

## The Impact of Trunk Strengthening on Functional Independence and Trunk Performance: A Randomised Trial

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### Abstract:

**Background:** Trunk stability and functional independence are crucial for individuals to perform daily activities and maintain their quality of life. Impaired trunk performance and reduced functional independence can significantly impact various tasks. Therefore, interventions targeting trunk strength and function are important in rehabilitation and physical therapy.

**Methods:** This randomized controlled trial aimed to assess the effect of trunk-strengthening exercises on functional independence and trunk performance. The study included post-stroke individuals aged 50-60 years, attending a rehabilitation center or receiving physiotherapy. Outcome measures such as the Total Independence Score (TIS) and Functional Independence Measure (FIM) were used to assess functional independence, while standardized assessments measured specific trunk performance tasks.

**Results:** In the control group, the TIS score showed a statistically significant improvement ( $p = 0.027$ ), but none of the subjects achieved the desired level of improvement. The FIM score did not show a significant change ( $p = 0.109$ ). Comparing the experimental and control groups, there were no significant differences in TIS ( $p = 0.755$ ) or FIM ( $p = 0.713$ ) changes.

**Conclusion:** The control group showed a significant improvement in TIS, but not in FIM. The changes in outcome variables were similar between the experimental and control groups, suggesting that the intervention did not yield significantly different outcomes. Further research is needed to explore alternative approaches or modifications to interventions targeting the assessed outcome variables.

**Keywords:** trunk strengthening, functional independence, trunk performance, randomized controlled trial, post-stroke, outcome measures.

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### Introduction

The ability to maintain trunk stability and perform functional tasks independently is essential for individuals to engage in daily activities and maintain the overall quality of life. Impaired trunk performance and reduced functional independence can significantly impact individuals' ability to perform various tasks, including activities of daily living, work-related activities, and recreational pursuits. Therefore, interventions aimed at improving trunk strength and function are of great importance in rehabilitation and physical therapy.[1]

The objective of this study is to examine the impact of trunk-strengthening exercises on both functional independence and trunk performance. By evaluating these two outcome measures, we aim to provide a comprehensive understanding of the effects of trunk-strengthening interventions on

individuals' overall functional abilities and specific trunk-related tasks.[2]The first objective of this study is to investigate the effect of trunk-strengthening exercises on functional independence. Functional independence encompasses the ability to perform daily tasks without assistance and is closely related to an individual's autonomy and quality of life. We hypothesize that targeted trunk strengthening exercises will lead to improvements in functional independence, as increased trunk stability and strength can enhance individuals' ability to perform activities such as sitting, standing, and walking, with reduced reliance on external support.[3]

The second objective of this study is to evaluate the impact of trunk-strengthening exercises on trunk performance. Trunk performance refers to the ability to control and coordinate movements

involving the trunk, including bending, twisting, and reaching. We hypothesize that a structured trunk strengthening program will result in enhanced trunk performance, as improved muscle strength and coordination will positively influence the execution of trunk-related movements and tasks.[4]

To investigate these objectives, a comparative study design will be employed, comparing a control group with an experimental group undergoing a targeted trunk-strengthening intervention. Outcome measures such as the Total Independence Score (TIS) and Functional Independence Measure (FIM) will be utilized to assess functional independence, while specific trunk performance tasks, such as trunk flexion and rotation range of motion, will be measured using standardized assessments.[5]

By conducting this comparative study, we aim to contribute to the existing body of literature on trunk-strengthening interventions and their impact on functional independence and trunk performance. The findings of this study may provide valuable insights for healthcare professionals, rehabilitation specialists, and physical therapists in designing and implementing effective interventions to improve functional outcomes and trunk-related tasks.[6]

**Material And Methods**

**Research Design:** A randomized controlled trial was undertaken to find out the effect of trunk strengthening exercise in improving trunk performance and functional outcome.

**Population:** Both male and female post stroke subjects with the duration of 3 months to 1 year, with the age group between 50 to 60 years, and who were attending the rehabilitation center or taking physiotherapy treatment at community level and who satisfied the selection criteria from the population of the study. Selection criteria

**a) Inclusion criteria**

- Age group between 50 –60 years
- First-ever stroke
- TIS score to be 17 out of 23
- Post stroke subjects from 3 months to 12 months
- Mini mental state examination(MMSE) score more than 24 and above

**b) Exclusion criteria**

- History of neurological condition other than stroke such as
- Parkinson’s disease, Head injury, Nerve injuries etc

- Patient who had acute back pain were screened by visual analog scale if the score exceed 5 on movements such subjects were excluded
- Medical history of heart disease or cardiac surgery conducted in the last 3 months of pre-assessment.

**Withdrawal criteria**

- Those patients who were not willing to continue their participation the study after signing the consent form were allowed to withdraw from the study.
- The subject with a second stroke or who develops any cardiac problems during the intervention duration was also allowed to withdraw from the study.

**Sampling**

30 post-stroke subjects were randomly distributed to 15 to control and 15 to the experimental group

**Sampling design**

Concealed random allocation of subjects into experimental and Control groups convenient sampling.

**Source of data**

OPD and Pacific centre of Neuroscience Department Pacific Hospital Udaipur.

**Duration of the study**

The study was conducted over a period of 3 months. The study was an experimental design. The intervention was given for 4 weeks alternate days for 14 days.

**Outcome measures**

- Trunk Impairment Scale(TIS)
- Functional Independence Measure

**Procedure**

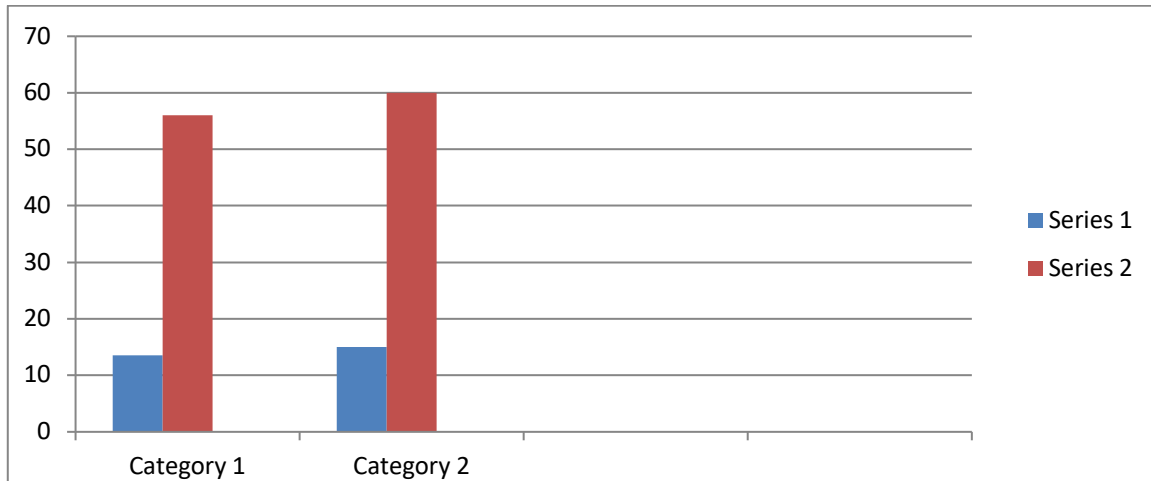
**Participants:** 30 post-stroke subjects were recruited from the hospital and were allotted into experimental and control groups through concealed allocation randomly who fulfilling the inclusion and exclusion criteria.

**Note:** Pacific Medical University, Institute’s ethical approval obtained dated 06/09/22, PMU/PMCH/IEC/2022/231. All participants completed information and consent form at recruitment.

**Results**

**Table 1: Evaluation of outcome variables in control group**

Variables	Outcome				
	Pre	Post	Delta	95%CI	P value
TIS	13.08±2.54 (13.50)	14.83±3.01 (15.0)	1.75±1.96	0.50 to 2.99	0.027*
FIM	56.25±9.50 (56.0)	58.00±8.17 (60.0)	1.75±3.59	0.53 to 4.03	0.109

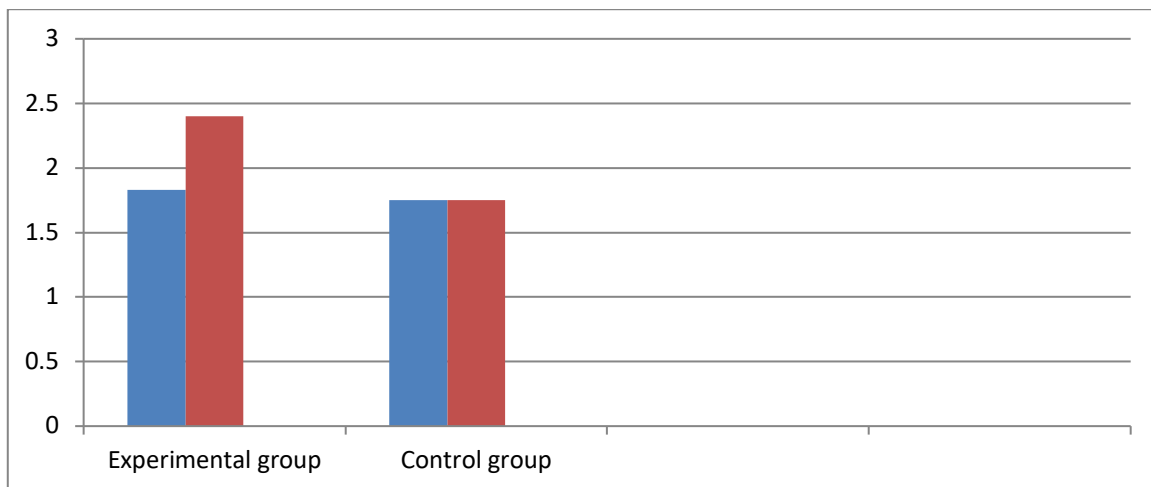


**Figure 1: Evaluation of outcome variables in control group**

The control group had a median value of 13.5 and 56 pre-intervention and 15 and 60 post-intervention with a p-value of 0.027 in TIS and 0.109 in FIM. The TIS shows statistical significance but the change of score 3 in the total score of TIS was not attained by any of the subjects. FIM shows no statistically significant change.

**Table 2: Comparison of delta in two groups of patients**

Variables	Outcome			
	Experimental Group	Control Group	P value	Effect Size
TIS	1.83±1.59	1.75±1.96	0.755	0.34
FIM	0.75±1.76	1.75±3.59	0.713	0.03



**Figure 2: Comparison of delta in two groups of patients**

The change in the experimental group in TIS was 1.83 and FIM was 0.75 pre and post-intervention and the change in the control group in TIS was 1.75 and FIM was 1.75 pre and post-intervention.

**Discussion**

The present study aimed to evaluate the outcome variables in the control group and compare them with previous studies. Table 1 provides a summary of the evaluation of outcome variables in the control group, specifically focusing on the Total Independence Score (TIS) and Functional Independence Measure (FIM). The pre-intervention

and post-intervention scores, as well as the delta values and statistical analysis results, are presented.[7]

In the control group, the TIS score showed a significant improvement from a pre-intervention median value of 13.5 to a post-intervention median value of 15 (p = 0.027).

However, it is important to note that none of the subjects achieved a change of score 3, which indicates that the desired level of improvement was not attained. On the other hand, the FIM score did not show a statistically significant change between

the pre- and post-intervention assessments ( $p = 0.109$ ).[8]

When comparing the delta values between the experimental and control groups (Table 2), the results indicate that the experimental group had a slightly higher change in TIS (1.83) compared to the control group (1.75), although the difference was not statistically significant ( $p = 0.755$ ). Similarly, the change in FIM in the experimental group (0.75) was lower than that in the control group (1.75), with no significant difference observed ( $p = 0.713$ ).[9]

These findings suggest that the intervention implemented in the experimental group did not result in significantly different outcomes compared to the control group. The effect size values for both TIS (0.34) and FIM (0.03) also indicate that the effect of the intervention was relatively small in both groups.[10]

When comparing these results with previous studies, it is important to consider the specific characteristics of the interventions, sample sizes, and populations studied. In the context of the current study, the limited change observed in both groups may indicate the need for further exploration or modifications to the intervention approach. Future studies with larger sample sizes and more diverse populations could provide additional insights into the effectiveness of interventions in improving the evaluated outcome variables.[11]

It is worth noting that this study has certain limitations. Firstly, the sample size of the control group may have been relatively small, which could have influenced the statistical power and generalizability of the findings. Additionally, the duration and intensity of the intervention may have also affected the observed outcomes. Moreover, the assessment of outcome variables relied solely on pre- and post-intervention measurements, and the long-term effects were not evaluated.[12]

### Conclusion

In conclusion, the control group in this study demonstrated a statistically significant improvement in TIS but not in FIM. The change in outcome variables was comparable between the experimental and control groups, indicating that the intervention did not yield significantly different outcomes. Further research is warranted to explore alternative approaches or modifications to interventions aimed at improving the assessed outcome variables.

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