Original Article

Evaluation of Spin in the Abstracts of Systematic Reviews and Meta-Analyses of Ulnar Collateral Ligament Reconstruction

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Purpose: To identify the quantity and types of spin present in systematic reviews and meta-analyses of ulnar collateral ligament reconstruction (UCLR) outcomes and to characterize the studies with spin to determine if any patterns exist. **Methods:** This study was conducted per Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. In August 2022, PubMed, Scopus, and SportDiscus databases were searched using the terms "ulnar collateral ligament reconstruction" AND "systematic review" OR "meta-analysis." Each abstract was assessed for the presence of the 15 most common types of spin derived from a previously established methodology. General data that were extracted included study title, authors, publication year, journal, level of evidence, study design, funding source, reported adherence to PRISMA guidelines, preregistration of the study protocol, and methodologic quality per A Measurement Tool to Assess Systematic Reviews Version 2 (AMSTAR 2). **Results:** In total, 122 studies were identified during the preliminary search, of which 19 met the inclusion criteria. Each study had at least 1 form of spin. The most common type of spin identified was type 5 ("The conclusion claims the beneficial effect of the experimental treatment despite a high risk of bias in primary studies") (7/19, 36.8%). AMSTAR type 9 ("Did the review authors use a satisfactory technique for assessing the RoB [risk of bias] in individual studies that were included in the review?") was associated with both a lower Clarivate Impact Factor ($P = .001$) and a lower Scopus CiteScore ($P = .015$). Studies receiving external funding were associated with the failure to satisfy AMSTAR type 3 ("Did the review authors explain their selection of the study designs for inclusion in the review?") ($P = .047$). **Conclusions:** Spin is highly prevalent in the abstracts of systematic reviews and meta-analyses that investigate the outcomes of UCLR. **Clinical Relevance:** Spin has been identified in peer-reviewed articles published on various topics, including many in orthopaedics. Systematic reviews and meta-analyses contain the most comprehensive evidence regarding a clinical question, so it is important to identify spin that may be included in these reports. Greater efforts are needed to ensure that the abstracts of papers accurately represent the results in the full text.

As the incidence of ulnar collateral ligament (UCL) tears continues to rise, ulnar collateral ligament reconstruction (UCLR) is becoming an increasingly popular option for treatment.[1,2] UCLR has been studied extensively since the description of the procedure by Jobe et al.[3] in 1986. With UCL tears commonly occurring in overhead athletes, research over the past 2 decades has focused on optimizing return-to-sport outcomes.[4-6] Although considered the current gold standard of treatment for UCL tears,[7] UCLR is not without potential risk of complications. Multiple surgical techniques for UCLR have been explored without a clear consensus on the optimal approach.[8] It is therefore important to critically examine the quality of the research on UCLR techniques and understand the risks of complication.

Systematic reviews and meta-analyses contain the most comprehensive evidence regarding a clinical question.[9] Yavchitz et al.[10] defined "spin" in systematic reviews as a specific way of reporting that highlights the beneficial effect of the experimental treatment to a greater extent than the results support. In this

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definition, spin has been separated into 3 categories: misleading representation, misleading reporting, and inappropriate extrapolation.[10] Multiple studies have found a high incidence of spin in the abstracts of systematic reviews for orthopaedic injuries such as proximal humerus fractures and superior capsular reconstruction.[11-14] This is of particular importance in considering that many physicians incorporate research findings into practice based solely on the abstract,[15] which can have negative impacts on clinical and research practices. It is therefore essential to gauge the incidence of spin when assessing the quality of systematic reviews and meta-analyses, paying particular attention to the abstracts.

The purpose of this study was to identify the quantity and types of spin present in systematic reviews and meta-analyses of UCLR outcomes and to characterize the studies with spin to determine if any patterns exist. We hypothesized that spin would be highly present in the included studies, specifically in the abstract.

Methods

This study was conducted per Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines using a predetermined protocol.[16] A single author (A.A.T.) conducted a search of the PubMed, Scopus, and SportDiscus databases using "ulnar collateral ligament reconstruction" AND "systematic review" OR "meta-analysis" in August 2022.

Systematic reviews and/or meta-analyses of UCLR published in an English peer-reviewed journal were eligible. Exclusion criteria were studies that were not peer reviewed, were not published in English, were not systematic reviews or meta-analyses, were retracted or withdrawn, included nonhuman or cadaver subjects, were published without an abstract, or did not have full text available. The search results were aggregated and de-duplicated in EndNote X9 (Clarivate). Two authors (A.A.T. and B.S.B.) independently screened the identified studies for inclusion.

Prior to assessing the included articles, 3 authors (A.A.T., B.S.B., and M.A.-Z.) were trained to identify common study designs and characteristics, as well as in the definition, classification, and severity rankings of the 15 most common types proposed by Yavchitz et al.[17] (Table 1). The same 3 authors were also trained to assess study quality using version 2 of A Measurement Tool to Assess Systematic Reviews (AMSTAR 2). AMSTAR 2 is a 16-point questionnaire that quantifies the quality of a systematic review based on criteria such as whether authors report the use of a predetermined protocol, funding sources, and conflicts of interest and/or adequately characterize studies included in the review.[18] AMSTAR 2 has undergone rigorous assessment itself and has shown high interrater reliability and construct validity.[19]

Two authors (A.A.T. and B.S.B.) extracted data independently with a third author (M.A.-Z.) providing guidance in case of disagreement. General data that were extracted included study title, authors, publication year, journal, level of evidence, study design, funding source, reported adherence to PRISMA guidelines, preregistration of the study protocol with International Prospective Register of Systematic Reviews (PROSPERO), and primary and secondary outcome measures. The title and abstract of each included study were assessed for the presence of the 15 most common types of spin, with full texts reviewed for clarification during assessment. Full texts were used in the assessment of study quality per AMSTAR 2. Study quality was further categorized based on the AMSTAR 2 assessment into low, moderate, and high.[18] The 2021 Scopus CiteScore (Elsevier) was obtained for Scopus Indexed Journals.

Statistical Analysis

The frequency of spin occurring in the included studies overall and by the 15 most common types was characterized using descriptive statistics. Because of the dearth of systematic reviews of UCL, this study was underpowered for multivariable logistic regression based on a precalculated power analysis. As a result, study characteristics and the presence of spin were associated using the χ^2 test and the Fisher exact test depending on the sample size. RStudio (version 2022.7.1.554; RStudio) was used for all analyses.

Results

Our systematic search identified 122 eligible studies, of which 77 were removed as duplicates. Twenty-four studies were excluded during the title and abstract screening process for failing to meet the inclusion criteria (Fig 1). During the full-text screening, 1 study was excluded for focusing on UCL repair, and 1 study was excluded for examining lateral ulnar collateral ligament reconstruction. Ultimately, 19 studies published in 8 unique journals were included in this review. Of the 19 included articles, 6 included meta-analysis (6/19, 32%). Eight articles (8/19, 42%) reported having received external funding for the study. Sixteen of the included studies reported adherence to the PRISMA guidelines (16/19, 84%). Only 5 studies (5/19, 26%) registered with PROSPERO (University of York). The 2021 Clarivate Impact Factor ranged from 0.8 to 6.057 in the included studies, with a mean impact factor of 4.182. Of the 8 unique journals included in the study, 2 (2/19, 11%) were not indexed in Scopus. For the other remaining journals, the Scopus CiteScores ranged from 0.8 to 9.8 with a mean of 7.243.

Frequency of Spin and Analysis

At least 1 form of spin was observed in all 19 studies. The median number of spin categories identified per

Table 1. Frequency of Each Spin Category and Type in Reviewed Studies

Category	Type	Description	No. of Abstracts with Spin	No. of Abstracts without Spin
Misleading interpretation				
	1	The conclusion formulates recommendations for clinical practice not supported by the findings	0/19	19/19
	2	The title claims or suggests a beneficial effect of the experimental intervention not supported by the findings	0/19	19/19
	4	The conclusion claims safety based on nonstatistically significant results with a wide confidence interval	0/19	19/19
	9	Conclusion claims the beneficial effect of the experimental treatment despite reporting bias	2/19	17/19
	12	Conclusion claims equivalence or comparable effectiveness for nonstatistically significant results with a wide confidence interval	1/19	18/19
Misleading reporting				
	3	Selective reporting of or overemphasis on efficacy outcomes or analysis favoring the beneficial effect of the experimental intervention	6/19	13/19
	5	The conclusion claims the beneficial effect of the experimental treatment despite a high risk of bias in primary studies	7/19	12/19
	6	Selective reporting of or overemphasis on harm outcomes or analysis favoring the safety of the experimental intervention	0/19	19/19
	10	Authors hide or do not present any conflict of interest	0/19	19/19

(continued)

Table 1. Continued

Category	Type	Description	No. of Abstracts with Spin	No. of Abstracts without Spin
	11	Conclusion focuses selectively on statistically significant efficacy outcome	6/19	13/19
	13	Failure to specify the direction of the effect when it favors the control intervention	3/19	16/19
	14	Failure to report a wide confidence interval of estimates	4/19	15/19
Inappropriate extrapolation				
	7	The conclusion extrapolates the review findings to a different intervention (e.g., claiming efficacy of one specific intervention although the review covered a class of several interventions)	1/19	18/19
	8	Conclusion extrapolates the review's findings from a surrogate marker or a specific outcome to the global improvement of the disease	1/19	18/19
	15	Conclusion extrapolates the review's findings to a different population or setting	1/19	18/19

study was 2 (range, 1-5). The most common type of spin identified was type 5 ("The conclusion claims the beneficial effect of the experimental treatment despite a high risk of bias in primary studies"), which was observed in 7 studies (7/19, 36.8%). The next most common types of spin were type 3 ("Selective reporting of or overemphasis on efficacy outcomes or analysis favoring the beneficial effect of the experimental intervention") and type 11 ("Conclusion focuses selectively on statistically significant efficacy outcome"), both of which were observed in 6 studies (6/19, 31.6%). The fourth most common type of spin was type 14 ("Failure to report a wide confidence interval of estimates"), which was observed in 4 studies (4/19, 21%). Full spin assessment of abstracts is shown in Table 1.

Table 2 reports complete 16-point AMSTAR 2 assessments. There was a statistically significant association between a lower Scopus CiteScore and the failure to satisfy AMSTAR type 9 spin ($P = .015$). Additionally, there was a statistically significant association between a lower Clarivate Impact Factor and the failure to satisfy the AMSTAR type 9 requirement ($P = .001$). Studies receiving external funding were associated with the failure to satisfy AMSTAR type 3 spin ($P = .047$). Last, studies not registered with PROSPERO were associated with the failure to satisfy AMSTAR type 2 spin ($P = .004$). Based on AMSTAR 2 assessment, 15 studies (15/19, 78.9%) were rated as "low quality." Four studies (4/19, 21%) were rated as "moderate quality." No studies met the criteria for "high quality."

Out of the 19 articles reviewed, 13 studies (16/19, 84.2%) positively spun their findings to claim the efficacy of UCLR, while 6 studies (3/19, 15.8%) negatively spun their findings to claim UCLR as an unfavorable intervention.

Discussion

The results of this systematic review indicate that at least 1 of the 15 types of spin originally proposed by Yavchitz et al.[10] is present in each of the 19 studies included. The most common type of spin was type 5

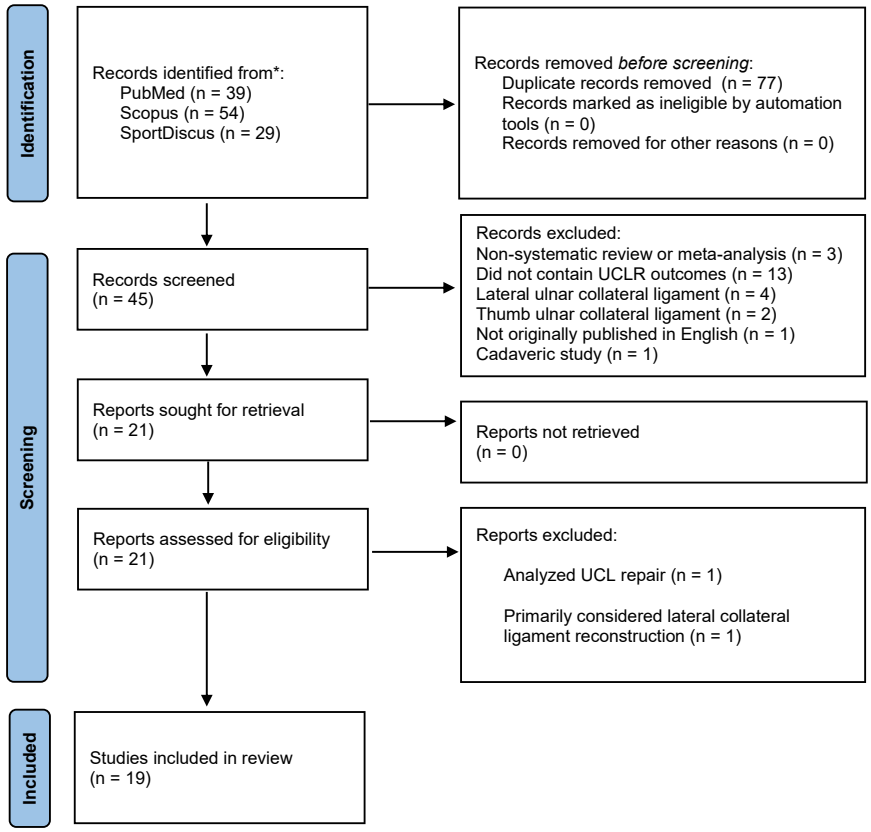

Fig 1. The Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) flow diagram.

("The conclusion claims the beneficial effect of the experimental treatment despite a high risk of bias in primary studies"), found in 36.8% of the included studies. The second most common types of spin were type 3 ("Selective reporting of or overemphasis on efficacy outcomes or analysis favoring the beneficial effect of the experimental intervention") and type 11 ("Conclusion focuses selectively on statistically significant efficacy outcome"), both found in 31.6% of the included studies. Failure to satisfy the AMSTAR type 9 requirement was associated with both a lower Scopus CiteScore ($P = .015$) and a lower Clarivate Impact Factor ($P = .001$).

Several studies have shown a high prevalence of spin in systematic reviews in orthopaedic research.[13,14,20] Regarding the most frequent types of spin identified, a systematic review by Hamer et al.[21] presents an example of type 3 spin. The results of the abstract state, "Significant differences in elbow extension, elbow extension velocity, and shoulder internal rotation velocity were found among amateur pitchers." However, the conclusion goes on to claim that "limited differences exist in pitchers before and after UCLR as well as in post-UCLR pitchers and healthy, age-matched controls." This indicates type 3 spin, as the authors overemphasized the beneficial effect of UCLR without considering the significant differences in range of motion between post-UCLR pitchers and control pitchers. This type of spin can mislead readers in believing that the conclusions of a study are more valid than the results support. An example of type 5 spin in Peters et al.[22] is present in the conclusion of the abstract, which states, "overall return to sport proportion is higher than return to sport at previous level, regardless of treatment type for UCL injury," despite reporting low-quality, high-bias evidence in primary studies. The study reported several athletes lost to follow-up in percentages as high as 42% and 54%, which introduces a great deal of bias into the validity of the study. Such definitive conclusions are difficult to support when the primary supporting studies are low quality and high in bias, making it possible for readers to have a distorted takeaway from the article. Last, an example of spin type 11 is present in the review by Erickson et al.[23] The conclusion focuses solely on the high return-to-sport rates of collegiate athletes and of those who received the docking and American Sports Medicine Institute techniques, but it fails to mention the relatively high "overall complication rate of 10.5%" that was found in the results. The abstract's selective reporting of efficacy outcomes indicates the presence of type 11 spin.

The significant associations found between the Scopus CiteScore, Clarivate Impact Factor, external funding, and preregistration with PROSPERO were surprising given the fact that previous findings of other spin studies have found no statistically significant

Table 2. AMSTAR 2 Assessment of Reviewed Studies

AMSTAR	Yes	No
1. Did the research questions and inclusion criteria for the review include the elements of PICO?	12/19	7/19
2. Did the report of the review contain an explicit statement that the review methods were established before the conduct of the review, and did the report justify any significant deviations from the protocol?	7/19	12/19
3. Did the review authors explain their selection of the study designs for inclusion in the review?	5/19	14/19
4. Did the review authors use a comprehensive literature search strategy?	18/19	1/19
5. Did the review authors perform study selection in duplicate?	14/19	5/19
6. Did the review authors perform data extraction in duplicate?	8/19	11/19
7. Did the review authors provide a list of excluded studies and justify the exclusions?	0/19	19/19
8. Did the review authors describe the included studies in adequate detail?	18/19	1/19
9. Did the review authors use a satisfactory technique for assessing the RoB in individual studies that were included in the review?	14/19	5/19
10. Did the review authors report on the sources of funding for the studies included in the review?	1/19	18/19
11. If meta-analysis was performed, did the review authors use appropriate methods for statistical combination of results?*	5/6	1/6
12. If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?*	3/6	3/6
13. Did the review authors account for RoB in primary studies when interpreting/ discussing the results of the review?	15/19	4/19
14. Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	6/19	13/19
15. If they performed quantitative synthesis, did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?*	5/6	1/6
16. Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	19/19	19/19

AMSTAR 2, A Measurement Tool to Assess Systematic Reviews Version 2; PICO, patient/population, intervention, comparison, and outcomes; RoB, risk of bias.

*Only applicable to studies conducting meta-analysis.

associations between these variables and spin types.[20,24-26] Failure to adhere to AMSTAR type 9 ("Did the review authors use a satisfactory technique for assessing the RoB [risk of bias] in individual studies that were included in the review?") was significantly associated with both a lower Scopus CiteScore ($P = .015$) and Clarivate Impact Factor ($P = .00059$). One explanation is that the studies that did not report using a validated risk of bias tool were only able to be published in lower-quality journals, as lack of accurate assessment of bias can result in distortion of results reporting.[27] Additionally, studies receiving external funding were associated with the failure to satisfy AMSTAR type 3 ("Did the review authors explain their selection of the study designs for inclusion in the review?") ($P = .047$). External funding may have influenced the authors' study selection process to confirm their expected hypotheses. Monetary influence can lead to reviewers selectively choosing studies that report favorable outcomes for the sponsor.[28,29] Last, studies not registered with PROSPERO were associated with the failure to satisfy AMSTAR type 2 ("Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review, and did the report justify any significant deviations from the protocol?") ($P = .0041$). Of the 19 included studies, only 2 that did not register with PROSPERO contained an explicit statement that the review methods were established a priori.

Based on the results of our study, it is clear that spin is pervasive in the UCLR literature. While most systematic reviews included in our study spun their findings to claim the positive effect of UCLR (84.2%), 3 studies (15.8%) spun their findings to claim the negative effect of UCLR. Upon close examination, we found that the studies that painted UCLR in a positive light tended to focus on excellent patient-reported outcomes and minimal complications while ignoring the beneficial effect of the intervention being compared, likely to show that UCLR is a safe and effective procedure overall.[30-38] In the few studies in which we identified spin that claimed the negative effect of UCLR, it was common for the study's conclusion to overemphasize the findings of a slight decline in athletic performance to overshadow the high rate of return to play and claim an overall negative effect of the procedure.[22,39] Each of

these studies was scored as having spin in category 13 ("Failure to specify the direction of the effect when it favors the control intervention"). This is particularly interesting given the fact that other published spin studies in the orthopaedic literature have not reported this kind of variability among their respective topics.[13,14] Our findings may be due to the fact that as the number of UCL tears continues to rise, there is a push for research to be published with definitive answers to guide clinical decision-making. A decisive positive or negative spin may increase the study's likelihood of being published, influencing the authors to bias their study conclusions, rather than allowing the reader to draw their own interpretations based on the objective findings of the study.

Many systematic reviews in the current UCLR literature are limited by a small number of included studies, making a clear analysis and conclusion difficult. Another factor that may contribute to the incidence of spin is the word count limit for the abstract section in a journal submission, which might pressure authors to highlight their most significant results and leave out others. While the findings reported in the abstract might be true, it could give an incomplete picture of the study. This is important in considering the findings from Boutron et al.,[40] who found that physicians may believe an intervention is favorable from the abstract alone despite the rest of the article concluding insignificant results. As the number of UCLR procedures continues to increase, it is imperative that the abstracts in research reflect an accurate representation of the efficacy of UCLR to best guide clinical practices. Greater efforts are needed to ensure that the abstracts of studies accurately represent the results in the full text.

Researchers can certainly take steps to mitigate the risk of spin in their publications. One way to do this is registering the protocol with public registers such as PROSPERO. We recommend that peer reviewers and editors of journals be wary of the reporting of results in abstracts, ensuring that the conclusions stated are an accurate reflection of the study's findings. Instead of concluding a definitively positive or negative spin, authors can simply present the objective results of their results. In addition, improving education on the types and frequency of spin may minimize biased reporting in the scientific literature. Future studies should continue to investigate the prevalence of spin in orthopaedic research to determine the contributing factors.

Limitations

One of the main limitations of our study was the subjective nature of identifying spin in abstracts and full texts. We attempted to mitigate the risk of inaccuracy by having multiple reviewers screen and score the articles independently and using a third-party reviewer in cases of disagreement. Additionally, we solely evaluated the abstracts when identifying the different spin categories, using the full texts for categories that needed clarification. We chose this method based on previously described methodologies and the knowledge that many physicians make clinical decisions based only on the abstract of the article.[15] Furthermore, our included studies were of low levels of evidence, likely due to the recent rise in popularity of UCLR. Last, 2 of the included articles were published before the PRISMA statement was published in 2009[41] and PROSPERO registration was established in 2011.[42] Since these studies could not have adhered to either guideline, it may have influenced our analysis.

Conclusions

Spin is highly prevalent in the abstracts of systematic reviews and meta-analyses that investigate the outcomes of UCLR.

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