

**Autogenic Training (AT)**
To log the practice of AT, during the 12 weeks of practice, following training in the AT intervention phase, participants were asked to maintain a diary. Each diary entry included information regarding the date, the duration of the AT session, and what time the session was performed (e.g., before going to bed, after practicing dance).

**Broad-based Coping Skills**
In addition to recording their AT sessions, participants in the broad-based coping skills condition were also asked to log self-talk and imagery during the 12-week practice phase. The diary entries consisted of the date; the frequency of the AT, self-talk, and imagery; the types of self-talk and imagery (concentration, confidence and achievement motivation, coachability, and coping with adversity); and what time the session was performed.

**Control**
Participants were asked to log their dancing in regular practice and performance for 12 weeks.

**Interventions**
This study included three conditions, namely, the control, AT, and broad-based coping skills interventions. Content of the interventions was based on results of the previous studies with ballet dancers (Noh et al. 2002, 2005). Dancers interviewed about sources of stress emphasized body condition and their relationships with directors and other dancers as major factors that were associated with stress (Noh et al. 2002). For example, the dance director often criticized dancers, who felt they could not defend themselves. Noh et al. considered this stressor to be similar to coachability, one of the subscales in the ACSI-28.
Autogenic Training (AT)
AT is a technique of self-hypnosis. AT is based on six stages: (a) heaviness in the extremities, (b) warmth in the extremities, (c) regulation of cardiac activity, (d) regulation of breathing, (e) abdominal warmth, and (f) cooling of the forehead. In this study, an accelerated presentation version of AT was used, in which all six stages were introduced in Session 1, and the dancers repeated them in the following sessions. Autogenic training (AT) was chosen as an intervention for coping effectively with stressful situations in training and performance, and because it is a simple, one-technique intervention that Bhum, Morris and Andersen (1998) had shown to be effective for reducing stress (see also Payne 2004). The AT condition addressed one of the coping skills measured by the ACSI-28, peaking under pressure, because it provided a foundation of relaxation, which could help dancers to remain free from or, at least, reduce worry and, thus, more effectively peak under pressure. For a complete description of this version of AT see Payne (2004). An AT session took around 25 minutes to complete all six stages. This version of AT has been used successfully in previous studies (e.g., Bhum et al. 1998).

Broad-based Coping Skills
In addition to the AT technique, the broad-based coping skills intervention included positive self-talk and positive self-imagery. Positive self-talk involved statements that individuals said to themselves about coping with the kinds of stressful situations they typically experienced as professional dancers. Positive self-imagery involved imagery that enhanced self-confidence, coachability, coping with adversity, and concentration, again, specific to the ballet context of the participants. Dancers relaxed and then imagined coping with stressful situations, such as when the dance director criticized them. Broad-based coping skills intervention sessions were of longer duration than AT sessions, lasting around 40 minutes. The extra 15 minutes was used for practice of positive self-talk and self-imagery, which were important aspects of this intervention. The broad-based coping skills intervention, which included AT, imagery, and self-talk, was aimed at managing peaking under pressure, coachability, coping with adversity, confidence and achievement motivation, and concentration. In the broad-based coping skills intervention package, it was proposed that practice of the AT technique would produce a level of relaxation that would help participants apply the self-talk and imagery techniques effectively, as well as reduce stress directly. Thus, the sequence of AT followed by self-talk and imagery was employed. The broad-based coping skills intervention addressed all five areas measured by the ACSI-28: imagery and self-talk targeted management of the coachability (e.g., I can keep dancing without becoming upset, when a director yells at me), coping with adversity (e.g.,
I can maintain emotional control no matter what happens), concentration (e.g., I can focus my attention to practice dance without any distractions), confidence and achievement motivation (e.g., I can dance even difficult techniques), with guided imagery scripts focusing on all these specific areas, and peaking under pressure.

**Procedure**

To gain access, we contacted the directors of ballet institutes by telephone. Once permission was given, we visited the institutes and explained the intervention study to dancers. Those individuals who were interested in participating signed informed consent statements. In total, 170 dancers completed the ACSI-28 and the history of injury survey. From one dance institute, we assigned the 30 participants with the lowest coping skills scores to the AT and broad-based coping skills conditions randomly. We instructed participants not to discuss the study with anyone else at the institute to minimize cross-contamination between the two interventions and to ensure participants’ involvement was not divulged to other institute staff, such as dance directors and medical staff. We assigned low scoring participants (n=15) from the other dance institute to the control condition. We adopted this approach to minimize the chance that control condition participants would hear about the interventions and this would affect their behavior. We trained participants in the AT condition and the broad-based coping skills condition three times a week for 12 weeks. During the first AT training session in Week 1, we presented the accelerated version of the whole AT procedure. This was repeated three times a week for 12 weeks. We also taught participants in the broad-based coping skills condition the full AT procedure in the first session of Week 1. Participants repeated this exercise three times a week for 12 weeks. In addition, in Session 1 of Week 1, we taught the broad-based coping skills participants an imagery procedure related to coping with adversity and a self-talk procedure, which also addressed coping with adversity. Participants also practiced these procedure three times a week. For the broad-based coping skills condition, in Week 4, we introduced another imagery procedure with content related to the development of confidence and achievement motivation and a new self-talk procedure on the same topic. Again, the participants practiced the procedures three times a week for 3 weeks. In Weeks 7 and 10, we presented participants in the broad-based coping skills intervention with different imagery and self-talk procedures on concentration and coachability, respectively. Participants practiced the concentration procedures three times a week for 3 weeks, and then they practiced the coachability procedures three times a week for 3 weeks. When we introduced the interventions in the AT and broad-based coping skills conditions,
participants were trained in groups. All participants in both these conditions were asked to practice the interventions individually. For the control condition, participants were asked to maintain their regular practice schedule for 12 weeks. At the end of the 12-week training period, we measured the levels of coping skills again, using the ACSI-28. Then, we asked participants in the AT condition to practice the AT three times a week for another 12 weeks, and we asked those in the broad-based coping skills intervention condition to practice three times a week for another 12 weeks. The participants in the control condition continued to undertake their usual practice for another 12 weeks. During the 12-week intervention training period and the following 12-week practice period, training staff recorded injury every day for participants in the three conditions, blind to the dancers’ intervention condition. During the 12-week period of AT practice and the broad-based coping skills intervention practice, participants kept a diary, logging practice of the AT technique or the broad-based coping intervention. We also asked control condition participants to log their activities in regular training for that period. We collected the adherence diaries every 3 weeks for 24 weeks. Following the 24 weeks of training and practicing, we asked the participants to record their injuries for an additional 24 weeks using an injury report form, without requiring them to practice the interventions or report on their use. Finally, after 48 weeks, we debriefed participants and thanked them for taking part. At the end of the study, we gave participants in the control condition the opportunity to participate in the broad-based intervention.

**Analysis**

One-way multivariate analysis of variance (MANOVA) was conducted to examine gain scores (post- minus preintervention scores) on the five ACSI-28 subscales among the three groups (control, AT, broad-based coping skills). In experimental–control, pre–post-test designs, mixed ANOVAs or MANOVAs are often used. These statistics are suboptimal for the analysis of such designs. Mixed ANOVAs/MANOVAs actually underestimate the magnitude of main effects (Huck and McLean 1975). Huck and McLean have suggested two alternatives: the use of analysis of covariance or using change scores from pretest to posttest. We chose to examine pretest to posttest change scores using one-way MANOVA. We chose not to make Bonferroni corrections for multiple tests of significance, because they can radically increase the probability of Type II errors, especially for studies with relatively low sample sizes. The present study does have a limited sample size, being exploratory, and the focus of the results is not statistical significance, but rather the magnitude of the effects. Although discriminant function analysis (DFA) should follow from a MANOVA, we
conducted univariate tests for each dependent variable, because the sample size did not meet minimum requirements for a DFA. Although $\eta^2$ effect sizes were calculated for each $F$ test, univariate, one-degree of freedom effect sizes (Cohen’s $d$) were also calculated for each group comparison for each dependent variable (five ACSI-28 subscales and frequency and duration of injury) to provide more information about the magnitude of the differences. The *Publication Manual of the American Psychological Association* (APA 2001) states that “multiple degree-of-freedom effect indicators tend to be less useful than effect indicators that decompose multiple degree-of-freedom tests into meaningful one degree-of-freedom effects” (p. 26). Analyses of covariance (ANCOVA) were conducted to examine injury frequency and duration reduction after the intervention phase, using preintervention injury frequency and duration as the covariates, respectively (see History of Injury section above). One ANCOVA was carried out for frequency of injury, and a separate ANCOVA was calculated for injury duration.

**RESULTS**

*Adherence to Interventions*

We checked level of adherence to the two coping skills interventions by examining frequency of use reported in adherence diaries, as a percentage of the instruction to practice three times a week. It was predetermined that no dancer whose percentage was below 60% across 12 weeks, which approaches two out of three sessions, would be included in further analyses. All participants reported an adherence level above 60%. For the AT condition, average reported adherence was 83%, and for the broad-based coping skills condition average reported adherence was 82%, so no dancers were excluded and adherence rates were comparable.

*Effects of Coping Skills Interventions*

We examined gain scores (post- minus preintervention scores) on the five ACSI-28 subscales that were addressed in the broad-based coping skills intervention (i.e., peaking under pressure, coachability, coping with adversity, confidence and achievement motivation, concentration) for the three conditions, to determine whether the two coping interventions enhanced coping skills. Means and standard deviations for each subscale (pre- and postintervention) for each group are presented in Table 1. A one-way independent groups (control, AT, broad-based coping skills) multivariate analysis of variance (MANOVA) for gain scores on the five ACSI-28 subscales was significant overall, Wilks’ lambda=.50, $F(10/58)=2.23; p < .05.$
An examination of the univariate tests for each dependent variable indicated the following: peaking under pressure, F(2/32)=3.71, \( p < .05 \), \( \eta^2 = .19 \); coping with adversity, F(2/32)=4.92, \( p < .01 \), \( \eta^2 = .24 \); concentration, F(2/32)=4.60, \( p < .05 \), \( \eta^2 = .22 \); confidence and achievement motivation, F(2/32)=3.37, \( p < .05 \), \( \eta^2 = .17 \); and coachability, F(2/32)=2.87, \( p < .10 \), \( \eta^2 = .15 \). As predicted, the broad-based coping skills intervention enhanced coping skills more than the AT intervention and the control condition in peaking under pressure, coping with adversity, confidence and achievement motivation, and concentration, with large effect sizes. Coachability did not reach significance, but also showed a large effect size. To examine the magnitude of effects for differences between the three groups, univariate effect sizes (Cohen’s \( d \)) were calculated for the ACSI-28 subscales. These effect sizes are presented in Table 2.

### Table 1. Means and Standard Deviations (in parentheses) for Five ACSI-28 Sub-scales for Three Conditions at Pre- and Posttest

<table>
<thead>
<tr>
<th>Subscales</th>
<th>Control ( (n=12) )</th>
<th>AT ( (n=12) )</th>
<th>BBCS ( (n=11) )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest ( M (SD) )</td>
<td>Posttest ( M (SD) )</td>
<td>Pretest ( M (SD) )</td>
</tr>
<tr>
<td>Peaking</td>
<td>8.0 (2.1)</td>
<td>8.5 (1.8)</td>
<td>8.0 (1.8)</td>
</tr>
<tr>
<td>Coping</td>
<td>7.0 (1.0)</td>
<td>9.0 (2.0)</td>
<td>7.7 (1.5)</td>
</tr>
<tr>
<td>Confidence</td>
<td>9.5 (1.6)</td>
<td>9.3 (2.4)</td>
<td>9.3 (2.4)</td>
</tr>
<tr>
<td>Concentration</td>
<td>9.4 (1.9)</td>
<td>9.7 (2.4)</td>
<td>9.3 (2.1)</td>
</tr>
<tr>
<td>Coachability</td>
<td>11.8 (2.8)</td>
<td>11.3 (1.9)</td>
<td>13.2 (2.1)</td>
</tr>
</tbody>
</table>

*Note:* Peaking=Peaking under pressure; Coping=Coping with adversity; Confidence=Confidence and achievement motivation. BBCS=broad-based coping skills.

### Frequency and Duration of Injury

Examination of injury frequency and duration for 48 weeks showed reductions over time. A one-way ANCOVA for frequency of injury, with condition (control, AT, broad-based coping skills) as the independent groups factor, using preintervention frequency of injury as the covariate, did not reach significance, but showed a large effect size, F(2/32)=3.23, \( p > .05 \), \( \eta^2 = .17 \). Another one-way ANCOVA for duration of injury, with condition (control, AT, broad-based coping skills) as the independent groups factor, using preintervention duration of injury as the covariate, revealed significant differences among the three conditions for duration of injury, with a large effect size, F(2/32)=3.58, \( p < .05 \), \( \eta^2 = .19 \). Tukey HSD post hoc tests indicated that the average duration of injuries was significantly shorter for the broad-based coping skills condition than for the
Intervention and Dance Injury

To examine the magnitude of effects for differences between the three groups, we calculated univariate effect sizes (Cohen’s $d$) for the injury variables and also are presented in Table 2.

**DISCUSSION**

This study examined the effectiveness of an AT intervention and a broad-based coping skills intervention for the development of specific coping skills in Korean ballet dancers and the impact of those coping skills interventions on the frequency and duration of injuries. All of the improvements in coping skills were in the directions hypothesized. The overall results of this study indicate that the combination of imagery, self-talk, and relaxation was effective in enhancing coping skills and reducing injury frequency and duration. These results are consistent with previous research in sports (Davis 1991; Kerr and Goss 1996). Impressive effect sizes were found in this research, supporting the efficacy of the broad-based coping skills intervention for enhancing coping skills and reducing injury rates. Nonetheless, it is unknown what changes on ACSI-28 subscales mean in terms of effective coping behavior in the dance training and performance context. For example, we do not know what a change in the coachability subscale means in terms of a dancer’s relationship with her dance director. Furthermore, we do not know how the intervention program influenced other aspects of the dancers’ lives. Thus, although it is valuable to demonstrate the effects of intervention programs on the development of psychological skills, further research should also consider the effects of programs on actual behaviors and on the quality of people’s lives.

**Table 2. Effect Sizes (Cohen’s $d$) for Differences Among the Groups on ACSI-28 Subscales and Injury**

<table>
<thead>
<tr>
<th>Scales</th>
<th>AT Control ($n=12$)</th>
<th>BBCS Control ($n=12$)</th>
<th>BBCS AT ($n=11$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACSI-28 Subscales</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peaking</td>
<td>1.08</td>
<td>1.09</td>
<td>0.27</td>
</tr>
<tr>
<td>Coping</td>
<td>−0.28</td>
<td>1.02</td>
<td>1.21</td>
</tr>
<tr>
<td>Confidence</td>
<td>0.28</td>
<td>1.14</td>
<td>0.80</td>
</tr>
<tr>
<td>Concentration</td>
<td>0.03</td>
<td>1.22</td>
<td>1.14</td>
</tr>
<tr>
<td>Coachability</td>
<td>−0.38</td>
<td>0.60</td>
<td>1.23</td>
</tr>
<tr>
<td>Injury</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>−0.57</td>
<td>−1.21</td>
<td>−0.84</td>
</tr>
<tr>
<td>Duration</td>
<td>−0.63</td>
<td>−0.95</td>
<td>−0.52</td>
</tr>
</tbody>
</table>

*Note: Peaking=Peaking under pressure; Coping=Coping with adversity; Confidence=Confidence and achievement motivation. BBCS=broad-based coping skills.*
This study is the first we have seen in the literature that has examined the effectiveness of a combination of coping skills interventions with dancers within the framework of the psychosocial stress–injury model (Williams and Andersen 1998) developed in sports. The results of the present study supported the suggestion in Williams and Andersen’s (1998) model that interventions that reduce stress or increase coping resources or both will reduce the likelihood of injury. The results of this study also shed light on the comparison of single technique interventions with interventions comprising combinations of mental skills. As expected, the mental skills package (broad-based coping skills) was more effective than the stand-alone relaxation technique (AT). In sports, there is evidence that a combination of mental skills is advantageous for enhancing performance (Kendall, Hrycaiko, Martin and Kendall 1990; Patrick and Hrycaiko 1998; Thelwell and Greenless 2001). This finding about combining psychological skills training techniques may arise because relaxation with self-talk and imagery help the athlete produce more positive effects (e.g., relaxed attention, sharper focus on relevant cues) than relaxation alone (Weinberg, Seabourne and Jackson 1981). In the broad-based coping skills intervention used in the current study, the content of the imagery and self-talk was focused on specific stressors that had been identified in previous studies of similar ballet dancers in Korea (Noh et al. 2002, 2005). The imagery and self-talk procedures also addressed coping skills identified as weak in the ACSI-28 pretest and in a previous study using the ACSI-28 (Noh, et al. 2005). Targeting the imagery and self-talk content on handling dance directors’ criticism, the pressure associated with performance, and the tension of competing against members of the same dance group for roles should be more meaningful than presenting generalized stress management and coping techniques. Korean culture, which is strictly hierarchical, gives dancers no opportunity to respond to dance directors’ criticism. Noh et al. (2002) reported that dance directors’ criticism was a particularly powerful stressor for Korean ballet dancers. The benefit of the targeted coping skills training in the broad-based coping intervention was particularly valuable in that respect. Also, the collective emphasis of the Confucian culture places additional pressure on dancers when they must compete for roles. These culture-specific factors were addressed in the broad-based coping skills intervention. This was one of the first studies to address the issues of stress and coping among performers from a non-Western culture. It is important that research continues to consider the sociocultural context in this way. The findings in the current study support the claim that the use of targeted, combined interventions is more effective than single-technique or generalized interventions for increasing relevant coping skills and reducing injury occurrence in Korean ballet performers, who frequently report low levels of the coping skills needed to deal with the stressors in their lives.
In terms of the mechanisms by which the interventions employed in the present study might have lead to a reduction in injury, it is possible that the changes in coping skills reduced the impact of some of the major stressors. This could have led to a decrease in muscle tension, and reduction in peripheral narrowing and distractibility, as proposed by Williams and Andersen (1998) in the psychosocial stress and injury model that underlies this study. This explanation of the results of the present study is also consistent with the role of coping skills as potential moderators of life stress, in the manner discussed by Smith, Smoll, and Ptacek (1990).

Methodological Issues

We identified two noteworthy limitations in this study: (a) participants came from different institutes; and (b) we only examined student participants. The first limitation of this study was that we assigned the participants to the control group from a different dance institute than the one from which the AT and broad-based coping skills intervention participants came. This group assignment method was chosen to minimize the possibility that control condition participants would learn about the interventions. If the control condition participants were from the same institute, it is likely that they would realize that other dancers were receiving coping skills interventions, and they might undertake aspects of the interventions informally, thus distorting their role as members of the control group. Also, it was not easy to find participants who had low levels of coping skills in the numbers required for the three conditions in the same dance institute. It is possible that differences between the institutes (e.g., different styles of teaching and dancing, dance directors, and practicing times) could have influenced the results. Our assessment of the two institutes and the students from them, who were involved in this study, is that they did have similar characteristics. Some support for the claim that the institutes did not have a major influence comes from the results for coping and, separately, for injury. Except for peaking under pressure, which we predicted would be affected by AT, we found similar patterns of results for the AT participants and participants in the control condition, who were from different institutes.

The second limitation of this study was that all participants were ballet students aged 14 to 19 years, and previous research has shown that professional ballet dancers experience higher levels of stress and have more injuries than ballet students (Hamilton 1997; Hamilton, Hamilton, Meltzer et al. 1989; Noh, Morris and Andersen 2005; Pedersen and Wilmerding 1998). Noh et al. (2005) found that professional ballet dancers experienced injuries more frequently than university ballet students and high school ballet majors. Hamilton et al. (1989) also reported that older dancers (≥ 30
years old) had more injuries and spent longer periods disabled than younger dancers. In another study, Pedersen and Wilmerding (1998) found that professional flamenco dancers had more injuries than student dancers. Some professional dancers had two or more injuries at once, probably due, in part, to practicing or performing almost four times longer than student dancers. The daily practice of professional ballet dancers is extensive, involving extremely demanding schedules and at a high intensity during the performance season. Because of physical and emotional demands from companies, professional dancers may experience higher levels of stress from a variety of occupational situations than do student dancers. Noh et al. (2002) also found that professional ballet dancers in Korea reported limited coping skills. Based on these findings, replication of the present research with professional dancers would be of great interest, perhaps producing larger effects than we observed here.

**Future Research**

The results of the present study are promising for research on the stress–injury relationship in dance. In particular, this study points out the potential to reduce the incidence of injury in dance by interventions that reduce stress and increase coping skills. Research on stress and injury in dance is in its infancy, but the current study points to some issues that should be addressed.

One reason for the effectiveness of the interventions in the current study, in particular the broad-based coping skills intervention, could have been the way the interventions were designed on the basis of the previous quantitative and qualitative studies with ballet dancers (Noh, Morris and Andersen 2002, 2005). Hays (2002) also proposed that the combination of qualitative and quantitative research is needed to understand what performing artists want and need. When coping skills programs are designed based on target variables that test specific areas, the results have strong positive effects (Smith 1999). The focus on enhancing coping skills that are known to influence practice and performance appeared to help dancers cope more effectively with the demands of the dance environment and reduce injury incidence. Researchers could replicate the design of our sequence of studies (Noh, Morris and Andersen 2002, 2005) to explore which factors play a central role in the prediction of injury outcomes and to design interventions to cope with stressful situations. Because these studies were conducted with ballet dancers in the Korean society, which is culturally quite different from that of Western countries, it is not clear whether these results would apply to the relationship between stress and injury generally. For example, given all the sources of pressure experienced by ballet dancers in Korea, it is possible that they are reluctant to
report injuries. Although our experience is that this is likely to be less evident at the level of dance we studied here, research should explore the potential for underestimating injury frequency and duration due to underreporting. Further, future research should examine the relative effectiveness of interventions designed in this way, compared with general stress management and general coping skills packages.

Recently, researchers have started to examine the psychological aspects of dance injury (Mainwaring, Kerr and Krasnow 1993; Patterson, Smith, Everett et al. 1998; Smith, Ptacek and Patterson 2000). Previous research has been conducted mainly in Western cultures. That research has found that psychosocial factors, such as stress, social support, and anxiety, are important variables related to injury (Mainwaring, Kerr and Krasnow 1993; Patterson, Smith, Everett et al. 1998; Smith, Ptacek and Patterson 2000). The current study, however, was conducted in Korea. Noh et al. (2005) found that coping skills are the most important factor related to injury outcome in Korean ballet dancers. Another study (Noh, Morris and Andersen 2002) found that Korean professional ballet dancers experienced high levels of stress, which had a number of sources, mainly in dance practice and performance environments. Also, dancers lacked coping skills to deal with those stressors. The psychosocial factors that are most closely related to injury in Korean ballet dancers are different from those found in previous research in Western countries. The results of the current study are unclear as to whether cultural differences are associated with injury occurrence. Although ballet is a Western art form that imposes similar conditions on dancers, such as thin and prepubescent body shape, prolonged practice, turnout, flexibility, and strength, regardless of culture (Hamilton and Hamilton 1994), there are specific sources of stress that need to be addressed by coping strategies different from those used in Western countries. Thus, further research on cultural and possibly gender issues is needed to compare the major stressors and coping strategies, and effective interventions in Western, Korean, and a range of other cultures.

The current study has relatively low power, but many of the results are statistically significant, and all variables have large or medium effect sizes. Nowadays, the value of examining effect sizes, which often have more meaning in practice than statistical significance, is emphasized (Cohen 1988). Larger sample sizes should be used, where possible, to increase the power of studies, so the findings for intervention programs can be more confidently generalized.

Implications for Practice

The results of the current study have shown that designed intervention programs are effective among dancers with low levels of coping skills. The
results could be informative for directors and teachers in Korea. At a minimum, practitioners could start educational programs for dance directors, choreographers, managers, and dancers concerning the importance of knowing about psychosocial factors related to injury risks and how to apply intervention programs to reduce injury occurrence. In particular, Korean ballet dancers rarely used mental training for enhancing coping (Noh, Morris and Andersen 2002). Dancers could learn effective coping skills for dealing with stressful situations, such as practice, performance, audiences, and auditions for promotion and not just think anxiety is a routine element of performance (Hays 2002). We suggest that it would be valuable to include training in coping skills in the education of students and professional Korean ballet dancers to prepare them for the inevitable stress of practice and performance. If ballet dancers practiced intervention programs regularly, they might be better prepared to deal with the stressful situations they meet, and their injury rates might be reduced.

In conclusion, the current study found that interventions to enhance coping among dancers who had low levels of coping skills did improve coping skills, and they also led to a reduction in injury occurrence. We hope that the findings of the current study stimulate further intervention studies in relation to dance injuries. Focus on the non-Western culture of Korea highlighted how tailored interventions can be used to address culture-specific stressors. We encourage researchers to study such cultures more in the future.

REFERENCES


