

# Do Psychological Factors Affect Return to Sport after Anterior Cruciate Ligament Injury? A Narrative Review

Jaspreet Kaur<sup>1</sup>, Pratik M Rathod<sup>2</sup>, Rajesh K Rajnish<sup>3</sup>, Mandeep S Dhillon<sup>4</sup>

## ABSTRACT

**Background:** Psychological factors have a major role that affect the incidence, prevention, rehabilitation and return to sport (RTS) after injuries. There has been an increase in research and more attention towards evaluation of the impact that these factors play in deciding the outcomes after a sports injury. Therefore, the aim of this narrative review was to summarize the evidence for association between psychological factors and returning to sport following anterior cruciate ligament (ACL) injury.

**Materials and methods:** Electronic databases were searched for publications on effect of psychological factors on return to sport after ACL reconstruction. After reviewing the articles found in the database, 20 articles of interest were identified. An additional Google Scholar search was also done to look for any missed articles; and relevant articles were taken from other journals that were added to the narration. The selected articles were read thoroughly to arrive at this review.

**Observation and analysis:** This narrative review has brought to light some interesting facts. The majority of the research about personality and injury has been inconsistent. It means that until now the characteristics of specific personality associated with the onset of sports injuries have not been identified and measured. Stress levels are the strongest predictor of sport injuries. Fear of reinjury/anxiety and pain catastrophizing are significantly correlated with athletes' confidence in their ability to return to their sport. Higher motivation, self-efficacy and psychological "readiness" are positively associated with return to sport. Resources helping the athletes to cope have suggested to decrease the strength of the stress response and also decrease the amount of perceivable stress by the athletes. More specifically, coping is found to have a buffering effect, and thus decreases the probability of getting injured. Female and male athletes differ significantly when compared with the amount of stress perception, and coping after an injury, and thus gender may be an important factor to be considered in ACL injury and rehabilitation.

**Conclusion:** Positive psychological factors like self-confidence, self-motivation, psychological-readiness, self-efficacy, optimism and social support appear to promote a greater probability of return to sports after ACL injury. Fear of reinjury is most significantly associated with RTS and physical activity levels.

**Keywords:** Anterior cruciate ligament reconstruction, Coping, Psychophysical parameters, Return to play, Sports injuries, Sports rehabilitation.

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## BACKGROUND

Return to sports (RTS) to the pre-injury level after anterior cruciate ligament (ACL) reconstruction is seen in 47–70% among athletic population in spite of having a good compliance to the rehabilitation program.<sup>1–4</sup> The literature shows that there was no significant functional knee deficit or loss of strength but they have little or negligible pain.<sup>1,3,5–8</sup> The psychological differences between athletes could be an important contributor to the mismatch between the knee functional scores and the rate of RTS. The differences between behavioral response and psychology are some of the reported factors that may contribute to failure to RTS even after sufficient rehabilitation.<sup>9,10</sup> Some athletes may mimic the behavior patterns exhibited by patients with chronic pain syndrome, as they continue to have knee pain and discomfort during and after rehabilitation.<sup>9,10</sup>

Return to sports after ACL reconstruction is influenced by multiple factors.<sup>11,12</sup> However, there are no definite conclusive evidence over the factors that help in coping with injury, rehabilitation, and RTS. It has been well documented that good physical rehabilitation and function is necessary for RTS to a preinjury level.<sup>13–16</sup> In recent past, the psychological factors have gained importance in consideration of recovery and RTS.<sup>17–21</sup> Morrey et al.<sup>22</sup> found that poor motivation and mood had negative impact on rehabilitation after ACL reconstruction, which has negative impact on RTS. The higher optimism is

<sup>1</sup>Department of Physical and Rehabilitation Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh, India

<sup>2–4</sup>Department of Orthopedics, Postgraduate Institute of Medical Education and Research, Chandigarh, India

**Corresponding Author:** Rajesh K Rajnish, Department of Orthopedics, Postgraduate Institute of Medical Education and Research, Chandigarh, India, Phone: +91 9650736850, e-mail: duktiraj@gmail.com

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associated with knee function and rehabilitation, and higher motivation along with the above-stated factors also helped in RTS after injury. One of the most common negative factors responsible for failure to RTS to the preinjury level was fear of reinjury.<sup>23–25</sup>

There has been an increase in research and evaluation of the impact of psychological factors in RTS. Therefore, the aim of the current narrative review is to summarize the current evidence regarding the psychological factors affecting the RTS after ACL reconstruction.

## MATERIALS AND METHODS

Three researchers (RKR, PMR, and JK) independently searched PubMed and EMBASE for publications on effect of psychological factors on RTS after ACL reconstruction using a well-defined search strategy on March 8, 2020 (Table 1). A secondary search was done through the references of included studies and relevant review articles identified from the primary search were also included.

Search was restricted to articles in English language only without the restriction to time frame. The primary search resulted in 438 articles. Each article was reviewed for inclusion with the following criteria: English language, studies related to clinical outcomes of ACL reconstruction, and assessment of RTS and reports on the impact of psychological factors on RTS as per our study protocol.

After screening of these article through abstract, 420 articles were excluded. Two additional articles we got through the secondary search of references of the articles. Finally, 20 articles were shortlisted for the current review. Any discrepancy was resolved by mutual discussion among the three authors. In addition to above, Google search was also done and a few relevant articles were also added to this review. Articles excluded were case reports, review articles, unpublished abstracts, and non-English articles. The research question was whether the personality factors, stressors, fear and anxiety, motivation and self-efficacy, coping behaviors, and the gender differences affect the RTS after ACL reconstruction.

**Table 1:** Search strategy and search results

S. no.	Search terms	Total results
1.	PubMed (from inception to March 8, 2020) (("athletic injuries"[MeSH Terms] OR ("athletic"[All Fields] AND "injuries"[All Fields]) OR "athletic injuries"[All Fields] OR ("sports"[All Fields] AND "injury"[All Fields]) OR "sports injury"[All Fields]) AND ("psychology"[Subheading] OR "psychology"[All Fields] OR "psychology"[MeSH Terms]) AND ("return to sport"[MeSH Terms] OR ("return"[All Fields] AND "sport"[All Fields]) OR "return to sport"[All Fields] OR ("return"[All Fields] AND "play"[All Fields]) OR "return to play"[All Fields])) OR ("athletic injuries"[MeSH Terms] OR ("athletic"[All Fields] AND "injuries"[All Fields]) OR "athletic injuries"[All Fields] OR ("sports"[All Fields] AND "injury"[All Fields]) OR "sports injury"[All Fields]) AND ("psychology"[Subheading] OR "psychology"[All Fields] OR "psychology"[MeSH Terms]) AND ("return to sport"[MeSH Terms] OR ("return"[All Fields] AND "sport"[All Fields]) OR "return to sport"[All Fields]))	273
2.	Embase (from inception to March 8, 2020) sports AND injury AND psychology AND "return to sport" OR (sports AND injury AND psychology AND return AND to AND sport)	165
	Total	438

## OBSERVATION AND ANALYSIS

The evidence shown in this review supports the qualitative studies that psychological factors have influence on the health of athletes and contributes to recovery, rehabilitation, and RTS after ACL reconstruction. In the current review, we found that a healthier state of mind is beneficial in allowing the athlete in returning to sports after ACL reconstruction. Some of the relevant factors include personality factors, stressors, fear and anxiety, motivation and self-efficacy, and gender.

### Personality Factors

Interactive relationship between sports injury and psychological factors can be understood by personality, life stress, coping resources, stress response, and potential interventions. Williams et al.<sup>26</sup> reported that personality factors might have an effect upon how the athlete responds to a stressful situation. These personality factors include internal motivation, control locus, coherence, hardiness, and anxiety regarding the competition. Personality factors affect the stress response directly as well as indirectly through history of stressors and coping resources. They indirectly affect the athlete's response to stress, which in turn predict athletic injury.

Inference: the personality factors are among the first factors associated with sports injuries. The majority of the research about personality and injury has been inconsistent. It means that until now the characteristics of specific personality associated with the onset of sports injuries have not been identified and measured.

### Stressors

Common stressors include social and family life events, daily obstacles, and injuries sustained previously. Taken together, these factors are believed to have an interactive effect upon the stress response leading to athletic injury. Life stress tends to undermine the ability of the athlete to respond to stress and associated consequences that lead to reinjury fear and poorer RTS.<sup>27</sup> How an athlete adjusts to previous injury determine its impact on the stress response to a potentially stressful athletic situation. Athletes who are constantly worried about reinjury are more prone to sustain the injury the subsequent times.<sup>27</sup>

Inference: stress levels are the strongest predictor of sports injuries. Negative life events are more likely to have a negative impact on RTS after rehabilitation in an athlete who has undergone ACL reconstruction.

### Fear and Anxiety

Fear and anxiety have been associated with poorer performance after returning from an injured state in multiple studies.<sup>28-35</sup> Kinesiophobia (fear of movement) and pain (avoids movements that causes pain) are two factors that are strongly correlated with poor RTS level.<sup>28-35</sup>

Anxiety about the performance and getting reinjured while RTS is identified as a normal stressor, which every athlete undergoes. In fact, these issues of anxiety dictate some of the behavior on and off the ground in these athletes. Responses for such anxiety are the factors that contribute to returning to the same level of sports activity after rehabilitation.<sup>36</sup>

Inference: Fear of reinjury/anxiety and pain is significantly correlated with athletes' confidence in their ability to return to their sport.

## Motivation and Self-efficacy

A casual and consistent relationship has been found between higher motivation, self-confidence, and optimism in athletes who recover and RTS after sustaining injuries in their sporting career.<sup>23,25,37</sup> These factors are necessary for both postinjury and presurgery, as better confidence has shown to improve postoperative knee scores and thereby helps in better rehabilitation and RTS.<sup>23,37</sup> This theory is in fact supported by the Bandura's concept of relationship between inner levels of self-efficacy (confidence to complete a task) and actual follow-through or factual behavior.<sup>23,25,37</sup> Most studies included in this review support the theory of importance of self-efficacy and motivation with psychological readiness in RTS.<sup>38-46</sup> Further, Thomee et al.<sup>15</sup> reported high motivation is necessary for a better rehabilitation program, which primes the athlete very well before he gets back to the playing in field.

Inference: higher motivation, self-efficacy, and psychological "readiness" are positively associated with RTS.

## Coping Behaviors

Coping behaviors include general coping behavior, stress management, and social support along with attention strategy. Coping behavior is that which helps the athlete to overcome the stressful situation without difficulty. Coping behaviors are highly individualistic and varied in nature. Well-developed general coping behaviors have been linked with the reduced incidence of athletic injuries in several research studies.<sup>47</sup> Social support is one of the most important factor that helps to deal with the rising stress regarding the individuals' performance and RTS. Social support includes support from friends and family along with teammates and coach. This social support forms the basis of a happier environment where the stress levels are nullified easily and help to improve the psychological readiness of the athlete to RTS.<sup>48</sup> Social support is an effective coping mechanism as well as a powerful moderator between life stress and the incidence of athletic injury. These above-stated factors have impact on surgery and postsurgery recovery too, as social support and coping factors reinforce the optimism in the athletes' ability to rehabilitate and RTS.<sup>47,48</sup> In addition, coping behavior is also believed to affect subjective outcomes such as self-reported pain and objective outcomes such as RTS.<sup>39</sup>

Quinn et al.<sup>49</sup> observed that the psychological response to injury includes cognitive appraisal, emotional response, and behavioral response. Factors associated with cognitive appraisal include need to adjust performance goals, an estimate of recovery time, evaluation of perceived self-worth and confidence, appraisal of beliefs about attribution, sense of loss, and appraisal of coping skills. Researchers who have studied self-confidence and self-efficacy found a decline in these factors after sports injury. It has been seen that self-confidence about sport performance declines following an injury but recovers by the end of the rehabilitation phase. Factors associated with emotional response following injury are anger, tension, depression, fear of unknown, and boredom. These factors are associated with being injured, attitude of the athlete toward injury and recovery, grief associated with an injury, and emotional coping skills. It has been seen that frustrations expressed by sports injury athletes included shattered hopes and dreams, fear of reinjury, isolation, others recovery expectations, physical inactivity, and concern about future performance.<sup>49</sup> The factors associated with behavioral response to injury include level of rehabilitation compliance, social support, risk-taking behavior, and

coping ability. Even these factors contribute toward well-being after an injury and thus improve the objective outcome of RTS.<sup>39,47-49</sup>

Inference: adequate and optimal coping resources and coping strategies have been associated with ability to handle the stress in a better way, thereby allowing better RTS. Social support from friends, teammates, and family reinforces the optimism in recovery of the athletes and their successful ability to RTS at their previous best.

## Gender Differences

Few studies have focused on nonmodifiable factors such as gender, which conclude that there exist a potential difference between the psychological readiness between males and females.<sup>50-52</sup> Both the gender tend to face different levels of stress (social, economical, familial). Sports persons differ in their socialization processes and social connections when their gender is considered. Therefore, it is difficult to draw a conclusive line regarding which gender has a better coping capability.<sup>50-54</sup>

Females also been noted to have a delayed RTS as compared to males as per Ardern et al.<sup>5</sup> owing to their physiologic differences such as increased ligamentous laxity, inherent valgus in the knees, and more vulnerability to injuries. In India, this cannot be commented upon as the participation of males in sports is many times more as compared to girls due to social factors, and not enough female athletes are available for evaluation.

Inference: male and female athletes differ on how they cope with their injuries, the amount of optimism they carry, and the amount of social support they receive. Gender may be an important variable in athletes' ability to return back to sports owing to vast amount of variable subjective social causes, which hamper the ability of the athlete to return back to sports.

## CONCLUSION

Empirical evidence suggests that the psychological factors are likely to influence the prognosis for recovery and successful return to sport following injury. Positive psychological factors like self-confidence, self-motivation, psychological readiness, self-efficacy, optimism, and social support appear to promote the probability of returning to the preinjury level of same RTS. Fear of reinjury was most significantly associated with RTS and physical activity level as it was the most commonly reported impediment to RTS.

Future research should explore the effectiveness of psychoeducation techniques and systematically address psychological factors that decrease injury-related fear and enhance self-efficacy, with the hypothesis that addressing these factors may improve RTS after injury.

## REFERENCES

1. Ardern CL, Taylor NF, Feller JA, et al. Return to sport outcomes at 2-7 years after anterior cruciate ligament reconstruction surgery. *Am J Sports Med* 2012;40(1):41-48. DOI: 10.1177/0363546511422999.
2. Ardern CL, Webster KE, Taylor NF, et al. Return to the preinjury level of competitive sport after anterior cruciate ligament reconstruction surgery: two-thirds of patients have not returned by 12 months after surgery. *Am J Sports Med* 2011;39(3):538-543. DOI: 10.1177/0363546510384798.
3. Daniel DM, Fithian DC. Indications for ACL surgery. *Arthroscopy* 1994;10(4):434-441. DOI: 10.1016/S0749-8063(05)80196-3.
4. Linschoten NJ, Johnson CA. Arthroscopic debridement of knee joint arthritis: effect of advancing articular degeneration. *J South Orthop Assoc* 1997;6(1):25-36.

5. Ardern CL, Webster KE, Taylor NF, et al. Return to sport following anterior cruciate ligament reconstruction surgery: a systematic review and meta-analysis of the state of play. *Br J Sports Med* 2011;45(7):596–606. DOI: 10.1136/bjism.2010.076364.
6. Lee DY, Karim SA, Chang HC. Return to sports after anterior cruciate ligament reconstruction—a review of patients with minimum 5 year follow-up. *Ann Acad Med Singap* 2008;37(4):273–278.
7. McCullough KA, Phelps KD, Spindler KP, et al. Return to high school- and college-level football after anterior cruciate ligament reconstruction: a multicenter orthopaedic outcomes network (MOON) cohort study. *Am J Sports Med* 2012;40(11):2523–2529. DOI: 10.1177/0363546512456836.
8. Ardern CL, Taylor NF, Feller JA, et al. Fear of reinjury in people who have returned to sport following anterior cruciate ligament reconstruction surgery. *J Sci Med Sport* 2012;15(6):488–495. DOI: 10.1016/j.jsams.2012.03.015.
9. Chmielewski TL, Jones D, Day T, et al. The association of pain and fear of movement/reinjury with function during anterior cruciate ligament reconstruction rehabilitation. *J Orthop Sports Phys Ther* 2008;38(12):746–753. DOI: 10.2519/jospt.2008.2887.
10. Chmielewski TL, Zeppieri Jr G, Lentz TA, et al. Longitudinal changes in psychosocial factors and their association with knee pain and function after anterior cruciate ligament reconstruction. *Phys Ther* 2011;91(9):1355–1366. DOI: 10.2522/ptj.20100277.
11. Czuppon S, Racette BA, Klein SE, et al. Variables associated with return to sport following anterior cruciate ligament reconstruction: a systematic review. *Br J Sports Med* 2014;48(5):356–364. DOI: 10.1136/bjsports-2012-091786.
12. Feller J, Webster KE. Return to sport following anterior cruciate ligament reconstruction. *Int Orthop* 2013;37(2):285–290. DOI: 10.1007/s00264-012-1690-7.
13. Adams D, Logerstedt DS, Hunter-Giordano A, et al. Current concepts for anterior cruciate ligament reconstruction: a criterion-based rehabilitation progression. *J Orthop Sports Phys Ther* 2012;42(7):601–614. DOI: 10.2519/jospt.2012.3871.
14. Muller U, Kruger-Franke M, Schmidt M, et al. Predictive parameters for return to pre-injury level of sport 6 months following anterior cruciate ligament reconstruction surgery. *Knee Surg Sports Traumatol Arthrosc* 2015;23(12):3623–3631. DOI: 10.1007/s00167-014-3261-5.
15. Thomee R, Kaplan Y, Kvist J, et al. Muscle strength and hop performance criteria prior to return to sports after ACL reconstruction. *Knee Surg Sports Traumatol Arthrosc* 2011;19(11):1798–1805. DOI: 10.1007/s00167-011-1669-8.
16. Ellman MB, Sherman SL, Forsythe B, et al. Return to play following anterior cruciate ligament reconstruction. *J Am Acad Orthop Surg* 2015;23(5):283–296. DOI: 10.5435/JAAOS-D-13-00183.
17. Ardern CL. Anterior cruciate ligament reconstruction-not exactly a one-way ticket back to the preinjury level: a review of contextual factors affecting return to sport after surgery. *Sports Health* 2015;7(3):224–230. DOI: 10.1177/1941738115578131.
18. Ardern CL, Taylor NF, Feller JA, et al. Psychological responses matter in returning to preinjury level of sport after anterior cruciate ligament reconstruction surgery. *Am J Sports Med* 2013;41(7):1549–1558. DOI: 10.1177/0363546513489284.
19. Christino MA, Fantry AJ, Vopat BG. Psychological aspects of recovery following anterior cruciate ligament reconstruction. *J Am Acad Orthop Surg* 2015;23(8):501–509. DOI: 10.5435/JAAOS-D-14-00173.
20. Everhart JS, Best TM, Flanigan DC. Psychological predictors of anterior cruciate ligament reconstruction outcomes: a systematic review. *Knee Surg Sports Traumatol Arthrosc* 2015;23(3):752–762. DOI: 10.1007/s00167-013-2699-1.
21. Ardern CL, Taylor NF, Julian A, et al. Sports participation 2 years after anterior cruciate ligament reconstruction in athletes who had not returned to sport at 1 year: a prospective follow-up of physical function and psychological factors in 122 athletes. *Am J Sports Med* 2015;20(10):1–9. DOI: 10.1177/0363546514563282.
22. Morrey MA, Stuart MJ, Smith AM, et al. A longitudinal examination of athletes' emotional and cognitive responses to anterior cruciate ligament injury. *Clin J Sport Med* 1999;9(2):63–69. DOI: 10.1097/00042752-199904000-00004.
23. Swirtun LR, Renstrom P. Factors affecting outcome after anterior cruciate ligament injury: a prospective study with a six year follow-up. *Scand J Med Sci Sports* 2008;18(3):318–324. DOI: 10.1111/j.1600-0838.2007.00696.x.
24. Falstrom A, Hagglund M, Kvist J. Factors associated with playing football after anterior cruciate ligament reconstruction in female football players. *Scand J Med Sci Sports* 2016;26(11):1343–1352. DOI: 10.1111/sms.12588.
25. Gobbi A, Francisco R. Factors affecting return to sports after anterior cruciate ligament reconstruction with patellar tendon and hamstring graft: a prospective clinical investigation. *Knee Surg Sports Traumatol Arthrosc* 2006;14(10):1021–1028. DOI: 10.1007/s00167-006-0050-9.
26. Williams JM, Andersen MB. Psychosocial antecedents of sport injury: review and critique of the stress and injury model. *J Appl Sport Psychol* 1998;10(1):5–25. DOI: 10.1080/10413209808406375.
27. Hanson SJ, McCullagh P, Tonymon P. The relationship of personality characteristics, life stress, and coping resources to athletic injury. *J Sport Exc Psychol* 1992;14(3):262–272. DOI: 10.1123/jsep.14.3.262.
28. Marx RG, Jones EC, Angel M, et al. Beliefs and attitudes of members of the 295 american academy of Orthopaedic surgeons regarding the treatment of anterior 296 cruciate ligament injury. *Arthroscopy* 2003;19(7):762–770. DOI: 10.1016/S0749-8063(03)00398-0.
29. Myklebust G, Bahr R. Return to play guidelines after anterior cruciate ligament 301 surgery. *Br J Sports Med* 2005;39(3):127–131. DOI: 10.1136/bjism.2004.010900.
30. Kvist J, Ek A, Sporrstedt K, et al. Fear of re-injury: a hindrance for returning to sports after anterior cruciate ligament reconstruction. *Knee Surg Sports Traumatol Arthrosc* 2005;13(5):393–397. DOI: 10.1007/s00167-004-0591-8.
31. Hartigan EH, Lynch AD, Logerstedt DS, et al. Kinesiophobia after anterior cruciate ligament rupture and reconstruction: noncopers vs potential Copers. *J Orthop Sports Phys Ther* 2013;43(11):821–832. DOI: 10.2519/jospt.2013.4514.
32. Rogelio A, Coronado RA, Sterling EK, et al. Cognitive-behavioral-based physical therapy to enhance return to sport after anterior cruciate ligament reconstruction: an open pilot study. *Phys Ther* 2020;42:82–90. DOI: 10.1016/j.ptsp.2020.01.004.
33. Lentz TA, Zeppieri Jr G, George SZ, et al. Comparison of physical impairment, functional, and psychosocial measures based on fear of reinjury/lack of confidence and return to sport status after ACL reconstruction. *Am J Sports Med* 2014;42(2):345–353. DOI: 10.1177/0363546514559707.
34. Theunissen WWES, van der Steen MC, Liu WY, et al. Timing of anterior cruciate ligament reconstruction and preoperative pain are important predictors for postoperative Kinesiophobia. *Surg Sports Traumatol Arthrosc* 2020;28(8):2502–2510. DOI: 10.1007/s00167-019-05838-z.
35. Burland JP, Toonstra J, Werner JL, et al. Decision to return to sport after anterior cruciate ligament reconstruction, part I: a qualitative investigation of psychosocial factors. *J Athl Train* 2018;53(5):452–463. DOI: 10.4085/1062-6050-313-16.
36. Ardern CL, Österberg A, Tagesson S, et al. The impact of psychological readiness to return to sport and recreational activities after anterior cruciate ligament reconstruction. *Br J Sports Med* 2014;48(22):1613–1619. DOI: 10.1136/bjsports-2014-093842.
37. Thomeé P, Währborg P, Börjesson M, et al. Self-efficacy of knee function as a pre-operative predictor of outcome 1 year after anterior cruciate ligament reconstruction. *Knee Surg Sports Traumatol Arthrosc* 2008;16(2):118–127. DOI: 10.1007/s00167-007-0433-6.
38. Brewer BW, Cornelius AE, Van Raalte JL, et al. Age-related differences in predictors of adherence to rehabilitation after anterior cruciate ligament reconstruction. *J Athl Train* 2003;38(2):158–162.
39. Langford JL, Webster KE, Feller JA. A prospective longitudinal study to assess psychological changes following anterior cruciate ligament reconstruction surgery. *Br J Sports Med* 2009;43(5):377–378. DOI: 10.1136/bjism.2007.044818.



40. McPherson AL, Feller JA, Hewett TE, et al. Smaller change in psychological readiness to return to sport is associated with second anterior cruciate ligament injury among younger patients. *Am J Sports Med* 2019;20(10):1–7. DOI: 10.1177/0363546519825499.
41. Slagersa AJ, Akker-Scheekb IVD, Geertzena JHB, et al. Responsiveness of the anterior cruciate ligament—return to sports after injury (ACL-RSI) and injury—psychological readiness to return to sport (I-PRRS) scales. *J Sports Sci* 2019;37(20):1–7. DOI: 10.1080/02640414.2019.1646023.
42. Meierbachtol A, Yungtum W, Paur E, et al. Psychological and functional readiness for sport following advanced group training in patients with anterior cruciate ligament reconstruction. *J Orthop Sports Phys Ther* 2018;48(11):864–872. DOI: 10.2519/jospt.2018.8041.
43. Paterno MV, Kiefer AW, Bonnette S, et al. Prospectively identified deficits in sagittal plane hip–ankle coordination in female athletes who sustain a second anterior cruciate ligament injury after anterior cruciate ligament reconstruction and return to sport. *Clin Biomech* 2015;30(10):1094–1101. DOI: 10.1016/j.clinbiomech.2015.08.019.
44. Lefevre N, Klouche S, Mirouse G, et al. Return to sport after primary and revision anterior cruciate ligament reconstruction: a prospective comparative study of 552 patients from the FAST cohort. *Am J Sports Med* 2016;45(1):34–41. DOI: 10.1177/0363546516660075.
45. Raoul T, Klouche S, Guerrier B, et al. Are athletes able to resume sport at six-month mean follow-up after anterior cruciate ligament reconstruction? Prospective functional and psychological assessment from the French anterior cruciate ligament study (FAST) cohort. *Knee* 2019;26(1):155–164. DOI: 10.1016/j.knee.2018.11.006.
46. Zarzycki R, Failla M, Capin J, et al. Psychological readiness to return to sport is associated with knee Kinematic asymmetry during gait following ACL reconstruction. *J Orthop Sports Phys Ther* 2018;48(12):968–973. DOI: 10.2519/jospt.2018.8084.
47. DiMatteo MR, Lepper HS, Croghan TW. Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and depression on patient adherence. *Arch Intern Med* 2000;160(14):2101. DOI: 10.1001/archinte.160.14.2101.
48. Moussavi S, Chatterji S, Verdes E, et al. Depression, chronic diseases, and decrements in health: results from the world health surveys. *Lancet* 2007;370(9590):851–858. DOI: 10.1016/S0140-6736(07)61415-9.
49. Quinn AM, Fallon BJ. The changes in psychological characteristics and reactions of elite athletes from injury onset until full recovery. *J Appl Sport Psychol* 1999;11(2):210–229. DOI: 10.1080/10413209908404201.
50. Corbillon F, Crossman J, Jamieson J. Injured athletes perceptions' of the social support provided by their coaches and teammates during rehabilitation. *J Sport Behav* 2008;31(2):93–107.
51. Granito VJ. Psychological response to athletic injury: gender differences. *J Sport Behav* 2002;25(3):244–259.
52. Webster KE, Nagelli CV, Hewett TE, et al. Factors associated with psychological readiness to return to sport after anterior cruciate ligament reconstruction surgery. *Am J Sports Med* 2018;46(7):1545–1550. DOI: 10.1177/0363546518773757.
53. Koivula N. Perceived characteristics of sports categorized as gender-neutral, feminine and masculine. *J Sport Behav* 2001;24(4):377–393.
54. Sims M, Mulcahey MK. Sex-specific differences in psychological response to injury and return to sport following ACL reconstruction. *JBJS Rev* 2018;6(7):e9. DOI: 10.2106/JBJS.RVW.17.00170.