International Journal of Yoga, Physiotherapy and Physical Education
www.sportsjournal.in
ISSN: 2456-5067
Received: 20-09-2021, Accepted: 05-10-2021, Published: 21-10-2021
Volume 6, Issue 5, 2021, Page No. 25-27

A study to evaluate influence of attentional cognitive tasks on postural sway in school going children

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Abstract
Introduction: Postural stability is the ability to maintain or control the centre of mass (COM) in relation to the base of support (BOS) to prevent falls and complete desired movements. Postural sway represents an effective indicator of balance abilities, the alteration observed that, developmental change and backpack carriage originates balance impairment and thus may increase the risk of unintentional fall in children. The postural control is modified when cognitive task is executed simultaneously.
Aim: The aim of study is to find out the influence of Attentional Cognitive Tasks on postural sway in school going children.
Objective: - To evaluate the influence of Attentional Cognitive Tasks on postural sway by using Paediatric Balance Scale (PBS)
Method: The study was pre and post experimental study, a total 10 children of age between 8 to 10yrs of both sex were selected and an interventional program of Attentional Cognitive Task are given every day half an hour for 5 days in a week.. As baseline assessment Paediatric Balance Scale is measured and reassessed after a month.
Result: The showed a significant improvement in outcome measure, proving that the study was effective.
Conclusion: The study concluded that, Attentional Cognitive Task is effective on Postural Sway in school going children.

Keywords: attentional cognitive task, postural sway, school children

Introduction

Postural control during normal upright stance in humans is a well-learned task. Hence, it has been argued that it requires very less attention. However, many studies have recently shown that postural control is modified when cognitive task is executed simultaneously. This study examined postural control modification when a cognitive task of varying difficulty level is added.

Balance is an ability to maintain the line of gravity of a body within the base of support with minimal postural sway. Sway is the horizontal movement of the centre of gravity even when a person is standing still.

Postural stability is defined as the ability to maintain or control the centre of mass (COM) in relation to the base of support (BOS) to prevent falls and complete desired movements.

Various systems contributes to postural control which are,

1. Musculoskeletal
2. Internal representation
3. Adaptive mechanisms
4. Anticipatory mechanism
5. Sensory strategies
6. Individual sensory system
7. Neuromuscular synergies

Developmental change occurs in the contact surface area of the sole. The contact surface area increased markedly between the ages of three to five and of seven to nine years, and increased slightly between six and seven years. Age six to seven years is proposed as a turning point of plantar arch formation as regards change in the contact surface area of the sole. Upright postural sway decreased markedly between the ages of three to five years and then slowly after age six. Boys under ten years swayed more than girls. The centre of gravity of the foot in children standing upright shifted towards the toes with increasing age: its distance from the heel was about 36 per cent of the foot length at age three to five years and 42 per cent at 11 years.

Need for the study

Postural sway represent an effective indicator of balance abilities, the alteration observed that, developmental change and backpack carriage originates balance impairment and thus may increase the risk of unintentional fall in children.

To remain balanced, a person standing must be able to keep the vertical projection of their centre of mass within their base of support, resulting in little medial-lateral or anterior – posterior sway.

The cognitive processes, via executive processes, controls the mechanisms of attention, activation and inhibition, the aim being to focus on relevant information and to manage attention sharing between the different tasks.

Cognitive load can lead to an improvement in balance performance, that during disruptive postural situations. This study involved in performing a cognitive task while walking may influence walking patterns in children who are developing typically.

Aim

The aim of study is to find out the influence of Attentional Cognitive Tasks on postural sway in school going children.

Objectives
To evaluate the influence of Attentional Cognitive Tasks on postural sway by using Pediatric Balance Scale.

Materials and Methododlogy
Materials
- Wobble board
- Pediatric balance scale
- Step stool
- Foot print
- Yardstick
- Flash card
- An object to pick up
- Stop watch

Methodology
Study design: Pre and post experimental study design

Study Setting: The study was conducted in the outpatient department of Thanthai Roever College of Physiotherapy, Roever Institution, Perambalur under the supervision of concerned authority.

Sampling Method: Purposive sampling method.

Sampling Size: A total number of 10 children.

Study Duration: The study was conducted for a period of 3 months.

Inclusion Criteria
- Sex: Both sex
- Age: 8-10 years (Normal healthy children)
- Children those who walk independently.

Exclusion Criteria
- Any orthopaedic or neurological impairment.
- Any congenital and structural abnormalities
- Visual or auditory impairment.
- Acute illness (fever, cough).

Parameters- Paediatric Balance Scale
Name: Age, Sex, Date
Item description, Score (0-4), Total (56)
1. Sitting to standing
2. Standing to sitting
3. Transfers
4. Standing unsupported
5. Sitting unsupported
6. Standing with eye closed
7. Standing with feet together
8. Standing with one foot in front
9. Standing on one foot
10. Turning 360 Degrees
11. Turning to look behind
12. Retrieving object from floor
13. Placing alternate foot on stool
14. Reaching forward without stretched arm

Procedure
All the participants are selected according to the inclusion and exclusion criteria and oral consent was taken from parents and class in charge before the children administrated to the study. All the participants are well explained about the entire task. Interventional programs of Attentional Cognitive Task are given everyday half an hour for 5 days in a week. As baseline assessment Paediatric Balance Scale is measured and reassessed after 2 months.

Tasks
1. Standing Task
Subjects were asked to stand on the wobble board and looking at an image projected on a wall.

2. Counting Backwards
Subjects were instructed to stand on the wobble board while counting backwards out loud.

3. Reading Task
Subjects standing on wobble board while reading sentences projected on the wall facing the child at the rate of 5 seconds for each sentence.

4. A visual-verbal (Stroop test)
The cognitive exertion was based on naming in a clear, the colour of the writing of the word itself meaning another colour.

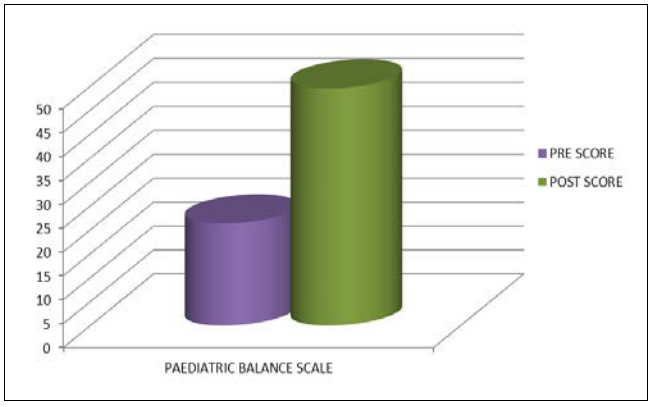
5. An auditory verbal
To compare a listening word meaning a listening side and if identifiable the subject will say “right” otherwise the subject will say “wrong”.

Data analysis and interpretation

Table 1: Represents pre and Post test values by using paediatric balance scale.

Tool	Pre score	Post Score
PBS	213	495
Mean	21.3	49.5
SD	2.75	1.27
M. Diff	28.2	
T Value	29.4	

P value < 0.0001 this difference is considered to be extremely statistically significant.



Graph 1: Represent pre and post-test values by using paediatric balance scale

Result
Results showed that Attentional Cognitive Tasks was effective in correcting postural sway. Paediatric balance scale showed a significant difference in the pre and post values before and after the application of Attentional Cognitive Tasks.

Discussion

Results showed that Paediatric balance scale has a significant difference in the pre and post values before and after the application of Attentional Cognitive Tasks. The cognitive process, via executive processes, controls the mechanisms of attention, activation and inhibition. Thus the study proved that Cognitive load can lead to an improvement in balance performance, during disruptive postural situations.

Conclusion

The study concluded that Attentional Cognitive Task is effective on postural sway in school going children.

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