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A Systematic Review of Stress Management Interventions with Sport Performers

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Abstract

The purpose of this review was to systematically identify and evaluate the psychosocial interventions used to manage a component of the stress process in competitive sport performers. Inclusion criteria were devised to select research relevant to the topic area. Studies were assessed for inclusion by examining their title, abstract, and then full text. Based on the outcome of this process, 64 studies were included in the review. These studies encompassed a variety of cognitive (n = 11), multimodal (n = 44), and alternative interventions (n = 9). The results indicate that, in general, a variety of stress management interventions are associated with athletes' optimized stress experience and enhanced performance. The findings suggest that the effectiveness of stress management is moderated by a number of diverse design features (e.g., treatment adopted, stress component outcome measured). These design features are important to consider when designing interventions for athletes of varying sports, ages, and competitive standards.

Keywords: anxiety, athletes, emotions, evidence-based, psychological skills

A Systematic Review of Stress Management Interventions with Sport Performers

The competitive sport arena is a highly demanding and potentially stressful environment. Based on a transactional conceptualization, stress is defined as "an ongoing process that involves individuals transacting with their environments, making appraisals of the situations they find themselves in, and endeavouring to cope with any issues that may arise" (Fletcher, Hanton, & Mellalieu, 2006, p. 329; adapted from Lazarus, 1999). In line with this perspective of stress, it is widely acknowledged that sport performers must manage a wide range of environmental demands and psychological responses if they are to enhance their athletic performance and sport experience. Although some performers are able to manage the various causes and consequences of the stress process, many others struggle, resulting in severe impairments to their performance and health (e.g., burnout, depression, illness). It is for this reason that stress management interventions are important for facilitating athlete's experiences and performances in a range of sport-related settings.

Within the sport psychology literature, it is acknowledged that intervention research should be of paramount importance to better understand the most appropriate approach to manage sport performers' stress (Anshel, 2005; Jones & Hardy, 1990; Thomas, Mellalieu, & Hanton, 2008). Aligned with this view, researchers have implemented a number of stress management interventions to optimize different aspects of the transactional stress process in typically one of the following ways: a) a reduction in stressors, b) a modification of cognitive appraisals, c) a reduction in negative affect and an increase in positive affect, or d) to facilitate effective coping behaviors. Hence, for the purposes of this paper, optimization of the stress process involves the interrelation and balance between the components of the stress process to benefit an individual's well-being and performance. However, there is still debate as to the effectiveness of different stress management interventions in optimizing athletes' stress and performance.

This study was the first to synthesize results from across the research literature on the stress management interventions that have attempted to optimize athletes' stress experience and performance. Of the intervention reviews that have been published to date within sport psychology, the emphasis has been placed on evaluating performance enhancing treatments that are solely focused on improving performance-related outcomes. Greenspan and Feltz (1989) reviewed 23 interventions with athletes and concluded that relaxation-based and cognitive restructuring programs were generally effective in improving athletes' performance. Martin, Vause, and Schwartzman (2005) also reviewed psychological interventions with sport performers, although they had more stringent inclusion criteria than Greenspan and Feltz (1989). They incorporated only 15 studies that employed either single-subject and experimental designs to evaluate performance enhancement. These interventions mainly consisted of cognitive-behavioral-based multimodal programs. Of the seven single-subject designs that were evaluated by Martin et al. (2005), it was found that five studies reported positive effects for all participants. In addition, eight out of eight experimental designs reported performance improvements for the treatment group in comparison to a control group. Although these reviews (Greenspan & Feltz, 1989; Martin et al., 2005) have provided support for athletes' performance enhancement, psychosocial programs also play a salient role in contributing towards performers' affective well-being (Miller & Kerr, 2002). In particular, the prominence of stress in athletes' experience of competitive sport indicates that intervention reviews should also assess the extent to which interventions alter athletes' stress experience. However, to date, no reviews have specifically assessed the effectiveness of interventions that aim to optimize athletes' stress experience and performance.

Effective Stress Management

Effectiveness has been referred to as "the applicability, feasibility, and usefulness of the intervention in the local or specific setting where it is to be offered" (American

Psychological Association, 2002, p. 1053). Researchers who seek to assess effectiveness generally recommend that manipulation checks are conducted to assess participants' perceptions of and satisfaction with a specific program (Greenspan & Feltz, 1989; Vealey, 1994). These checks are generally in the form of quantitative social validation measures or interviews post intervention. Other evaluations of effectiveness include calculating the overall effect size and power of behavior change for the various stress process component and performance outcomes measured. To date, the sport psychology literature has indicated that stress management interventions may generally be effective in reducing athletes' state and trait anxiety (Thomas et al., 2008). However, anxiety is only one component of the dynamic, ongoing stress process. It is, therefore, important that researchers seek to broaden their understanding of the interventions that are effective in optimizing the wider stress process (e.g., stressors, appraisals, emotions, coping). Establishing the circumstances in which programs are effective would assist sport psychologists in assessing when treatments are effective for performers of particular age groups and competitive levels. Notwithstanding the importance of assessing effectiveness, in order to accurately reflect a rigorous and robust evidence-base, the treatment efficacy should also be considered.

Treatment Efficacy of Stress Management

As stated in the Criteria for Evaluating Treatment Guidelines (American Psychological Association, 2002), treatment efficacy is the "systematic and scientific evaluation of whether a treatment works" (p. 1053). The difference between efficacy and effectiveness is that efficacy is concerned with effective outcomes that are based on acceptable internal validity. When attempting to reliably estimate the effect of stress management for sport performers, applied researchers should also consider the research designs which are able to infer causality and increase confidence in the strength of an intervention effect. According to the APA framework, such interventions employ randomized

controlled trials (RCTs) that include a control or comparison group. The randomization of participants to treatment and control groups allows for causality to be inferred and provides reliable estimates of effects (Martin et al., 2005). Such designs are considered more likely to be classified at the highest level of empirically supported treatments (Chambless & Ollendick, 2001). Other noteworthy evaluations of efficacy include: (a) whether interventions included information descriptions to allow other researchers to replicate studies, (b) whether interventions were carried out in naturalistic settings, and (c) whether manipulation checks and follow up assessments were conducted.

It is important, therefore, that stress management interventions with sport performers are considered in terms of both their effectiveness and their efficacy. Although the primary focus in this review is the assessment of effective stress management, at the highest level of empirical support it is necessary to demonstrate efficacy before demonstrating effectiveness. Indeed, for the field of sport psychology to report good evidence-based programs, researchers need to incorporate designs and validation methods that are robust enough to infer causality, but also, on a more practical level, take into account the personal and situational needs of sport performers (Anshel, 2005; Mellalieu, Hanton, & Fletcher, 2006; Thomas et al., 2008). The latter point was illustrated by Mellalieu et al. (2006) who noted that employing certain anxiety reducing programs (e.g., relaxation training) may not be appropriate in sports that may require higher cognitive and physical activation states prior to performance (e.g., weightlifting). In view of this observation, it is likely that various personal and situational characteristics will act as moderators that influence the relationship between treatments and effects. These moderators, therefore, should be considered prior to designing interventions and when assessing the various types of effective stress management interventions that have been applied with sport performers.

Moderators of Intervention Effects

In assessing the effectiveness of stress management with sport performers, it is important to consider the various study characteristics that may be associated with effective outcomes for athletes' stress experience and performance. Identifying moderating variables could help to explain inconsistencies across findings, improve intervention efficiency, and enhance dissemination of effective evidence-based programs. Understanding which characteristics may moderate the main effect of treatment is important because this may enable applied researchers to identify who will benefit most from particular treatments. For example, it is possible that different types of treatment (e.g., cognitive, multimodal, alternative) may be an important predictor of change for performers of particular competitive ages or standards. In this way, it is possible that cognitive restructuring techniques may be more beneficial for elite athletes in comparison to non-elite and younger performers who may find stress reduction treatments more effective (Fletcher & Hanton, 2001).

An important message to emerge from this overview is that applied researchers require a greater understanding of the programs that are effective at managing performers' stress experience. In addition, there is a need to provide practitioners with a greater awareness of the treatments that are deemed to be effective for optimizing competitive athletes' stress and performance. To date, however, there has been no systematic attempt to critically review the effectiveness of stress management interventions or outline their treatment efficacy. The purpose of this research, therefore, was to systematically identify and evaluate the psychosocial interventions used to manage a component of the stress process in competitive sport performers. The systematic review examined the effectiveness of these interventions in facilitating athletes' stress experience and performance and reported the highest level of empirically supported treatments.

Method

Design

Through critical exploration, evaluation, and synthesis, a systematic review identifies and summarizes all of the empirical studies that pertain to a research topic (Cooper, 1982; Green et al., 2008). This approach involves a rigorous protocol that reduces reporter bias and random error (Cook, Mulrow, & Haynes, 1997). For these reasons, a systematic review was deemed the most appropriate method to address the research question, because a large number of findings may be evaluated in combination (Mulrow, Cook, & Davidoff, 1997; Murlow, 1994). Systematic reviews can include the statistical methods of meta-analysis if studies provide sufficient data to calculate effect sizes. However, because a large number of studies provided insufficient statistics (e.g., means and standard deviations) to calculate effect sizes, and because some of the studies were qualitative in nature, narrative analysis was undertaken in conjunction with vote counting methods (Cooper, 1998).

Search Strategy

The procedure for identifying appropriate studies was based on well-established systematic review guidelines reported in the fields of health care (Edwards, Hannigan, Fothergill, & Burnard, 2002; Egger & Davey Smith, 2001), occupational psychology (Cooper, 1982; Cooper, 2003), and sport psychology (Goodger, Gorely, Lavallee, & Harwood, 2007; Nicholls & Polman, 2007). The search strategy adopted three main approaches to gather research evaluating stress management interventions with sport performers. Firstly, between April 2009 and May 2010, research papers were gathered and identified from the following electronic databases: ArticleFirst (1990 to present), Applied Social Sciences Index and Abstracts (1987 to present), MEDLINE (1965 to present), Physical Education Index (1970 to present), PsycARTICLES (1894 to present), PsycINFO (1967 to present), SPORTDiscus (1985 to present), Web of Science (1945 to present), and Zetoc (1993 to present). For each database various keyword combinations were used to identify relevant empirical studies, including: affect regulation, anxiety, appraisals, athletes, biofeedback,

burnout, cognitive-behavioral therapy, coping, demands, depression, emotions, goal setting, imagery, interventions, relaxation, self talk, sport, strain, stress, stressors, stress inoculation training, stress management, stress management interventions, stress management programs, and well-being. The first author contacted eight experts in stress in sport to establish if there were any keywords missing from this list. This resulted in the inclusion of two additional keywords: competition and pressure. The second search strategy involved conducting a manual search of the following journals from the first issue of publication: International Journal of Sport and Exercise Psychology (2003 to 2010), International Journal of Sport Psychology (1994 to 2010), Journal of Applied Sport Psychology (1989 to 2010), Journal of Clinical Sport Psychology (2007 to 2010), Journal of Sport Behavior (1990 to 2010), Journal of Sport and Exercise Psychology (1979 to 2010), Journal of Sports Sciences (1983 to 2010), Psychology of Sport and Exercise (2000 to 2010), Research Quarterly for Exercise and Sport (2001 to 2010), and The Sport Psychologist (1987 to 2010). Once this strategy was complete, the third search strategy involved citation pearlgrowing (Hartley, 1990), which involved searching reference lists of the full papers that were collected and met the inclusion criteria.

Inclusion Criteria

The literature search was conducted to gather and identify the studies that employed psychosocial interventions used to manage a component(s) of the psychological stress process in sport performers. In this way, psychosocial interventions refer to studies of social influences and their effect in modifying individual behavior (Frosh, 2003). An example of some typical interventions include cognitive (e.g., imagery, self-talk) and multimodal treatments (e.g., stress inoculation training, progressive muscular relaxation). For research papers to be included in the review, the subjects within each study were required to train and compete regularly in a specific physical activity to be considered authentic *sport* performers. In this way, novice individuals were not considered as sport performers. On the basis of this

criterion, a selection of intervention studies were excluded from the review. For example, two studies by Griffiths and colleagues (Griffiths, Steel, Vaccaro, Allen, & Karpman, 1985; Griffiths, Steel, Vaccaro, & Karpman, 1981) that tested the effects of relaxation techniques on anxiety levels of scuba divers were rejected. These studies were not included due to the sample of novice students. Additionally, psychophysiological interventions were not included since they did not measure athletes' psychological stress. When retrieving the interventions that had been conducted with sport performers, it was also a requirement that the papers were published in peer-reviewed journals and available in the English language. Although this approach represents a publication bias (Egger & Davey Smith, 2001), it is impractical and expensive to obtain copies of unpublished documents and translate foreign written material. In addition, given the limited amount of information that is provided in published abstracts of conference proceedings, it is unlikely that these studies can be evaluated with sufficient rigor to determine whether an intervention is effective (Scharf et al., 2008).

Sifting of Research Papers

The research papers that were potentially appropriate for the review were assessed by title, abstract, and then full text (see Figure 1). At each stage of evaluation, studies were excluded from the sifting process if certain inclusion criterion were not satisfied. To elaborate, studies were required to provide information pertaining to study demographics (e.g., sample size), the experimental study design (e.g., whether the method incorporated a control or comparison group), and the stress component(s) outcome measured (e.g., stressors, appraisals, emotions). These features were important to identify in the systematic review to consider any potential moderators that may influence the relationship between treatments and effects. Moreover, because the review focused on the stress management interventions conducted in sport *performers*, studies of other populations (e.g., sport coaches, managers, parents) were excluded from the analysis. The following descriptive information was

extracted and coded from each study: sample size, gender, mean age, type of sport, skill classification, competitive standard, country location, type of intervention, measures used, stress process and performance outcomes measured, the design employed, the duration of intervention, where intervention were conducted, whether treatment manuals were provided, whether manipulation checks and follow up assessments were carried out.

The second author coded approximately 10% of the original titles (n = 80/845), abstracts (n = 40/417), and full text papers (n = 10/109) to assess inter-coder reliability. On the basis that inter-rata agreement was 95%, the first author coded the remaining studies and when necessary, received assistance from the second author to evaluate any ambiguous information. Any discrepancies were resolved through discussion until a consensus was reached. The vote counting procedure adopted meant that studies were coded on the outcome effects reported for each intervention variable. More specifically, we used statistical significance of effects as the criterion for a positive effect. In addition, where computable, effect sizes (Cohen's d) were calculated using comprehensive meta-analysis (CMA) version-2 software, to reduce the likelihood of human error (Borenstein, Hedges, Higgins, & Rothstein, 2005). In the case where qualitative analyses were conducted, outcome effects were coded based on the interpretations of the original authors.

Results

Study Characteristics

Of the original 845 citations that were retrieved, 63 research papers (64 studies) were included in the systematic review.[1] Table 1 summarizes the following study characteristics of the interventions that were included: sample size, gender, mean age, type of sport, skill classification of the sport, competitive standard of the athletes, research design employed,

[1]63 papers were included in the systematic review. However, a study by Weinberg, Seabourne and Jackson (1982) reported two interventions with separate samples and this research paper was, therefore, reported as two separate intervention studies.

type of measures used, stress concept measured, type of intervention implemented, and the duration of intervention. In terms of the sample sizes gathered for each of the studies, 52 studies (82%) recruited between 1-50 participants, and only two studies (2%) had sample sizes over one-hundred (viz., Bakker & Kayser, 1994; Devlin & Hanrahan, 2005). In view of smaller sample sizes, it is possible that any significant effects reported are more likely to display insufficient power.

When considering the potential moderators of intervention effects, it was revealed that the mean age of participants ranged from 12-21 years for over half of the intervention research (n = 38, 59%). Seventeen of the studies (27%) failed to provide participant age-related data. With regards to the sport classification of studies, the results showed that 26 studies (40%) were classified as team sports, 32 (50%) were classified as individual sports, and only 3 studies (5%) combined both sport types. Fifty-three interventions (83%) included sports that require gross motor skills movements, with only one study sampling a fine motor skilled sport in isolation (viz., Prapavessis, Grove, McNair, & Cable, 1992). Turning to the competitive standard of participants, 20 studies (31%) recruited collegiate performers, while elite (n = 4, 6%) and semi-professional populations (n = 3%) were largely neglected. Thirteen studies (21%) did not provide sufficient information as to the competitive standard of the participants. An analysis of the research designs revealed that 21 studies (33%) employed true experimental designs, which involved the randomization of participants to an intervention and control or comparison group. Of the remaining studies, 16 (25%) utilized single-subject designs, 16 (25%) used a variety of quasi-experimental designs, and 11 (17%) employed pre- experimental designs. Additionally, the use of predominantly experimental designs meant that 47 studies (74%) implemented quantitative measures, 15 used mixed methods (23%), and only 2 studies (3%) employed qualitative methods exclusively (viz., Mace, Eastman, & Carroll, 1986; Mace, Eastman, & Carroll, 1987).

A perusal of the stress component outcomes that were measured revealed that 46 interventions assessed state and trait anxiety (72%). When further analyzing the anxiety interventions (n = 46/64), imagery (n = 28), relaxation (n = 27), and self-talk training (n = 10) were the most frequently implemented, either in isolation or in combination with other treatments. In terms of the imagery programs that measured state anxiety (n =26), 17 studies (65%) reported a post-intervention reduction in state anxiety, while three out of the total 28 imagery interventions (11%) reported a decrease in trait anxiety. In the main, imagery only produced beneficial effects for anxiety when included as part of a multimodal intervention, of which 35 (76%) were effective. When assessing relaxation techniques, 16 out of 23 (70%) studies reported state anxiety reductions. When imagery and relaxation were both employed with a combination of additional treatments (n = 18), the findings showed positive effects for state anxiety in 11 studies (61%). In terms of the self-talk techniques that were utilized exclusively, or as part of a multimodal program, nine out of the ten studies were effective in reducing state anxiety.

Effectiveness and Efficacy of Stress Management Interventions

When assessing the overall effectiveness for interventions that measured both stress and performance outcomes, 22 out of 39 studies (56%) provided evidence for combined positive effects. In addition, when evaluating the effects for performance only, 30 of the 39 studies (77%) reported positive effects. However, when evaluating the effects for stress component outcomes only, it was found that positive effects were reported for 52 out of the 64 studies (81%). Conversely, when establishing treatment efficacy for the highest level of empirical support, a total of only 21 RCTs and two single subject designs with a comparison group (36%) were evaluated. Of these studies, 22 out of 23 studies (96%) altered performers' stress experience beneficially. When turning attention to these programs that measured both stress and performance outcomes (13 out of 23 studies), the findings were mixed, with only

seven studies (54%) providing evidence of positive effects for both variables. To assess the effectiveness of stress management programs in more depth, the interventions that shared common techniques were grouped into cognitive, multimodal and alternative interventions. When accounting for the number of treatments within each intervention category, 11 of the 64 studies employed cognitive treatments (17%), 44 comprised a combination of different multimodal programs (69%), and nine implemented alternative interventions (14%). The following sub-sections detail the programs employed in these treatments and their effects on various components of the stress process and performance. In addition, the treatment efficacy of these interventions is outlined.

Cognitive interventions. Within cognitive intervention studies (n = 11, 17%), the content of treatments consisted of: cognitive-behavioral therapy, coping, goal-setting, hypnosis, imagery, rational-emotive therapy, and self-talk. Table 2 illustrates the summary of effects for cognitive interventions on various stress component and performance outcomes. The summary of study effects revealed that there were 23 positive effects, six null effects, and one negative effect for stress components and performance. When considering the competitive level, it was found that 13 out of the 23 (57%) positive effects were reported in studies that sampled collegiate performers. Six out of the 11 studies measured stress and performance, of which four reported combined positive effects (66%) for both outcomes (viz., Barker & Jones, 2008; Burton, 1989; Hamilton & Fremouw, 1985; Hatzigeorgiadis et al., 2009).

Although the interventions ranged in duration from one session to one season, studies that implemented treatments over a two month period have provided support for prolonged positive effects for different components of the stress process (viz., Barker & Jones, 2008; Burton, 1989; Maynard, Smith, & Warwick-Evans, 1995; Mellalieu, Hanton, & Thomas, 2009) and performance (viz., Barker & Jones, 2008; Burton, 1989). In terms of the research

methods adopted, only two studies employed RCT designs (viz., Arathoon & Malouff, 2004; Hatzigeorgiadis et al., 2009), which both enhanced positive affect and reduced cognitive anxiety respectively. However, although these studies had comparatively large samples sizes ($n \geq 68$), the intervention lengths were only between 1-5 sessions. Of the remaining nine studies, two utilized non-RCTs, six employed single-subject designs, and one used a one group design. An examination of the cognitive interventions revealed that five studies were conducted within the training environment and two were delivered before or after competition. Furthermore, interventions produced nine out of the 23 positive effects (39%) for stress and performance outcomes when delivered in training environments. In addition, six studies (55%) supplied standardized treatment manuals and five (45%) provided manipulation checks. No follow-up assessments were carried out.

Multimodal interventions. Within multimodal interventions ($n = 44$, 69%), the content of treatments consisted of a combination of the following: arousal control, attentional training, centering, cognitive control, cognitive and somatic relaxation training, concentration, COPE therapy, energising, goal setting, hypnosis, imagery, meditation, motivation, pre-performance routines, positive thinking, self-talk, stress inoculation training, team building, thought stopping, and visuo-motor behavior rehearsal. These studies assessed a wide variety of grouped treatments, stress components, and performance measures.

Table 3 illustrates the summary of effects for multimodal interventions on various stress component and performance outcomes. The summary of study effects revealed from 44 studies that there were 86 positive effects, 36 null effects, and six negative effects for various stress components and performance. When considering the competitive level, it was found that 27 of the 86 (32%) positive effects were reported in studies that sampled collegiate performers. In addition, 25 out of the 85 (29%) positive effects were reported from studies that did not provide information as to the competitive level. Thirty studies (68%) measured

both stress process and performance outcomes, of which 16 reported positive effects (53%), with 13 (43%) reporting mixed effects and one (3%) reporting no effect for both variables. In addition, when evaluating the effects for performance only (n = 30, 68%), 23 studies (77%) reported positive effects and seven studies reported null effects. When considering the efficacy of these interventions, a large number of studies provided treatment procedures (n = 33, 75%), however, a smaller proportion included manipulation checks (n = 17, 39%) or follow-up assessments (n = 6, 14%). These programs were conducted in training (n = 10, 23%), competition (n = 9, 20%), and laboratory environments (n = 13, 30%), although 12 studies (27%) did not report this information. In addition, interventions produced 33 positive effects (38%) when delivered in laboratory environments.

Alternative interventions. Within alternative interventions (n = 9, 14%), the content of treatments consisted of the following: anger awareness, applied relaxation, biofeedback, music interventions, personal goal management, and progressive relaxation training. Table 4 illustrates the summary of effects for alternative interventions on stress component and performance outcomes. The summary of study effects showed that there were 15 positive effects, 11 null effects, and no negative effects for stress components and performance. When considering the competitive level, it was revealed that 3 out of the 15 (20%) positive effects were reported in studies that sampled high school, national, semi-professional performers, and a mixture of competitive levels. Three studies measured both stress process and performance outcomes, of which two reported positive effects (viz., Bishop et al., 2009, Lanning & Hisanga, 1983). These studies were conducted over a wide range of intervention time periods and appear to provide provide mixed findings for optimizing performers' stress experiences in particular. For example, the findings from two randomised controlled trials provided contradictory support for reducing anger within team sports (viz., Brunelle, Janelle, & Tennant, 1999; Simpson & Karageorghis, 2006). Using anger awareness as a treatment,

Brunelle et al. (1999) found no effect for state anger, but a positive effect for reducing angry behaviour (d = 1.18). On the other hand, Simpson and Karageorghis (2006), who used synchronous music treatments, found that anger remained the same from pre- to post-intervention. When considering the efficacy of alternative interventions, seven of the nine studies provided at least some description of a standardized treatment procedure and only one study (viz., Bishop et al., 2009) conducted a manipulation check. Five studies were conducted within the training environment and three were delivered before competition. Also, programs produced five out of 15 positive effects (33%) for stress and performance when delivered in training environments. No follow-up assessments were conducted.

Discussion

This systematic review extends stress research by identifying the psychosocial interventions that measured a component(s) of the stress process *and* performance outcomes in sport performers. In addition, the evidence for the effectiveness of stress management interventions was evaluated and their treatment efficacy reported.

Effective Stress Management Interventions

The evidence from cognitive, multimodal, and alternative stress management interventions appears to indicate that, for the most part, stress components were optimized in one of the following ways: a) stressors were reduced, b) cognitive appraisals were modified, c) negative affect states were reduced and positive affect states increased, and d) effective coping behaviors were facilitated. More specifically, our results offer initial support for an overall positive Cohen's d treatment effect of stress management interventions on various components of the stress process. Tables 2 to 4 illustrate the range of effect sizes reported over the 30 years of stress management interventions with competitive sport performers. The evidence in favor of optimized stress and performance, on the other hand, appears to be weaker than the effectiveness of all interventions that measured the stress process solely. This

was most apparent in relation to the multimodal interventions employed. Therefore, reducing athletes' stress in certain sporting situations may not necessarily result in improved performance. This supports the salience of considering appropriate activation states prior to designing interventions, to increase the chances of athletes performing optimally (Mellalieu et al., 2006). When examining the stress management interventions in more detail, the results reveal that a large number of programs measured sport performers' anxiety. A closer inspection of these interventions showed that self-talk, when employed within a cognitive or multimodal intervention seem to be the most effective technique at reducing state anxiety. Moreover, it appears that multimodal interventions were most effective in reducing cognitive and somatic anxiety when self-talk and imagery were employed. The findings also revealed that relaxation techniques seemed to be generally effective at reducing state anxiety, either in isolation or when combined with imagery. However, in the main, imagery only appeared to produce positive effects as part of a multimodal program.

Multimodal interventions, therefore, may be the most effective approach to stress management for competitive athletes, which supports previous narrative reviews for performance enhancement (Greenspan & Feltz, 1989; Martin et al., 2005). However, in contrast to these reviews, the findings from this systematic review seem to indicate that these programs were generally effective for optimizing the stress process, and to a lesser extent, performance. Although multimodal interventions may help to reduce both cognitive and somatic symptoms (Jones & Hardy, 1990), it is also possible that these programs serve the purpose of optimizing various components of the stress process in succession (e.g., appraisals, affect, coping). For example, a multimodal program may be effective in enabling a performer to appraise competitive stressors in a challenging way, which acts as a condition for more adaptive emotional responses, and facilitative coping.

Treatment Efficacy

Despite this systematic review's findings, that suggest that stress management interventions with sport performers may be generally effective, it is worth exercising a degree of caution in light of the results regarding the treatment efficacy of these programs. As proposed in the Criteria for Evaluating Treatment Guidelines (American Psychological Association, 2002), only research designs that provide comparison to another group should be evaluated at the highest level of empirically supported treatment. Based on this criterion, approximately less than one-third of the interventions (n = 23) would be considered at this level of empirical support in reporting positive effects for optimizing performers' stress experience. Of these studies, 22 out of 23 studies (96%) altered performers' stress experience beneficially. When assessing the programs that measured stress and performance outcomes (n =13), seven empirically supported treatments reported positive effects (54%). Although a large number of studies did not conduct randomized or controlled experiments, the interventions in these studies should not necessarily be deemed ineffective, it is simply not possible to infer causality (American Psychological Association, 2002).

Approximately a third of all studies (23 out of 64) provided a manipulation check to assess whether participants felt that the programs were effective. However, less than half of these programs (10 out of 23) provided extracts from case studies or segments from social validation data. In her review of sport psychology interventions, Vealey (1994) concluded that one of the weaknesses of many interventions was the lack of appropriate manipulation checks to evaluate participants' perceptions of treatment. Indeed, the value of manipulation checks should not be underestimated in supplementing the objective outcomes of each intervention. Over 15 years on and the findings of this review suggest that it is still an issue within stress management research. More extensive assessment is therefore needed to provide greater confidence in treatment effects and support for validity. These checks are important in contributing to our knowledge of empirically supported treatments for future replication. One

of the most salient findings from the overall analysis was that only six multimodal studies carried out follow-up assessments of intervention effects (viz., Crocker, 1989a; 1989b; Gravel, Lemieux, & Ladouceur, 1980; Haney, 2004; Hanton & Jones, 1999b; Jones, 1993). These evaluations are critical for identifying which treatments have enduring effects and assessing when these effects subside. On this point, it is believed that interventions should be assessed after at least a season/twelve months for any sustainable behavior change to be validly confirmed (Martin et al., 2005).

Another issue regarding treatment efficacy relates to the assessment of programs that were conducted in highly 'transferable' environments. It has been argued that interventions conducted in laboratory or training settings cannot be considered as a satisfactory evidence-base for providing treatments for athletes in competition (Hale & Whitehouse, 1998; Martin et al., 2005). For the most part, in this review, the interventions failed to expose athletes to competitive performance environments. Certainly, one of the challenges for intervention researchers is to assess whether athletes require exposure to stressful competitive settings, to test the likelihood of enhanced performance under competitive pressure. Research by Holahan and Moos (1990) suggests that individuals are more likely to strengthen their adaptive resources and personal growth from confronting highly stressful environments. Therefore, where logistically possible, psychologists should attempt to deliver interventions within a competitive sport environment, to strengthen the ecological validity of any positive performance effects. The findings also highlight a need to provide internal validity through strong research designs, with the controls required to infer causality.

Moderators of Intervention Effects

In the knowledge that stronger research designs will allow for inference of greater causality, there are a number of additional factors that may moderate the relationship between treatment and effect. Firstly, the competitive level of the athletes is important to consider

when designing and evaluating a stress management intervention. To elaborate briefly, Fletcher and Hanton (2001) suggested that stress reduction strategies may be more appropriate when working with non- and sub-elite performers. However, in contrast, elite and professional athletes may benefit more from techniques which aim to positively reappraise how they view their stress experience (Hanton & Jones, 1999a). The results from this review indicated that stress management interventions were most effective for collegiate sport performers, but 21% of the total studies did not provide information relating to performers' competitive level. Published research should be clear about this moderator for consultants to assess which interventions are most effective for particular clientele in various sports.

Another important finding to emerge from the review was that for 59% of the studies, the mean age ranged from 12-21 years of age. Although it appears that stress management interventions are generally effective with this age group, it should also be noted that 27% of studies did not provide age-group data. Age is an important consideration, as research by Warr (1992) has identified a U-shape curve between age and affective well-being (e.g., anxiety) across a wide range of occupations, whereby individuals in their 20s and 30s report lower well-being in comparison to younger and older workers. In light of this research, it appears that age could moderate the outcome of stress management interventions. Further, the current findings suggest that more interventions need to be assessed with older performers to examine the moderating effect of age.

The type of intervention employed is also considered a key moderator of program effects. Researchers have indicated that in order for a multimodal treatment to be implemented, the intervention will likely require a larger period of time to be set aside by the practitioner, athletes and sport organization, in comparison to a unimodal treatment (Maynard, Hemmings, Greenlees, Warwick-Evans, & Stanton, 1998; Prapavessis et al., 1992). Therefore, the time taken to administer an intervention may indeed influence how

enduring any effects are for optimizing stress and performance. Moving to review the various components of the stress process that were measured, the results indicated that the majority (75%) of studies focused on changing anxiety levels. Therefore, other salient aspects of the stress process should be examined more extensively. For example, only two studies measured competitive stressors (viz., Kerr & Goss, 1996; Savoy, 1993). Moreover, cognitive appraisal, which is considered to be at the core of the transactional stress process (Fletcher et al., 2006), has also received little intervention attention. This is an important area for further investigation, because appraisal research will provide a greater understanding of when competitive stress may be facilitative, rather than debilitative towards performance. Undoubtedly, the component of stress measured will impact on the relationship between program and outcome effects as these variables are particularly important in determining the stress management techniques and designs used. In addition, when evaluating the effectiveness of stress management on performance, it is acknowledged that the wide variety of ways in which performance was operationalized may explain some of the differences between outcome effects for stress and performance.

Gaps in the Literature

An examination of the intervention characteristics gave rise to a number of gaps in the stress management literature in sport to date. Firstly, it was observed that there were relatively few elite samples in the review. Although the shortage of elite athletes has historically been a challenging issue for the field of sport psychology (cf. Greenspan & Feltz, 1989), research has demonstrated that the stress-related phenomena is experienced by elite and professional athletes in a variety of competitive environments (Dugdale, Eklund, & Gordon, 2002; Fletcher & Hanton, 2003). Certainly, this population may well be the most vulnerable to experiencing stress due to the close proximity and involvement with the sport organizations in which they operate. It was noted in the current review that all of the

interventions measured athletes' *competitive* stress experience. When considering the numerous organizational-related demands that may be imposed on individuals within the sport environment, it is evident that interventions need to be employed to measure sport performers' experiences of *organizational* stress. This term has been defined as "an ongoing transaction between an individual and the environmental demands associated primarily and directly with the organization in which he or she is operating" (Fletcher et al., 2006, p. 329). In recognizing the potential impact of organizational stress in sport, it is likely that practitioners may need to consider broadening their competencies to assist sport performers in managing their overall stress experience (Hanton & Fletcher, 2005). For example, within the current review, there were few interventions that used team building as a method of stress management (Cogan & Petrie, 1995). Team building could indeed be a useful technique for practitioners to implement when attempting to optimize organizational stress-related issues, such as poor communication channels and team cohesion. However, to date, no interventions within sport psychology have attempted to manage this type of stress. It should also be noted that athletes are individuals whose personal stress experience may impact on how they manage stress in sport. For example, an athlete who may cope ineffectively when arguing with his/her parents may also be prone to ineffective coping with disagreeing with his/her sport coach. Therefore, the management of athletes' personal stress may also facilitate their management of competitive and organizational stress in sport.

Future Research

This review has highlighted a number of gaps in the stress management literature. These gaps provide a base to generate future research in this area. Future interventions should attempt to account for the potential factors (e.g., research design, stress component measured, skill level) that may influence the effects of different treatments. For example, the component of stress measured will likely impact on the relationship between the program and outcome

effects as the variables measured should determine the treatment that is implemented. However, intervention research based on the tenets of the transactional perspective should attempt to manage the stress process more holistically, encompassing the demands that performers experience, their appraisals, emotional responses, and subsequent coping strategies (Fletcher et al., 2006). Indeed, Lazarus (1999) stated that stress, emotion, and coping should exist in a part-whole relationship and that "separation distorts the phenomena as they appear in nature" (p. 37).

Another research endeavour that is lacking is the assessment of interventions for other *performers* in the sport environment (e.g., coaches, parents, and support staff). The current review has focused on stress management in competitive athletes, but researchers have also shown that coaches, parents, and sport psychology practitioners are prone to a wide range of competitive and organizational stress (Fletcher, Rumbold, Tester, & Coombes, 2011; Fletcher & Scott, 2010; Harwood & Knight, 2009). An important future research consideration is the assessment of theoretically guided multimodal interventions. Although multimodal programs appeared to be the most effective treatments in this review, the vast amalgamation of treatments made it hard to establish which combinations may lead to better outcome effects.

Limitations

Although contemporary definitions adopt a transactional perspective of stress (Lazarus, 1999), it was evident in this systematic review that studies were ambiguous in reporting a theoretical and conceptual basis for intervention. Therefore, it was not possible to assess whether different conceptually-based programs were effective for particular components of the stress process. To improve the theoretical credibility for future interventions, researchers should clearly report their conceptual underpinnings of stress. In addition, drawbacks to the vote counting procedure adopted were recognized. Namely, studies are interpreted in terms of their reported significance, rather than their effect size.

Although our systematic review has provided a comprehensive and heterogeneous number of stress management intervention effects, meta-analyses could focus on the overall effect size for specific components of stress and performance. Because this is the first systematic review in sport psychology to report effect sizes for stress management interventions, it was not possible to interpret the effect sizes in "explicit, direct comparison with the prior effect sizes in the related literature" (Thompson, 2002, p. 28). Therefore, in line with Thompson's recommendations for reporting effect sizes, we strongly advocate that future researchers who conduct meta-analyses should compare their effect sizes to the effects reported in the previous literature and not by interpreting against Cohen's benchmarks for "small," "medium," and "large" effects. The rigid use of benchmarks for effects prevents readers to consider that small effects with important outcomes may be more noteworthy than large effects with less important outcomes. Finally, although the challenges of obtaining unpublished studies have been acknowledged, future reviewers should also consider contacting researchers who have published on a particular research area to increase the likelihood of obtaining unpublished manuscripts.

Conclusion

In summary, stress management interventions appear to be generally associated with optimized stress in competitive sport performers. This is particularly apparent when only evaluating the interventions' effects on the stress process. However, the findings for optimizing both stress and performance were relatively weak. Although our findings could represent a publication bias of only significant outcomes (Egger & Davey Smith, 2001), our approach may in fact strengthen the overestimation of performance effects. Nonetheless, these results suggest that psychologists need to consider developing interventions that are in line with athletes' optimal activation and emotional states for improving performance. An important finding to emerge from the systematic review was that multimodal programs

appeared to be the most effective technique employed. However, more studies need to investigate the moderating factors (e.g., type of treatment adopted, stress component outcome measured, age, competitive level) that affect the relationships between interventions and effects. Also, these moderators need to be considered prior to intervention design. Finally, the systematic review indicates that future researchers must find a better balance between attending to athletes' personal and situational needs, at the same time as delivering strong experimental research designs, with the controls required to infer causality.

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Table 1

Descriptive Analysis of Study Characteristics

Characteristic	Frequency of Studies
Sample size	
1	7 (11%)
2-20	21 (33%)
20-50	24 (38%)
51-100	10 (16%)
101-200	1 (1%)
200+	1 (1%)
Gender	
females only	17 (27%)
males only	19 (29%)
combined	23 (36%)
not reported	5 (8%)
Mean age, years	
12-21	38 (59%)
22-40	8 (13%)
40 +	1 (1%)
not reported	17 (27%)
Type of sport	
team only	26 (40%)
individual only	32 (50%)
combination	3 (5%)
not reported	3 (5%)
Skill classification	
open skilled sport	20 (31%)
closed skilled sport	23 (36%)
combination of open and closed skills	18 (28%)
gross motor skilled sport	53 (83%)
fine motor skilled sport	1 (1%)
combination of gross and fine skills	7 (11%)
sport unclear/not reported	3 (5%)
Competitive standard	
high school	3 (5%)
collegiate	20 (31%)
club (non-professional)	6 (9%)

regional (non-professional)	2 (3%)
national (non-professional)	4 (6%)
semi-professional	2 (3%)
elite (international, Olympic, professional)	4 (6%)
a variety of competitive levels	10 (16%)
not reported	13 (21%)
Design	
pre-experimental designs	
case study design (posttest only)	6 (9%)
one group design (pretest-posttest)	5 (8%)
single-subject designs	
single-subject designs with comparison	2 (3%)
single-subject designs without comparison	14 (22%)
quasi-experimental designs	
non-randomized controlled trial (pretest-posttest)	11(17%)
non-randomized trial with comparison (pretest-posttest)	2 (3%)
non-randomized controlled interrupted time-series	3 (5%)
true-experimental designs	
randomized controlled trial (pretest-posttest)	16 (25%)
randomized controlled trial (posttest only)	1 (1.5%)
randomized trial with comparison group (pretest-posttest)	3 (5%)
randomized controlled interrupted time series	1 (1.5%)
Measures	
quantitative measures (e.g., questionnaires, surveys)	47 (74%)
qualitative measures (e.g., interviews)	2 (3%)
mixed methods	15 (23%)
Type of intervention	
cognitive	11 (17%)
multimodal	44 (69%)
alternative	9 (14%)
Duration of intervention	
1-5 sessions	9 (15%)
6-12 sessions	4 (6%)
1-4 weeks	5 (8%)
5-8 weeks	20 (31%)
9-12 weeks	4 (6%)
6 months +	11 (17%)
not reported	11 (17%)

Table 2. Summary of Effects for Cognitive Stress Management Interventions (n =11)

Outcome	Positive Effect (+)	No Effect (0)	Negative Effect (-)	No of Studies	Summary of Study Effects		
					+	0	-
Appraisals							
positive thoughts	25			1	1	0	0
thought listing	21			1	1	0	0
Affective responses							
anxiety perceptions	49 (.43)			1	1	0	0
cognitive anxiety	9 (.63), 16 (1.38), 21, 28 (.67)	49 (.09)		5	4	1	0
cognitive anxiety direction	44 (2.07), 46			2	2	0	0
cognitive anxiety intensity		44 (0.00)		1	0	1	0
negative affect	5, 46	45		3	2	1	0
positive affect	3 (.59), 5, 45, 46			4	4	0	0
somatic anxiety	16 (2.04), 28 (.46)	21, 49 (-.14)		4	2	2	0
somatic anxiety direction	44 (2.07), 46			2	2	0	0
somatic anxiety intensity			44 (-.94)	1	0	0	1
Performance	5, 9 (.25), 25, 28 (.54)	21, 44		6	4	2	0
Stress components and performance	5, 9, 25, 28	21*, 44*		6	4	2*	0

Note
Parentheses indicate effect sizes (Cohen's d) where calculable, * = mixed effects for stress components and performance
Study reference numbers: 3 = Arathoon & Malouff (2004); 5 = Barker & Jones (2008); 9 = Burton (1989); 16 = Cumming, Olphin, & Law (2007); 21 = Elko & Ostrow (1991); 25 = Hamilton & Fremouw (1985); 28 = Hatzigeorgiadis, Zourbanos, Mpoumpaki, & Theodorakis (2009); 44 = Maynard, Smith, & Warwick-Evans (1995); 45 = McCarthy, Jones, Harwood, & Davenport (2010); 46 = Mellalieu, Hanton, & Thomas (2009); 49 = Page, Sime, & Nordell (1999).

Table 3. Summary of Effects for Multimodal Stress Management Interventions (n = 44)

Outcome	Positive Effect (+)	No Effect (0)	Negative Effect (-)	No of Studies	Summary of Study Effects		
					+	0	-
Stressors							
athletic stressors	32 (.80)[SI]			1	1	0	0
athletic & life stressors	32 (.89)[SI]			1	1	0	0
Appraisals							
benign appraisals	35 (.33)[SI]			1	1	0	0
challenge appraisals	35 (.18)[SI]			1	1	0	0
irrelevant appraisals		35 (.08)[SI]		1	0	1	0
negative thoughts	23 (.79)[VM]	14 (.34)[CA], 15 (-.52)[CA]		3	1	2	0
positive thoughts	15 (.21)[CA], 38[SI]	14 (.31)[CA]		3	2	1	0
threat appraisals	35 (.69)[SI]			1	1	0	0
Affective responses							
affect reactions	2			1	1	0	0
anxiety	64 (1.21)			1	1	0	0
cognitive anxiety	15 (.85)[CA], 20 (1.19), 29, 31, 50, 53, 54, 55, 58 (.08)	10 (-.63), 11(.-88), 14 (-.38)[CA], 41(-.12)	13 (-.52)	14	9	4	1
cognitive anxiety direction	24 (.77), 27, 40, 42 (.73), 60	1 (-.58)		6	5	1	0
cognitive anxiety intensity	1 (.93), 24 (.77), 42 (.94), 60	27, 47		6	4	2	0
negative affect	56 (.53)			1	1	0	0
negative emotions	59 (.64)			1	1	0	0
positive affect	56 (.64)			1	1	0	0
somatic anxiety	15 (.60)[CA], 20 (1.09), 29, 39[SI], 50, 51 (1.02), 53, 54, 55	10 (-.63),11(-.28), 14 (.24)[CA], 41 (-.20), 58 (-.21)	4, 13 (-1.15)	16	9	5	2
somatic anxiety direction	24 (.77), 27, 40, 42 (1.04), 60	1 (-.66)		6	5	1	0
somatic anxiety intensity	1 (1.06), 24 (.77), 42 (.18), 60	27, 47		6	4	2	0
state anxiety	37[SI], 48 (1.09), 62[VM], 63[VM], 52 (.24)[SI]			5	5	0	0

stress reaction		22 (.27)		1	0	1	0
tension			30 (-.85)	1	0	0	1
trait anxiety	26 (.15), 61 (.18)[VM], 62[VM], 63[VM]	14 (-.41)[CA], 15 (.01)[CA], 18, 35 (-.23)[SI], 47	33 (-1.04)[SI]	10	4	5	1
Coping							
adaptive coping		26 (-.37)		1	0	1	0
approach coping		47		1	0	1	0
avoidance coping		47		1	0	1	0
control over emotions	2			1	1	0	0
coping with negative thoughts	17			1	1	0	0
maladaptive coping	26 (.33)			1	1	0	0
negative thinking coping	35 (1.03)[SI]			1	1	0	0
positive thinking coping		35 (-.04)[SI]		1	0	1	0
wishful thinking coping			30 (-1.47)	1	0	0	1
Performance	4, 10, 14 (.57)[CA], 17, 18, 23[VM], 27, 29, 33 (.12)[SI], 35[SI],38[SI], 39[SI], 40, 48 (.97), 50, 51 (1.17), 53, 54, 56 (.85), 59 (.36, .49, .64), 60, 61 (.11, .17, .24)[VM], 63[VM]	1 (-.29, -.36), 13, 15 (.04)[CA], 20 (.24), 22, 62[VM], 64		30	23	7	0
Stress components and performance	17, 23[VM], 29, 38[SI], 39[SI], 40, 48, 50, 51, 53, 54, 56, 59, 60, 61[VM],63[VM]	1*, 4*, 10*, 13*, 14[CA]*, 15[CA]*, 18*, 20, 22*, 27*, 33[SI]*, 35[SI]*, 62[VM]*, 64*		30	16	1, 13*	0

Note
Parentheses indicate effect sizes (Cohen's *d*) where calculable, [CA] = Cognitive Affective Stress Management, [SI] = Stress Inoculation Training, [VM] = Visuo-motor behavioral rehearsal,
* = Mixed effects for stress components and performance
Study reference numbers: 1 = Abouzekri & Karageorghis (2010); 2 = Anshel & Gregory (1990); 4 = Bakker & Kayser (1994); 10 = Carter and Kelly (1997); 11 = Cogan & Petrie (1995); 13 = Crocker (1989a); 14 = Crocker, Alderman, & Smith (1988); 15 = Crocker (1989b), follow up to Crocker et al. (1988); 17 = Davis (1991); 18 = Daw & Burton (1994); 20 = Edwards & Steyn (2008); 22 = Fournier, Calmels, Durand-Bush, & Salmela (2005); 23 = Gravel, Lemieux, & Ladouceur (1980); 24 = Hale & Whitehouse (1998); 26 = Haney (2004); 27 = Hanton & Jones (1999); 29 = Holm, Beckwith, Ehde, & Tinius (1996); 30 = Johnson (2000); 31 = Jones (1993); 32 = Kerr & Goss (1996); 33 = Kerr and Leith (1993); 35 = Larsson, Cook, & Starrin (1988); 37 = Mace & Carroll (1986); 38 = Mace, Eastman, & Carroll (1986); 39 = Mace, Eastman, & Carroll (1987); 40 = Mamassis & Doganis (2004); 41 = Maynard & Cotton (1993); 42 = Maynard, Hemmings, Greenlees, Warwick Evans, & Stanton (1998); 47 = Mesagno, Marchant, & Morris (2008); 48 = Owen & Lanning (1982); 50 = Prapavessis, Grove, McNair, & Cable (1992); 51 = Robazza, Pellizzari, & Hanin (2004); 52 = Ross & Berger (1996); 53 = Savoy (1993); 54 = Savoy (1997); 55 = Savoy & Beitel (1997); 56 = Sheard & Golby (2006); 58 = Terry, Coakley, & Karageorghis (1995); 59 = Thomas & Fogarty (1997); 60 = Thomas, Maynard, & Hanton (2007); 61 = Weinberg, Seabourne, & Jackson (1981); 62 = Weinberg, Seabourne, & Jackson (1982a); 63 = Weinberg, Seabourne, & Jackson (1982b); 64 = Wojcikiewicz & Orlick (1987).

Table 4. Summary of Effects for Alternative Stress Management Interventions (n = 9)

Outcome	Positive Effect (+)	No Effect (0)	Negative Effect (-)	No of Studies	Summary of Study Effects		
					+	0	-
Affective responses							
anger		57		1	0	1	0
angry behavior	8 (1.18)			1	1	0	0
arousal	7 (1.38)			1	1	0	0
cognitive anxiety direction		19 (.11), 43 (-.36)		2	0	2	0
cognitive anxiety intensity	43 (.24)	19 (.11)		2	1	1	0
confusion		36 (.05)		1	0	1	0
depression	36 (.60)	57		2	1	1	0
fatigue	36 (.56)			1	1	0	0
hostility		36 (-.78)		1	0	1	0
mood	6			1	1	0	0
pleasantness	7 (1.5)			1	1	0	0
somatic anxiety direction	43 (2.81)	19 (.22)		2	1	1	0
somatic anxiety intensity	43 (.41)	19 (.12)		2	1	1	0
state anger		8		1	0	1	0
state anxiety	12			1	1	0	0
tension	36 (.42)			1	1	0	0
trait anxiety	34			1	1	0	0
vigor		36 (.53)		1	0	1	0
Performance	7 (.40), 34, 57 (1.36)			3	3	0	0
Stress components and performance	7, 34	57*		3	2	1*	0

Note
Parentheses indicate effect sizes (Cohen's d) where calculable, * = mixed effects for stress components and performance
Study reference numbers: 6 = Bishop, Karageorghis, & Loizou (2007); 7 = Bishop, Karageorghis, & Kinrade (2009); 8 = Brunelle, Janelle, & Tennant (1999); 12 = Costa, Bonaccorsi, & Scrimali (1984); 19 = Devlin & Hanrahan (2005); 34 = Lanning & Hisanaga (1983); 36 = Laurin, Nicolas, & Lavallee (2008); 43 = Maynard, Hemmings, & Warwick-Evans (1995); 57 = Simpson & Karageorghis (2006).

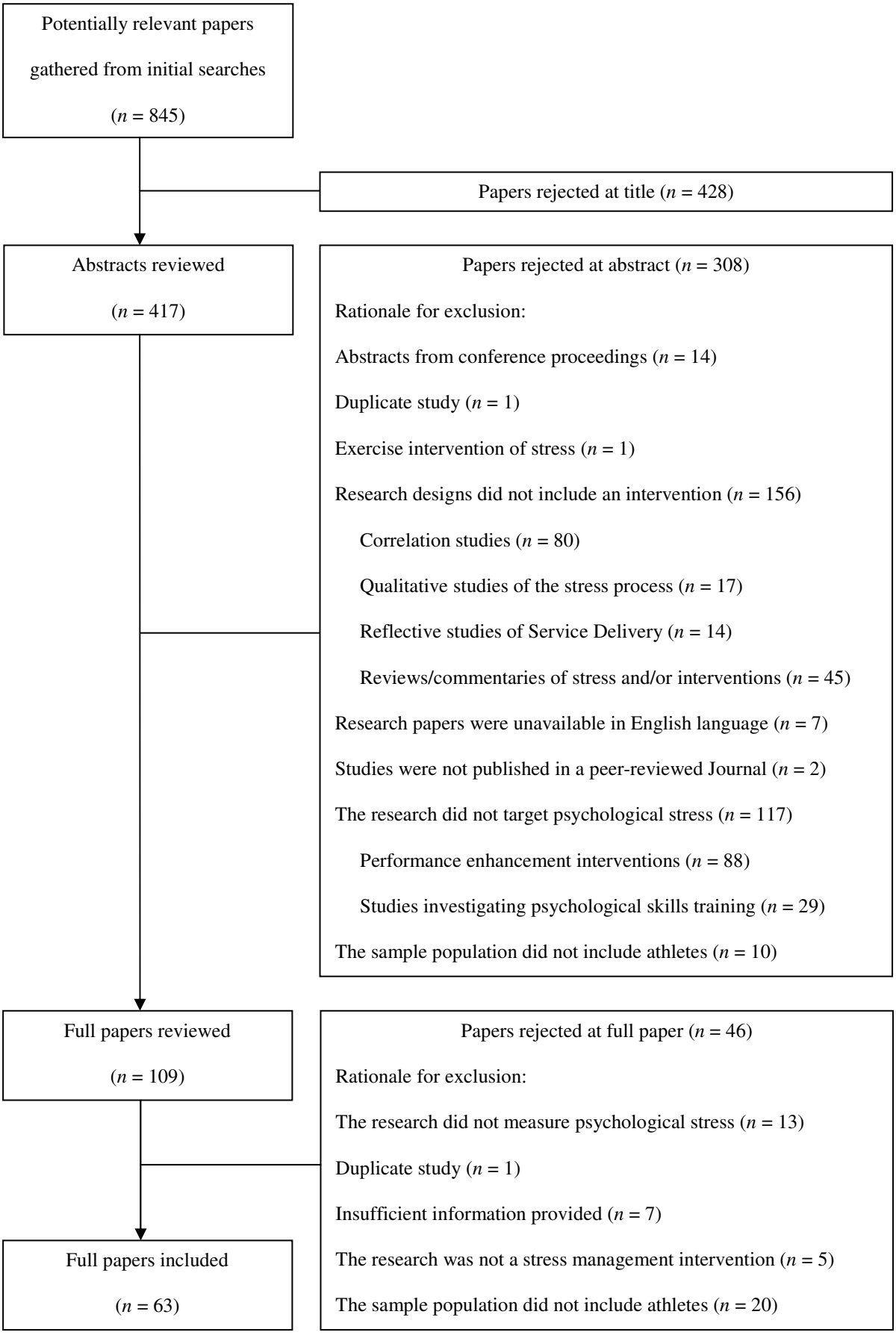

Figure 1. Flow diagram of the stages of the systematic review.