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The roles of acceptance and catastrophizing in rehabilitation following anterior cruciate ligament reconstruction

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ABSTRACT

Objectives: The purpose of this study was to determine if pain catastrophizing and experiential acceptance predicted depression, pain intensity, and maladaptive behaviour following anterior cruciate ligament reconstruction.
Design: Patients who had undergone anterior cruciate ligament surgery completed assessment within 2 weeks of surgery ($N = 44$) and again 6 months post-surgery ($N = 26$).
Methods: Predictor measures were the Pain Catastrophizing Scale and the Acceptance and Action Questionnaire. Outcome measures included the depression scale of the Depression Anxiety and Stress Scale, numerical rating scale of pain intensity, and the alcohol and substance misuse subscale of the Brief Coping Orientations to the Problem Experience inventory. Demographic variables and athletic identity were also measured.
Results: Higher pain catastrophizing scores were associated with greater pain intensity and depressive symptoms in the 2-week post-operative period. Lower acceptance scores in the 2-week post-operative period were predictive of more severe depression scores at 6 months, even after controlling for early post-operative depression and athletic identity. Lower acceptance was also associated with greater use of alcohol and other substances, reportedly to cope with the stress of being injured.
Conclusions: This study highlights the importance of acceptance in an athletic population undergoing rehabilitation after ACL reconstruction.

1. Introduction

Anterior cruciate ligament (ACL) rupture is a common and debilitating injury among athletes,[1] and rehabilitation following surgical reconstruction involves a relatively prescribed process of physical therapy that typically improves function and decreases pain.[2] Although return to competitive sport usually commences between 6 and 9 months following surgery,[2] approximately two-thirds of athletes who undergo ACL reconstruction (ACLR) rehabilitation do not return to pre-injury level of competitive sport by 12 months.[3] Investigation of the psychological aspects of ACLR rehabilitation may provide further information about barriers to return to function.[4]

Pain intensity following ACLR has been shown to have a negative effect on rehabilitation outcomes.[5] A large number of chronic pain studies have demonstrated strong positive associations between catastrophizing, pain intensity, and measures of depression, anxiety, and disability.[6] Catastrophizing is characterised by negative thoughts associated with the anticipation of threat,[7] and has been investigated in a small number of studies focused on ACLR rehabilitation.[8–10] A higher level of catastrophic thinking is associated with greater pain intensity and poorer knee function during the post-operative phase,[8,9] and with poorer knee function and greater pain intensity at 6–12 months.[8]

Pain acceptance is a construct of increasing interest in chronic pain research,[11] and has been associated with adjustment difficulties and reduced function in the context of chronic pain.[12] There are now over 100 studies examining pain acceptance in chronic pain. Given that pain typically improves over the course of ACLR rehabilitation, a more general conceptualisation of acceptance may have greater relevance to ACLR rehabilitation than the narrower domain of chronic pain acceptance.

Acceptance, as defined in acceptance and commitment therapy, involves a willingness to embrace uncomfortable private

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experiences such as thoughts, emotions, and bodily sensations in the pursuit of important goals and actions.[13] Hayes et al.[14] have described in detail the theoretical and empirical underpinnings of the experiential acceptance construct. There is evidence that experiential acceptance correlates with measures of psychopathology.[15] Low scores on experiential acceptance are associated with greater avoidant coping behaviours and, in turn, are related to higher anxiety in student populations.[16] Higher levels of acceptance, as measured by the Acceptance and Action Questionnaire, also correlate with higher levels of hope, positive affect, and spiritual wellbeing in patients undergoing medical rehabilitation following spinal cord injury, stroke, amputation, and orthopaedic surgery.[17] By contrast, lower acceptance has been associated with more severe depression and negative affect.[17]

The role of experiential acceptance has not been investigated in the sport injury rehabilitation context. Specifically, the relationships between acceptance and depressed mood and maladaptive behaviours in sport injury rehabilitation require investigation. Depression and pain intensity may impede progress in rehabilitation and, therefore, are dependent variables relevant to the rehabilitation context.[5] In addition, alcohol and other substances are sometimes used to numb emotions and block unwanted thoughts during physical rehabilitation.[18] Alcohol use has been associated with coping in athletic populations,[19] and several studies have shown that acceptance may relate to alcohol use in veteran populations.[20] However, no studies have explored the relationship between acceptance and the use of alcohol and other substances to cope with injury in an athletic sample.

A strong and exclusive athletic identity has been consistently associated with higher levels of depression and distress during sport injury rehabilitation.[21] Therefore, examining the predictive capacity of a measure of acceptance after accounting for the effects of athletic identity represents a strong test of the utility of the acceptance construct in sport injury rehabilitation.

The aim of the current study was to assess the roles of catastrophizing and acceptance in relation to depression, pain intensity, and substance use to cope with injury within 2 weeks post-surgery and after 6 months of ACLR rehabilitation. The primary hypothesis was that higher pain catastrophizing scores would be associated with greater pain intensity and depression in the 2 weeks after surgery. By contrast, lower acceptance was hypothesised to be associated with greater pain intensity and depression in the 2 weeks after surgery; further, lower acceptance was hypothesised to predict higher depression and pain intensity at 6 months after accounting for depression, pain intensity, and athletic identity at 2 weeks post-surgery. A secondary hypothesis was that lower acceptance would be associated with greater alcohol and substance use, as this is a way of disengaging from the stress of being injured.

2. Methods

Individuals who had undergone ACL surgical reconstruction completed assessment within the first 2 weeks following surgery (mean = 7.4 days; $N = 44$; 27 male) and a subset of the questionnaires again at 6 months post-surgery (mean = 6.4 months; $N = 26$; 12 male). Participants also completed a consent form and provided demographic and sport participation information. The mean age of participants was 27 years ($SD = 9.4$ years) and the mean time between injury and surgery was 7 weeks 6 days ($SD = 9$ weeks 4 days; mode = 2 weeks). The most common primary sports of the participants in order of frequency were Australian rules football ($n = 13$; 29.5%), netball ($n = 8$; 18.2%), and basketball ($n = 6$; 13.6%). Five participants (11.4%) reported reconstruction using an allograft and 39 (89%) reported use of an autograft. For four participants (6.8%), this was their second ACL reconstruction. At the initial assessment, the measure of athletic identity and both predictor variables (acceptance, catastrophizing) and outcome variables (depression, pain intensity, and alcohol and substance use as coping) were administered; 6 months after surgery, patients were administered outcome measures only.

The Acceptance and Action Questionnaire (AAQ) was used to measure experiential acceptance.[14] The nine items include "I am able to take action on a problem even if I am uncertain what is the right thing to do" and "My thoughts and feelings get in the way of my success" (reverse scored). Participants are asked to rate the truth of statements as they apply to themselves on a scale of 1 (never true) to 7 (always true). Cronbach's alpha for the AAQ has been reported as 0.70[14] and was 0.72 in the present study. The test re-test reliability of the AAQ over a 4-month period was reported to be 0.64.[14] The AAQ has been shown to have good concurrent validity with measures of psychopathology and quality of life.[14] In this study, the AAQ was scored such that higher scores indicated greater acceptance.

Catastrophizing was measured using the 13-item Pain Catastrophizing Scale (PCS).[7] Participants are asked how often they have particular thoughts when they feel pain and then rate the frequency of each thought on a scale of 0 (not all) to 4 (all the time). An example question is "I become afraid that the pain will get worse". Three subscales have been identified: rumination, helplessness, and magnification, although the aggregate score is most commonly used in both ACL rehabilitation and chronic pain studies.[6,10] Higher scores on the PCS indicate greater catastrophizing. Cronbach's alpha for the total PCS has previously been reported as 0.87,[7] and was 0.83 in the present study. The test re-test reliability was reported to be 0.75 across a 6-week period and 0.70 across 10 weeks.[7] The PCS has been shown to significantly correlate with measures such as fear of pain, pain intensity, and negative affectivity.[7]

The 7-item Athletic Identity Measurement Scale (AIMS) was used to measure the degree to which individuals identify themselves as athletes in areas that relate to social identity, exclusivity, and negative affectivity.[20] Questions (e.g., "I consider myself an athlete") are rated on a 7-point scale from 1 (strongly disagree) to 7 (strongly agree). Higher scores on the AIMS indicate a stronger athletic identity. Cronbach's alpha has been reported to be 0.80[20] and was 0.84 in the present study. The test re-test reliability of the AIMS was $r = 0.89$ over a 2-week period.[22]

A numerical rating scale (NRS) was used to assess pain intensity. The scale was from 0 (no pain) to 10 (worst possible pain), and has previously been used in studies of ACL rehabilitation.[5] In the present study of ACL rehabilitation, participants were asked to report on the pain intensity they experienced during activity.

The depression scale of the Depression Anxiety and Stress Scale 21 (DASS 21) contains seven items (e.g., "I couldn't work up the initiative to do anything"). Each question has a four-point response scale from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time) and measures depressive symptoms over the previous week. Higher scores on the depression scale indicate more severe depression. Adequate convergent and discriminant validity have been reported.[23] Lovibond and Lovibond[23] reported the depression scale to have an internal consistency of 0.91. Cronbach's alpha for the depression scale in the present study was 0.85.

The Brief Coping Orientations to the Problem Experience (COPE)[24] inventory is a 28-item scale that assesses a range of coping styles and has been widely used in health research. Each question has a four-point scale ranging from 1 (I haven't been doing this at all) to 4 (I've been doing this a lot). The alcohol and substance was modified to refer to the extent to which alcohol and substances were being used to cope with the sports injury (e.g., "Since I have been injured I've been using alcohol or other drugs to make myself feel better"). Higher scores indicated greater reported use of alcohol and other drugs to cope with sports injury. Carver[24] reported