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RELATIONSHIP BETWEEN RESPIRATORY STRENGTH AND TRUNK CONTROL IN STROKE INDIVIDUALS.

Physiotherapy

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ABSTRACT

Objective To evaluate the correlation between trunk control and respiratory strength in stroke individual **Method** A scoping review of observational, experimental, randomized control trial, cross sectional studies were performed. SCOPUS, Google scholar, EBSCO and PubMed were searched using the terms respiratory muscle strength and trunk control and stroke. Preferred reporting items for scoping review, PRISMA-Scoping review checklist was used to examine the section of each report. **Result** A total of 55 studies were identified, of which 11 were published between 2011-2023 and were included in the study. Two studies which were included in our study showed positive correlation between Trunk control and Respiratory function and Respiratory strength. Furthermore, few studies which were included showed significant improvement in MIP and MEP in stroke. **Conclusion** This study demonstrated that there is a significant correlation between trunk control and the respiratory muscle strength, particularly the expiratory muscles.

KEYWORDS

Stroke, Respiratory muscle strength, Trunk control.

INTRODUCTION

A stroke is characterized by rapidly developing clinical indicators of a localized disturbance of brain activity, complaints that last for more than 24 hours, or even deadly outcomes, and no other obvious cause for the symptoms than vascular origin [1]. Hemiparesis, a disorder that can impair a patient's ability to manage their trunk's posture normally, is frequently experienced by stroke patients [2]. According to a comprehensive review, respiratory performance is directly correlated with several features of the clinical development of stroke, such as trunk stability or ambulation capacity [3]. The structures impacted by the lesion determine how a stroke affects the respiratory system. The neuromuscular system's functioning components must remain intact to sustain regular breathing. A person suffering from a stroke finds it difficult to maintain an upright posture due to the loss of selectivity in their trunk muscle groups. There are changes in the neural activation of the trunk muscles in the presence of cerebral injury, which may also have an impact on the diaphragm, resulting in a reduction in the breathing process's efficiency [4] This study was created to assess the relationship between respiratory muscle strength and trunk control.

Patients who have had a stroke may have respiratory muscle weakness, which results in a decrease in respiratory strength. Hence, assessing the MIP and MEP is important as it measures the maximum inspiratory pressure and maximum expiratory pressure [5].

METHODS

AIM – the present study aims to review the relationship between trunk control and respiratory muscle strength.

Search strategies

The first researcher conducted an initial limited search in PubMed and Google Scholar databases between April and May 2023 using the following terms – Stroke AND Trunk control AND Respiratory muscle strength. from these searches, studies were identified and screened for another relevant searches.

In addition, all observational studies e.g. [correlation, cohort case-control, and cross-sectional studies] or those using experimental study design, related to respiratory function, strength or trunk control were included.

Screening and data extraction

The selection criteria were set to identify the studies with a relation between respiratory function and trunk control in stroke, including the following:

1. Adult patients with stroke
2. Outcome variables were parameters of respiratory muscle strength [MIP and MEP]
3. TIS [Trunk impairment scale]
4. MMSE [mini mental state examination]

In a total of fifty-five studies, twelve duplicate studies were removed and the remaining forty-three studies were then entered into the screening process. All the studies selection was performed by the author. Finally, we identified eleven studies that met our review objectives and all inclusion criteria. Seen in (figure 1).

Ethical consideration

This scoping review included only summary data or statistics from previously published studies; therefore, this study did not require a review or approval by an institutional review board.

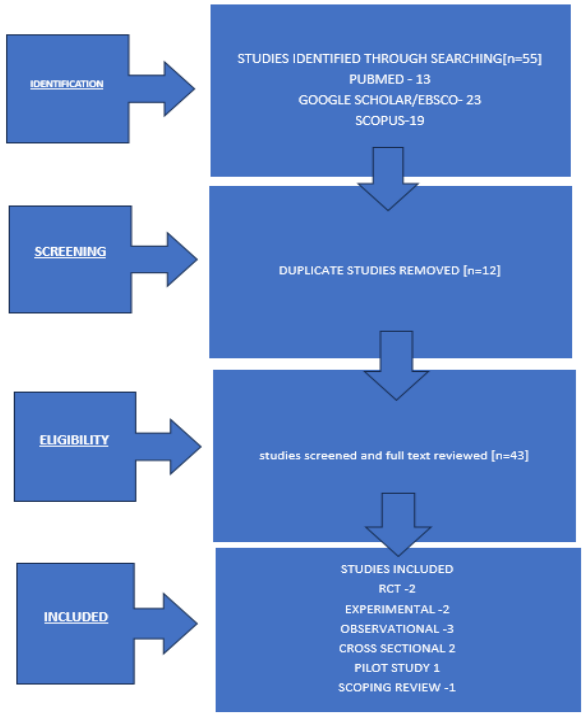

Figure 1. Selection process for inclusion of studies in the scoping review

RESULTS

Study demographic and characteristics

A total of eleven studies were included which were published between 2011-2023. The mean age of the participants reported in this study ranged from 55.20 -56.30.

Author	Time since stroke/participants	Study design	Assessment measured	Major findings
Hsiang-Chu-Pai et al,2023[6]		A scoping review and meta-analysis		Patients' trunk control and respiratory muscle strength were found to increase with respiratory training with the use of diaphragmatic resistance exercise or abdominal breathing.
Saniye Aydoğan Arslan et al 2022[7]	Time since stroke 3 months. 21 Stroke patients over 40 years of age	Randomized Control study	MIP MEP TIS TUG 6MWT	IMT enhanced trunk control and inspiratory muscle strength. This finding will increase awareness regarding the benefits of incorporating respiratory muscle training into stroke patients.
Silvia Raquel Jandt et al, 2010 [Brazil]	Time since stroke 36.6 ± 23.9 months. 23 Stroke patient (12 female 9 males) Mean age was 58.9 ± 13.5 years	Observational Study	TIS MIP MEP FVC FEV1 PEF	This study showed a relationship between respiratory muscle strength and trunk control, particularly regarding the expiratory muscles.
Jandt et al., 2011 Brazil	Mean time since stroke was 36.60 (SD ¼ 23.90) months 21 stroke patients: 9 women, 12 men; mean age ¼ 58.90 (SD ¼ 13.50) years	An observational study	TIS MIP MEP FVC FEV1 PEF TIFF	There was a noteworthy positive connection between trunk control and MEP (r ¼.517, p ¼.016) and PEF (r ¼.489, p ¼.024). FVC, FEV1, TIFF, MIP, and TIS did not correlate with each other (r ¼.38,.3 4,.39,.43, p >.5).
Santos et al, 2019 Brazil [8]	Mean time since stroke was 14.90 (SD ¼ 26.30) days 44 stroke patients: 25 women, 19 men; mean age ¼ 59.40 (SD ¼ 12.20)	A Cross sectional study	TIS MIP MEP FVC FEV1 TIFF FEV1/FVC FIM	MIP, FVC, FEV1, and FIM showed a strong positive association with trunk control (r ¼.26,.28,.29,.77, p <.05). The TIS was 14.4 (SD ¼ 5.8) while the mean of MEP was 36.1 (SD ¼ 18.6).
Lee et al., 2019 Korea [9]	The mean time (months) since stroke was TG ¼ 11.15 (2.38); CG ¼ 11.00 (2.17) 25 stroke patients: TG ¼ 13, mean age ¼ 58.62 (SD ¼ 12.38) years; CG ¼ 1, mean age ¼ 59.75 (SD ¼ 13.38) years.	Randomized control trial	MEP MIP PEF Vital capacity (VC) peak inspiratory flow (PIF)	The intervention group's trunk stability rose noticeably. The intervention group showed a considerable increase in respiratory muscle thickness.

Limitations –

Number of relevant studies were small; we recommend that more studies which focus on interventional trunk control to be analyzed in future. Number of more participants can strengthen the study.

CONCLUSION-

our study mapped the positive relations between trunk control and respiratory strength in stroke patients. We also found that respiratory function training along with diaphragmatic movement can improve trunk control and further strengthens the patients MIP and MEP that is maximum inspiratory and expiratory pressures.

DISCUSSION-

The purpose of this scoping review was to investigate the connection between stroke patients' respiratory muscle strength and trunk control. The results of this research show a strong body of data indicating a positive correlation between these two variables, indicating that pulmonary function impairment in stroke survivors may be linked to trunk control deficiencies [10]. Studies that are part of this review regularly show that respiratory muscle strength is decreased in stroke patients with impaired trunk control, as indicated by metrics like Maximum Inspiratory Pressure (MIP) and Maximum Expiratory Pressure (MEP) [11]. Moreover, respiratory function-focused therapies, such as diaphragmatic exercise and respiratory muscle training, seem to improve trunk control [12].

The findings of the included studies shed light on the intricate interplay between trunk control and respiratory function following a stroke. The observed connections emphasize the need of including respiratory therapy as a component of stroke recovery programs, especially for people with poor trunk control.[6]

Even with the strong evidence that the included studies provided, it is critical to recognize some limitations. The comparatively small number of research included in this evaluation is one significant restriction that might restrict how far the findings can be applied. Furthermore, care should be taken when interpreting the findings due to the variability in participant characteristics, study designs, and outcome measures among the included studies. Harik-Khan et al in his study, MIP is an index of inspiratory muscle strength, measured by having the individual expire to a residual volume and then performing a maximum inspiratory manoeuvre. MIP is indirectly related to exhalation, which explains the link between trunk control and MIP.[13]

This scoping review concludes by emphasizing how crucial it is to treat respiratory strength and trunk control as interdependent parts of stroke therapy. The findings highlight the importance of rehabilitation programs that target both motor and respiratory impairments in stroke survivors to improve outcomes.

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