

# Psychological Factors Associated With Return to Play After Ulnar Collateral Ligament Reconstruction

## A Systematic Review

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**Background:** The role of psychological factors in return to play (RTP) after ulnar collateral ligament (UCL) reconstruction remains unclear.

**Purpose:** To perform a systematic review of the literature to (1) identify the specific psychological factors that affect RTP after UCL reconstruction and (2) determine the proportion of failures to RTP after UCL reconstruction because of psychological factors.

**Study Design:** Systematic review; Level of evidence, 4.

**Methods:** A systematic review of the literature following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines was conducted. We queried the Cochrane Database of Systematic Reviews, Ovid/Embase, PubMed, and Web of Science databases to identify studies examining psychological factors and RTP after UCL reconstruction. Data pertaining to study characteristics and design, clinical and demographic characteristics, and psychological factors were collected. Patients were pooled across included studies, weighted means were calculated, and descriptive statistical analysis was performed.

**Results:** A total of 8 studies consisting of 378 patients were included for analysis. The mean time to RTP was 12.2 months, and the overall RTP rate was 89.4%. Psychological factors affecting RTP included loss of interest, fear of reinjury, individual personality traits, personal reasons, and psychological concerns. While clinical factors accounted for 46.2% ( $n = 24$ ) of failures to RTP, psychological factors comprised 40.4% ( $n = 21$ ) of the reasons for failure to RTP. The most commonly cited psychological factors affecting RTP were loss of interest ( $n = 15$  [28.8%]) and fear of reinjury ( $n = 3$  [5.8%]).

**Conclusion:** Psychological factors represented a substantial proportion of failures to RTP after UCL reconstruction, especially in adolescent athletes. Future prospective studies and multicenter initiatives are needed to more thoroughly evaluate the psychological concerns of patients before and after UCL reconstruction.

**Keywords:** ulnar collateral ligament; ulnar collateral ligament reconstruction; psychological factors; psychology

Ulnar collateral ligament (UCL) reconstruction has been established as an effective surgical technique to restore UCL function after an injury, with the goal of allowing overhead-throwing athletes to return to their previous level of play. Notably, recent literature has shown that return-to-play (RTP) rates after UCL reconstruction are highly variable, ranging from 33% to 92%.<sup>7</sup> Previously established factors affecting RTP include surgical technique, graft fixation technique, level of competition, and sport and position played.<sup>4,20,21</sup> With the dramatic increase in the number of

UCL reconstruction procedures performed annually and the expansion of UCL reconstruction candidates to include younger patient populations,<sup>7,9,10</sup> it is imperative to more thoroughly understand factors affecting RTP after UCL reconstruction.

Psychological factors are a key component in recovery for the injured athlete, as studies have shown that individual personality traits, fear of reinjury, and loss of interest all affect the ability to successfully RTP.<sup>2,5,13</sup> In a recent systematic review, Nwachukwu et al<sup>13</sup> determined that psychological factors comprised 64.7% of the reasons that patients were unable to RTP after anterior cruciate ligament (ACL) reconstruction. Further, there exists evidence that psychological factors affect RTP after UCL

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reconstruction as well.<sup>11,14</sup> Mehta et al<sup>11</sup> recently noted that individual personality traits, including resilience and self-motivation, were a key theme allowing patients to successfully RTP after UCL reconstruction. Conversely, in their retrospective case series of high school baseball players, Petty et al<sup>14</sup> determined that 15% of patients did not RTP after UCL reconstruction because of a loss of interest. However, the magnitude of the effect of psychological factors on RTP after UCL reconstruction is unknown, as no comprehensive review has been performed on the topic.

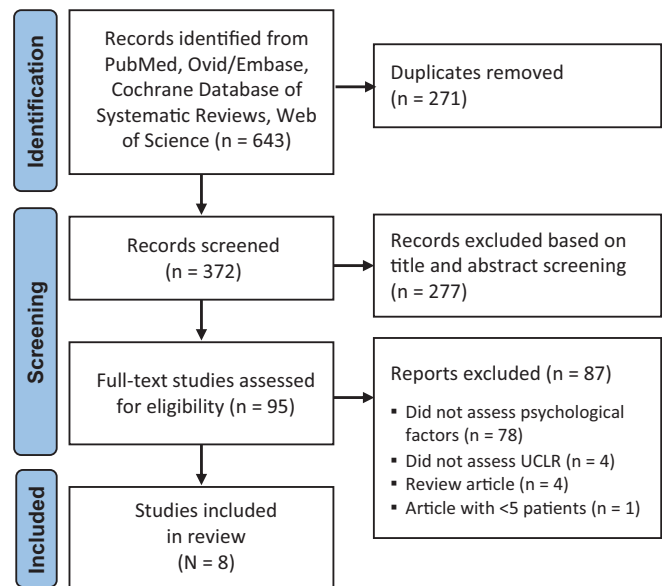
The aims of the present study were to perform a systematic review of the literature to (1) identify the specific psychological factors affecting RTP after UCL reconstruction and (2) determine the proportion of failures to RTP after UCL reconstruction because of psychological factors. It was hypothesized that psychological factors would represent the majority of reasons that patients were unable to RTP after UCL reconstruction.

## METHODS

A systematic review of the literature was conducted to identify articles pertaining to factors affecting RTP after UCL reconstruction. In May 2021, the Cochrane Database of Systematic Reviews, Ovid/Embase, PubMed, and Web of Science were searched using the specific strategies outlined in Appendix Table A1. The search period of the study was from January 1974 to May 2021. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines were appropriately applied and followed.

The initial search yielded a total of 643 studies. Studies were included based on the following criteria: relating to clinical outcomes of UCL reconstruction, assessment of RTP, assessment of psychological factors, and inclusion of more than 5 patients. Articles were excluded if they were non-English language articles or review articles. Overall, 2 independent reviewers (A.Z.C., K.M.G.) screened the articles for inclusion, first at the title/abstract stage and then at the full-text stage (Figure 1).

The following study characteristics were extracted from the included articles: author, date of publication, journal name, study design, and level of evidence. Further, demographic and clinical data, including the total number of patients, patient age, sport type, level of competition, graft type, and mean time to RTP, were gathered. Psychological factors mentioned by each study and the psychological factors that resulted in the failure of RTP were noted. Psychological factors considered in the present



**Figure 1.** PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines for included studies. UCLR, Ulnar Collateral Ligament Reconstruction.

analysis were derived from the original investigation of psychological factors in ACL reconstruction by Nwachukwu et al<sup>13</sup> and included psychological concerns, fear of reinjury, loss of interest, individual personality traits, and personal reasons. The method of assessment that each study utilized to document psychological factors for failure to RTP was noted and classified as chart review or follow-up interview. The reasons for failure to RTP were classified into psychological factors, clinical factors, and other. Consistent with previous studies,<sup>13</sup> study quality was analyzed using the Methodological Index for Non-Randomized Studies (MINORS) criteria. The MINORS is a validated scoring tool for nonrandomized studies, with a score of 0 to 16 for noncomparative studies and 0 to 24 for comparative studies.<sup>18</sup>

Last, statistical analysis was performed with descriptive statistics. Patients were pooled across included studies, and weighted means were calculated where appropriate. The number and proportion of patients across each sport, competition level, and graft type were noted and calculated. Similarly, the proportion of failures to RTP because of each psychological factor was pooled across included studies and

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Ethical approval was not sought or needed for the present study.

TABLE 1  
Characteristics of Included Studies<sup>a</sup>

Lead Author (Year)	Journal	Level of Evidence	Method of Assessment of Psychological Factors	Psychological Factors Considered
Dines <sup>3</sup> (2012)	AJSM	4	Chart review	Loss of interest <sup>b</sup>
Hechtman <sup>8</sup> (2011)	AJSM	4	Follow-up interview	Fear of reinjury
Mehta <sup>11</sup> (2020)	J Orthop	4	Follow-up interview	Loss of interest, fear of reinjury, individual personality traits
Mirzayan <sup>12</sup> (2020)	JSES	4	Follow-up interview	Loss of interest
Petty <sup>14</sup> (2004)	AJSM	4	Follow-up interview	Loss of interest
Ramkumar <sup>16</sup> (2019)	JSES	4	Chart review	Loss of interest
Saper <sup>17</sup> (2018)	OJSM	4	Follow-up interview	Fear of reinjury, personal reasons
Swindell <sup>19</sup> (2020)	OJSM	3	Follow-up interview	Loss of interest, <sup>c</sup> psychological concerns

<sup>a</sup>AJSM, *The American Journal of Sports Medicine*; J Orthop, *Journal of Orthopaedics*; JSES, *Journal of Shoulder and Elbow Surgery*; OJSM, *The Orthopaedic Journal of Sports Medicine*.

<sup>b</sup>The patient graduated high school and chose not to participate in college.

<sup>c</sup>One patient decided to not use an additional year of eligibility with a medical redshirt, and 2 patients decided to stop playing to focus on academics.

calculated. The heterogeneity of the included studies prevented a formal meta-analysis.

RESULTS

In total, 8 studies were included for final analysis (Table 1).<sup>3,8,11,12,14,16,17,19</sup> Of these, 1 study<sup>19</sup> (12.5%) had level 3 evidence, and 7 studies<sup>3,8,11,12,14,16,17</sup> (87.5%) had level 4 evidence. The mean MINORS score of the noncomparative studies was 11.7 (range, 10-13), and the MINORS score of the single comparative study was 21, indicating acceptable methodological quality.<sup>1</sup> Included studies were from the following journals: *The American Journal of Sports Medicine* (3 studies<sup>3,8,14</sup>), *Journal of Shoulder and Elbow Surgery* (2 studies<sup>12,16</sup>), *The Orthopaedic Journal of Sports Medicine* (2 studies<sup>17,19</sup>), and *Journal of Orthopaedics* (1 study<sup>11</sup>) (Table 1).

A total of 378 patients were included across all studies. The mean patient age was 19.3 years (range, 13-35 years) (Table 2). In terms of sport and position played, the vast majority of included patients were baseball pitchers (n = 327 [86.5%]), followed by baseball position players (n = 35 [9.3%]). With regard to level of competition, the majority of included patients played at the college level (n = 162 [49.5%]), followed by the high school level (n = 143 [43.7%]) and then the professional level (n = 20 [6.1%]). Notably, the most common graft types were palmaris longus (n = 223 [75.6%]) and gracilis (n = 59 [20.0%]) autografts (Table 2).

The mean time to RTP was 12.2 months (range, 5-24 months) (Table 3). Overall, 338 patients (89.4%) were successfully able to RTP, while 314 patients (83.1%) returned to the same level of play. There were 52 patients across all studies for whom the specific reason for failure to RTP or return to the same level of play was recorded. The most common reasons for failure to RTP were clinical factors, including elbow pain, other injury/medical condition, and reinjury (n = 24 [46.2%]). Notably, psychological factors were the primary reasons that 21 patients (40.4%) did not RTP. Specifically, loss of interest (n = 15 [28.8%]) was the most common reason that patients did not RTP, followed by fear of reinjury (n = 3

TABLE 2  
Clinical and Demographic Characteristics of Included Patients (N = 378)<sup>a</sup>

	Value
Age, mean (range), y	19.3 (13-35)
Sport	
Baseball: pitcher	327 (86.5)
Baseball: position player	35 (9.3)
Javelin	10 (2.6)
Other	6 (1.6)
Total	378 (100.0)
Level of competition <sup>b</sup>	
High school	143 (43.7)
College	162 (49.5)
Professional	20 (6.1)
Other	2 (0.6)
Total	327 (100.0)
Graft type <sup>c</sup>	
Palmaris longus	223 (75.6)
Gracilis	59 (20.0)
Allograft	6 (2.0)
Plantaris	3 (1.0)
Achilles tendon	2 (0.7)
Semitendinosus	1 (0.3)
Hybrid	1 (0.3)
Total	295 (100.0)

<sup>a</sup>Data are reported as No. (%) unless otherwise indicated.

<sup>b</sup>There were 7 studies that reported on level of competition.<sup>3,8,11,12,14,17,19</sup>

<sup>c</sup>There were 6 studies that reported on graft type.<sup>3,8,12,14,17,19</sup>

[5.8%]), personal reasons (n = 2 [3.8%]), and psychological concerns (n = 1 [1.9%]) (Table 3).

There were 3 studies<sup>3,14,19</sup> that noted the level of competition of patients who did not RTP. Among the 8 high school athletes who did not RTP across 2 studies,<sup>3,14</sup> 5 (62.5%) did not RTP because of psychological factors, and 3 (37.5%) did not RTP because of clinical factors. In the 9 collegiate athletes who did not RTP across 1 study,<sup>19</sup> 4 (44.4%) did not because of psychological factors; 2 (22.2%), because of

TABLE 3  
Psychological Factors and RTP Characteristics<sup>a</sup>

	Value
Time to RTP, mean (range), mo	12.2 (5-24)
Assessment of RTP (N = 378)	
Returned	338 (89.4)
Did not return	40 (10.6)
Assessment of return to same level of play (N = 378)	
Returned to same level	314 (83.1)
Did not return to same level	64 (16.9)
Reasons for failure to RTP/return to same level (n = 52)	
Psychological factors	21 (40.4)
Loss of interest	15 (28.8)
Fear of reinjury	3 (5.8)
Personal reasons	2 (3.8)
Psychological concerns	1 (1.9)
Clinical factors	24 (46.2)
Elbow pain	16 (30.8)
Other injury or medical condition	6 (11.5)
Reinjury	2 (3.8)
Other	7 (13.5)
Career change	3 (5.8)
Coaching decision	1 (1.9)
Unknown	3 (5.8)

<sup>a</sup>Data are reported as No. (%) unless otherwise indicated. RTP, return to play.

clinical factors; and 3 (33.3%), because of other reasons or unknown. Notably, there was a slightly higher proportion of high school athletes who did not RTP because of psychological factors compared with collegiate athletes (62.5% vs 44.4%, respectively).

## DISCUSSION

The present systematic review established that psychological factors, most notably loss of interest and fear of reinjury, affected RTP after UCL reconstruction. In the earliest study included, Petty et al<sup>14</sup> noted that 4 of 27 high school baseball players (14.8%) did not RTP because of loss of interest. Furthermore, in the studies in which the level of competition of patients who did not RTP was known, a substantial proportion (5/8 [62.5%]) of high school athletes did not RTP because of psychological factors.<sup>3,14,19</sup> This finding is noteworthy, as the high school population is one in which a dramatic increase in UCL reconstruction being performed has been seen.<sup>9,10</sup> In an analysis of a national insurance database, Idowu et al<sup>10</sup> recently determined that the rate of UCL reconstruction procedures in the United States has increased from 3.3 to 22.1 per million in 11- to 15-year-old patients and from 105.4 to 293.2 per million in 16- to 20-year-old patients from 2003 to 2014. As more high school athletes undergo UCL reconstruction, it is important to understand how psychological factors affect RTP in this population. Specifically, high school athletes may be more prone to loss of interest in returning to play, and some high school athletes may not desire to play at a higher

competition level. In this population, it thus becomes crucial for surgeons to carefully evaluate the competition goals of each patient through a comprehensive discussion with the patients and their families at the initial visit. Specifically in patients who may waver in their interest level and not wish to play at a higher level, we believe that there is a role for nonoperative management and alternative UCL management strategies to avoid unnecessary surgery.

Results from the current study indicated that the second most common psychological factor affecting successful RTP after UCL reconstruction was fear of reinjury. In sports medicine, fear of reinjury has been established as a common reason for failure to RTP and is the predominant reason for failure in 20% to 50% of patients.<sup>2</sup> However, the vast majority of these studies have analyzed ACL reconstruction, and there is limited evidence surrounding how fear of reinjury affects athletes after UCL reconstruction. Notably, the mechanism of injury between these 2 injuries differs significantly, as ACL injuries typically involve an acute, traumatic onset of pain, whereas UCL injuries are more often associated with nontraumatic repetitive exercise. Despite the differences in the mechanism, there is reason to believe that fear of reinjury is very relevant to the population of patients sustaining UCL tears as well.

In qualitative interviews of athletes sustaining different types of musculoskeletal injuries, Podlog and Eklund<sup>15</sup> noted the reasons behind fear of reinjury and failure to RTP. Specifically, athletes are unaware of how their bodies will respond upon returning to competition, are fearful that they will not achieve their previous athletic goals, and are worried that they will have wasted rehabilitation time. Therefore, fear of reinjury is multifactorial and complex, extends beyond solely the mechanism of injury, and along with the findings of the present study, is very applicable to patients undergoing UCL reconstruction. In addition to resulting in failure to RTP, fear of reinjury is a common concern even among those able to RTP. In their qualitative assessment of 22 athletes undergoing UCL reconstruction, Mehta et al<sup>11</sup> determined that athletes successfully returning to play felt transient feelings of fear of reinjury but that other psychological factors such as individual personality traits, motivation, and resilience ultimately led to their success. Notably, the study by Mehta et al was the only study included that examined psychological factors affecting successful RTP. On the contrary, the other 7 studies in the current review focused on psychological factors for failure to RTP.

In total, psychological factors comprised 40.4% of failures to RTP after UCL reconstruction, which represents a previously unknown but significant proportion. Thus, the results of this study highlight the need for future investigations into this topic. Previous authors have advocated for the use of preoperative psychological screening in patients undergoing ACL reconstruction, including the "psychovitality" questionnaire and the 12-item Short Form Health Survey Mental Component Summary, as there is evidence to suggest that patients with higher psychological scores are more likely to RTP than those with lower scores.<sup>6,13</sup> As a result, there are many standardized and

validated psychological instruments utilized in this population.<sup>13</sup> However, the present review identified no studies that employed standardized psychological screening for their patients undergoing UCL reconstruction. As this study determined that psychological factors underlie a large proportion of failures to RTP, surgeons should consider standardized preoperative and postoperative psychological screening in their patients undergoing UCL reconstruction. Further, risk stratification to identify patients who might benefit from appropriate psychological interventions may ultimately lead to improved outcomes after surgery. At the very least, surgeons should be attentive to the psychological considerations of their patients and empathize with their emotional concerns during their recovery from an injury.

The current review highlights the need for additional prospective studies to further evaluate how psychological factors affect RTP after UCL reconstruction. Because of the sample size limitations with single-institution studies, we believe that there is a role for multi-institution studies that enroll and longitudinally evaluate clinical outcomes in a larger sample of patients undergoing UCL reconstruction. With regard to psychological factors and UCL reconstruction, there is a specific need for prospective studies that employ standardized psychological assessments, RTP criteria, and clinical outcomes across multiple institutions to evaluate this important issue.

### Limitations

The present study is not without limitations. First, the quality of the current review is dependent on the quality of the individual studies from which the data were extracted. The majority of studies included were retrospective case series or cohort studies, representing level 4 evidence. Most studies did not include additional reasons and rationales behind the individual patient responses, such as loss of interest. Furthermore, studies were only included if they mentioned psychological factors affecting RTP, potentially biasing the results. The included studies were also heterogeneous in design and included different patient populations, surgeon experience, surgical and graft fixation techniques, and RTP criteria. In addition, we examined 1 clinical outcome measure after UCL reconstruction, RTP, but did not look at the influence of psychology on other outcomes including elbow function or patient-reported outcomes. Further, loss of interest was defined in the present study according to the terminology set forth by Petty et al,<sup>14</sup> who determined that loss of interest comprised patients graduating school or pursuing other interests. In their study of javelin throwers, Dines et al<sup>3</sup> noted that 1 athlete graduated high school and decided not to participate in college. While the patient was determined to have lost interest for the purpose of the present study, the true rationale for his not returning to play is unknown and could have been because of other factors such as a lack of collegiate recruitment due to ability. Last, the population of patients included in this study primarily consisted of high school and collegiate athletes, and thus, these findings are less generalizable to professional athletes. Altogether,

these limitations reiterate the need for future prospective studies that minimize study heterogeneity and expand on clinical outcomes. Despite these limitations, the present review included a rigorous and reproducible search strategy and methodology. In all, it provides the first review focused on the effect of psychological factors on RTP after UCL reconstruction and highlights the need for future research in this direction.

### CONCLUSION

Psychological factors are an important determinant of RTP after UCL reconstruction. The most common factors cited in the existing literature included loss of interest and fear of reinjury. Among reasons for failure to RTP after UCL reconstruction, 40.4% were because of psychological factors. With the dramatic rise in UCL reconstruction being performed, especially in younger populations, physicians should thoroughly evaluate patients' psychological state both preoperatively and postoperatively to maximize their ability to RTP. Future prospective studies and multicenter initiatives are needed to more thoroughly evaluate the psychological concerns of patients before and after UCL reconstruction.

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## APPENDIX

TABLE A1  
Database Search Strategies

Database	Search Run
Cochrane Database of Systematic Reviews	((ucl return play) OR ucl return sport) OR ulnar collateral ligament return sport) OR ulnar collateral ligament return play
Ovid/Embase	(1) return to sport/ (2) ulnar collateral ligament/ (3) ucl.mp. (4) return to play.mp. (5) 1 or 4 (6) 2 or 3 (7) 5 and 6
PubMed	ucl return play OR ucl return sport OR ulnar collateral ligament return sport OR ulnar collateral ligament return play
Web of Science	ucl return play OR ucl return sport OR ulnar collateral ligament return sport OR ulnar collateral ligament return play