Zusätzliches Onlinematerial zu Bolm-Audorff und Reißig: Zusammenhang zwischen beruflichen Belastungen und Läsionen der Rotatorenmanschette der Schulter – Ein Metareview aktueller systematischer Reviews

Online-Tabelle 1: Suchstring in Medline

#1 (Outcome):

shoulder or „rotator cuff“ or arm or „upper limb“ or extremit* or „cumulative trauma disorder“

#2 (Arbeitskontext)

(occupational diseases [MH] OR occupational exposure [MH] OR occupational medicine [MH] OR occupational risk [TW] OR occupational hazard [TW] OR (industry [MeSH Terms] mortality [SH]) OR occupational group* [TW] OR work-related OR occupational air pollutants [MH] OR working environment [TW])

#3 (systematische Reviews)

(“evidence” OR "meta-analysis as topic"[MeSH Terms] OR meta-analysis[pt] OR meta-analysis[tiab] OR review[pt] OR review[tiab] NOT (letter[pt] OR editorial[pt] OR comment[pt]) NOT ("animals"[MeSH Terms:noexp] NOT "humans"[MeSH Terms]))

#4 (zeitliche Eingrenzung):

Filter: ab 2021

#1-4

Online-Tabelle 2: Quality assessment of the systemic review of Curti et al. 2023 [14] according to AMSTAR 2 (Shea et al. 2017) [8]

Item-No.	Item[1]	Yes	Partial Yes	No
1	Did the research questions and inclusion criteria for the review include the components of PICO (population, intervention, control group and outcome)?			X
2	Did the report of the review contain an explicit statement that the review methods were established prior to conduct of the review and did the report justify any significant deviations from the protocol?			X[2]
3	Did the review authors explain their selection of the study designs for inclusion in the review?	[3]		[3]
4	Did the review authors use a comprehensive literature search strategy?			X[4]
5	Did the review authors perform study selection in duplicate?	X		
6	Did the review authors perform data extraction in duplicate?	X		
7	Did the review authors provide a list of excluded studies and justify the exclusions?			X[5]
8	Did the review authors describe the included studies in adequate detail?	X		
9	Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	X		
10	Did the review authors report on the sources of funding for the studies included in the review?			X
11	If meta-analysis was justified did the review authors use appropriate methods for statistical combination of results?	[6]		[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?	[6]		[6]
13	Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?	X		
14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	X		
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?	[6]		[6]
16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	X		

[1]For an explanation of the items, see Shea et al. 2017 Appendix 1 and Supplementary Figure The AMSTAR 2 Instrument.

[2]The authors do not mention a PROSPERO protocol in their publication. However, such a PROSPERO protocol exists [15]. However, this differs significantly from the publication because, according to the PROSPERO protocol, only studies that objectify the diagnosis of shoulder tendinopathy through imaging should be included. In fact, in all 5 included studies, diagnosis was based on physical examination. The authors do not mention this deviation from the PROSPERO protocol.

[3]The item is not applicable for systematic reviews of observational studies.

[4]The authors did not searched at least 2 databases (Shea et al. 2017, Supplementary Figure The AMSTAR 2 Instrument)

[5]The authors provided a list of excluded studies (Supplementary table 3) but did not provide a reason for exclusion in this table.

[6]A meta-analysis was not performed.

AMSTAR 2 critical domains (Shea et al. 2017, Box 1)

• Protocol registered before commencement of the review (item 2)

• Adequacy of the literature search (item 4)

• Justification for excluding individual studies (item 7)

• Risk of bias from individual studies being included in the review (item 9)

• Appropriateness of meta-analytical methods (item 11)

• Consideration of risk of bias when interpreting the results of the review (item 13)

• Assessment of presence and likely impact of publication bias (item 15)

Rating overall confidence in the results of the review (Shea et al. 2017, Box 2)

High

No or one non-critical weakness: the systematic review provides an accurate and comprehensive summary of the results of the available studies that address the question of interest

Moderate

More than one non-critical weakness*: the systematic review has more than one weakness but no critical flaws. It may provide an accurate summary of the results of the available studies that were included in the review

Low

One critical flaw with or without non-critical weaknesses: the review has a critical flaw and may not provide an accurate and comprehensive summary of the available studies that address the question of interest

Critically low

More than one critical flaw with or without non-critical weaknesses: the review has more than one critical flaw and should not be relied on to provide an accurate and comprehensive summary of the available studies

*Multiple non-critical weaknesses may diminish confidence in the review and it may be appropriate to move the overall appraisal down from moderate to low confidence

Overall confidence in the results of the systematic review of Curti et al. 2023 according to AMSTAR 2 (Shea et al. 2017): The overall confidence in the results of the systematic review ist critically low because 3 critical flaws were observed (item 2, 4 and 7). The systematic review should not be relied on to provide an accurate and comprehensive summary of the available studies

Online-Tabelle 3: Risk of bias assessment of the systematic review of Curti et al. 2023 [14] by the ROBIS tool (Whiting et al. 2016) [12]

Phase 2: Identifying concerns with the review process

DOMAIN 1: STUDY ELIGIBILITY CRITERIA	
Describe the study eligibility criteria, any restrictions on eligibility and whether there was evidence that objectives and eligibility criteria were pre-specified:	
1.1 Did the review adhere to pre-defined objectives and eligibility criteria?	Y/PY/PN/**N**/NI
1.2 Were the eligibility criteria appropriate for the review question?	Y/PY/PN/**N**/NI
1.3 Were eligibility criteria unambiguous?	**Y**/PY/PN/N/NI
1.4 Were all restrictions in eligibility criteria based on study characteristics appropriate (e.g. date, sample size, study quality, outcomes measured)?	**Y**/PY/PN/N/NI
1.5 Were any restrictions in eligibility criteria based on sources of information appropriate (e.g. publication status or format, language, availability of data)?	**Y**/PY/PN/N/NI
Concerns regarding specification of study eligibility criteria	LOW/**HIGH**/UNCLEAR
The authors have significantly changed their inclusion criteria compared to the PROSPERO protocol [15], which is not mentioned in the publication [14]. According to the PROSPERO protocol, only studies that objectify the diagnosis of shoulder tendinopathy through imaging should be included. In fact, in all 5 included studies, diagnosis was based on physical examination. The authors do not mention this deviation from the PROSPERO protocol. The limitation to studies in which occupational exposure is measured using video analyzes or inclinometers is not sufficiently justified because objectifying occupational exposure using job exposure matrices is also suitable. Furthermore, the limitation to studies in which the diagnosis of shoulder tendinopathy is based on a physical examination is inappropriate because studies in which the diagnosis is based on hospital discharge registers are also sufficiently certain.	

DOMAIN 2: IDENTIFICATION AND SELECTION OF STUDIES	
Describe methods of study identification and selection (e.g. number of reviewers involved):	
2.1 Did the search include an appropriate range of databases/electronic sources for published and unpublished reports?	Y/PY/PN/**N**/NI
2.2 Were methods additional to database searching used to identify relevant reports?	**Y**/PY/PN/N/NI
2.3 Were the terms and structure of the search strategy likely to retrieve as many eligible studies as possible?	**Y/**PY/PN/N/NI
2.4 Were restrictions based on date, publication format, or language appropriate?	**Y**/PY/PN/N/NI
2.5 Were efforts made to minimise error in selection of studies?	**Y/**PY/PN/N/NI
Concerns regarding methods used to identify and/or select studies	LOW/**HIGH**/UNCLEAR
Rationale for concern: The authors only conducted a search in Medline. The required search in a second database, e.g. EMBASE (Whiting et al. 2016, Appendix B) was not carried out.	

DOMAIN 3: DATA COLLECTION AND STUDY APPRAISAL	
Describe methods of data collection, what data were extracted from studies or collected through other means, how risk of bias was assessed (e.g. number of reviewers involved) and the tool used to assess risk of bias:	
3.1 Were efforts made to minimise error in data collection?	**Y**/PY/PN/N/NI
3.2 Were sufficient study characteristics available for both review authors and readers to be able to interpret the results?	Y/PY/PN/**N**/NI
3.3 Were all relevant study results collected for use in the synthesis?	Y/PY/PN/**N**/NI
3.4 Was risk of bias (or methodological quality) formally assessed using appropriate criteria?	**Y**/PY/PN/N/NI
3.5 Were efforts made to minimise error in risk of bias assessment?	**Y**/PY/PN/N/NI
Concerns regarding methods used to collect data and appraise studies	**LOW**/HIGH/UNCLEAR
Rationale for concern: 3.2: Table 3 of the systematic review does not contain any information on how the outcome was diagnosed. 3.3: Table 3 of the systematic review does not contain any information about the fact that the study by Werner et al. 2005 [19] does not contain an effect estimate for the risk of shoulder tendonitis, but only for any upper extremity tendonitis (Table IV of Werner et al. 2005). This study should therefore have been excluded. The systematic review contains the following statement in Table 3 about the study by Svendsen et al. 2004a [20]: "No association was found for lifetime upper arm elevation above 90 degrees for both dominant and non-dominant shoulder." However, the authors found a statistically borderline significant trend between an increase in lifetime upper arm elevation above 90 degrees by 6 months of 1.14 (95% CI 0.97-1.35, Table 5 of Svendsen et al. 2004a)	

DOMAIN 4: SYNTHESIS AND FINDINGS	
Describe synthesis methods:	
4.1 Did the synthesis include all studies that it should?	Y/PY/PN/**N**/NI
4.2 Were all pre-defined analyses reported or departures explained?	Y/PY/PN/N/**NI**
4.3 Was the synthesis appropriate given the nature and similarity in the research questions, study designs and outcomes across included studies?	Y/PY/PN/**N**/NI
4.4 Was between-study variation (heterogeneity) minimal or addressed in the synthesis?	Y/PY/PN/**N**/NI
4.5 Were the findings robust, e.g. as demonstrated through funnel plot or sensitivity analyses?	Y/PY/PN/**N**/NI
4.6 Were biases in primary studies minimal or addressed in the synthesis?	**Y**/PY/PN/N/NI
Concerns regarding the synthesis and findings	LOW/**HIGH**/UNCLEAR
Rationale for concern: 4.1: Four studies that assessed the level of occupational shoulder exposure using video analysis or inclinometers in relation to lesions of the rotator cuff and that were included in the justification of the occupational disease 2117 [1] are missing in the systematic review by Curti et al. 2023: Luopajärvi et al. 1979 [21], Punnett et al. 2000 [22], Hansson et al. 2000 [23], and Svendsen et al. 2004b [24]. The limitation to studies in which occupational exposure is measured using video analyzes or inclinometers is not sufficiently justified because objectifying occupational exposure using job exposure matrices is also suitable. Furthermore, the limitation to studies in which the diagnosis of shoulder tendinopathy is based on a physical examination is inappropriate because studies in which the diagnosis is based on hospital discharge registers or magnetic resonance image are also sufficiently certain (see domain 1).or 4.2: The PROSPERO protocol [15], which is not mentioned in the publication [14], is largely uninformative regarding the planned analyses. 4.3: The synthesis of the existing evidence based on the few studies using measurement techniques to determine occupational shoulder exposure and diagnosis of rotator cuff lesions after physical examination is incomplete because studies that determined occupational exposure using job exposure matrices and disease using hospital discharge registers were excluded [e.g., 25,26]. 4.4: The reasons for the observed study variations were not discussed. 4.5: The results of the systematic review are not robust because very few studies with different results were included.	

Y=YES, PY=PROBABLY YES, PN=PROBABLY NO, N=NO, NI=NO INFORMATION

Phase 3: Judging risk of bias

Summarize the concerns identified during the Phase 2 assessment:

Domain	Concern	Rationale for concern
1. Concerns regarding specification of study eligibility criteria	High	The authors have significantly changed their inclusion criteria compared to the PROSPERO protocol [15], which is not mentioned in the publication [14]. The limitation to studies in which occupational exposure is measured and in which the diagnosis of shoulder tendinopathy is based on a physical examination is inappropriate.
2. Concerns regarding methods used to identify and/or select studies	High	Search in only one database. The required search in a second database is missing.

3. Concerns regarding methods used to collect data and appraise studies	Low	
4. Concerns regarding the synthesis and findings	High	Four studies that assessed the level of occupational shoulder exposure using video analysis or inclinometers were missing in the systematic review. The synthesis of the existing evidence based on the few studies using measurement techniques to determine occupational shoulder exposure and diagnosis of rotator cuff lesions after physical examination is incomplete because the majority of studies that determined occupational exposure using job exposure matrices and disease using hospital discharge registers were excluded.

RISK OF BIAS IN THE REVIEW	
Describe whether conclusions were supported by the evidence:	
A. Did the interpretation of findings address all of the concerns identified in Domains 1 to 4?	Y/PY/PN/**N**/NI
B. Was the relevance of identified studies to the review's research question appropriately considered?	Y/PY/PN/**N**/NI
C. Did the reviewers avoid emphasizing results on the basis of their statistical significance?	**Y**/PY/PN/N/NI
Risk of bias in the review	RISK: LOW/**HIGH**/UNCLEAR
Rationale for risk: The phase 2 assessment identified a number of areas of concern with the review process which were not addressed by the authors. These include a significant change of inclusion criteria compared to the PROSPERO protocol, search in only one database, and missing studies. There is therefore a high risk of bias in this review.	

Y=YES, PY=PROBABLY YES, PN=PROBABLY NO, N=NO, NI=NO INFORMATION

Online-Tabelle 4: Quality assessment of the systemic review of Diener et al. 2024 [16] according to AMSTAR 2 (Shea et al. 2017) [8]

Item-No.	Item[1]	Yes	Partial Yes	No
1	Did the research questions and inclusion criteria for the review include the components of PICO (population, intervention, control group and outcome)?	X		
2	Did the report of the review contain an explicit statement that the review methods were established prior to conduct of the review and did the report justify any significant deviations from the protocol?			X[2]
3	Did the review authors explain their selection of the study designs for inclusion in the review?	[3]		[3]
4	Did the review authors use a comprehensive literature search strategy?			X[4]
5	Did the review authors perform study selection in duplicate?	X		
6	Did the review authors perform data extraction in duplicate?			X
7	Did the review authors provide a list of excluded studies and justify the exclusions?			X
8	Did the review authors describe the included studies in adequate detail?			X[5]
9	Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	X		
10	Did the review authors report on the sources of funding for the studies included in the review?			X
11	If meta-analysis was justified did the review authors use appropriate methods for statistical combination of results?	X		
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?	X		
13	Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?	X		
14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?			X[6]
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?			X[7]
16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?			X[8]

[1]For an explanation of the items, see Shea et al. 2017 Appendix 1 and Supplementary Figure The AMSTAR 2 Instrument

[2]An explicit statement that the review methods were established prior to conduct of the review was not given. A PROSPERO protocol does not exist.

[3]The item is not applicable for systematic reviews of observational studies.

[4]The search string is very simple and does not contain any specific occupational exposure (overhead work, repetitive movements in the shoulder joint, force exertions in the shoulder joint, e.g. heavy lifting or hand arm vibration). The requirement that the systematic review must be completed a maximum of 24 months after the database query (see Shea et al. 2017, Supplementary Figure The AMSTAR 2 Instrument, Item 4) is not met. This is because the database query took place on March 30, 2020 and the manuscript was submitted on June 1, 2022.

[5]The systematic review does not contain a data extraction table. It is therefore unclear which primary studies were included.

[6]Heterogeneity in the four meta-analyses conducted was not assessed.

[7]Publication bias was not assessed.

[8]The authors declare that they have no conflicts of interest. However, information on research funding for the study is missing.

AMSTAR 2 critical domains (Shea et al. 2017, Box 1)

• Protocol registered before commencement of the review (item 2)

• Adequacy of the literature search (item 4)

• Justification for excluding individual studies (item 7)

• Risk of bias from individual studies being included in the review (item 9)

• Appropriateness of meta-analytical methods (item 11)

• Consideration of risk of bias when interpreting the results of the review (item 13)

• Assessment of presence and likely impact of publication bias (item 15)

Rating overall confidence in the results of the review (Shea et al. 2017, Box 2)

High

No or one non-critical weakness: the systematic review provides an accurate and comprehensive summary of the results of the available studies that address the question of interest

Moderate

More than one non-critical weakness*: the systematic review has more than one weakness but no critical flaws. It may provide an accurate summary of the results of the available studies that were included in the review

Low

One critical flaw with or without non-critical weaknesses: the review has a critical flaw and may not provide an accurate and comprehensive summary of the available studies that address the question of interest

Critically low

More than one critical flaw with or without non-critical weaknesses: the review has more than one critical flaw and should not be relied on to provide an accurate and comprehensive summary of the available studies

*Multiple non-critical weaknesses may diminish confidence in the review and it may be appropriate to move the overall appraisal down from moderate to low confidence

Overall confidence in the results of the systematic review of Diener et al. 2024 according to AMSTAR 2 (Shea et al. 2017):

The overall confidence in the results of the systematic review is critically low because 4 critical flaws were observed (item 2, 4, 7 and 15). The systematic review should not be relied on to provide an accurate and comprehensive summary of the available studies

Online -Tabelle 5: Risk of bias assessment in the systematic review of Diener et al. 2024 [16] by the ROBIS tool (Whiting et al. 2016) [12]

Phase 2: Identifying concerns with the review process

DOMAIN 1: STUDY ELIGIBILITY CRITERIA	
Describe the study eligibility criteria, any restrictions on eligibility and whether there was evidence that objectives and eligibility criteria were pre-specified:	
1.1 Did the review adhere to pre-defined objectives and eligibility criteria?	**Y**/PY/PN/N/NI
1.2 Were the eligibility criteria appropriate for the review question?	**Y**/PY/PN/N/NI
1.3 Were eligibility criteria unambiguous?	**Y**/PY/PN/N/NI
1.4 Were all restrictions in eligibility criteria based on study characteristics appropriate (e.g. date, sample size, study quality, outcomes measured)?	**Y**/PY/PN/N/NI
1.5 Were any restrictions in eligibility criteria based on sources of information appropriate (e.g. publication status or format, language, availability of data)?	Y/**PY**/PN/N/NI
Concerns regarding specification of study eligibility criteria:	**LOW**/HIGH/UNCLEAR
Exclusion of studies not published in English or German is not appropriate. However, despite an own systematic review (Seidler et al. 2020 [3]) we do not know any study to this topic in a language other than English or German.	

DOMAIN 2: IDENTIFICATION AND SELECTION OF STUDIES	
Describe methods of study identification and selection (e.g. number of reviewers involved):	
1.1 Did the search include an appropriate range of databases/electronic sources for published and unpublished reports?	**Y**/PY/PN/N/NI
1.2 Were methods additional to database searching used to identify relevant reports?	Y/PY/**PN**/N/NI
1.3 Were the terms and structure of the search strategy likely to retrieve as many eligible studies as possible?	Y/PY/**PN**/N/NI
1.4 Were restrictions based on date, publication format, or language appropriate?	Y/PY/**PN**/N/NI
1.5 Were efforts made to minimise error in selection of studies?	Y/PY/PN/N/**NI**
Concerns regarding methods used to identify and/or select studies	LOW/**HIGH**/UNCLEAR
Rationale for concern: Only one method additional to database searching (checking references in existing reviews) was used. Other methods (handsearching of references in the included primary studies or citation tracking) were not used. The search string is very simple and does not contain any specific occupational exposures (overhead work, repetitive movements in the shoulder joint, force exertions in the shoulder joint, e.g. heavy lifting or HAV). The restriction on studies published after 1991 in German or English is not appropriate. It is not clear from the publication whether the full-text screening was carried out by two people.	

DOMAIN 3: DATA COLLECTION AND STUDY APPRAISAL	
Describe methods of data collection, what data were extracted from studies or collected through other means, how risk of bias was assessed (e.g. number of reviewers involved) and the tool used to assess risk of bias:	
3.1 Were efforts made to minimise error in data collection?	Y/PY/PN/N/**NI**
3.2 Were sufficient study characteristics available for both review authors and readers to be able to interpret the results?	Y/PY/PN/N/**NI**
3.3 Were all relevant study results collected for use in the synthesis?	Y/PY/PN/N/**NI**
3.4 Was risk of bias (or methodological quality) formally assessed using appropriate criteria?	**Y**/PY/PN/N/NI
3.5 Were efforts made to minimise error in risk of bias assessment?	Y/PY/PN/N/**NI**
Concerns regarding methods used to collect data and appraise studies	LOW/**HIGH**/UNCLEAR
Rationale for concern: It is unknown whether data extraction and risk of bias assessment was done by two authors. A data extraction table and a risk of bias table is not existing. It is not known which 13 studies were included in the systematic review.	

DOMAIN 4: SYNTHESIS AND FINDINGS	
Describe synthesis methods:	
1.1 Did the synthesis include all studies that it should?	Y/PY/PN/N/**NI**
1.2 Were all pre-defined analyses reported or departures explained?	Y/PY/PN/N/**NI**
4.3 Was the synthesis appropriate given the nature and similarity in the research questions, study designs and outcomes across included studies?	Y/PY/PN/**N**/NI
4.4 Was between-study variation (heterogeneity) minimal or addressed in the synthesis?	Y/PY/PN/N/**NI**
4.5 Were the findings robust, e.g. as demonstrated through funnel plot or sensitivity analyses?	Y/PY/PN/N/**NI**
4.6 Were biases in primary studies minimal or addressed in the synthesis?	Y/PY/PN/N/**NI**
Concerns regarding the synthesis and findings	LOW/**HIGH**/UNCLEAR
Rationale for concern: There is no published study protocol, e.g. in PROSPERO. Therefore, it cannot be assessed whether all analyses planned a priori were carried out or not. Forest plots for the four meta-analyses mentioned in Table 2 with presentation of the effect estimates of the primary studies included are missing. Finally, the heterogeneity of the study results was not presented and discussed.	

Y=YES, PY=PROBABLY YES, PN=PROBABLY NO, N=NO, NI=NO INFORMATION

Phase 3: Judging risk of bias

Summarize the concerns identified during the Phase 2 assessment:

Domain	Concern	Rationale for concern
1. Concerns regarding specification of study eligibility criteria	Low	All signalling questions were answered as "Yes" or "Probably Yes", so no potential concerns about the specification of eligibility criteria were identified.
2. Concerns regarding methods used to identify and/or select studies	High	The number of only 13 studies included in the systematic review is

		low and very much lower than the 34 studies included in chapters 3.1-3.2 of the scientific justification for the recommended occupational disease.
3. Concerns regarding methods used to collect data and appraise studies	High	It is unknown which 13 studies were included in the systematic review, what results they came to and how the risk of bias in these studies was assessed. It is unknown whether risk of bias assessment was done by two authors.
4. Concerns regarding the synthesis and findings	No information	There is no published study protocol, e.g. in PROSPERO. Therefore, it cannot be assessed whether all analyses planned a priori were carried out or not. Forest plots for the four meta-analyses mentioned above with presentation of the effect estimates of the primary studies included are missing. Finally, the variability of the study results was not presented and discussed.

RISK OF BIAS IN THE REVIEW	
Describe whether conclusions were supported by the evidence:	
D. Did the interpretation of findings address all of the concerns identified in Domains 1 to 4?	Y/PY/PN/**N**/NI
E. Was the relevance of identified studies to the review's research question appropriately considered?	**Y**/PY/PN/N/NI
F. Did the reviewers avoid emphasizing results on the basis of their statistical significance?	**Y**/PY/PN/N/NI
Risk of bias in the review	RISK: LOW/**HIGH**/UNCLEAR
Rationale for risk: The phase 2 assessment identified a number of areas of concern with the review process which were not addressed by the authors. These include missing studies, lack of formal quality assessment, missing details on included studies, and failure to appropriately consider differences between studies in the synthesis. There is therefore a high risk of bias in this review.	

Y=YES, PY=PROBABLY YES, PN=PROBABLY NO, N=NO, NI=NO INFORMATION

Online -Tabelle 6: Quality assessment of the systemic review of Versloot et al. 2024 [17] according to AMSTAR 2 (Shea et al. 2017) [8]

Item-No.	Item[1]	Yes	Partial Yes	No
1	Did the research questions and inclusion criteria for the review include the components of PICO (population, intervention, control group and outcome)?			X
2	Did the report of the review contain an explicit statement that the review methods were established prior to conduct of the review and did the report justify any significant deviations from the protocol?		X[2]	
3	Did the review authors explain their selection of the study designs for inclusion in the review?	[3]		[3]
4	Did the review authors use a comprehensive literature search strategy?			X[4]
5	Did the review authors perform study selection in duplicate?	X		
6	Did the review authors perform data extraction in duplicate?	X		
7	Did the review authors provide a list of excluded studies and justify the exclusions?			X[5]
8	Did the review authors describe the included studies in adequate detail?		X[6]	
9	Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	X		
10	Did the review authors report on the sources of funding for the studies included in the review?			X
11	If meta-analysis was justified did the review authors use appropriate methods for statistical combination of results?	[7]		[7]
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?	[7]		[7]
13	Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?	X		
14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	X		
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?	[7]		[7]
16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	X		

[1]For an explanation of the items, see Shea et al. 2017 Appendix 1 and Supplementary Figure The AMSTAR 2 Instrument.

[2]The study authors announced in the PROSPERO protocol [32] that the underlying body of evidence will be evaluated with GRADE. This assessment step was deviated from in the publication [17] without justification and no GRADE assessment was carried out.

[3]The item is not applicable for systematic reviews of observational studies.

[4] Methods in addition to database searching (citation searching, reference checking, handsearching or contacting experts) were not used.

[5]The authors excluded 1005 studies after full-text screening (Figure A). The study does not contain a list of which studies were excluded and for what reasons.

[6]Data extraction from individual studies was inaccurate. The study by Arcury et al. 2016 [26] was described as a prospective study, although cases diagnosed with rotator cuff syndrome during the first of 2 cross-sectional examinations were not excluded. Consequently, the study did not calculate an incidence ratio for rotator cuff syndrome, but rather a prevalence OR. The study by Meyers et al. 2023 [18] was discussed in the chapter rotator cuff syndrome. Meyers et al. 2023 have diagnosed rotator cuff syndrome when shoulder pain occurs during resisted abduction, internal rotation or external rotation in the shoulder joint, a painful arc occurs when the arm is raised to 60-120° in the shoulder joint or shoulder pain occurs when the elbow joint is flexed against resistance (Meyers et al. 2023, Supplemental Figure 3). Shoulder pain during abduction, internal rotation, or external rotation in the shoulder joint is an appropriate method for diagnosing a rotator cuff lesion [1]. A painful arc in the shoulder joint when the arm is raised to 60-120° is a diagnostic procedure for impingement syndrome (Buckup 2019 [47], page 149). On the other hand, the detection of shoulder pain when flexing the elbow joint against resistance is a method for diagnosing tendinitis of the biceps brachii muscle (Palmer et al. 2000 [60], Sluiter et al. 2001 [33]). According to the International Classification of Diseases (ICD), a rotator cuff lesion (M75.1) is a tear or partial tear of the rotator cuff that did not occur after trauma [49]. Tendinitis of the biceps brachii muscle is not a lesion of the rotator cuff, but is, according to the ICD [49], an independent disease (M75.2). According to the ICD, impingement syndrome is not a lesion of the rotator cuff, but rather an independent disease (M75.4). The study by Holm et al. 2016 [31] is reported in the systematic review by Versloot et al. 2024 in the chapter on subacromial impingement. In fact, in the study by Holm et al. 2016, only the odds ratio for complaints in the shoulder area among employees using pipettes was calculated (Figure 3). Of the 199 cases with complaints in the upper extremity area, 33 cases (11%) showed shoulder impingement syndrome on physical examination. A risk estimate for shoulder impingement syndrome from pipette work has not been calculated. Versloot et al. 2024 cite the study by Chu et al. 2021 [43] in the chapter on impingement syndrome. In the study of Chu et al. 2021, n=931 employees in the electronics industry in Taiwan were asked about their shoulder complaints in a cross-sectional study. Of the n=284 employees with shoulder problems, n=100 were assessed for the frequency of shoulder diseases using the method of Sluiter et al. 2001 [33] and diagnosed with subacromial impingement. A control group without shoulder complaints was not physically examined. When comparing the n=19 employees with subacromial impingement and the n=81 employees without subacromial impingement, there was no statistically significantly higher occupational shoulder exposure by repetition, overhead work, lifting or hand-arm-vibrations. A risk estimate for subacromial impingement adjusted for non-occupational confounders was not calculated. The study suffers from the fact that no employees without shoulder complaints were physically examined. Since employees without subacromial impingement also had shoulder complaints and since the above-mentioned occupational exposures also increase the prevalence of shoulder complaints [44], the study is of no informative value.

[7]A meta-analysis was not performed.

AMSTAR 2 critical domains (Shea et al. 2017, Box 1)

• Protocol registered before commencement of the review (item 2)

• Adequacy of the literature search (item 4)

• Justification for excluding individual studies (item 7)

• Risk of bias from individual studies being included in the review (item 9)

• Appropriateness of meta-analytical methods (item 11)

• Consideration of risk of bias when interpreting the results of the review (item 13)

• Assessment of presence and likely impact of publication bias (item 15)

Rating overall confidence in the results of the review (Shea et al. 2017, Box 2)

High

No or one non-critical weakness: the systematic review provides an accurate and comprehensive summary of the results of the available studies that address the question of interest

Moderate

More than one non-critical weakness*: the systematic review has more than one weakness but no critical flaws. It may provide an accurate summary of the results of the available studies that were included in the review

Low

One critical flaw with or without non-critical weaknesses: the review has a critical flaw and may not provide an accurate and comprehensive summary of the available studies that address the question of interest

Critically low

More than one critical flaw with or without non-critical weaknesses: the review has more than one critical flaw and should not be relied on to provide an accurate and comprehensive summary of the available studies

*Multiple non-critical weaknesses may diminish confidence in the review and it may be appropriate to move the overall appraisal down from moderate to low confidence

Overall confidence in the results of the systematic review of Versloot et al. 2024 according to AMSTAR 2 (Shea et al. 2017):

The overall confidence in the results of the systematic review is critically low because 2 critical flaws were observed (item 4 and 7). The systematic review should not be relied on to provide an accurate and comprehensive summary of the available studies

Online-Tabelle 7: Risk of bias assessment in the systematic review of Versloot et al. 2024 [17] by the ROBIS tool (Whiting et al. 2016) [12]

Phase 2: Identifying concerns with the review process

DOMAIN 1: STUDY ELIGIBILITY CRITERIA	
Describe the study eligibility criteria, any restrictions on eligibility and whether there was evidence that objectives and eligibility criteria were pre-specified:	
1.1 Did the review adhere to pre-defined objectives and eligibility criteria?	**Y**/PY/PN/N/NI
1.2 Were the eligibility criteria appropriate for the review question?	**Y**/PY/PN/N/NI
1.3 Were eligibility criteria unambiguous?	**Y**/PY/PN/N/NI
1.4 Were all restrictions in eligibility criteria based on study characteristics appropriate (e.g. date, sample size, study quality, outcomes measured)?	**Y**/PY/PN/N/NI
1.5 Were any restrictions in eligibility criteria based on sources of information appropriate (e.g. publication status or format, language, availability of data)?	Y/PY/PN/**N**/NI
Concerns regarding specification of study eligibility criteria	LOW/**HIGH**/UNCLEAR
1.5: The exclusion of studies in which the exposure assessment was carried out using a job exposure matrix cannot be found in the PROSPERO protocol, was not justified by the authors, and is to our opinion also not justified because the exposure assessment is based on an expert assessment and is carried out independently of the study participants.	

DOMAIN 2: IDENTIFICATION AND SELECTION OF STUDIES	
Describe methods of study identification and selection (e.g. number of reviewers involved):	
2.1 Did the search include an appropriate range of databases/electronic sources for published and unpublished reports?	**Y**/PY/PN/N/NI
2.2 Were methods additional to database searching used to identify relevant reports?	Y/PY/PN/**N**/NI
2.3 Were the terms and structure of the search strategy likely to retrieve as many eligible studies as possible?	**Y**/PY/PN/N/NI
2.4 Were restrictions based on date, publication format, or language appropriate?	Y/PY/PN/**N**/NI
2.5 Were efforts made to minimise error in selection of studies?	**Y**/PY/PN/N/NI
Concerns regarding methods used to identify and/or select studies	LOW/**HIGH**/UNCLEAR
Rationale for concern: 2.2: Methods in addition to database searching (citation searching, reference checking, handsearching or contacting experts) were not used. 2.4: It is not clear from the publication whether studies in certain languages or in a certain format (not full text studies, gray literature) were excluded during the title-abstract screening.	

DOMAIN 3: DATA COLLECTION AND STUDY APPRAISAL	
Describe methods of data collection, what data were extracted from studies or collected through other means, how risk of bias was assessed (e.g. number of reviewers involved) and the tool used to assess risk of bias:	
3.1 Were efforts made to minimise error in data collection?	**Y**/PY/PN/N/NI
3.2 Were sufficient study characteristics available for both review authors and readers to be able to interpret the results?	**Y**/PY/PN/N/NI
3.3 Were all relevant study results collected for use in the synthesis?	Y/PY/**PN**/N/NI
3.4 Was risk of bias (or methodological quality) formally assessed using appropriate criteria?	**Y**/PY/PN/N/NI
3.5 Were efforts made to minimise error in risk of bias assessment?	**Y**/PY/PN/N/NI
Concerns regarding methods used to collect data and appraise studies	**LOW**/HIGH/UNCLEAR
Rationale for concern:	
3.2: Data extraction from individual studies was inaccurate. The study by Arcury et al. 2016 [26] was described as a prospective study, although cases diagnosed with rotator cuff syndrome during the first of 2 cross-sectional examinations were not excluded. Consequently, the study did not calculate an incidence ratio for rotator cuff syndrome, but rather a prevalence OR. The study by Meyers et al. 2023 [18] was discussed in the chapter rotator cuff syndrome. Meyers et al. 2023 have diagnosed rotator cuff syndrome when shoulder pain occurs during abduction, internal rotation or external rotation in the shoulder joint, a painful arc occurs when the arm is raised to 60-120° in the shoulder joint or shoulder pain occurs when the elbow joint is flexed against resistance (Meyers et al. 2023, Supplemental Figure 3). Shoulder pain during abduction, internal rotation, or external rotation in the shoulder joint is an appropriate method for diagnosing a rotator cuff lesion [1]. A painful arc in the shoulder joint when the arm is raised to 60-120° is a diagnostic procedure for impingement syndrome (Buckup 2019 [47], page 149). On the other hand, the detection of shoulder pain when flexing the elbow joint against resistance is a method for diagnosing tendinitis of the biceps brachii muscle (Palmer et al. 2000 [60], Sluiter et al. 2001 [33]). According to the International Classification of Diseases (ICD), a rotator cuff lesion (M75.1) is a tear or partial tear of the rotator cuff that did not occur after trauma [49]. Tendinitis of the biceps brachii muscle is not a lesion of the rotator cuff, but is, according to the ICD [49], an independent disease (M75.2). According to the ICD, impingement syndrome is not a lesion of the rotator cuff, but rather an independent disease (M75.4). The study by Holm et al. 2016 [31] is reported in the systematic review by Versloot et al. 2024 in the chapter on subacromial impingement. In fact, in the study by Holm et al. 2016, only the odds ratio for complaints in the shoulder area among employees using pipettes was calculated (Figure 3). Of the 199 cases with complaints in the upper extremity area, 33 cases (11%) showed shoulder impingement syndrome on physical examination. A risk estimate for shoulder impingement syndrome from pipette work has not been calculated. Versloot et al. 2024 cite the study by Chu et al. 2021 [43] in the chapter on impingement syndrome. In the study of Chu et al. 2021, n=931 employees in the electronics industry in Taiwan were asked about their shoulder complaints in a cross-sectional study. Of the n=284 employees with shoulder problems, n=100 were assessed for the frequency of shoulder problems using the method of Sluiter et al. 2001 [33] examined and diagnosed with subacromial impingement. A control group without shoulder complaints was not physically examined. When comparing the n=19 employees with subacromial impingement and the n=81 employees without subacromial impingement, there was no statistically significantly higher occupational shoulder exposure by repetition, overhead work, lifting or hand-arm-vibrations. A risk estimate for subacromial impingement adjusted for non-occupational confounders was not calculated. The study suffers from the fact that no employees without shoulder complaints were physically examined. Since employees without subacromial impingement also had shoulder complaints and since the above-mentioned occupational exposures also increase the prevalence of shoulder complaints [43], the study is of no informative value.	

DOMAIN 4: SYNTHESIS AND FINDINGS	
Describe synthesis methods:	
4.1 Did the synthesis include all studies that it should?	Y/PY/PN/**N**/NI
4.2 Were all pre-defined analyses reported or departures explained?	Y/PY/PN/**N**/NI
4.3 Was the synthesis appropriate given the nature and similarity in the research questions, study designs and outcomes across included studies?	Y/PY/PN/**N**/NI
4.4 Was between-study variation (heterogeneity) minimal or addressed in the synthesis?	Y/PY/PN/N/**NI**
4.5 Were the findings robust, e.g. as demonstrated through funnel plot or sensitivity analyses?	Y/PY/PN/**N**/NI
4.6 Were biases in primary studies minimal or addressed in the synthesis?	**Y**/PY/PN/N/NI
Concerns regarding the synthesis and findings	LOW/**HIGH**/UNCLEAR
Rationale for concern: 4.1: Seven studies that assessed the association between occupational mechanical in relation to lesions of the rotator cuff and that were included in the justification of the occupational disease 2117 [1] are missing in the systematic review by Versloot et al. 2024: Bodin et al. 2012 [34], Gold et al. 2009 [35], Nordander et al. 2009 [36], Punnett et al. 2000[37], Svendsen et al. 2013 [38] and Thygesen et al. 2016 [39]. 4.2: The study authors announced in the PROSPERO protocol [32] that the underlying body of evidence will be evaluated with GRADE. This assessment step was deviated from in the publication [17] without justification and no GRADE assessment was carried out. 4.3: A meta-analysis of comparable studies could have been carried out. To this end, reference is made to the meta-analyses in the systematic reviews by Dalbøge et al. 2017 [40], Leong et al. 2019 [41], and Seidler et al. 2020 [4] which included in part identical studies. 4.5: Publication bias was not assessed.	

Y=YES, PY=PROBABLY YES, PN=PROBABLY NO, N=NO, NI=NO INFORMATION

Phase 3: Judging risk of bias

Summarize the concerns identified during the Phase 2 assessment:

Domain	Concern	Rationale for concern
1. Concerns regarding specification of study eligibility criteria	High	The exclusion of studies in which the exposure assessment was carried out using a job exposure matrix cannot be found in the PROSPERO protocol, was not justified by the authors, and is to our opinion also not justified because the exposure assessment is based on an expert assessment and is carried out independently of the study participants.
2. Concerns regarding methods used to identify and/or select studies	High	Methods in addition to database searching (citation searching, reference checking, handsearching or contacting experts) were not used. It is not clear from the publication whether studies in certain languages or in a certain format (not full text studies, gray literature) were excluded during the title-abstract screening.
3. Concerns regarding methods used to collect data and appraise studies	Low	Not applicable

4. Concerns regarding the synthesis and findings	High	Missing studies, missing GRADE assessment, meta-analysis of was possible but not performed, missing assessment of between study variation and assessment of publication bias.

RISK OF BIAS IN THE REVIEW	
Describe whether conclusions were supported by the evidence:	
A Did the interpretation of findings address all of the concerns identified in Domains 1 to 4?	Y/PY/PN/**N**/NI
B Was the relevance of identified studies to the review's research question appropriately considered?	**Y**/PY/PN/N/NI
C Did the reviewers avoid emphasizing results on the basis of their statistical significance?	**Y**/PY/PN/N/NI
Risk of bias in the review	RISK: LOW/**HIGH**/UNCLEAR
Rationale for risk: The phase 2 assessment identified a number of areas of concern with the review process which were not addressed by the authors. These include exclusion of studies in which the exposure assessment was carried out using a job exposure matrix, missing methods in addition to database searching (citation searching, reference checking, handsearching or contacting experts), missing studies, missing GRADE assessment, meta-analysis of was possible but not performed, missing assessment of between study variation and assessment of publication bias. There is therefore a high risk of bias in this review.	

Y=YES, PY=PROBABLY YES, PN=PROBABLY NO, N=NO, NI=NO INFORMATION