

# Return to Overhead Sport Following Ulnar Collateral Ligament Injury: A Systematic Review

Taylor Stern, SPT, CSCS, Jeremy McCullough, SPT, CSCS, Avi Bagley, SPT, NCSF, Derek Poulson, SPT, Aaron Rygiel, SPT, Evan Vasilauskas, SPT, Dr. Michael Reiman, PT, DPT, OCS, SCS, ATC/L, FAAOMPT, CSCS

## Background

- The prevalence of Ulnar Collateral Ligament (UCL) injuries in overhead athletes has risen exponentially in the past decade.
- 25% major league pitchers report a history of UCL reconstruction (UCLR).
- UCLR is a common procedure to alleviate injury and improve return to play (RTP).
- There has been little research showing outcomes for athletes' return to same level of play (RTSLP).

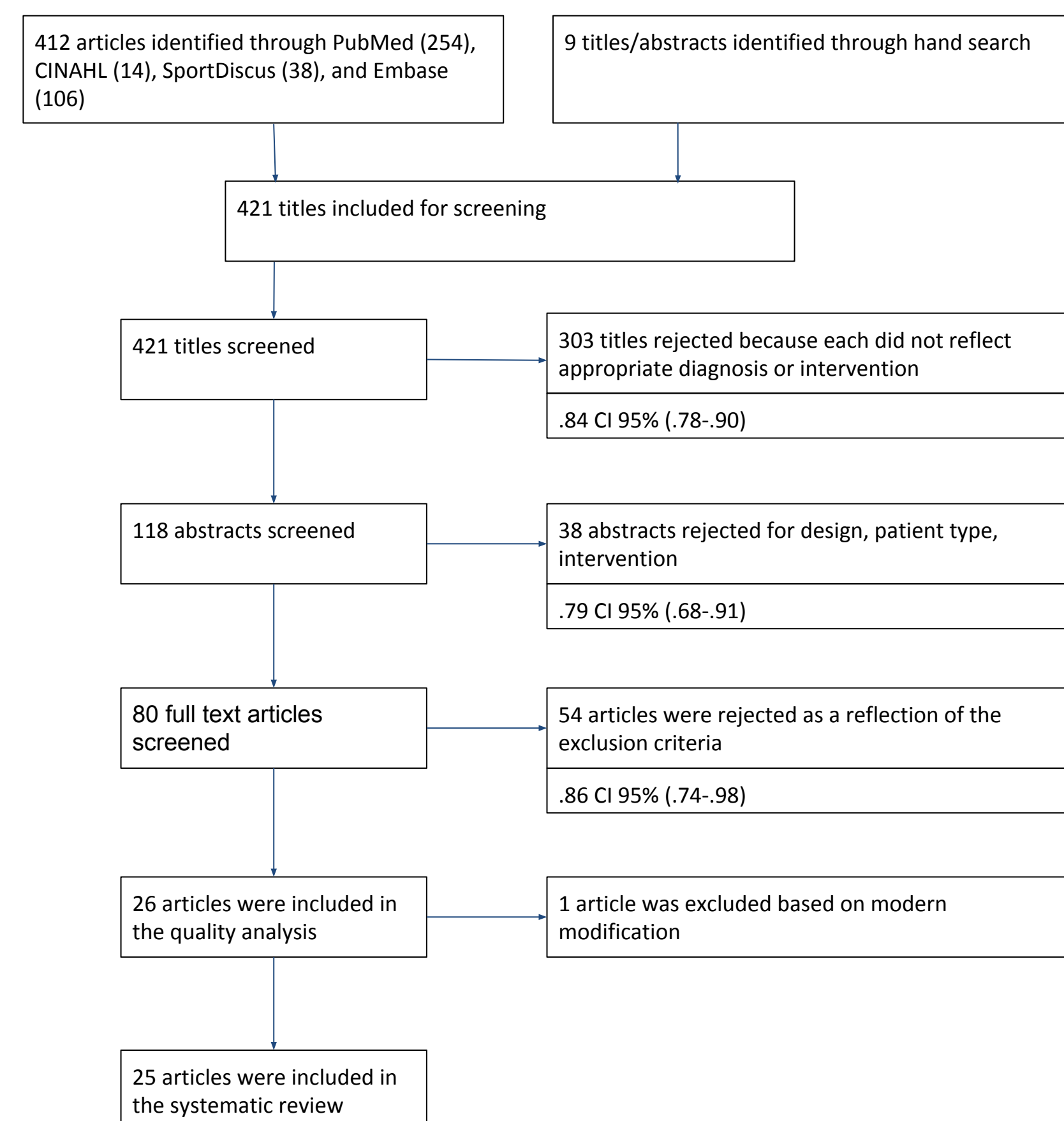
## Purpose

Previous studies have reported a RTP rate ranging from 73-94 percent to pre-injury level of performance after reconstruction of the UCL. The goal of this systematic review was to examine if overhead athletes with UCL injury return to competition following treatment and to what level they return.

## Methods

- **Inclusion Criteria**
  - Randomized control trials, prospective and retrospective controlled studies, overhead athletes, UCL injury
- **Exclusion Criteria**
  - Not a research study, Non-human, Cadaver, Non-english, Injury to other UCL besides elbow, Injury to other area of body, Case study <10 subjects, Surgery to elbow not UCLR, No RTP criteria, Surgical technique article, Previous systematic or narrative/literature reviews, articles before 1999.

## Flow of Study Selection



## Analysis

A Modified Down's and Black Risk of Bias assessment revealed 2 high, 4 moderate, 19 low quality studies. Inter-rater reliability (kappa) of .76 (CI 95% 0.68-0.83).

## Results

Downs and Black Scale Key				
12-15	10-11	8-9	6-7	0-5

RTP and RTSLP for All Overhead Athletes After UCL Reconstruction			
Study	RTP Percentage (n)	RTSLP Percentage (n)	RTP Criteria
Keller et al 2014	N/A	87% (146/168)	N/A
Jiang and Leland 2014	97% (37/38)	79% (30/38)	N/A, statistically evaluated
Ford et al 2016	87% (13/15)	73% (11/15)	Success = 1 full season
Gibson et al 2007	N/A	82% (56/68)	N/A
Erickson 2014	97% (174/179)	83% (148/179)	Pitched in any MLB game
Makhni 2014	N/A	80% (118/147)	Active = 1 game; Established >10 games
Osbaehr et al 2014	90% (231/256)	83% (213/256)	Conway Scale
O'Brien et al 2015	94% (31/33)	82% (27/33)	N/A
Lansdown and Feeley 2014	79% (102/129)	N/A	N/A
Erickson 2016	94% (80/85)	N/A	Conway Scale
Jones et al 2014	91% (50/55)	87% (48/55)	Conway Scale
Argo et al 2006	N/A <sup>1</sup>	N/A	Andrews and Carson
Cohen et al 2011	67% (8/12)	50% (6/12)	N/A
Azar et al 2000	N/A	81% (48/59)	N/A
Cain et al 2010	N/A	83% (610/733)	N/A
Park et al 2014	77% (13/17)	53% (9/17)	Conway Scale
Dines et al 2012	90% (9/10)	90% (9/10)	Conway Scale
Petty et al 2004	93% (25/27)	74% (20/27)	Success = RTSP
<b>Total</b>	<b>90.30% (773/856)</b>	<b>82.69% (1381/1670)</b>	
<b>[95% CI]</b>	<b>[88.14,92.11]</b>	<b>[80.81,84.43]</b>	

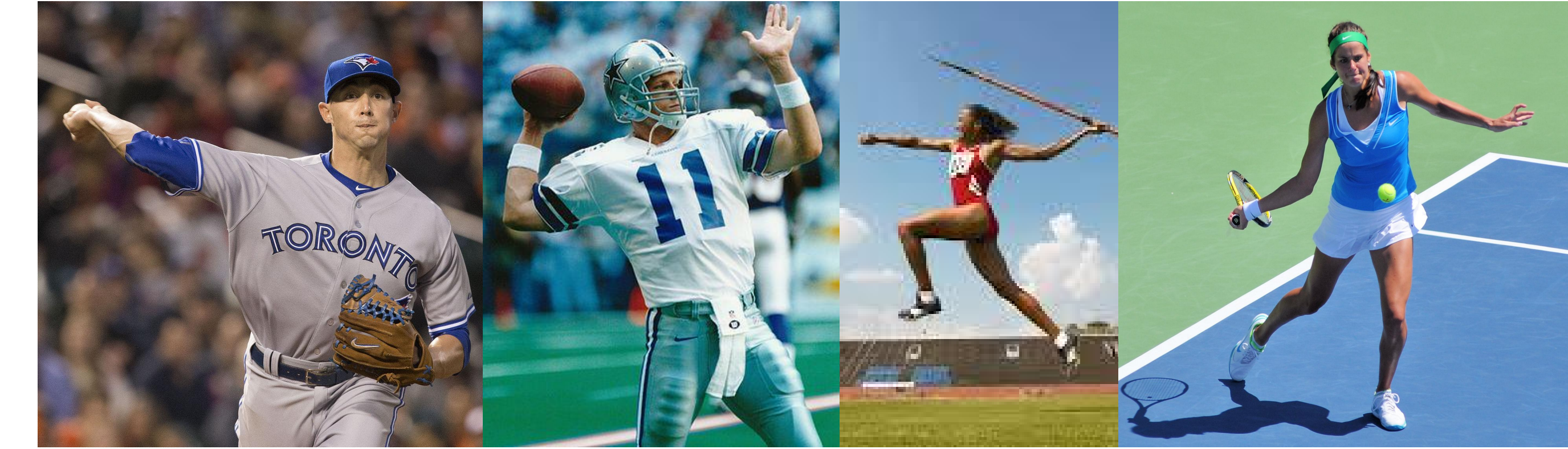
RTP and RTSLP for All Overhead Athletes After UCL Repair			
Study	RTP Percentage (n)	RTSLP Percentage (n)	RTP Criteria
Argo et al 2006	94% (17/18) <sup>2</sup>	N/A	Andrews and Carson
Azar et al 2000	N/A	63% (5/8)	N/A
Cain et al 2010	N/A	70% (7/10)	N/A
Dodson et al 2010	N/A	100% (1/1) <sup>3</sup>	N/A
Savoie 2008	N/A	93% (56/60)	Andrews and Carson
<b>Total</b>	<b>94.44%(17/18)</b>	<b>87.34%(69/79)</b>	
<b>[95% CI]</b>	<b>[74.24,99.01]</b>	<b>[78.24,92.98]</b>	

RTP and RTSLP for All Overhead Athletes After UCL Revision			
Study	RTP Percentage (n)	RTSLP Percentage (n)	RTP Criteria
Liu 2016	N/A	65% (17/26)	Active = 1 game; established >10 games
Marshall 2015	84.8% (28/33)	65.5 (19/29)	N/A - statistically evaluated
Jones et al 2013	78% (14/18)	22% (4/18)	N/A - statistically evaluated
Dines et al 2008	60% (9/15)	33% (5/15)	Conway Scale
<b>Total</b>	<b>77.27% (51/66)</b>	<b>69.36% (163/235)</b>	
<b>[95% CI]</b>	<b>[65.83,85.71]</b>	<b>[63.20,74.90]</b>	

RTP and RTSLP for All Overhead Athletes After UCL Nonoperative			
Study	RTP Percentage (n)	RTSLP Percentage (n)	RTP Criteria
Ford et al 2016	93% (26/28)	93% (26/28)	Success = 1 full season
Rettig et al 2001	N/A	42% (13/31)	Questionnaire
Dodson et al 2010	100% (10/10)	N/A	N/A
<b>Total</b>	<b>94.74% (36/38)</b>	<b>66.10% (39/59)</b>	
<b>[95% CI]</b>	<b>[82.71,98.54]</b>	<b>[53.37,76.86]</b>	

<sup>1</sup> = Only 1 reconstruction that is lumped with other repairs, <sup>2</sup> = May include a reconstruction, <sup>3</sup> = Most likely a repair

- 25 articles met inclusion for the systematic review.
- Overall return to play after UCL injury ranged from 42-100%.
- Of the 14 individual articles that include both RTP and RTSLP rates, 12 of them report lower RTSLP rates when compared to their ability to RTP.



## Results

Study	Subjects	Innings Pitched			ERA			WHIP		
		Pre-Surgery Mean (SD)	Post-Surgery Mean (SD)	P-Value	Pre-Surgery Mean (SD)	Post-Surgery Mean (SD)	P-Value	Pre-Surgery Mean (SD)	Post-Surgery Mean (SD)	P-Value
Keller et al 2014 <sup>1</sup>	n = 168	59.81 (4.61)	50.28 (3.92)	0.026	4.15 (0.13)	4.74 (0.14)	0.001	1.4 (0.03)	1.48 (0.03)	0.011
Jiang and Leland 2014 <sup>2</sup>	n = 28	NR	NR	0.001	NR	NR	0.9	NR	NR	0.18
Gibson et al 2007 <sup>3</sup>	n=54	97.1 (6.0-234.56)	70.17 (2.0-198.0)	0.003	4.12 (0.0-11.37)	4.21 (0.0-8.24)	0.14	1.362 (1.0-2.42)	1.356 (0.5-1.96)	0.83
Erickson 2014	n = 148	77.4 (51.7)	58.7 (47.2)	0.001	5.67 (4.01)	4.18 (1.36)	<.001	1.60 (0.567)	1.39 (2.52)	<.001
Liu 2016 <sup>4</sup>	n = 17	83.97 (NR)	36.95 (NR)	0.012	4.14 (NR)	4.89 (NR)	0.336	1.45 (NR)	3.1 (NR)	0.291
Marshall 2015	n = 33	67.18 (7.97)	39.10 (8.97)	<0.01	4.74 (0.34)	4.87 (0.42)	0.81	1.45 (0.07)	1.59 (0.08)	0.13
Makhni 2014	n=92	84.1 (NR)	89.3 (NR)	0.448	4.23 (NR)	4.63 (NR)	0.027	1.368 (NR)	1.432 (NR)	0.029
Lansdown and Feeley 2014	n=80	83 (55.5)	57.3 (50.1)	0.0001	4.75 (2.16)	4.73 (1.90)	0.94	1.48 (0.47)	1.45 (0.31)	0.6

<sup>1</sup> = Standard error rather than standard deviation, <sup>2</sup> = P-values were reported as control group vs intervention group for 1 year after surgery, <sup>3</sup> = Reported ranges rather than standard deviation, <sup>4</sup> = Study involved UCL revision

- Only 32% of articles investigated pitching performance post UCL surgery
- 88% of these showed a decrease in innings pitched was following UCL surgery
- 75% of these showed an increase in earned runs allowed (ERA) following UCL surgery
- 63% of these showed an increase in walks plus hits per innings pitched (WHIP) was reported following UCL surgery

## Conclusions

- There is tremendous variability in reporting of data and a lack of a standardized definition for returning to play after UCL injury.
- There needs to be more high quality studies done to analyze the return to sport outcomes in athletes that undergo UCL surgery.

## Clinical Relevance

- Stronger studies are necessary to provide understanding for the actual benefit of UCL surgery and prognosis for RTP & RTSLP.

## Acknowledgements / References

Conte, SA, et. al. (2015). Prevalence of Ulnar Collateral Ligament Surgery in Professional Baseball Players. *American Journal of Sports Medicine*. 43(7): 1764-9  
 Jiang, JJ, and Leland, J2M (2014). Analysis of pitching velocity in major league baseball players before and after ulnar collateral ligament reconstruction. *Am J Sports Med*. 42(4): 880-885.  
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