

Opinion

# Go to the back before going forward: Addressing psychological responses in anterior cruciate ligament reconstruction rehabilitation

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Helping athletes return to sports participation is a primary goal of anterior cruciate ligament (ACL) reconstruction rehabilitation. To facilitate the achievement of this goal, decades of research studies have sought to identify knee impairments that reduce knee function as well as interventions to resolve them.<sup>1</sup> Yet, over the past 10 years, research pertaining to psychological responses (i.e., cognitions and emotions) after ACL reconstruction has grown exponentially—a phenomenon that can be visualized by entering the search terms “psychological” and “anterior cruciate ligament reconstruction” into the PubMed search engine. The heightened research attention follows an unexpected but consistent finding that around 40% of athletes do not return to their pre-injury level of sports participation after ACL reconstruction and fear of re-injury is the primary reason (expressed by 19% of patients) for changing or ceasing sports participation.<sup>2</sup>

Even before the surge of studies in the ACL reconstruction population, research on the topic of psychological responses to sports injury has been growing. In studies spanning different types of sports injuries, a pattern of psychological responses has emerged (a) anger and depression immediately after injury, (b) frustration and low motivation during rehabilitation, and (c) excitement tempered by fear of re-injury and lack of confidence near the time of return to sport participation.<sup>3–5</sup> These findings highlight the dynamic nature of psychological responses after a sports injury, and the consistency indicates that some psychological responses are common among athletes.

In 1998 an Integrated Model of Response to Sports Injury conceptualized the connection between psychological response and clinical outcome by way of behavior (psychological response → behavior → clinical outcome).<sup>6</sup> The model helps to explain how cognitions and emotions related to re-injury might lead to avoidance behaviors, such as quitting rehabilitation or quitting the team to create the clinical outcome of not returning to sport participation. According to the model, the connections are bidirectional (i.e., can occur in reverse order, such as a behavior leading to thoughts and emotions) and applicable to positive psychological responses as well (e.g., motivation and excitement). Additionally, the model recognized that personal and situational factors impact psychological responses, creating individuality in the psychological responses across athletes.<sup>6</sup>

Although fear of re-injury was the initial focus of studies on psychological responses after ACL reconstruction, kinesiophobia, knee-related self-efficacy, and psychological readiness for sport have now been studied fairly extensively.<sup>7,8</sup> Kinesiophobia is pain-related fear of movement/re-injury, self-efficacy is one’s confidence in performing a specific task, and psychological readiness for sport pertains to psychological responses in the domains of distress, emotions, and risk appraisal.<sup>7,9</sup> Many studies have used questionnaires to measure and characterize these psychological responses.<sup>7</sup> More recently, studies have examined the associations between these psychological responses (i.e., questionnaire scores) and clinical outcomes, and the understanding is evolving. To date, these psychological responses have shown association with not returning to pre-injury sports participation and low self-reported knee function, albeit not always in a predictive manner.<sup>7,10</sup> In addition,

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preliminary evidence variably links these psychological responses with risk of re-injury, altered movement patterns, and slower knee impairment resolution.

The growing evidence connecting psychological responses to clinical outcomes has elevated psychological responses from being interesting to being important. Clinical experts and consensus statements recommend that best practices in ACL reconstruction rehabilitation include an assessment of psychological responses to inform rehabilitation progression and return to play decision-making<sup>11,12</sup> and interventions to address psychological responses.<sup>13</sup> Yet clinicians will find little practical guidance for translating research findings and expert recommendations into their interactions with patients.<sup>13,14</sup> How do you assess the psychological response? When should you assess the psychological response? What represents a transient psychological response to sports injury *vs.* one that will negatively impact rehabilitation outcomes? If the psychological response is negative, what should you do differently in treatment? When should you refer the patient to a clinical or sports psychologist? Answers to these questions are needed to inform practical strategies for addressing psychological responses in ACL reconstruction rehabilitation.

A potential strategy for managing psychological responses in ACL reconstruction rehabilitation may be gleaned from the low back pain literature.<sup>10</sup> In patients with acute low back pain, psychological responses contribute to the secondary development of chronic pain and disability.<sup>15</sup> From this understanding, a rehabilitation approach called “psychologically informed practice (PIP)”, or alternatively “psychologically informed physical therapy” was proposed for low back pain management to prevent the transition to chronic pain and disability.<sup>16</sup> The PIP approach includes administering a psychological questionnaire at the initial evaluation to screen for psychological factors that may negatively impact the clinical outcome (e.g., kinesiophobia).<sup>16</sup> Patients identified as having a high risk of chronic pain development, also called “yellow flags”, receive psychologically based interventions (e.g., cognitive–behavioral techniques) alongside traditional physical therapy interventions (e.g., exercise and manual therapy).<sup>17</sup> Perspectives on PIP have evolved over time to encompass a broader aim of improving patient health, serial monitoring of psychological responses during the course of rehabilitation, and patient-centered communication as an overarching focus.<sup>18</sup> Patient-centered communication techniques, including motivational interviewing and shared decision-making, can be incorporated into assessment and treatment to strengthen the therapeutic alliance and patient adherence to rehabilitation.<sup>18</sup>

Translating a PIP approach from low back rehabilitation to ACL reconstruction rehabilitation has appeal for several reasons. First, there are similarities between the psychological responses of patients with ACL reconstruction and patients with low back pain. Both patient populations exhibit fear avoidance behavior, including elevated kinesiophobia, which negatively impacts activity levels.<sup>10,16</sup> Also, both patient populations experience low self-efficacy, although in patients with low back pain the self-efficacy may be primarily related to pain control whereas in patients with ACL reconstruction it may be primarily related to

functional tasks or activity.<sup>7,16</sup> Another reason is that psychological questionnaires used in ACL reconstruction research, such as the Anterior Cruciate Ligament Return to Sport after Injury tool,<sup>9</sup> might be useful for screening psychological responses. Moreover, some clinicians are already familiar with patient-centered communication concepts or cognitive–behavioral techniques. Each of the reasons represents a potential building block for translating the PIP approach to ACL reconstruction rehabilitation. An additional appeal of the PIP approach relates to the youth of the ACL reconstruction population, which mainly consists of adolescent and young adult athletes. Patient-centered communication and psychologically based interventions could facilitate growth in self-awareness and the development of positive coping skills to benefit mental health after rehabilitation is complete.

Even so, swift adoption of the PIP approach is not realistic. Sports physical therapists and athletic trainers (i.e., clinicians) will need formal education in PIP theoretical concepts and implementation methods to gain competence and confidence with using the rehabilitation approach.<sup>18</sup> To date, PIP implementation has been less successful in routine practice than in controlled clinical trials because clinicians fall back on the more familiar biomedical approach (i.e., treating physical impairments only) when they do not feel competent or confident implementing PIP.<sup>18</sup> Also, it appears that few clinicians currently administer psychological questionnaires,<sup>12,19</sup> and research has not yet identified questionnaire cut-off scores to inform clinical decision-making for screening. Other possible barriers to PIP implementation include negative beliefs held by clinicians, hostile clinical culture, or a lack of administrative support related to using a PIP approach in rehabilitation.<sup>18</sup>

The PIP approach may also need to be refined for application in the ACL reconstruction population. ACL rupture is a traumatic injury and could be the first traumatic life event experienced by young patients. Subsequently, patients may exhibit a stress response similar to post-traumatic stress disorder, including avoidance, intrusion, and hyperarousal.<sup>20</sup> Additionally, patients with ACL reconstruction are likely to experience unique stressors from sports participation that impact their psychological responses.<sup>6</sup> For example, there may be time pressures due to prolonged rehabilitation<sup>6</sup> or challenges to athletic identity, especially for those with early sport specialization.<sup>21</sup> Finally, pain generally decreases over time after ACL reconstruction,<sup>22</sup> and it may not contribute as significantly to psychological responses in the ACL reconstruction population as it does in the low back pain population. It is unknown how these differences might shape PIP implementation in ACL reconstruction rehabilitation. It is possible that additional PIP interventions may be needed and that they would be informed by supplemental psychological theories, such as polyvagal theory. Regardless, we anticipate substantial overlap with the PIP approach outlined for low back pain. This is because patient-centered communication is universal to all patients, and some psychologically based interventions have already shown limited efficacy in the ACL reconstruction population.<sup>23</sup>

So, what steps should be taken to begin translating a PIP approach into ACL reconstruction rehabilitation? First, sports

physical therapists and athletic trainers will need to increase their knowledge base and skillset in patient-centered communication and the use of psychologically based interventions, as these are foundational to PIP. They could initiate this process by seeking out educational courses on PIP or its components (e.g., motivational interviewing or cognitive-behavioral techniques in rehabilitation). It would also benefit them to seek out clinical mentorship to reinforce PIP concepts, which may be achieved through residency, fellowship, or by establishing professional relationships with physical therapists experienced in the PIP approach. The profession can support this by making 1:1 clinical mentorship more accessible, as this is vital to the translation of didactic knowledge to clinical skills. Sports rehabilitation clinics can seek to develop integrated services that include a sports psychologist/psychotherapist or referral pathways to external sports psychologists/psychotherapists for athletes with more extensive psychological needs (e.g., clinical depression or unresolving fear of re-injury). We have found communication between physical therapists and sports psychologists/psychotherapists to be mutually beneficial toward the goal of improving clinical care. We challenge researchers to become educated on the psychological constructs they are studying. For example, it is important to understand the distinctions between fear of re-injury, kinesiophobia, and psychological readiness for sport because the information obtained in the questionnaires is different and there is some indication of specificity for clinical outcome. A comprehensive understanding will lead to more accurate conclusions in research studies to better inform clinicians. We also challenge researchers to move beyond measuring and reporting psychological responses to examining clinical application. This could include learning how to identify psychological questionnaire scores that indicate risk for poor clinical outcomes or developing psychologically based interventions that can be implemented within the clinician's scope of practice. Finally, educators can incorporate evolving knowledge on PIP into entry-level curriculums or residency/fellowship programs. Programs that already teach PIP concepts related to pain conditions may be able to make the transition more easily.

Future efforts might also explore the application of a PIP approach to the rehabilitation of other sport injuries or extending it to other sports medicine clinicians. It is interesting that a review of psychological responses after sports injury from 1996 described key aspects of a PIP approach: administering a psychological questionnaire during the initial interview and integrating psychological interventions such as positive self-talk, relaxation, goal setting, healing imagery, and modeling.<sup>24</sup> We foresee that a PIP approach could be used for, and would be beneficial to, the rehabilitation of any injured athlete. Although the PIP approach, as described, is directed at rehabilitation, it is logical that other sports medicine clinicians (e.g., primary care physicians, physiatrists, orthopedic surgeons) would benefit from knowledge about psychological responses after sports injury and skills in patient-centered communication. It is reasonable to expect that

patients will voice emotions and cognitions to these health care providers, and an intentional response (either verbal or through referral to a sports psychologist/psychotherapist) could facilitate patient engagement and recovery.

The biopsychosocial model was introduced in 1977<sup>25</sup> and has been adopted by numerous health care organizations as the guiding framework for health and disease. Including the assessment and treatment of psychological responses within ACL reconstruction rehabilitation aligns with the biopsychosocial model. We acknowledge that a PIP approach is just 1 possible method for managing psychological responses and that effective intervention(s) directed at psychological responses in athletes during rehabilitation have yet to be defined. It is feasible that other approaches, either in isolation or combined with PIP principles, may be most effective. Regardless, we advocate that PIP be considered and explored for managing psychological responses in ACL reconstruction rehabilitation. Foremost, PIP integrates psychologically based interventions alongside interventions for physical impairments, whereas other interventions, such as imagery, have been administered separately from rehabilitation. By not being limited to a single intervention, PIP has the flexibility to adapt to the diverse and dynamic psychological responses of the individual athlete. Finally, PIP can enhance clinician–patient communication for a potential downstream effect of improved rehabilitation adherence, which is critical given the extended duration of ACL reconstruction rehabilitation. We look forward to seeing progress in the management of psychological responses after ACL reconstruction.

### Authors' contributions

TLC conceived, planned, drafted, and edited the manuscript; AM, RA, TG, JS, and KC contributed ideas to the manuscript and edited the manuscript. All authors have read and approved the final version of the manuscript, and agree with the order of presentation of the authors.

### Competing interests

The authors declare that they have no competing interests.

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