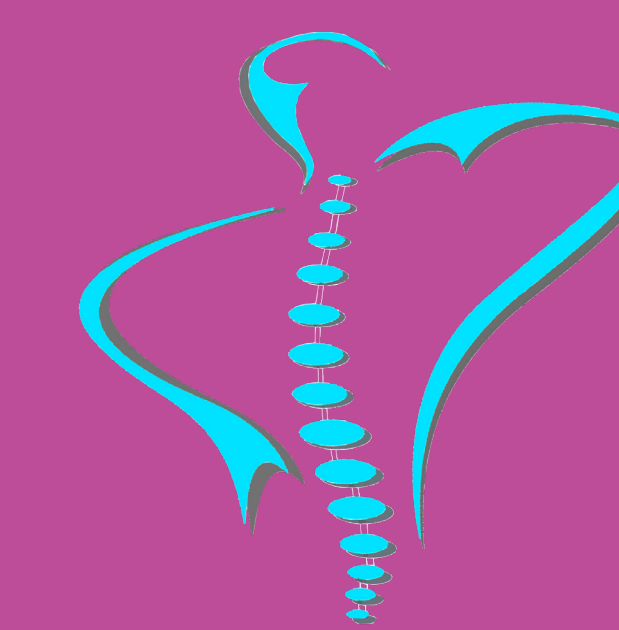


## properties in adults with chronic neck pain—a systematic review

Deepa Abichandani<sup>1</sup>, Jonathan Tong Yuk Ting<sup>2</sup>, Edith Elgueta Cancino<sup>2</sup>, Shouq Althobaiti<sup>2</sup> and Deborah Falla<sup>2</sup>

1 Department of Physiotherapy, Institute of Health and Social Care, London South Bank University, London, UK

2 Centre of Precision Rehabilitation for Spinal Pain (CPR Spine), School of Sport, Exercise and Rehabilitation Sciences, University of Birmingham, Birmingham, UK



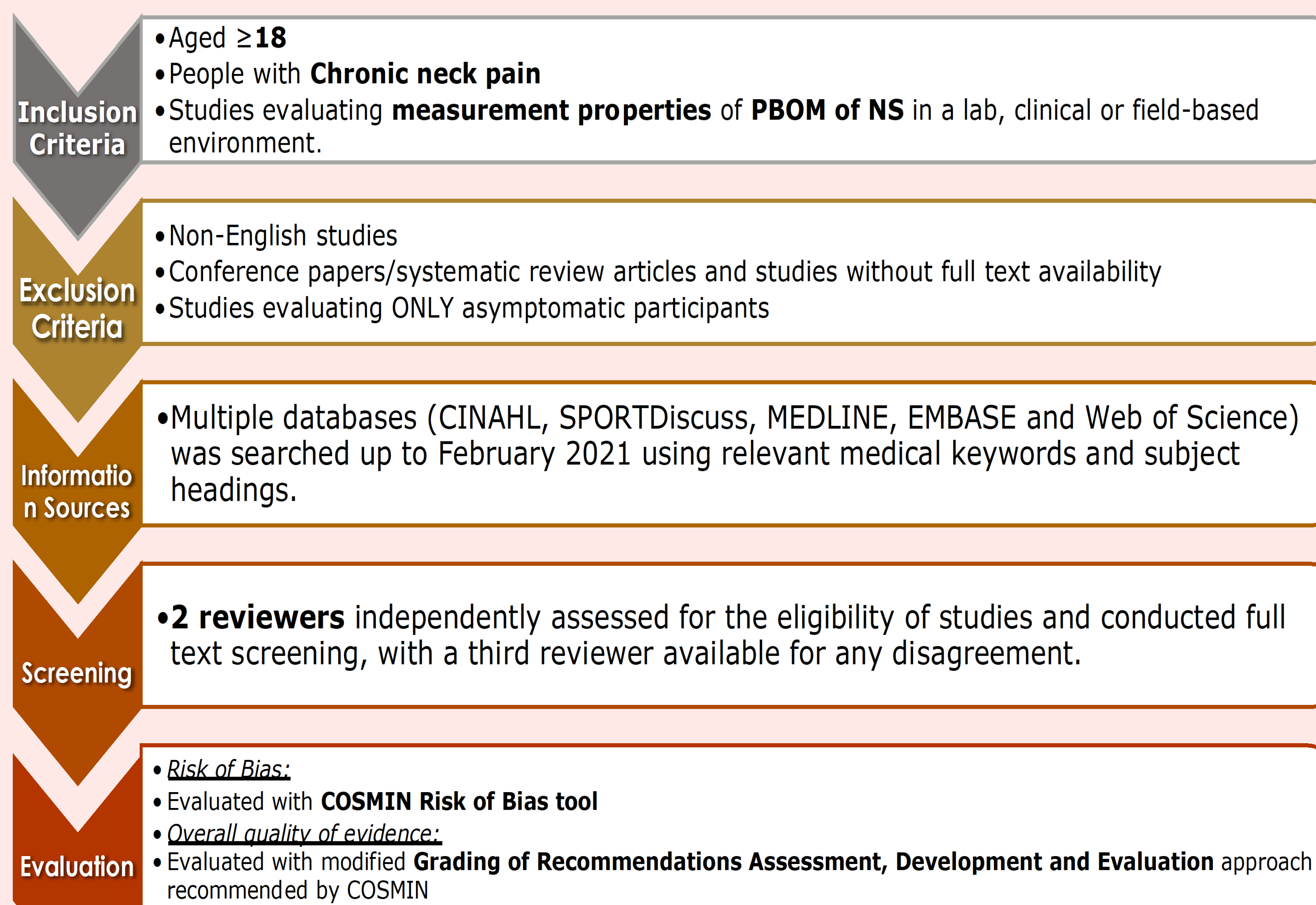
### Introduction

- People with neck pain commonly present with altered physical function including neck muscle weakness. [1]
- An association exists between the extent of the reduction in neck pain and disability and an increase in neck strength following neck strengthening in people with chronic neck pain (CNP). [2]
- Numerous methods have been used to evaluate neck strength, including manual muscle testing, hand-held dynamometry, strain-gauge dynamometry, isometric, and isokinetic tests and specialized equipment such as the multi cervical unit. [3, 4,5]
- It is imperative that clinicians utilise performance-based outcome measures (PBOM) that meet certain bench- marks for measurement properties to ensure the highest clinical accuracy.

### Aim

To appraise the psychometric properties of various neck strength outcome measures (without limits on the duration of testing or cost of the equipment) and establish their appropriateness for the evaluation of neck strength in patients with chronic neck pain based on their measurement properties.

### Methodology



- PROSPERO - CRD42021233290
- Total of 11 studies were included with initial search of 794 studies
- Data was analysed through Narrative synthesis

### Results

- Risk of bias was rated as doubtful or inadequate for most reliability studies, with one study evaluating reliability of handheld dynamometer rated as adequate.
- None of the studies included in this review evaluated content validity or criterion validity; the only study evaluating construct validity was rated as doubtful.
- No studies were identified which evaluated responsiveness.
- Overall quality of evidence was rated low or very low for the measurement properties of all NS measures

Outcome measure	Study	Measurement property	Risk of bias	Criteria for good measurement properties	Overall rating	Quality of evidence
Handheld Dynamometer	Cibulka et al. (2017)	Intra-rater Reliability	Doubtful	+	+	Low
		Measurement error	Doubtful	?	?	Moderate
	Shahidi et al. (2012)	Measurement error	Adequate	?	-	Very Low
		Inter-rater Reliability	Adequate	-	-	Very Low
Isokinetic Dynamometer	Cagnie et al. (2007)	Inter-rater Reliability	Doubtful	+	+	Very Low
		Intra-rater Reliability	Doubtful	+	+	Very Low
		Measurement error	Doubtful	?	?	Very Low
Isometric Dynamometer	O'Leary et al. (2005)	Test-retest Reliability	Inadequate	+	+	Very Low
		Measurement error	Inadequate	?	?	Low
Strain gauge Dynamometer	Jordan et al. (1997)	Intra-rater Reliability	Inadequate	?	-	Very Low
		Measurement error	Doubtful	?	?	Low
Modified Sphygmomanometer Dynamometer	Vernon et al. (1992)	Intra-rater Reliability	Inadequate	?	?	Very Low
Force Transducer	Barton and Hayes (1996)	Test-retest Reliability	Doubtful	-	-	Very Low
		Construct Validity	Doubtful	?	?	Very Low
Multi Cervical Unit	Chiu and Lo (2002)	Test-retest Reliability	Doubtful	+	+	Low
		Test-retest reliability	Doubtful	+	+	Low
	Pearson et al. (2009)	Measurement error	Doubtful	?	?	Very Low
Multifunctional Measurement Unit	Scheuer and Friedrich (2010)	Inter-rater Reliability	Doubtful	+	+	Very Low
		Intra-rater Reliability	Doubtful	+	+	Low
	Ylinen et al. (2004)	Intra-rater Reliability	Doubtful	?	?	Low

Key: Sufficient (+); Insufficient (-); Indeterminate (?)

### Discussion & Conclusions

- There was lack of consistency in methodology like description of experimental preparation, examiners/raters' positions, time interval between measurements and their expertise or training using the measurement tool; with unclear statistical measures models utilised.
- Two important aspects of internal validity, randomization and blinding of raters, were also poorly documented across studies.
- Overall quality of evidence for all measurement properties was rated as low or very low, apart from measurement error of a handheld dynamometer.

### Recommendations

Further high-quality research is required to evaluate measurement properties of neck muscle strength measures in order to determine the most appropriate measure for future use.

### References

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