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PIO Systematic Review Paper: Psychological Assessors and Coping Strategies for Injured Athletes during Recovery

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Abstract

Due to the large number of athletes participating in sports who sustain injuries there are common negative psychological responses presented such as the loss of athletic identity, low self-esteem, depression, anxiety, and fear[1,4,13,15,18]. According to the National Athletic Trainers' Association (NATA) and the National Collegiate Athletic Association (NCAA), nearly one in three adolescents in the United States (31.9 %) will have an anxiety disorder[18] and around 10% will have depression[18,19]. The objective of this paper is to determine if there are psychological assessors and coping strategies to best determine psychological preparedness and evaluate these negative psychological effects of athletic injury for return to sport in athletes. The systematic review included 21 articles about the negative psychological responses associated with athletic injury and ways to identify and cope with them. The articles were reviewed from a retrospective database search, narrowed down by reading the titles, then abstracts, and lastly the articles. Search criteria included English language publications between 1996 and 2016, with a subject population of adolescents and young adults presenting with an injury from athletics. After review of the literature, the CES-D, BDI, and POMS were validated and utilized the most along with HRQOL and stated to have high reliability and sensitivity[3,8,10,14,18,19]. In regards to coping, when athletes were satisfied with social support, they reported fewer symptoms of depression ($p < 0.0001$) or anxiety ($p < 0.0001$) at return to play compared with athletes who were dissatisfied with the social support[20,21]. Thus, it is recommended to use a mixed methods approach with multiple assessors, such as the ERAIQ and the POMS scale to accurately obtain patient-rated measures from an injured athlete[4,14], as well as various coping strategies specific for the individual athlete, with social support emphasis throughout recovery[1,11,13,17,20,21].

Introduction

More than 30 million children and adolescents participate in organized sports, including interscholastic athletics, summer camps, club leagues, and sports enhancement programs, and there are approximately 460,000 NCAA student-athletes in the United States[10,18]. Out of those NCAA athletes approximately 1.6% will go on to the major professionals (pros) and 3.7% will go on to the total pros for football, 1.2% to major pros and 11.6% to total pros for men's basketball, 0.9% to major pro and 4.7% to total pro for women's basketball, 8.6% for men's baseball pros, 6.8% for men's ice hockey pros, and 1.4% for men's soccer pros[18]. Thus, the amount of injuries sustained is a massive number with individually unique side effects to each athlete[5,7,9,11,13,15,17,19].

Every individual responds differently to an experience, whether it is a traumatic incident such as a car crash, a broken leg, or a panic attack, or achieving a goal such as returning to play, or realizing a weight has lifted from your mind. Many athletes will sustain an injury at some point in their athletic career, which can lead to psychological and social consequences anytime during the recovery process or after[2,3,4,5,7,8,9,12,13,15,17,18,19,20,21]. A sport-related or athletic injury is classified as an injury sustained during exercise, sport, athletic practice or competition, and required the athlete to seek treatment due to restricted participation greater than one day[15]. In a study[7] of 15 sports with a follow-up of 16 years, there were13.8 sports injuries per 1000 athletes-exposures in games and 4.0 sports-injuries per training or practice. Athletes typically have to cope with these injuries relatively quickly in order to get back to the game. Negative psychological responses have mainly been associated with athletic injury, making it essential to cope with the injury and postinjury psychological effects[1,2,7,8,12,13,15,17,20].

The most common psychological responses to athletic injury are loss of athletic identity, tension, low self-esteem, depression and/or anxiety, fear, and frustration. Athletic identity is the degree to which an individual identifies with the athlete role, or how an individual perceives themselves[13]. During the recovery process following athletic injury, studies have found psychosocial responses to alter[1,2,4,7,13,15,18]. Several studies[4,12,13] discovered that during the early stages of rehabilitation, athletes often present frustration and depression due to their lack of athletic involvement. In the middle of recovery, athletes will usually experience poor adherence to the program or impatience to return to sport. Before return to play athletes may encounter self-confidence issues related to fear or anxiety of re-injury[4,12,13,15,17].

According to NATA and NCAA, nearly one in three adolescents in the United States (31.9 %) will have an anxiety disorder[18]. NCAA research shows that almost 85% of certified athletic trainers believe anxiety disorders are currently an issue with student-athletes on their campus[21]. Signs and symptoms of an anxiety disorder typically include feeling apprehensive and/or powerless, fear of a panic attack, an increased heart rate, breathing rapidly, sweating, trembling, and feeling weak or tired. Whether discussing “performance” anxiety or anxiety disorder (generalized anxiety), the construct of this emotion remains relatively similar[7,11,13,17,18]. Specifically, anxiety has a unique set of properties that distinguishes it from other emotions. For athletes and non-athletes, the thoughts and feelings that induce anxiety tend to be about the future. Thus, when an athlete is injured anxiety may be present throughout the recovery process and appear significantly before return to competition. Many people who experience anxiety will also experience depression[2,7,17,18].

Depression affects an estimated 6.7% of today’s adult population in a12-month –period[5,18]. According to the U.S. Department of Health and Human Services, the prevalence rates for

certain age groups, such as young adults and older adults, are higher. For example, the 12-month depression prevalence rate was 8.7% in 2008 in the 18-to-25 age group[18,19]. Given such a high prevalence rate in certain age groups and many in these age groups participating in athletics, it is reasonable to infer that there are thousands of athletes with depression participating at the high school and collegiate levels. Depression signs and symptoms include difficulty concentrating, remembering details, and making decisions; fatigue and decreased energy; feelings of guilt, worthlessness, and/or helplessness; feelings of hopelessness and/or pessimism; insomnia, early-morning wakefulness, or excessive sleeping; irritability and/or restlessness; loss of interest in activities or hobbies; overeating or appetite loss; persistent aches or pains, headaches, cramps, or digestive problems that do not ease even with treatment; persistent sad, anxious, or "empty" feelings; and thoughts of suicide or suicide attempts[3,13,17,18,21]. All people experience some of these feelings at times, but it becomes a disorder when these feelings become overwhelming, involve physical symptoms, and last for long periods of time that can keep one from leading a normal, active life.

Athletic injuries can hinder performance and negatively impact athletes' mental health and well-being, including threats to self-esteem, social isolation and motivational demands associated with rehabilitation[3,4,5,7,11,13,17,19,20]. Therefore, injury is one of the most demanding physical and psychological tests confronting athletes. The athlete's athletic identity is ultimately affected with the inability to participate or changing roles within the team due to the injury. This causes stress and anxiety and depression in many athletes, and may increase or decrease throughout treatment[3,4,13,17]. Athletes are generally independent individuals, and being injured may require them to be dependent, affecting their outlook on life and their self-esteem. Injured athletes experience negative psychological responses such as depression and anxiety throughout the

return to play process. Thus, understanding the negative psychological effects of athletic injury is pertinent to a successful recovery. Research shows psychological assessors to determine patient-rated outcome measures, as well as coping strategies to help an athlete control and diminish these negative psychological effects from injury. Therefore, this paper attempts to answer the question: "Are there psychological assessors and coping strategies to best evaluate negative psychological responses and determine psychological preparedness from the negative psychological responses of athletic injury for return to sport?"

Methods

This systematic review search considered articles that explored the negative psychological effects of athletic injury, psychological assessors, patient-rated outcome measures and coping strategies for an injured athlete to return to play. The study selection and search criteria included only peer-reviewed and full text articles. Publication types included in the search were meta-analysis, systematic review, cross-sectional studies, longitudinal studies, cohort studies, and randomized controlled trials. Only articles written in English language were reviewed for use, with publication between 1996 and 2016, and performed on human subjects. In order to narrow the search, articles were only considered if they discussed the importance of addressing negative psychological effects in athletes who sustained an injury. The articles were reviewed for age and gender ranges, sports, patient screening and self-reported measures per each study, time period of the study, acceptance of psychological assessors or coping methods, and how assessors were compared between other psychological scales and coping responses in correlation with coping strategies. Articles about negative psychological responses following athletic injury and characteristics of these responses were used to provide a background and understanding for which to analyze the numerical data and discussions.

After reading and reviewing the articles data applicable to the objective of the paper was extracted. This data, or principle summary measures, included the sensitivity, specificity, validity, reliability, percentage between various scales for psychological assessment, and variance between coping strategies. The methods, results and discussions of each study were compared to one another for combination of statistics or similar themes of the studies for this paper. Articles that did not discuss the negative psychological responses of athletes who had sustained an injury or coping methods during return to play were excluded from the study, as well as studies that only talked about psychological effects without regard to athletes. Relevant studies and information was obtained through multiple databases including PubMed, SPORTDiscus, CINAHL Complete, and ProQuest in Grand Valley State University's library database (all databases searched from December 20th, 2015 – March 29th, 2016). National Athletic Trainer's Association (NATA), *Journal of Athletic Training*, *Journal of Sport Rehabilitation*, and *Journal of Sport & Exercise Psychology* were also searched to obtain relevant articles.

The search terms entered into each database fell under three concepts: (1) athlete, injury, and athletic injuries; (2) biopsychosocial, psychosocial, psychological techniques, psychological scales, psychological assessors, patient-rated outcome measures, attitude to health, negative psychological effects, depression, anxiety, fear, motivation, reinjury, coping behavior, coping strategy, intervention, and sport psychology; and (3) return to sport, return to play, recovery, rehabilitation, sport competition, athletic participation. Keywords in each concept were grouped with the 'AND' in the database search bar. For example, the PubMed database and SPORTDiscus database search strategy included searching key words of "athletic injury AND psychological effects", "athlete AND depression", "athletic injury AND negative psychological

responses", "athlete AND return to play", "psychosocial AND athletic injury", "coping strategies AND athlete AND injury", and "depression AND anxiety". Terms not searched for included recreational athlete or questionnaire specifically, but if found in the articles with other key search words they were not necessarily excluded.

The search criteria for the PubMed database for "athletic injury AND psychology" resulted in as many as 888 article results and as few as 104 article results depending on the database and key words used. This meant only full-text English articles from the years of 1996-2016, with human subjects of either gender under the age of 45 years were searched. Using the prior stated selection criteria, the titles were reviewed, limiting the search to 80 articles. Then only clinical trials were searched, limiting the search to 35 articles and then the full abstracts were briefly read. In order to select articles for review, search characteristics included: discussion of application of either psychological assessment tool or coping strategy, academic journal, central themes (patient symptoms, athletic participation, etc), sustaining an athletic injury of some type, age of subjects (adolescents or young adults), gender (both male and female), and if the psychological state of an athlete was monitored or measured during return to play. After the previously stated criteria were enacted, the search yielded 20 articles. The studies were then reviewed, eliminating nine articles that did not truly apply to this papers purpose. Other searches were completed through other databases finding ten more articles specific to this paper on the use of psychological assessment or coping strategies of the negative psychological responses to athletic injuries. The process to determine these articles was similar to the search through PubMed. The PEDro scale was used to evaluate the articles and measure the level of evidence for each article. The range was from 6 to 9, with 6 being the lowest article and 9 being the highest.

Results

Demographics

Patient demographics throughout the majority of the studies were very similar (Table 1). The 15 articles reviewed reported on a total of 3,109 athletes who were adolescents and young adults, with a mean age around 21.0 (range = 11 to 54 years; Table 1). The athletes ranged from international level to recreational level. Gender was not a factor, but studies typically involved more men than women[1,3,9,10,17]. Patients had sustained an injury of some type, either orthopedic[4,5,7,9,11,16,17,19,20,21] or a concussion[5,9]. Inclusion criteria for recruitment included: (a) athlete, (b) had incurred a sport injury (through training or competition), (c) experienced an injuring requiring more than one day of absence, (d) had experienced their injury within the last few weeks, (e) were planning to return to sport upon recovery[17,19]. Participants were excluded if they (a) failed to complete all assessments over the course of the study, (b) experienced serious setbacks in their recovery and had to undergo additional surgery, (c) did not meet eligibility requirements[16].

Measures

Based on the selection criteria, subjects were then asked to complete self-report questionnaires before undergoing the rehabilitation process for return to play, typically within one week of injury[5]. Many athletes were identified using the Sport Injury Monitoring System (SIMS) at NCAA universities[5,8,11,17,19,20,21]. The questionnaires also included psychological assessment tools and coping scales to measure psychological responses from injury, health status and quality of life, feelings about themselves or the injury, coping abilities, and confidence and self-efficacy inventories. There were 29 scales found throughout 19 studies. These scales ranged from the Center for Epidemiological Studies Depression (CES-D) Scale to the State Trait

Anxiety Inventory (STAI) to the Injury-Psychological Readiness to Return to Sport (I-PRRS) Scale. Thus, there are many scales and psychological assessors out there to obtain patient-rated outcome measures for application[1,3,5,6,7,8,9,10,11,12,14,15,16,17,19,20,21].

Psychological Factors, Assessors and Interventions

Throughout the study review there were several main responses identified, specifically depression and anxiety following injury. Studies included personality variables such as hardiness, optimism or pessimism, fear, global self-esteem, competitive trait anxiety, as well as various coping strategies such as avoidance, goal-setting, relaxation skills, cognitive restructuring, thought stoppage, motivation and confidence training, imagery, and social support[2,4,7,8,15]. Before coping strategies can be applied the psychological assessment tools must be identified, including their ability to be able to recognize these negative psychological responses to athletic injury.

A commonly used scale includes the CES-D scale[3,19,21], which is a reliable list of 20 items of cognitive, affective, somatic, and behavioral aspects of depression and has been well validated[3]. In many studies, the CES-D scale is used in combination with the Beck Depression Inventory (BDI) and the Profile of Mood States (POMS) scale. BDI[3,16] is a 21-item, self-report rating inventory that measures characteristic attitudes and symptoms of depression. Internal consistency for the BDI ranges from 0.73 to 0.92 with a mean of 0.86, thus confirming its effectiveness for studies reviewed in this systemic review. The POMS scale[3,8,15,16] measures emotional reactions to an injury, which includes six subscales: Tension-Anxiety, Depression-Dejection, Anger-Hostility, Vigor-Activity, Fatigue-Inertia, and Confusion-Bewilderment. It has an internal reliability above 0.80 for all six subscales[16] and is based on a 5-point continuum from

0 (Not at all) to 4 (Extremely). Also, a Total Mood Disturbance (TMD) score can be obtained by adding the negative mood factors of Tension-Anxiety, Depression-Dejection, Anger-Hostility, Fatigue-Inertia, and Confusion-Bewilderment and subtracting the positive mood factor of Vigor-Activity. Typically, a shortened version of the POMS scale is used in studies for quantitative measurement of emotional responses to athletic injury[3,8,15,16].

The CES-D scale has been applied at the collegiate level[3,19] for 465 and 164 participants. The survey took about 10-15 minutes to complete. At one university[3], the individuals were divided into groups of injured and non-injured athletes and were tested at one week, one month, and three months post initial injury. The repeated measure analysis on CES-D scores displayed a significant depressive effect for time of follow-up ($F = 19.21$, $p < 0.001$) and a significant injury group by time ($F = 5.48$, $p < 0.01$), specifically for women[3]. In injured athletes, the simple effect of time was significant at $p < 0.0001$. It has been discovered that both groups of athletes reported high levels of depressive symptoms, as 33% of athletes with injury and 27% of non-injured athletes could be classified as depressed on the basis of the CES-D results[18].

Based on this data, the sensitivity and specificity of CES-D for depression was established using the Hamilton Rating Scale for Depression (SIGH-D) as the gold standard. Out of 13 injured athletes that stated they were depressed at one month follow-up according to the gold standard, 12 were identified as depressed using the CES-D. Thus, CES-D sensitivity was 92.3% at one month postinjury and relatively consistent throughout the full postinjury follow-up time period. Zero-order Pearson correlations between CES-D and SIGH-D scores were significant at all follow-up assessments ($rs = 0.72, 0.56, 0.29$; $p < 0.001$ for all, respectively)[3]. The CES-D scale was able to identify 23.7% of athletes with depressive symptoms and 6.3% with moderate to severe levels of depression[19]. Differences in gender were found throughout the

studies with women endorsing clinically relevant levels of depressive symptoms at significantly higher rates (28.5%) than men (17.6%) $\chi^2 = 7.459$, $p = 0.006$, and demonstrating 1.844 (95% Confidence Interval [CI]) times greater risk than men for having depression[3,19]. This data was also found using the BDI, with significant depressive symptoms found in injured athletes ($p = 0.005$), with women presenting as more significantly depressed than men ($p = 0.01$)[3,18].

The Emotional Responses of Athletes to Injury Questionnaire (ERAIQ) can serve as an initial interview of an injured athlete, typically in correlation with the POMS scale[15]. When athletes were examined at two-week intervals until return to sport four months later, the more seriously injured athletes reported increased tension, depression, and anger. Less seriously injured athletes displayed mood improvement within two weeks and more seriously injured athletes did not begin to improve mentally until a month postinjury[3,15]. The POMS scale can be utilized pre and postinjury. For example, in the high school and collegiate setting, there were increases in depression and anger of injured athletes on the postinjury POMS scale when compared to their preinjury score. Depression scores were 13 times higher when athletes were seriously injured as well[3,15].

POMS scale is often used in correlation with the I-PRRS Scale. Athletes were administered the scales one day after injury, completed after returning to full practice, before competition, and after the first day of competition. Athletic trainers also completed the I-PRRS within one day of competition and after competition. ANOVA (α level = 0.05) revealed a trend indicating an increase in I-PRRS scores immediately after injury to before practice and from before practice to before competition ($F = 68.26$, $p < 0.001$)[8]. TMD scores were also affected in the same time frames ($F = 27.98$, $p < 0.001$). Therefore, I-PRRS scores revealed negative correlations compared to TMD scores after injury ($r = -0.62$, $p = 0.002$), before practice ($r = -$

0.78, $p < 0.001$), before competition ($r = -0.59$, $p = 0.004$), and after competition ($r = -0.57$, $p = 0.005$)[8].

An increasingly common psychological assessment tool is the Health-Related Quality of Life (HRQOL) to measure clinical outcomes of treatment effectiveness for athletes returning to play from musculoskeletal injuries[10,14]. It is a broad, multidimensional concept that assesses the physical, psychological, and social domains of health related to individual experiences, expectations, beliefs, and perceptions. More often than not, HRQOL is combined with the Short-Form 36 Health Survey (SF-36) and/or the Pediatric Outcomes Data Collection Instrument (PODCL)[10,14]. The SF-36 assesses eight subscales: physical functioning (PF), role limitations due to physical health problems (RP), bodily pain (BP), general health perceptions (GH), vitality (VT), social functioning (SF), role limitations due to emotional problems (RE), and mental health (MH), with composite scores for physical (PCS) and mental (MCS) subscales.

It has been found to be valid and reliable ($\alpha = 0.78$-0.93)[10,14], while PODCI is commonly used in the pediatric population with internal consistency ($\alpha = 0.76$ to 0.92) and test-retest reliability ($r = 0.87$ to 0.97) to construct the validity of the scale. Based on a Bonferroni correction for multiple analyses, α was determined to be $p = 0.008$ for SF-36 and $p = 0.01$ for PODCI[7,10,14]. When 160 uninjured and 45 injured athletes were recruited from eight high schools to complete these surveys, the injured athletes reported lower scores for PF, RP, BP, and SF subscales and for the PCS score ($p < 0.008$)[10,14]. Injured athletes also reported lower scores for PCS and on the PODCI for global functioning on the HRQOL overall ($p < 0.01$). Therefore, the HRQOL can be utilized to determine how injured athletes feel overall throughout the recovery process and before and after they return to play[7,8,10,14].

Another scale or questionnaire than clinicians can utilize for emotional reactions of pain perception and returning to play include the Pain Catastrophizing Scale (PCS), the Fear-Avoidance Beliefs Questionnaire (FABQ) to develop and validate the Athlete Fear Avoidance Questionnaire (AFAQ)[6,7]. When 99 athletes completed these scales Pearson correlations revealed AFAQ was significantly correlated with the PCS ($r = 0.587$, $p < 0.001$), FABQ-Total ($r = 0.279$, $p = 0.005$), and FABQ-Physical Activity (PA) ($r = 0.352$, $p < 0.001$). Thus, the V coefficient and Cronbach α values (good: 0.805) for the PCS, FABQ-W, and FABQ-PA (0.87, 0.88, 0.77, respectively) represented a good internal validity and consistency[6,7]. Therefore, the AFAQ does indeed accurately measure fear avoidance in athletes following injury and should be used in concurrence with other assessors.

As athletes begin to go through the recovery process and approach return to play there are several scales that can be used to measure anxiety, like the AFAQ, and psychological preparedness, like the I-PRRS, in combination with providing coping strategies and ways to measure their effectiveness[4,11,20,21]. For example, anxiety is often measured using the STAI, a self-reported, 40-item questionnaire that includes 20 measures for each state anxiety and trait anxiety. There is excellent internal consistency ($\alpha = 0.86$ to 0.95) and test-retest reliability for state and trait anxiety ($r = 0.76$, $r = 0.86$, respectively)[4,21]. Anxiety has also been measured with the Sport Anxiety Scale (SAS)[11], the Reinjury Anxiety Inventory (RIAI)[17], and the Return to Sport After Serious Injury Questionnaire (RSSIQ)[17]. Social support has been validated to help with anxiety throughout previous studies[2,5,11,12,13,16,17,20,21].Therefore, it only seems reasonable that there is a scale to assess and identify the effectiveness of social support for injured athletes, with several being the 6-item Social Support Questionnaire (SSQ6)[5,20,21] and the Social Support Inventory (SSI)[16].

The SSQ6 assesses who provided support to the injured athlete during recovery and the athletes' degree of satisfaction with that social support provided from each individual. These individuals include (1) family, (2) friend, (3) coach, (4) athletic trainer (AT), (5) teammate, (6) physician, (7) counselor, or (8) other with satisfaction ranking of very satisfied, 1, to dissatisfied, 4[21]. It has been identified to have excellent internal reliability ($\alpha = 0.93$ to 0.96)[5,20,21]. When injured athletes were assessed using SSQ6 (126, 256, and 387, respectively) social support was primarily provided by family[5,20,21]. On average, 87%[5] to 96%[20] of all participating athletes reported relying on family, with a satisfaction of 5.7 out of 6. Followed by friends (84%), teammates (65%), ATs (57%), coaches (51%), and physicians (36%) and reported satisfaction with the support ($p = 0.046$)[5,21]. Female athletes reported relying on friends more ($p = 0.001$) than coaches ($p = 0.007$), ATs ($p < 0.0001$), physicians ($p < 0.0001$), and counselors ($p < 0.0001$) for social support and reported higher satisfaction scores than males[20].

When injured athletes completed a follow-up three months later the social support dimensions were altered, with athletes relying more on coaches ($p = 0.003$), ATs ($p < 0.0001$), and physicians ($p = 0.003$) for social support, while noting greater postinjury satisfaction received from friends ($p = 0.019$), coaches ($p = 0.001$), ATs ($p < 0.0001$), and physicians ($p = 0.003$). Male athletes reported decreased satisfaction with their family support at this time ($p = 0.011$) as well[20,21]. A main theme of social support postinjury included relying more on ATs. Male and female athletes reported relying on ATs more postinjury ($p < 0.0001$) with a greater satisfaction ($p < 0.0001$) when compared to preinjury scores[20,21]. These athletes were satisfied with social support from ATs and therefore, less likely to report symptoms of depression ($p < 0.0001$) or anxiety ($p < 0.0001$) at return to play compared with athletes who were dissatisfied with the social support received from ATs[20,21]. This data emphasizes the effects of this particular

relationship from the athletes' return to play and emotional responses observed and analyzed[5,20,21].

Similar to the SSQ6, the SSI resulted in five-factor solution that includes Acceptance-Belonging, Appraisal-Coping Assistance, Behavioral-Cognitive Guidance, Tangible Assistance-Material Aid, and Modeling (α = 0.93, 0.88, 0.81, 0.78, and 0.83, respectively), with high reliability (α = 0.96)[16]. It is a 39-item, self-report measure assessing perception of social resources using a 7-point Likert scale. The Coping With Health and Injury Problems (CHIP) scale was used in one study with the SSI to measure the emotional changes postinjury at 3, 6, 9, and 12 weeks post-surgery. The CHIP scale is a 32-item, self-report measure with four subscales including Instrumental, Negative Emotion, Distraction, and Palliative coping using a 5-point Likert scale, with an adequate internal reliability (α = 0.78 to 0.84)[12,16]. The Negative Emotion coping revealed significant changes over time (Wilks' $\lambda = 0.58$, $F = 3.78$, $p < 0.01$), noting a decrease from three to six weeks[16]. There was also significant changes over time with palliative coping (Wilks' $\lambda = 0.32$, $F = 10.43$, $p < 0.0001$), increasing from initial injury to three weeks and decreasing from three to six weeks[16].

The SSI and CHIP are similar tools to the RIAI, SAS, and RSSIQ as well as the Brief COPE and Sport Imagery Questionnaire (SIQ) because they all analyze anxiety during return to play, and determine different ways that injured athletes respond to injury to truly return to play[9,11,12,17]. The RIAI is a 28-item measure that assesses rehabilitation reinjury anxiety (RIA-R) and reentry into competition reinjury anxiety (RIA-RE). Research has shown this tool to have good internal reliability for RIA-R and RIA-RE (α = 0.98, 0.96, respectively) using a 7-point Likert scale[17]. The RSSIQ includes 21 items to assess return concerns and renewed perspective on sport, with an internal consistency of α = 0.89 and 0.68, respectively. The SAS is also a 21-

item measure for trait anxiety with a good internal consistency for somatic anxiety ($\alpha = 0.87$), worry ($\alpha = 0.91$), and concentration disruption ($\alpha = 0.70$)[11]. The SIQ is a 30-item questionnaire that reflects on the cognitive and motivational functions of imagery and includes five subscales: sport skills (CS-Skills), strategies and tactics (CS-Strategies), goal-related outcomes (MS-Goals), arousal (MG-Arousal), and mastery (MG-Mastery). The internal consistency ranged from $\alpha = 0.77$ to 0.90[11]. The Brief COPE is a 28-item self-report measure (or 48-item measure on the MCOPE) with 14 subscales including active coping, planning, positive reinterpretation, acceptance, humor, religion, seeking emotional social support, seeking informational social support, self-distraction, behavioral disengagement, denial, venting, substance use, and self-blame (as well as wishful thinking, instrumental reasons, and effort) rated on a 4-point Likert scale. The reliability was adequate ($\alpha > 0.60$) for all coping scales except self-blame ($\alpha = 0.47$)[9,17].

In regards to these coping strategies based on the various scales, SIQ[11] and RIAI[17] indicated that there were gender differences for coping (Wilks' $\lambda = 0.70$, $F = 2.61$, $p < 0.05$, $\eta^2 = 0.20$; Wilks' $\lambda = 0.90$, $F = 3.48$, $p < 0.001$, $\eta^2 = 0.10$, respectively), as well as return to sport outcomes (Wilks' $\lambda = 0.92$, $F = 14.5$, $p < 0.001$, $\eta^2 = 0.08$)[17]. Brief COPE also revealed gender differences for coping responses (Wilks' $\lambda = 0.79$, $F = 1.91$, $p = 0.03$, $\eta^2 = 0.21$)[9]. Univariate statistics were significant for CS-Skills ($F = 13.99$, $p = 0.001$, $\eta^2 = 0.29$), CG-Strategies ($F = 7.50$, $p = 0.01$, $\eta^2 = 0.18$), and MG-Arousal ($F = 6.67$, $p < 0.05$, $\eta^2 = 0.14$). Men reported higher scores (CS-Skills mean = 31.5 ± 7.5, CG-Strategies mean = 30.5 ± 5.7, MG-Arousal mean = 36.5 ± 5.7) than women (CS-Skills mean 24.6 ± 9.6, CG-Strategies mean = 25.4 ± 8.0, MG-Arousal mean = 30.8 ± 8.8)[11]. Men also reported significantly higher scores for mental imagery ($F = 3.43$, $p = 0.03$, $\eta^2 = 0.01$), relaxation ($F = 3.76$, $p = 0.05$, $\eta^2 = 0.01$), logical analysis ($F =$

4.94, $p = 0.03$, $\eta^2 = 0.01$), and venting emotions ($F = 50.66$, $p < 0.001$, $\eta^2 = 0.09$)[12]. In another study[17] women reported more venting of emotion ($F = 14.6$, $p < 0.001$, $\eta^2 = 0.05$) and return concerns ($F = 21.1$, $p < 0.001$, $\eta^2 = 0.06$) than men. These results are slightly conflicting and may be due to the participant size of the study[9,11,12,17]. Men reported lower scores for worry (10.2 ± 3.0) and concentration disruption (6.6 ± 2.3) than women (14.6 ± 5.5, 9.0 ± 3.3, respectively)[11,12]. While females reported more frequent self-distraction ($F = 4.26$, $p = 0.04$, $\eta^2 = 0.04$), active coping ($F = 4.46$, $p = 0.04$, $\eta^2 = 0.04$), instrumental support ($F = 6.11$, $p = 0.02$, $\eta^2 = 0.05$), and humor ($F = 3.82$, $p = 0.05$, $\eta^2 = 0.03$) than males[9]. Gender differences are found throughout studies similar to these when analyzing injury rates and return to play among athletes[1,2,9,11,12,17].

Besides gender, time loss was analyzed to be significantly related to suppression of competing activities ($r = 0.12$, $p < 0.05$), venting of emotions ($r = 0.21$, $p < 0.01$), effort ($r = 0.15$, $p < 0.01$), wishful thinking ($r = 0.14$, $p < 0.05$), and return concerns ($r = 0.24$, $p < 0.01$)[17]. It was determined after analyzing these studies that participants used planning and active coping, effort, and wishful thinking the most throughout recovery. When athletes used CG-Strategies they had lower scores for SAS ($F = 5.04$, $p < 0.05$), but when they used MG-Mastery participants had increased worry rates ($F = 2.99$, $p = 0.05$). It was also significant that the longer athletes were injured the less they used imagery (Wilks' $\lambda = 0.92$, $F = 3.97$, $p = 0.05$)[11,12].

These strategies can be grouped into avoidance-focused coping, emotion-focused coping, and problem-focused coping and personality dimensions of extraversion, neuroticism, openness, agreeableness, and conscientiousness[1,2]. MANOVA was significant ($F = 6.80$, $p < 0.01$, $\eta^2 = 0.12$) where women reported higher levels of neuroticism ($\alpha = 0.46$), agreeableness ($\alpha = 0.46$), and conscientiousness ($\alpha = 0.46$) than men. Higher levels of extraversion are associated with

problem-focused coping ($\beta = 0.15$, $p < 0.05$) when assessing personality and coping style. It was also found that athletes, who display emotional stability and openness and are extraverts, will likely adopt problem-focused coping as a strategy ($p < 0.01$). At high levels of extraversion, athletes who are compassionate and open are more likely to adopt emotion-focused coping strategies and when there is high emotional instability and low levels of openness there is more avoidance coping behavior present[1,2,12]. Overall, mental imagery, effort expenditure, thought control, support seeking, relaxation, logical analysis, distancing, mental distraction, venting emotions, and resignation were the common coping strategies[1,2,4,7,9,11,12,13,15,17].

Discussion

The population demographics (Table 1) do have an influence on how subjects responded to injury. If patients only had a minor injury the psychological responses were not as great of an effect and lasted for a shorter time period than when compared to a serious injury[3,15,18,19]. A relatively major injury would act as a stressor to athletes and have the potential to affect the psychological system for a longer period of time[16]. Age of the athlete also contributes to the response of an injury and recovery process. Research shows that at a young age, athletes have not sustained as many injuries and therefore do not know how to feel about the injury itself and react to it emotionally. Younger adolescents may be unable to apply the same coping strategies as others due to maturity level[12]. When adolescent athletes completed the SF-36, they had lower scores for physical functioning, pain, and social functioning and lower scores on the PODCI for global HRQOL[10]. This demonstrates that injury can affect adolescent's health beyond the physical domain. Athletes in their younger years are more affected by their athletic identities and their social interactions and family life[3,10,12,18], ultimately allowing injuries to create more

emotional distress. The studies reviewed did analyze high school athletes, which may have affected the outcomes of the study based on the factor of age alone[12,13].

Another large factor that affects how athletes respond to injury is gender. Throughout the results of the studies when using SSQ6, SIQ, SSI, and Brief COPE, gender appeared to be a common variable with differences in depression and anxiety and use of various coping strategies[3,5,9,10,11,12,15,16,17,19,20,21]. Men often sustained more injuries than women, however, regardless of injury status, women exhibited greater negative responses to injuries, specifically clinically relevant depressive symptoms[3,18,19]. Female athletes are four to seven times more likely to sustain a non-contact anterior cruciate ligament injury than males, which can be a very lengthy rehabilitation and therefore provide a time effect for higher anxiety and depression symptoms to arise[19].

In relation to gender differences for coping strategies and the effects on the psychological dimension, there are also significant changes found throughout the studies[5,9,11,17,20,21]. Females used cognitive imagery associated with both skills and strategies as well as imagery associated with excitement early in the rehabilitation plan less than males[11]. Injured female athletes reported more frequent use of self-distraction, active coping, instrumental support, humor, and self-blame than injured male athletes[9,17]. Male athletes reported more sources of social support than female athletes, however, female athletes were more satisfied with their overall support they received preinjury and postinjury[5,20,21]. Female athletes relied on family and friends more before they were injured, but after injury their sources of social support grew significantly. Therefore, it seems reasonable to conclude women are more willing to seek out help more than men when encountering health and mental issues[5,20].

These differences in coping between genders may reflect how society and the male sport environment has influenced and encouraged male athletes to minimize the effects of their injuries. This may also be the result of the culture of masculine sports, such as American football or baseball, where signs of injury or psychological responses can be viewed as a weakness. Also, males and females appraise orthopedic injuries differently, which is an important piece in how they respond to the injury. Females typically appraise stressors as more threatening than males and therefore may be more honest when reporting coping strategies or their responses to injury, whereas males may be more guarded[5,7,9,20,21]. Ultimately, social patterns are a large factor when considering the psychological responses and coping methods between genders. Studies are contradictory when stating that females tend to use problem-focused coping strategies more than males do, whereas others say females use more emotion-focused coping[1,2,12,17]. However, each individual is unique and has their own personality and history to consider before making gender assumptions on contradictory information.

Along with social patterns, personality factors have a major influence on how an individual responds to an injury. Anderson and Williams model and Weise-Bjornstal, Smith, and Shaffer[2,13] integrated a model of response to sport injury that provides a framework to assess the above statement. A summary of the model (Figure 1) dictates that a psychophysiological response is elicited if an athlete cognitively appraises a situation as stressful, has a history of stressors, has a personality to intensify the stress, and has inadequate or few coping resources, thereby increasing the likelihood of injury or affecting the response to injury[2,3,7,13,15]. It assesses the cognitive, behavioral, and emotional responses to injury influenced by personal, situational, and social factors. Personality factors include hardiness, locus of control, competitive trait anxiety, optimism, global self-esteem, openness, appraisal, etc.) As discussed throughout the

results, injury impacts the mind in a negative way the majority of the time, allowing self-esteem to decrease throughout recovery, which in turn permits for an increased risk for TMD and higher scores when using the POMS[2,4,7,9,13,15].

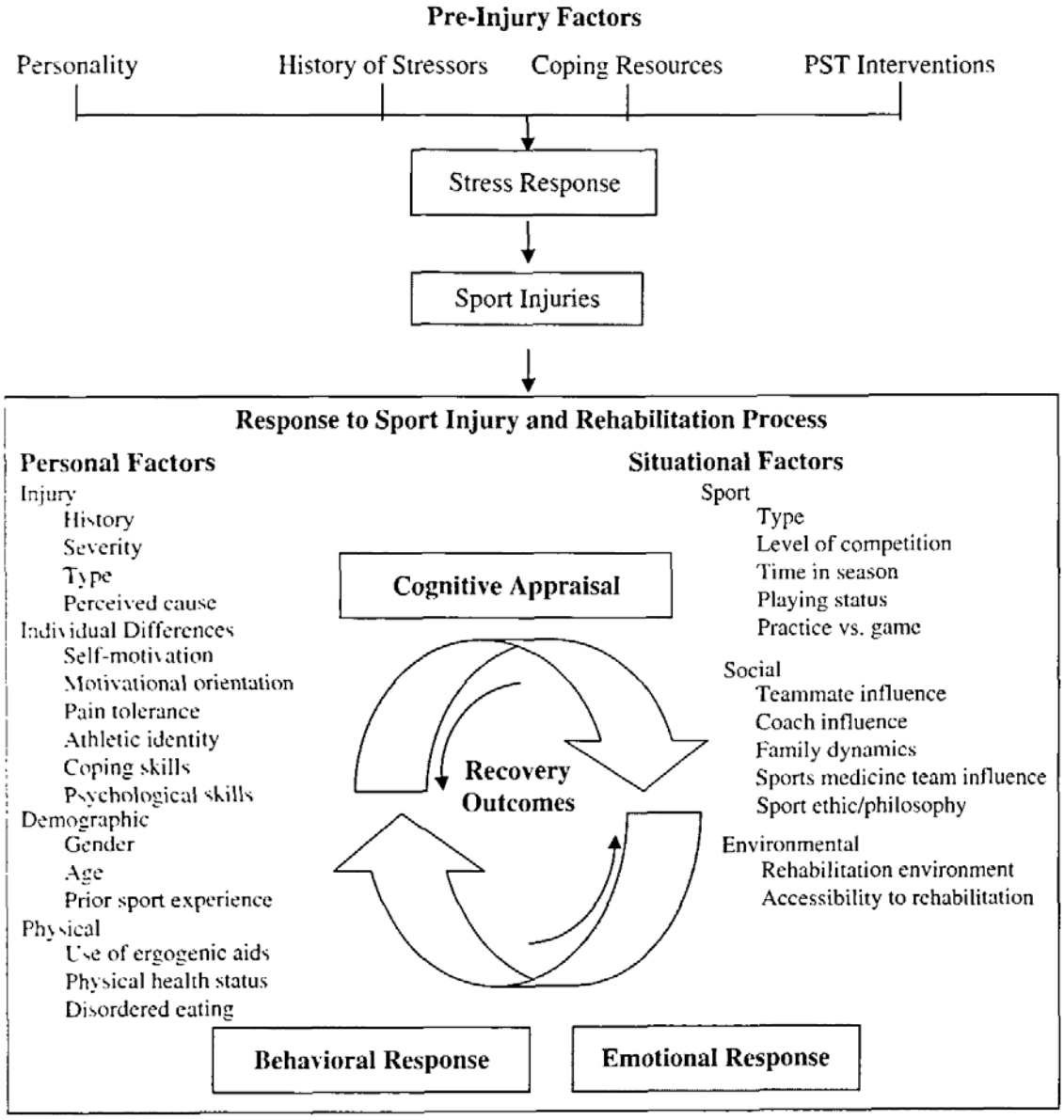

Figure 1. Williams and Anderson model integrated with Wiese-Bjornstal, Smith, and Shaffer to represent a model of response to sport injury including the psychological and sociological dimensions[2,7,13,15].

When athletes displayed optimism, global self-esteem, hardiness, and openness, there was a positive relationship between positive psychological measures and a decrease in injury-

time loss[7]. When athletes responded negatively to the stress or did not have adequate coping methods, the stress increased, negative psychological effects such as depression and anxiety increased along with injury time-loss, while overall there was a slower return to play[3,4,7,9,12,13,15,18,19]. For instance, one study[15] found that preinjury CI scores of 83.8 decreased to 64.0 following injury ($p < 0.01$), whereas non-injured athletes scores remained unchanged. Thus, a model such as in Figure 1, is useful to identify influencing factors that can affect the return to play and allow health-care providers to utilize as a type of checklist. Based on these factors, there are a variety of coping methods utilized by individuals that seem to significantly help, categorized into emotion - or problem-focused coping strategies typically[1,11,13,17].

Individuals that presented as extraverts used more problem-focused coping, especially if they were emotionally stable and open to new experiences. This describes an athlete that is socially skilled, cool headed, and happy to try new things. Extraverted athletes were more likely to use emotion-focused coping strategies if they were compassionate and open to new experiences. However, emotionally unstable athletes would use avoidance-focused coping behaviors and display neuroticism and disengagement. Those individuals who displayed positive emotions and psychological responses correlate with cognitive restructuring and social support properties[1,4,13].

Social support was determined to be a popular coping method during recovery throughout the results from the article review, specifically when utilizing SSI and SSQ6[5,9,11,17,20,21]. Research has concluded that athletes' social support patterns change after they become injured[17,20,21]. It was found that a majority of athletes would turn to coaches, ATs, and physicians postinjury. They also reported greater satisfaction received from friends, coaches, ATs, and physicians[4,20]. Emotional support is crucial to an injured athletes proper recovery[5,17,20,21]. This change in social

support is not surprising at a collegiate level, due to the fact injured athletes are at school and do not see their family as much, but have easy access to ATs, coaches, and teammates. Maintaining a relationship with their team is important, because they are already questioning their athletic identity and if the social support from the teammates and coaches is diminished they may respond more negatively with decreased motivation and commitment. The proportion of athletes who received social support from ATs increased from 43% to 83% postinjury, allowing social support to be recognized as a significant ($P = 0.01$) psychological intervention in athletes' injury recovery[20,21].

When athletes had greater satisfaction with their social support the risk of depression was decreased, as well as when ATs provided patients with a higher level of social support satisfaction[5,20,21]. It is crucial to have the right type of support available at the appropriate time, since individual athletes cope with stress differently over time. For example, immediately after injury athletes sought social support from family and significant others as a behavioral coping response to injury. Another common theme at this stage was that athletes who perceived their injury as severe had a more negative cognitive appraisal; whereas others would hope their injuries were not significant and appraised the injury more positively. As a diagnosis was made, athletes would respond differently to the injury[4,5]. Social support at this stage helps minimize the distress caused by the injury and allows the athlete to pursue rehabilitation for a more successful recovery.

In all settings, ATs can specifically enhance rehabilitation programs during functional return to play phase using imagery. As injured athletes begin treatment they typically respond with frustration[4,5,11,17]. Clinicians can help tame this frustration and "keep their heads in the game" by using various images representing cognitive and motivational factors, specifically CG-

Strategies and MG-Arousal imagery early in rehabilitation and CS-Skills, CG-Strategies, and MG-Arousal just before return to play[11]. However, if athletes already present with anxiety MG-Arousal should not be used and relaxation techniques would be more effective. The benefits of imagery include controlling that anxiety and arousal, enhancing pain management, increasing self-confidence and self-efficacy, decreasing muscle tension, and preparing the athlete to return to play following recovery. Desensitization to fear of reinjury is a primary example when imagery is utilized with injured athletes[1,13].

As athletes are nearing return to play status, they may experience negative and positive cognitive appraisals including nervousness, reinjury anxiety, caution, appreciation, and excitement[1,4,13,17]. When athletes reflected on their injuries and imagined themselves playing again the fear of reinjury anxiety decreased[4,17]. Throughout the entire recovery athletes remained consistent in their need for social support, even if from various sources. Findings of studies revealed that denial, wishful thinking, and venting of emotions mediated reinjury anxiety and return concerns. Thus, athletes would experience greater negative psychological effects than those who took active steps to handle the emotions and injury in some form[7,17]. If athletes disengaged in a behavioral coping sense, they were more likely to experience depression and a slower recovery rate[17]. When cognitive restructuring, positive self-talk, and thought stoppage techniques were applied athletes were able to avoid certain negative emotions and focus on positive rehabilitation outcomes instead.

Goal-setting is also a useful strategy briefly mentioned throughout the research review[7,13,15,17]. It has a positive effect on increasing athletes' motivation, rehabilitation adherence, and positive psychological responses. Realistic achievable goal setting is a way for injured athletes to direct their energies to ensure a rapid and safe return to play. In order to

determine what goals athletes should have though, psychological assessors should be initiated to determine what they would like out of the recovery as well as how the clinician can help them recover fully as a whole.

As stated in the results, common psychological scales include the CES-D scale, the POMS scale, the BDI, ERAIQ, I-PRRS, HRQOL, SF-36, AFAQ, SAS, STAI, RIAI, SSQ6, and the Brief COPE. These scales are all similar in that that they can assess emotional changes when athletes experience injury or when applying coping strategies with injury, yet each slightly different from one another. The CES-D, BDI, and POMS scales have been validated and utilized the most along with the HRQOL[3,10,14,18,19]. The CES-D scale determined that 6% of athletes had moderate to severe depressive symptoms, which was consistent with the major depression prevalence rate in the adult population found on a global depression scale rating (estimated 6.7% depression prevalence in a 12-month period)[18,19]. The CES-D scale is consistent with other research on depression, with clinician-based depression ratings for injured athletes exceeding those of healthy athletes. The POMS scale and the BDI were both stated to have high reliability and sensitivity[3,8,10,19]. The HRQOL is made up of a combination of activity-limitations and disability components that correlate the emotional, physical, and social well-being of the athlete, which is essential for recovery from an injury[10,14]. The ERAIQ is also a practical scale to guide the clinician through the injured athletes' recovery process and assesses most components of the model in Figure 1[15].

The I-PRRS scale and the AFAQ are tools to specifically assess how an athlete is feeling upon return to play and if they are psychologically prepared to do so. These tools are just as important as any of the others already discussed because injured athletes regain their confidence to play again at different times during their rehabilitation. The I-PRRS scale when used with the

POMS scale revealed that when TMD scores decreased at each time interval from initial injury to return to play, I-PRRS scores increased indicating mood states and psychological readiness are related[8]. The results of a study to validate the I-PRRS scale do contradict some research, but with further validation studies it could be a successful tool. Based on the results, AFAQ accurately measures fear avoidance in athletes and can be utilized to measure injury-related fear avoidance in athletes as a potential negative psychological barrier to rehabilitation. Utilizing scales to measure anxiety and depression can allow clinicians to address psychological barriers early in rehabilitation and potentially reduce recovery time[5,6,10].

There are three simple reasons why clinicians provide treatment to patients, which include making patients feel better, increasing longevity, and preventing future problems or ill health. Increasing longevity in an athlete means allowing an athlete to spend a longer time in full active participation of a sport. If athletic injuries are poorly managed than athletes may have a decrease in functional athletic performance and have further medical issues arise that affects the quality of their athletic performance. Thus, incorporating these patient self-report measures that assess an injury across a broad spectrum of health factors and psychosocial factors is extremely important. Evaluation of these scales is useful for identifying health issues, facilitating communication between the athlete and clinician, screening for other variables such as psychological issues that may be present, monitoring athletes' responses to treatment and rehabilitation, and determining how to progress the injured athlete to return to play[3,10,14,15].

Selecting a patient-rated outcome instrument or psychological assessor that is appropriate for each athlete is based on the criteria of the tool itself. Each athlete is uniquely different and therefore, may require multiple assessment tools to accurately and effectively help them. The tool should be for the appropriate gender and age of the athlete; whether it is for depression,

anxiety, or some other emotional response to the injury; if it is to assess personality factors in determining negative psychological responses or coping methods to help the athlete; and then how the treatment is helping the athlete physically and psychologically. For instance, the PODCI was created specifically for adolescents with more serious musculoskeletal conditions. Therefore, it may not be appropriate for high school athletes with minor injuries, and may produce ceiling effects or skew the sensitivity and specificity of that study[10]. Complementary measures may be worthwhile and should be used together in patient evaluations pre and postinjury and to monitor a patient's progress through recovery. Thus, it is recommended to use a mixed methods approach with multiple instruments and scales, such as the ERAIQ and the POMS scale to accurately obtain patient-rated measures from an injured athlete[4,14].

Throughout analysis of all the studies there were several common limitations. A large factor includes the sample size of the population and if it was a convenience sample. Throughout several studies[3,4,7,10,16,20] the sample size was relatively small or it was a convenience sample for the athletic population. The athletes may not have been a proper representation of athletes who compete at varying levels of competition[4]. A small sample size will result in a reduction of statistical power, whereas larger sample sizes permit the measurements and appropriate statistical analysis of multiple variables[7,16]. Other studies looked at the sample size in correlation with the age, gender, and sport variances as well[6]. One study consisted of large numbers of white, male athletes[20], and in another, male white football athletes[5].

Another limitation relates to the injury type and severity of the injury itself. Some studies[3,10] did not have enough information on the types of injuries to classify severity, whereas other studies only represented minor[5] or severe[4] injuries. Time was also a factor in several studies depending on the injury type and severity, because some athletes faced long rehabilitation

before return to play allowing greater negative psychological effects to occur[16], whereas other athletes did not miss much time from participation[8]. The history of the patient itself is important because if the athletes' psychological status was not assessed once the injury had occurred there could be life events occurring unrelated to the injury causing depression and/or anxiety[7,21], or the athlete could have a history or family history of depression[3].

The study design itself was also a limiting factor in several studies[1,17], because a longitudinal study design would be preferred with repeated assessments of psychological factors and rehabilitation outcomes than a cross-sectional design for the type of information desired. Lastly, a self-report measure does allow some bias[9,18] because athletes may underreport depression or anxiety symptoms in an attempt to portray themselves in a more favorable light or not show weakness, depending on the individual athletes' view on the situation at hand. There appears to be a tendency to portray a picture of psychological strength in the athletic environment and therefore, makes psychological assessment slightly more difficult. Further research should take into account the concern of underreporting with patient-rated outcome measures, as well as all the other limitations stated.

Further research should also be conducted to specifically assess sport, gender, age, injury, and location in correlation with the assessment and management of depression and anxiety and other various negative psychological responses to injury during the return to play process. Education of the athlete about the injury, psychological responses, and coping methods is extremely important from the products of studies such as reviewed in this paper[3]. Additional work is needed to enhance societies understanding of negative psychological responses to injury, specifically depression and anxiety due to their high prevalence in athletics and recovery programs.

Overall, this review found evidence that negative psychological responses such as depression and anxiety are very prevalent in athletes who have been injured and affect the athlete throughout the return to play process. Positive psychological responses are desired, due to the associated increased return to sport rate after injury, a faster return, and a greater likelihood to return to preinjury participation level. There are a variety of psychological assessors for preinjury status and postinjury status to monitor athletes' progress psychologically and emotionally as they go through rehabilitation. Overall, there is not one best psychological tool to utilize, and they should be used in combination with one another to provide the most benefit to the athlete. There are also a variety of coping methods present, and social support appeared to be the most prominent coping strategy for athletes to utilize to better return to play. Ultimately, clinicians should focus on the emphasis of how psychological effects also interact with the return to play process of an injured athlete and be able to identify what scales and methods are appropriate for the athlete.

Table 1. Population demographics of athletes throughout 19 studies reviewed including population age and location, sport, and number (ratio of gender).

Demographics					
Study	**Population**	**Sport**	**Subject number**	**Gender (M:F)**	**Age (year); mean (SD)**
Allen et al (1)	University, club, regional, national, international	34 sports, unspecific report	253	187:66	21.1 (3.7)
Andersen & Williams (2)	NCAA Division I (2)	gymnastics (36), swimming (48), cross country (24), track and field (27), wrestling (7), football (2), baseball (7), softball (6), volleyball (21), basketball (18)	196	79:117	range = 18 to 23
Appaneal et al (3)	NCAA Division I and II; 3 high schools in eastern US	football (46%), basketball (17%), soccer (15%), volleyball (9%), baseball (6%), gymnastics (4%), track and field (3%), wrestling (1%)	164	108:56	19.7 (2.0) (range = 14 to 24)
Clement et al (4)	NCAA Division II (mid-Atlantic region of US)	acrobatics/tumbling (4), football (3), baseball (1)	8	4:04	range = 18 to 22
Covassin et al (5)	NCAA Division I (2 Big Ten Universities)	football (55.6%), wrestling (14.3%), softball (6.3%), W soccer (6.3%), volleyball (6.3%), W basketball (4.8%), field hockey (3.2%), baseball (1.6%), M basketball (1.6%)	126	1/3/1900 20:34	22.69 (1.75) (range = 18 to 24)
Dover & Amar (6)	university varsity athletes	soccer, rugby, football, basketball, hockey	103	Not reported	Not reported
Ford et al (7)	Australian: state, national, international	football (41), basketball (20), cricket (14), field hockey (9), netball (26), volleyball (11)	121	65:56:00	22.5 (3.6) (range = 16 to 34)
Glazer (8)	NCAA Division II or III	football (9), basketball (3), wrestling (1), ice hockey (2), lacrosse (5), field hockey (2)	22	18:04	19.7 (1.4) (range = 18 to 22)
Kontos (9)	NCAA Division I	football (37%), soccer	121	74:49:00	19.25

	and III; 3 local high schools in mid-Atlantic region of US	(36%), basketball (12%), volleyball (5%), softball (1.6%), track (1.6%), wrestling (1.6%), rugby (1.6%), gymnastics (0.8%), crew (0.8%)			(2.15) (range = 14 to 24)
Nicholls et al (10)	international/national, academy, county, club	Not reported	527	322:205	13.77 (1.97) (range = 11 to 19)
Udry (16)	NCAA Division III, recreational, high school	Not reported	25	15:10	27.9 (8.4) (range = 16 to 40)
Wadey et al (17)	NCAA Division I - III, state, national, international	soccer (55), football (39), basketball (36), softball (22), track and field (23), skiing (13), volleyball (12), rugby (11), snowboarding (10)	335	209:126	23.5 (6.6) (range = 18 to 54)
Wolanin et al (19)	NCAA Division I in NE US	baseball/softball (68), basketball (26), cheerleading (35), crew (23), cross-country (10), field hockey (23), golf (9), lacrosse (111), soccer (52), swimming (1), tennis (25), track and field (82)	465	199:263:3	Not reported
Yang et al (20)	NCAA Division I (Big Ten Conference)	football (21.9%), baseball (14.1%), wrestling (12.5%), spirit squad (11.7%) (basketball, track, golf, gymnastics, cross-country, tennis, rowing, field hockey)	256	167:89	20 (1.3)
Yang et al (21)	NCAA Division I (2 Big Ten Conference universities)	baseball (25), basketball (70), football (235), wrestling (119), field hockey (35), soccer (41), softball (38), volleyball (31)	387	256:131	Not reported

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1. **Define your question using PICO** by identifying: Problem, Intervention, Comparison Group and Outcomes.

Your question should be used to help establish your search strategy.

Patient/Problem Injured athletes encounter negative psychological responses during the return to play process.

Intervention Psychological assessors of patient-rated outcome measures integrated with coping strategies to identify and evaluate the negative psychological effects.

Outcome There will be a few superior psychological assessors and coping strategies identified for psychological identification, intervention, and preparedness to return to play.

Write out your question: "Are there psychological assessors and coping strategies to best evaluate negative psychological responses and determine psychological preparedness from the negative psychological responses of athletic injury for return to sport?"

PEDro Scale

Allen, M. S., Greenlees, I., & Jones, M. (2011). An investigation of the five-factor model of personality and coping behaviour in sport. *Journal of Sports Sciences, 29*(8), 841-850. doi:10.1080/02640414.2011.565064

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1. eligibility criteria were specified — no ❑ yes ☑ where:

   Methods – Page 843

2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes ❑ where:

   Not specified.

3. allocation was concealed

   Not specified. — no ☑ yes❑ where:

4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:

   Methods – Page 843

5. there was blinding of all subjects

   Not specified. — no ☑ yes ❑ where:

6. there was blinding of all therapists who administered the therapy

   Not specified. — no ☑ yes ❑ where:

7. there was blinding of all assessors who measured at least one key outcome

   Not specified. — no ☑ yes ❑ where:

8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:

   Results – Page 845-846

9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to treat” — no ❑ yes ☑ where:

   Methods – Page 843

10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:

    Results – Page 845-846

11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:

    Results – Pages 845-846

= 6/10

PEDro Scale

Andersen, M. B., & Williams, J. M. (1999). Athletic injury, psychosocial factors and perceptual changes during stress. *Journal of Sports Sciences, 17*(9), 735-741. doi:10.1080/026404199365597

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1. eligibility criteria were specified — no ❑ yes ☑ where:
   Methods – Page 737
2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes ❑ where:
   Not specified.
3. allocation was concealed
   Not specified. — no ☑ yes❑ where:
4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:
   Methods – Page 737
5. there was blinding of all subjects
   Not specified. — no ☑ yes ❑ where:
6. there was blinding of all therapists who administered the therapy
   Not specified. — no ☑ yes ❑ where:
7. there was blinding of all assessors who measured at least one key outcome
   Not specified. — no ☑ yes ❑ where:
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:
   Results – Page 739-740
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to treat” — no ❑ yes ☑ where:
   Methods – Page 737-738
10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:
    Results – Page 739-740
11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:
    Results – Pages 739-740

= 6/10

PEDro Scale

Appaneal, R., Levine, B., Perna, F., & Roh, J. (2009). Measuring postinjury depression among male and female competitive athletes. *Journal of Sport & Exercise Psychology, 31*(1), 60-76.

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1. eligibility criteria were specified — no ❑ yes ☑ where:
   Methods – Page 63-64
2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ❑ yes ☑ where:
   Methods – Page 64-65
3. allocation was concealed
   Not specified. — no ☑ yes❑ where:
4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:
   Methods – Page 64-65
5. there was blinding of all subjects
   Not specified. — no ☑ yes ❑ where:
6. there was blinding of all therapists who administered the therapy
   Methods – Page 65 — no ❑ yes ☑ where:
7. there was blinding of all assessors who measured at least one key outcome
   Methods – Page 65 — no ❑ yes ☑ where:
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:
   Results – Page 66-70
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by "intention to treat" — no ❑ yes ☑ where:
   Methods – Page 64
10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:
    Results – Page 66-70
11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:
    Results – Pages 66-70

= 9/10

PEDro Scale

Clement, D., Arvinen-Barrow, M., & Fetty, T. (2015). Psychosocial responses during different phases of sport-injury rehabilitation: A qualitative study. *Journal of Athletic Training, 50*(1), 95-104. doi:10.4085/1062-6050-49.3.52

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1. eligibility criteria were specified — no ❑ yes ☑ where:
   Methods – Page 96
2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes ❑ where:
   Not specified.
3. allocation was concealed
   Not specified. — no ☑ yes❑ where:
4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:
   Methods – Page 96
5. there was blinding of all subjects
   Not specified. — no ☑ yes ❑ where:
6. there was blinding of all therapists who administered the therapy
   Not specified. — no ☑ yes ❑ where:
7. there was blinding of all assessors who measured at least one key outcome
   Not specified. — no ☑ yes ❑ where:
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:
   Results – Page 98-100
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to treat” — no ❑ yes ☑ where:
   Methods – Page 96
10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:
    Results – Page 98-100
11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:
    Results – Pages 98-100

= 6/10

PEDro Scale

Covassin, T., Crutcher, B., Bleecker, A., Heiden, E. O., Dailey, A., & Yang, J. (2014). Postinjury anxiety and social support among collegiate athletes: A comparison between orthopaedic injuries and concussions. *Journal of Athletic Training (Allen Press), 49*(4), 462-468.

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1. eligibility criteria were specified — no ❑ yes ☑ where:
   Methods – Page 463
2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes ❑ where:
   Not specified.
3. allocation was concealed
   Methods – Page 463 — no ❑ yes ☑ where:
4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:
   Methods – Page 463-464
5. there was blinding of all subjects
   Not specified. — no ☑ yes ❑ where:
6. there was blinding of all therapists who administered the therapy
   Not specified. — no ☑ yes ❑ where:
7. there was blinding of all assessors who measured at least one key outcome
   Not specified. — no ☑ yes ❑ where:
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:
   Results – Page 464-466
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to treat” — no ❑ yes ☑ where:
   Methods – Page 463
10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:
    Results – Page 464-466
11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:
    Results – Pages 464-466

= 7/10

PEDro Scale

Dover, G., & Amar, V. (2015). Development and validation of the athlete fear avoidance questionnaire. *Journal of Athletic Training, 50*(6), 634-642. doi:10.4085/1062-6050-49.3.75

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1. eligibility criteria were specified — no ❑ yes ☑ where:
   Methods – Page 635-636
2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes ❑ where:
   Not specified.
3. allocation was concealed
   Not specified. — no ☑ yes ❑ where:
4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:
   Methods – Page 635-636
5. there was blinding of all subjects
   Not specified. — no ☑ yes ❑ where:
6. there was blinding of all therapists who administered the therapy
   Not specified. — no ☑ yes ❑ where:
7. there was blinding of all assessors who measured at least one key outcome
   Not specified. — no ☑ yes ❑ where:
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:
   Results – Page 637-638
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to treat” — no ❑ yes ☑ where:
   Methods – Page 635
10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:
    Results – Page 636-638
11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:
    Results – Pages 637-638

= 6/10

PEDro Scale

Ford, I. W., Eklund, R. C., & Gordon, S. (2000). An examination of psychosocial variables moderating the relationship between life stress and injury time-loss among athletes of a high standard. *Journal of Sports Sciences, 18*(5), 301-312. doi:10.1080/026404100402368

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1. eligibility criteria were specified — no ❑ yes ☑ where:

   Methods – Page 305

2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes ❑ where:

   Not specified.

3. allocation was concealed

   Not specified. — no ☑ yes ❑ where:

4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:

   Methods – Page 303-305

5. there was blinding of all subjects

   Not specified. — no ☑ yes ❑ where:

6. there was blinding of all therapists who administered the therapy

   Not specified. — no ☑ yes ❑ where:

7. there was blinding of all assessors who measured at least one key outcome

   Not specified. — no ☑ yes ❑ where:

8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:

   Results – Page 305-308

9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to treat” — no ❑ yes ☑ where:

   Methods – Page 304

10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:

    Results – Page 305-308

11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:

    Results – Pages 305-308

= 6/10

PEDro Scale

Glazer, D. (2009). Development and preliminary validation of the injury-psychological readiness to return to sport (I-PRRS) scale. *Journal of Athletic Training, 44*(2), 185-189. doi:10.4085/1062-6050-44.2.185

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1. eligibility criteria were specified — no ❑ yes ☑ where:

   Methods – Page 186

2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes ❑ where:

   Not specified.

3. allocation was concealed

   Not specified. — no ☑ yes ❑ where:

4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:

   Methods – Page 186

5. there was blinding of all subjects

   Not specified. — no ☑ yes ❑ where:

6. there was blinding of all therapists who administered the therapy

   Not specified. — no ☑ yes ❑ where:

7. there was blinding of all assessors who measured at least one key outcome

   Not specified. — no ☑ yes ❑ where:

8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:

   Results – Page 187

9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to treat” — no ❑ yes ☑ where:

   Methods – Page 186

10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:

    Results – Page 187-188

11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:

    Results – Pages 187-188

= 6/10

PEDro Scale

Kontos, A. P., Elbin, R. J., Appaneal, R. N., & Covassin, T. (2013). Coping responses among high school and college athletes with concussion, orthopaedic injuries, and healthy controls. *Research in Sports Medicine, 21*, 367-379. doi:10.1037/e656462012-001

1.	eligibility criteria were specified	no ❑ yes ☑ where:
	Methods – Page 370-371	
2.	subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received)	no ❑ yes ☑ where:
	Methods – Page 370-371	
3.	allocation was concealed	
	Methods – Page 370-371	no ❑ yes ☑ where:
4.	the groups were similar at baseline regarding the most important prognostic indicators	no❑ yes ☑ where:
	Methods – Page 370-371	
5.	there was blinding of all subjects	
	Not specified.	no ☑ yes ❑ where:
6.	there was blinding of all therapists who administered the therapy	
	Not specified.	no ☑ yes ❑ where:
7.	there was blinding of all assessors who measured at least one key outcome	
	Not specified.	no ☑ yes ❑ where:
8.	measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	no ❑ yes ☑ where:
	Results – Page 373	
9.	all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to treat”	no ❑ yes ☑ where:
	Methods – Page 370	
10.	the results of between-group statistical comparisons are reported for at least one key outcome	no ❑ yes ☑ where:
	Results – Page 373	
11.	the study provides both point measures and measures of variability for at least one key outcome	no ❑ yes ☑ where:
	Results – Pages 373	

= 8/10

PEDro Scale

Mcleod, T. C., Bay, R. C., Parsons, J. T., Sauers, E. L., & Snyder, A. R. (2009). Recent injury and health-related quality of life in adolescent athletes. *Journal of Athletic Training, 44*(6), 603-610. doi:10.4085/1062-6050-44.6.603

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1. eligibility criteria were specified — no ❑ yes ☑ where:
   Methods – Page 604
2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes ❑ where:
   Not specified.
3. allocation was concealed
   Not specified. — no ☑ yes ❑ where:
4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:
   Methods – Page 640-641
5. there was blinding of all subjects
   Not specified. — no ☑ yes ❑ where:
6. there was blinding of all therapists who administered the therapy
   Not specified. — no ☑ yes ❑ where:
7. there was blinding of all assessors who measured at least one key outcome
   Not specified. — no ☑ yes ❑ where:
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:
   Results – Page 605
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to treat” — no ❑ yes ☑ where:
   Methods – Page 604
10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:
    Results – Page 605
11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:
    Results – Pages 605

= 6/10

PEDro Scale

Monsma, E., Mensch, J., & Farroll, J. (2009). Keeping your head in the game: Sport-specific imagery and anxiety among injured athletes. *Journal of Athletic Training, 44*(4), 410-417. doi:10.4085/1062-6050-44.4.410

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1. eligibility criteria were specified — no ❑ yes ☑ where:

   Methods – Page 411

2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes ❑ where:

   Not specified.

3. allocation was concealed

   Not specified. — no ☑ yes ❑ where:

4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:

   Methods – Page 413-414

5. there was blinding of all subjects

   Not specified. — no ☑ yes ❑ where:

6. there was blinding of all therapists who administered the therapy

   Not specified. — no ☑ yes ❑ where:

7. there was blinding of all assessors who measured at least one key outcome

   Not specified. — no ☑ yes ❑ where:

8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:

   Results – Page 413-414

9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to treat” — no ❑ yes ☑ where:

   Methods – Page 411

10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:

    Results – Page 413-414

11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:

    Results – Pages 413-414

= 6/10

PEDro Scale

Nicholls, A., Polman, R., Moley, D., & Taylor, N. (2009). Coping and coping effectiveness in relation to a competitive sport event: Pubertal status, chronological age, and gender among adolescent athletes. *Journal of Sport & Exercise Psychology, 31*(3), 299-317.

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1. eligibility criteria were specified — no ❑ yes ☑ where:
   Methods – Page 304
2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes ❑ where:
   Not specified.
3. allocation was concealed
   Not specified. — no ☑ yes ❑ where:
4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:
   Methods – Page 304
5. there was blinding of all subjects
   Not specified. — no ☑ yes ❑ where:
6. there was blinding of all therapists who administered the therapy
   Not specified. — no ☑ yes ❑ where:
7. there was blinding of all assessors who measured at least one key outcome
   Not specified. — no ☑ yes ❑ where:
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:
   Results – Page 307-309
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by "intention to treat" — no ❑ yes ☑ where:
   Methods – Page 306
10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:
    Results – Page 307-309
11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:
    Results – Pages 307-309

= 6/10

PEDro Scale

Udry, E. (1997). Coping and social support among injured athletes following surgery. *Journal of Sport & Exercise Psychology, 19*(1), 71-90.

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1. eligibility criteria were specified — no ❑ yes ☑ where:
   Methods – Page 77
2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes ❑ where:
   Not specified.
3. allocation was concealed
   Not specified. — no ☑ yes ❑ where:
4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:
   Methods – Page 77
5. there was blinding of all subjects
   Not specified. — no ☑ yes ❑ where:
6. there was blinding of all therapists who administered the therapy
   Not specified. — no ☑ yes ❑ where:
7. there was blinding of all assessors who measured at least one key outcome
   Not specified. — no ☑ yes ❑ where:
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:
   Results – Page 80-81
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by "intention to treat" — no ❑ yes ☑ where:
   Methods – Page 77
10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:
    Results – Page 80-83
11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:
    Results – Pages 80-83

= 6/10

PEDro Scale

Wadey, R., Podlog, L., Hall, M., Hamson-Utley, J., Hicks-Little, C., & Hammer, C. (2014). Reinjury anxiety, coping, and return-to-sport outcomes: A multiple mediation analysis. *Rehabilitation Psychology*,*59*(3), 256-266. doi:10.1037/a0037032

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1. eligibility criteria were specified — no ❑ yes ☑ where:

   Methods – Page 258

2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes ❑ where:

   Not specified.

3. allocation was concealed

   Not specified. — no ☑ yes ❑ where:

4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:

   Methods – Page 258

5. there was blinding of all subjects

   Methods – Page 259 — no ❑ yes ☑ where:

6. there was blinding of all therapists who administered the therapy

   Methods – Page 259 — no ❑ yes ☑where:

7. there was blinding of all assessors who measured at least one key outcome

   Methods – Page 259 — no ❑ yes ☑ where:

8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:

   Results – Page 260-261

9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to treat” — no ❑ yes ☑ where:

   Methods – Page 258-259

10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:

    Results – Page 260-261

11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:

    Results – Pages 260-261

= 9/10

PEDro Scale

Wolanin, A., Hong, E., Marks, D., Panchoo, K., & Gross, M. (2016). Prevalence of clinically elevated depressive symptoms in college athletes and differences by gender and sport. *British Journal of Sports Medicine Br J Sports Med, 50*(3), 167-171. doi:10.1136/bjsports-2015-095756

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1. eligibility criteria were specified — no ❑ yes ☑ where:

   Methods – Page 168

2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes ❑ where:

   Not specified.

3. allocation was concealed

   Not specified. — no ☑ yes ❑ where:

4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:

   Methods – Page 168

5. there was blinding of all subjects

   Methods – Page 168 — no ❑ yes ☑ where:

6. there was blinding of all therapists who administered the therapy

   Methods – Page 168 — no ❑ yes ☑ where:

7. there was blinding of all assessors who measured at least one key outcome

   Methods – Page 168 — no ❑ yes ☑ where:

8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:

   Results – Page 168-169

9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to treat” — no ❑ yes ☑ where:

   Methods – Page 168

10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:

    Results – Page 168-169

11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:

    Results – Pages 168-169

= 9/10

PEDro Scale

Yang, J., Peek-Asa, C., Lowe, J. B., Heiden, E., & Foster, D. T. (2010). Social support patterns of collegiate athletes before and after injury. *Journal of Athletic Training, 45*(4), 372-379. doi:10.4085/1062-6050-45.4.372

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1. eligibility criteria were specified — no ❑ yes ☑ where:

   Methods – Page 373

2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes ❑ where:

   Not specified.

3. allocation was concealed

   Not specified. — no ☑ yes❑ where:

4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:

   Methods – Page 373

5. there was blinding of all subjects

   Not specified. — no ☑ yes ❑ where:

6. there was blinding of all therapists who administered the therapy

   Not specified. — no ☑ yes ❑ where:

7. there was blinding of all assessors who measured at least one key outcome

   Not specified. — no ☑ yes ❑ where:

8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:

   Results – Page 374-376

9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by "intention to treat" — no ❑ yes ☑ where:

   Methods – Page 373

10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:

    Results – Page 374-376

11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:

    Results – Pages 374-376

= 6/10

PEDro Scale

Yang, J., Schaefer, J. T., Zhang, N., Covassin, T., Ding, K., & Heiden, E. (2014). Social support from the athletic trainer and symptoms of depression and anxiety at return to play. *Journal of Athletic Training,49*(6), 773-779. doi:10.4085/1062-6050-49.3.65

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1. eligibility criteria were specified — no ❑ yes ☑ where:
   Methods – Page 774
2. subjects were randomly allocated to groups (in a crossover study, subjects were randomly allocated an order in which treatments were received) — no ☑ yes❑ where:
   Not specified.
3. allocation was concealed
   Not specified. — no ☑ yes❑ where:
4. the groups were similar at baseline regarding the most important prognostic indicators — no❑ yes ☑ where:
   Methods – Page 774
5. there was blinding of all subjects
   Not specified. — no ☑ yes ❑ where:
6. there was blinding of all therapists who administered the therapy
   Not specified. — no ☑ yes ❑ where:
7. there was blinding of all assessors who measured at least one key outcome
   Not specified. — no ☑ yes ❑ where:
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups — no ❑ yes ☑ where:
   Results – Page 775-776
9. all subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analyzed by “intention to treat” — no ❑ yes ☑ where:
   Methods – Page 774
10. the results of between-group statistical comparisons are reported for at least one key outcome — no ❑ yes ☑ where:
    Results – Page 775-776
11. the study provides both point measures and measures of variability for at least one key outcome — no ❑ yes ☑ where:
    Results – Pages 775-776

= 6/10

The PEDro scale is based on the Delphi list developed by Verhagen and colleagues at the Department of Epidemiology, University of Maastricht (*Verhagen AP et al (1998). The Delphi list: a criteria list for quality assessment of randomised clinical trials for conducting systematic reviews developed by Delphi consensus. Journal of Clinical Epidemiology, 51(12):1235-41*). The list is based on "expert consensus" not, for the most part, on empirical data. Two additional items not on the Delphi list (PEDro scale items 8 and 10) have been included in the

PEDro scale. As more empirical data comes to hand it may become possible to "weight" scale items so that the PEDro score reflects the importance of individual scale items.

The purpose of the PEDro scale is to help the users of the PEDro database rapidly identify which of the known or suspected randomised clinical trials (ie RCTs or CCTs) archived on the PEDro database are likely to be internally valid (criteria 2-9), and could have sufficient statistical information to make their results interpretable (criteria 10-11). An additional criterion (criterion 1) that relates to the external validity (or “generalisability” or “applicability” of the trial) has been retained so that the Delphi list is complete, but this criterion will not be used to calculate the PEDro score reported on the PEDro web site.

The PEDro scale should not be used as a measure of the “validity” of a study’s conclusions. In particular, we caution users of the PEDro scale that studies which show significant treatment effects and which score highly on the PEDro scale do not necessarily provide evidence that the treatment is clinically useful. Additional considerations include whether the treatment effect was big enough to be clinically worthwhile, whether the positive effects of the treatment outweigh its negative effects, and the cost-effectiveness of the treatment. The scale should not be used to compare the "quality" of trials performed in different areas of therapy, primarily because it is not possible to satisfy all scale items in some areas of physiotherapy practice.

Notes on administration of the PEDro scale:

All criteria	**Points are only awarded when a criterion is clearly satisfied**. If on a literal reading of the trial report it is possible that a criterion was not satisfied, a point should not be awarded for that criterion.
Criterion 1	This criterion is satisfied if the report describes the source of subjects and a list of criteria used to determine who was eligible to participate in the study.
Criterion 2	A study is considered to have used random allocation if the report states that allocation was random. The precise method of randomisation need not be specified. Procedures such as coin-tossing and dice-rolling should be considered random. Quasi-randomisation allocation procedures such as allocation by hospital record number or birth date, or alternation, do not satisfy this criterion.
Criterion 3	*Concealed allocation* means that the person who determined if a subject was eligible for inclusion in the trial was unaware, when this decision was made, of which group the subject would be allocated to. A point is awarded for this criteria, even if it is not stated that allocation was concealed, when the report states that allocation was by sealed opaque envelopes or that allocation involved contacting the holder of the allocation schedule who was "off-site".
Criterion 4	At a minimum, in studies of therapeutic interventions, the report must describe at least one measure of the severity of the condition being treated and at least one (different) key outcome measure at baseline. The rater must be satisfied that the groups' outcomes would not be expected to differ, on the basis of baseline differences in prognostic variables alone, by a clinically significant amount. This criterion is satisfied even if only baseline data of study completers are presented.
Criteria 4, 7-11	*Key outcomes* are those outcomes which provide the primary measure of the effectiveness (or lack of effectiveness) of the therapy. In most studies, more than one variable is used as an outcome measure.
Criterion 5-7	*Blinding* means the person in question (subject, therapist or assessor) did not know which group the subject had been allocated to. In addition, subjects and therapists are only considered to be "blind" if it could be expected that they would have been unable to distinguish between the treatments applied to different groups. In trials in which key outcomes are self-reported (eg, visual analogue scale, pain diary), the assessor is considered to be blind if the subject was blind.
Criterion 8	This criterion is only satisfied if the report explicitly states *both* the number of subjects initially allocated to groups *and* the number of subjects from whom key outcome measures were obtained. In trials in which outcomes are measured at several points in time, a key outcome must have been measured in more than 85% of subjects at one of those points in time.
Criterion 9	An *intention to treat* analysis means that, where subjects did not receive treatment (or the control condition) as allocated, and where measures of outcomes were available, the analysis was performed as if subjects received the treatment (or control condition) they were allocated to. This criterion is satisfied, even if there is no mention of analysis by intention to treat, if the report explicitly states that all subjects received treatment or control conditions as allocated.
Criterion 10	A *between-group* statistical comparison involves statistical comparison of one group with another. Depending on the design of the study, this may involve comparison of two or more treatments, or comparison of treatment with a control condition. The analysis may be a simple comparison of outcomes measured after the treatment was administered, or a comparison of the change in one group with the change in another (when a factorial analysis of variance has been used to analyse the data, the latter is often reported as a group × time interaction). The comparison may be in the form hypothesis testing (which provides a "p" value, describing the probability that the groups differed only by chance) or in the form of an estimate (for example, the mean or median difference, or a difference in proportions, or number needed to treat, or a relative risk or hazard ratio) and its confidence interval.
Criterion 11	A *point measure* is a measure of the size of the treatment effect. The treatment effect may be described as a difference in group outcomes, or as the outcome in (each of) all groups. *Measures of variability* include standard deviations, standard errors, confidence intervals, interquartile ranges (or other quantile ranges), and ranges. Point measures and/or measures of variability may be provided graphically (for example, SDs may be given as error bars in a Figure) as long as it is clear what is being graphed (for example, as long as it is clear whether error bars represent SDs or SEs). Where outcomes are categorical, this criterion is considered to have been met if the number of subjects in each category is given for each group.