RAPID RESEARCH

@physicaltherapyresearch

March 2023

Inside This Week:

Training Shoulder Stability: Upper Traps & Serratus Anterior

- Push-Up Plus Muscle Activation Levels
- Stable vs. Unstable Exercises Shoulder Activation Levels
- Shoulder EMG Activity & Subacromial Pain Syndrome

PUSH-UP PLUS MUSCLE ACTIVATION LEVELS

FEBRUARY 2023

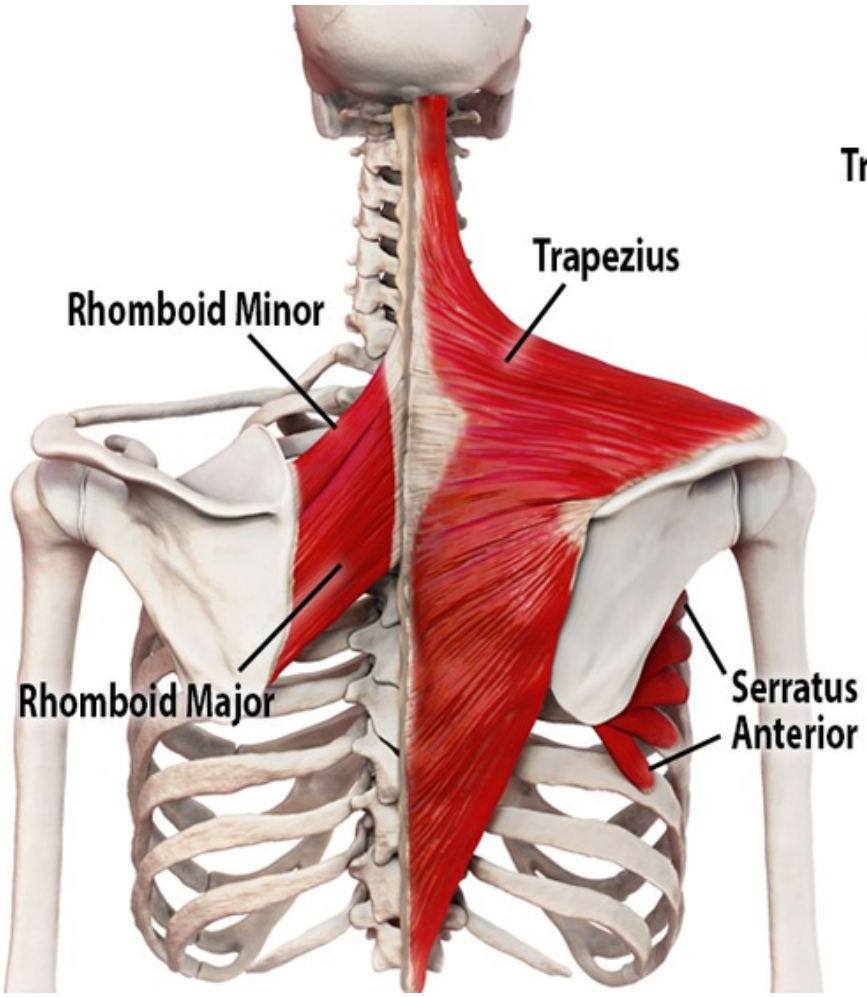
Click for Full Text (Kang et al. 2019)

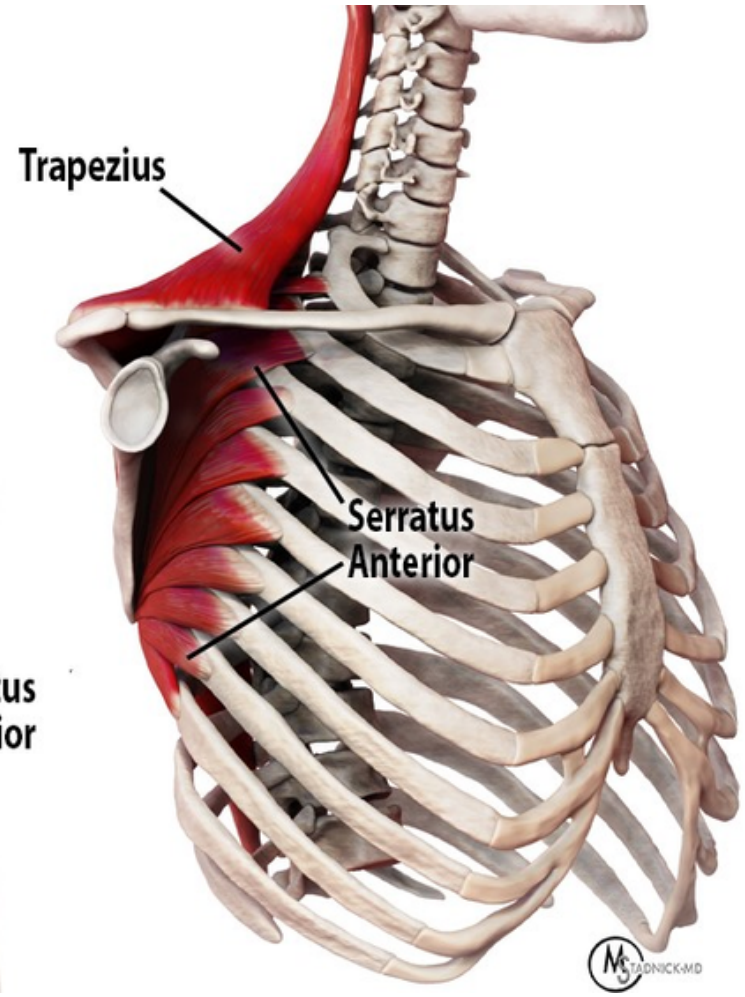
JBI 11/11 [100%]

Quality Check

*see appx

This systematic review compared the effectiveness of push-up plus (PUP) exercise variants based on the electromyographic (EMG) activity of the Serratus anterior (SA) and the Upper trapezius (UT).





KEY FINDINGS

19 studies included; 356 participants

Weakness of the SA and over-activation of the UT are frequently present in overhead athletes with shoulder dysfunction.

Push-Up Plus Variation Effects on SA & UT:
Distance between the hands [Highest SA @ shoulder width]
Shoulder-flexion angle [Highest SA @ 110-120 deg]
Elbow-flexion angle [Higher SA activation with more extension]
Different lower extremity position [Highest SA with same side leg lifted]

Push-Up Plus; Unstable vs. Stable Surface:
UT activity significantly increased [2.74%]

MAIN TAKEAWAYS

Participants generated higher SA and lower UT electromyographic activity when performing the Push-Up Plus exercise using the following form:

- On a stable surface
- In full elbow extension
- Hands shoulder-width apart
- 110° to 120° of shoulder flexion
- **Ipsilateral lower extremity lifted.**

Performing the PUP exercise on an unstable surface induced higher levels of UT activation but not SA activation.

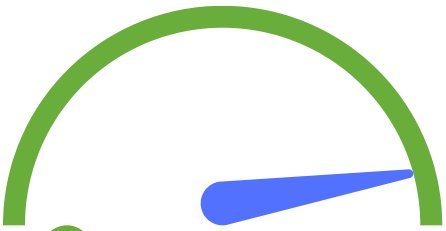
During the PUP exercise, serratus anterior activity did not differ between the stable and unstable surfaces.

STABLE VS. UNSTABLE EXERCISES SHOULDER ACTIVATION LEVELS

FEBRUARY 2023

Click for Full Text (Mendez-Rebolledo et al. 2022)

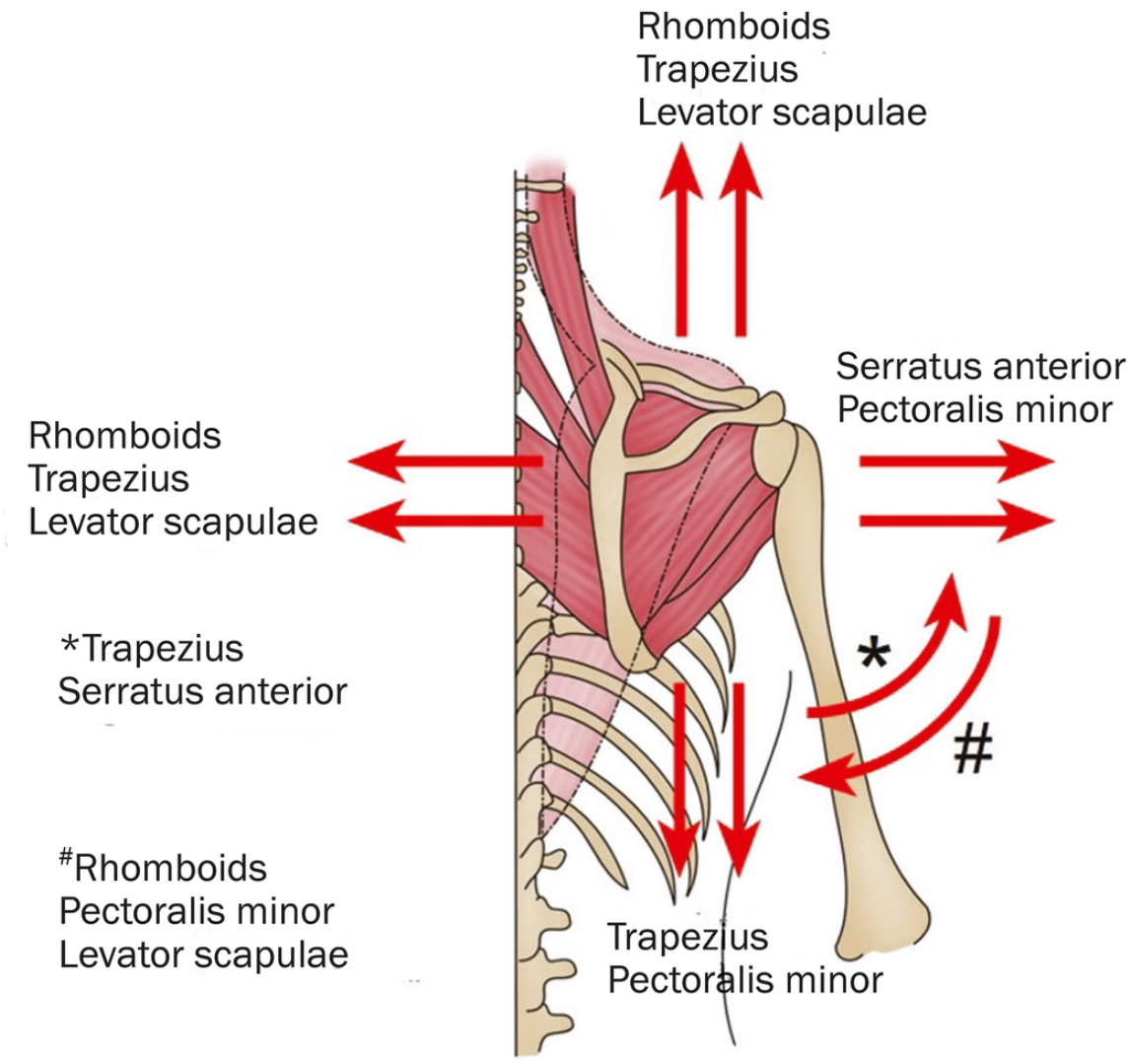
JBI 11/11 [100%]



Quality Check

*see appx

This systematic review analyzed the individual effect of different unstable support surfaces compared to a stable support surface on scapular muscles EMG activity during the execution of closed kinetic chain exercises.



KEY FINDINGS

30 studies were included, 498 participants

Upper Trapezius EMG Activity Unstable vs. Stable Surface:

Push-up Variations on

Suspension Equipment [2.92x higher vs. stable surface]

Therapeutic Exercise Ball [1.03x higher vs. stable surface]

Wobble board (30% higher vs. stable surface]

Bosu Ball [No Difference]

Serratus Anterior EMG Activity Unstable vs. Stable Surface:

No difference was observed for SA on any unstable device vs. a stable surface.

The certainty of the evidence is low due to high imprecision, inconsistency, and risk of publication bias.

MAIN TAKEAWAYS

Higher EMG activity in the Upper Trapezius occurs during push-up variations when using wobble boards, therapeutic balls, and suspension equipment.

No differences were observed in Serratus Anterior during unstable surface exercises.

Unstable, closed chain exercises tend to increase Upper Trapezius activation.

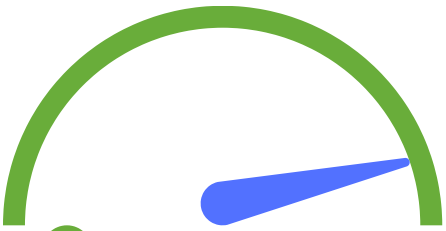
These findings can support selection of exercises for a given stage of rehabilitation or training program.

SHOULDER EMG ACTIVITY & SUBACROMIAL PAIN SYNDROME

FEBRUARY 2023

Click for Full Text (Kinsella & Pizzari et al. 2017)

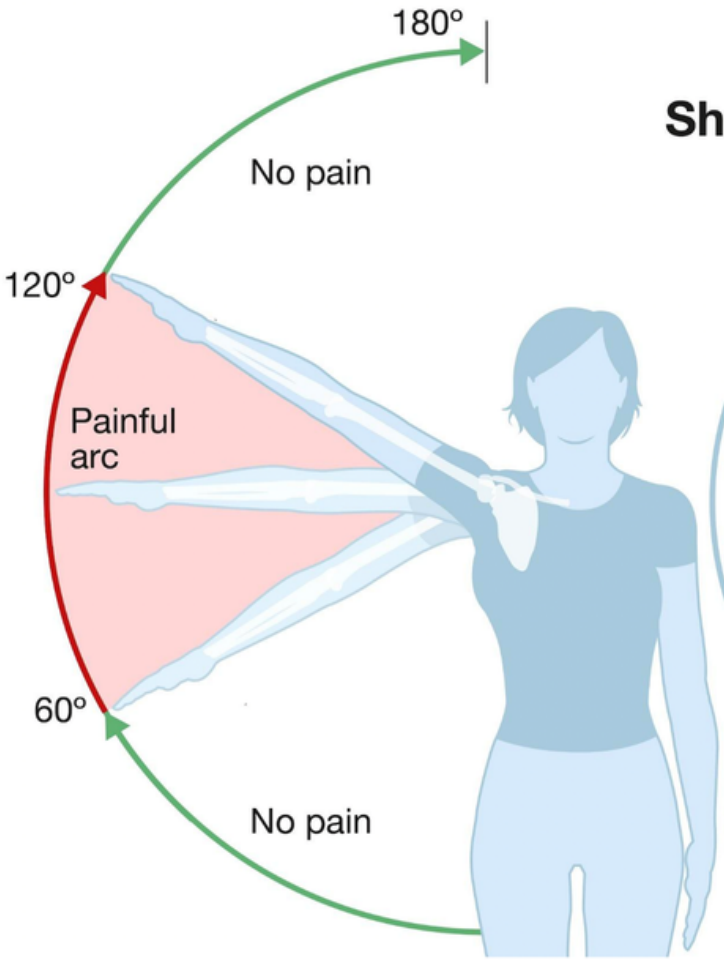
JBI 10/11 [90%]

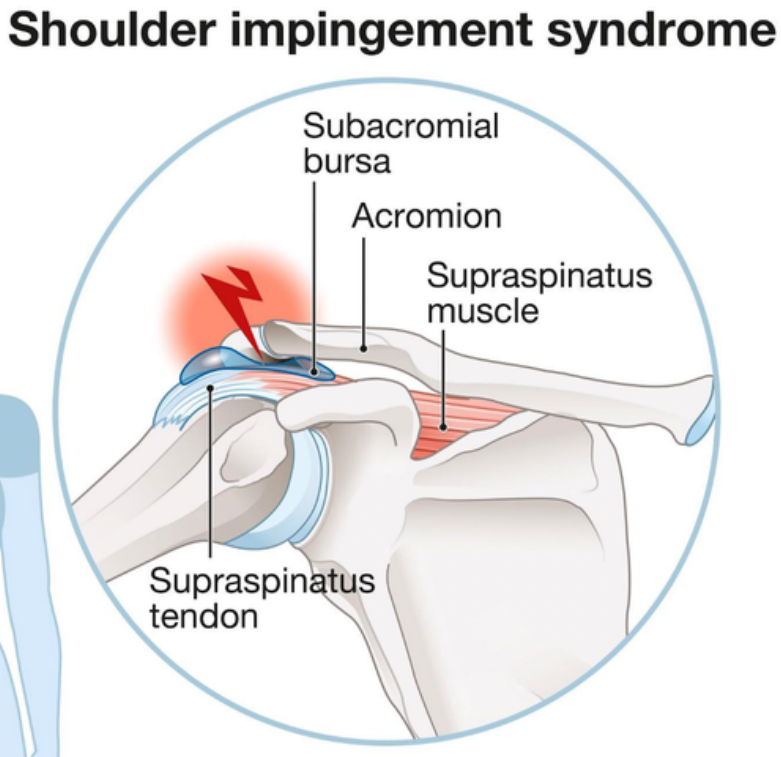


Quality Check

*see appx

This systematic review determined whether evidence exists of differences in electromyography (EMG) characteristics between subjects with and without Subacromial Pain Syndrome.





KEY FINDINGS

22 studies included; 342 with SPS, 334 Healthy

Scapular Muscle Activation in SPS vs. Healthy:

- No significant difference in Upper or Lower Trapezius (LT) activity, regardless of task, load or arm position
- Lower Serratus Anterior (SA) activity during loaded and unloaded elevation in SPS.
- Delayed Activation and Early termination during elevation for SA and LT vs healthy controls.

Rotator Cuff Activation in SPS vs. Healthy:

Inconsistent findings among rotator cuff activation for SPS vs healthy controls.

MAIN TAKEAWAYS

Limited evidence of significant differences in EMG activity in subjects with SPS compared to controls for the scapular, rotator cuff and other synergistic muscles.

For the majority of muscles, regardless of task, load or arm position, significant differences were not demonstrated.

Differences in amplitude and recruitment timing of Serratus Anterior were found. Mainly, lower amplitude, delayed activation and earlier termination demonstrated in those with SPS.

GIVE US YOUR FEEDBACK!

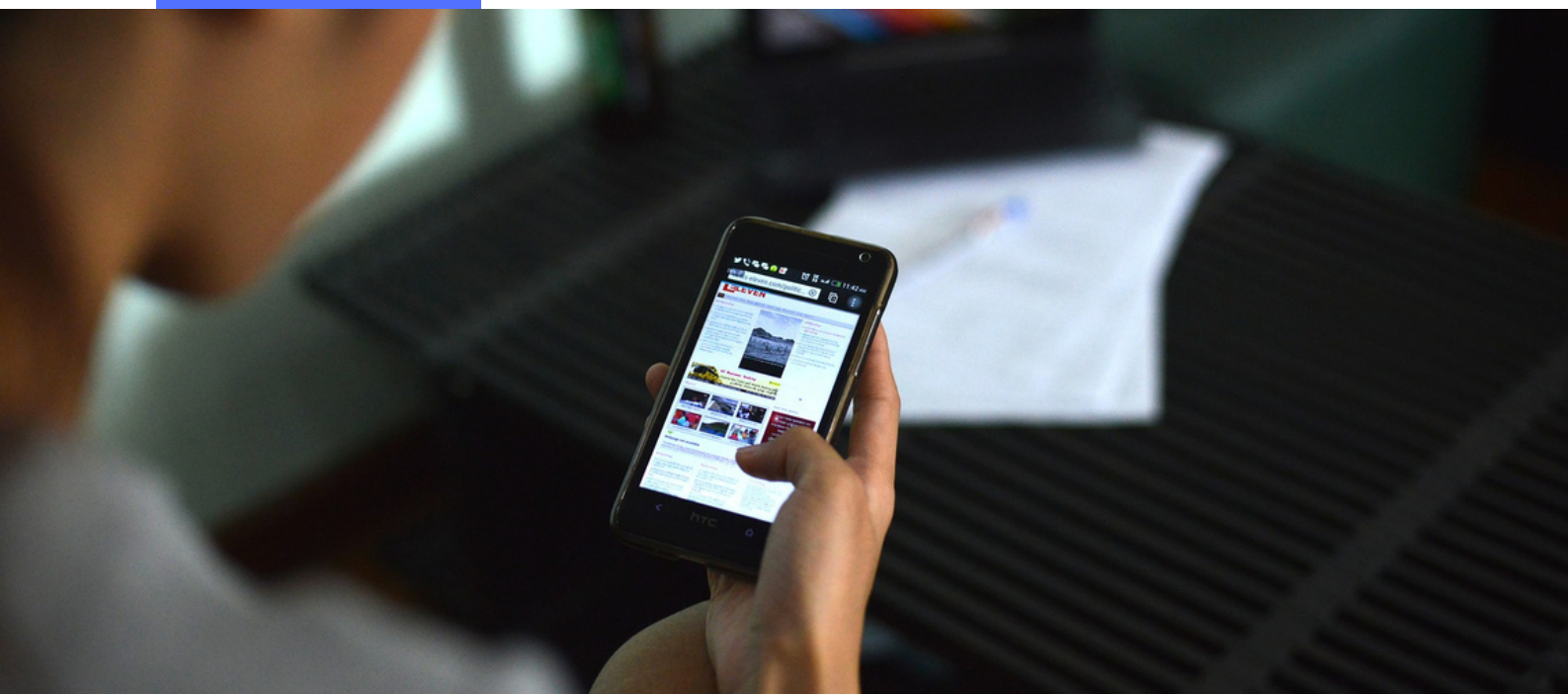
MEMBERS

We are on a mission to make research more accessible, easier to interpret, and quicker to implement.

Help us by giving 1 minute of your time to leave feedback for us.

We would greatly appreciate any feedback you have, as it helps us continually improve!

Leave Review



JBI Critical Appraisal Checklist for systematic reviews and research syntheses

Author: Kang et al. Year: 2019

		Yes	No	Unclear	Not applicable
1.	Is the review question clearly and explicitly stated?	+	☐	☐	☐
2.	Were the inclusion criteria appropriate for the review question?	+	☐	☐	☐
3.	Was the search strategy appropriate?	+	☐	☐	☐
4.	Were the sources and resources used to search for studies adequate?	+	☐	☐	☐
5.	Were the criteria for appraising studies appropriate?	+	☐	☐	☐
6.	Was critical appraisal conducted by two or more reviewers independently?	+	☐	☐	☐
7.	Were there methods to minimize errors in data extraction?	+	☐	☐	☐
8.	Were the methods used to combine studies appropriate?	+	☐	☐	☐
9.	Was the likelihood of publication bias assessed?	+	☐	☐	☐
10.	Were recommendations for policy and/or practice supported by the reported data?	+	☐	☐	☐
11.	Were the specific directives for new research appropriate?	+	☐	☐	☐

Overall appraisal: 11/11 (100%)

LIMITATIONS:

Few authors of the included studies justified their sample sizes or performed reliability tests.

JBI Critical Appraisal Checklist for systematic reviews and research syntheses

Author: Mendez-Rebolledo et al. Year: 2022

		Yes	No	Unclear	Not applicable
1.	Is the review question clearly and explicitly stated?	+	☐	☐	☐
2.	Were the inclusion criteria appropriate for the review question?	+	☐	☐	☐
3.	Was the search strategy appropriate?	+	☐	☐	☐
4.	Were the sources and resources used to search for studies adequate?	+	☐	☐	☐
5.	Were the criteria for appraising studies appropriate?	+	☐	☐	☐
6.	Was critical appraisal conducted by two or more reviewers independently?	+	☐	☐	☐
7.	Were there methods to minimize errors in data extraction?	+	☐	☐	☐
8.	Were the methods used to combine studies appropriate?	+	☐	☐	☐
9.	Was the likelihood of publication bias assessed?	+	☐	☐	☐
10.	Were recommendations for policy and/or practice supported by the reported data?	+	☐	☐	☐
11.	Were the specific directives for new research appropriate?	+	☐	☐	☐

Overall appraisal: 11/11 (100%)

LIMITATIONS:

Based only on the EMG activity normalized by MVIC and did not consider the UT/SA ratio as a valid outcome measure for inter-subject comparisons.

Unable to fully extrapolate findings to populations with shoulder musculoskeletal dysfunctions.

JBI Critical Appraisal Checklist for systematic reviews and research syntheses

Author: Kinsella & Pizzari et al. Year: 2017

		Yes	No	Unclear	Not applicable
1.	Is the review question clearly and explicitly stated?	+	☐	☐	☐
2.	Were the inclusion criteria appropriate for the review question?	+	☐	☐	☐
3.	Was the search strategy appropriate?	+	☐	☐	☐
4.	Were the sources and resources used to search for studies adequate?	+	☐	☐	☐
5.	Were the criteria for appraising studies appropriate?	+	☐	☐	☐
6.	Was critical appraisal conducted by two or more reviewers independently?	+	☐	☐	☐
7.	Were there methods to minimize errors in data extraction?	+	☐	☐	☐
8.	Were the methods used to combine studies appropriate?	+	☐	☐	☐
9.	Was the likelihood of publication bias assessed?	☐	X	☐	☐
10.	Were recommendations for policy and/or practice supported by the reported data?	+	☐	☐	☐
11.	Were the specific directives for new research appropriate?	+	☐	☐	☐

Overall appraisal: 10/11 (90%)

LIMITATIONS:

Only English studies included.