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The Effect of Proprioception Training with and without Visual Input on Single Limb Standing Balance Time in Deaf Students: A Pilot Study

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ABSTRACT

Background: Proprioception and balance are the key and inseparable components of daily activities and exercises. Hence this study was undertaken to find out the effect of proprioception training on single limb standing balance time in deaf students of Navsari by measuring their activated angle reconstruction test and the single limb standing test.

Purpose of The Study: Aim of this study was to examine the effectiveness of 4 weeks proprioception training with and without visual input on single limb standing balance time in deaf students and objective is to examine the effect of proprioception training with and without visual input in deaf students, to examine how the proprioception training with and without visual input affects proprioception of the knee joint, ankle and single limb standing balance in deaf students, to examine how the rehabilitation programs improve postural control and balance in the deaf on restricting vision and engaging other senses.

Methods: A pilot study was conducted in a local school in Gujarat (Shri Chimanlal Laxmichand Parikh Mamta Mandir, Manav Kalyan Trust, Dist. Navsari) from which 15 students were volunteered for this study including both male and female of Navsari district based on inclusion and exclusion criteria, out of which 5 were excluded. Outcome of the study that is the activated angle reconstruction test and the single limb standing test were assessed for each student with prior informed consent form signed by the guardian of the student. Effect of proprioception training is done statistically.

Outcome Measure: The angle reconstruction test and The Single Limb Standing Test.

Statistical Analysis: Statistical analysis was done using Microsoft Office Excel 2007.

Results: Study was done among 10 students who completed the full training protocol in which 5 students were undergone with proprioception training with visual input and other 5 students were undergone with proprioception training without visual input. The balance and proprioception were improved in both the groups. So, proprioception training with as well as without visual input is very effective to improve balance and proprioception in deaf students.

Conclusion: The present study showed that both the treatment groups attained significant improvement in SLS and AART after 4 weeks of proprioception training ($p < 0.05$). However, there was no significant difference in SLS and AART between Group A and Group B after 4 weeks of proprioception training ($p > 0.05$).

Keywords: Single Limb Standing balance Time; Deaf students; Navsari, Proprioception training.

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INTRODUCTION

Hearing deficit is the third most common chronic disorder that affects the health status largely and seriously, leading to stress in the patient and the family.[1] The vestibular system is an organ that detects the sensations of physical balance and plays an important role in the spatial relationship between the human body and the space it occupies.[7]

According to World Health Organization (WHO) in 2005 about 278 million people suffered from moderate to profound hearing impairment, of which 80% of them live in low and middle income countries.[7]

Proprioception was defined as "the perception of joint and body movement as well as position of the body, or body segments, in space" and it is considered as the most important sensory system in the maintenance of postural stability.[11] Studies indicate that balance disorder, motor development problems, and weak postural control are likely to occur in children with severe to profound hearing deficits.[3] Proprioception is a key component of the somatosensory system and transmits information to the central nervous system about motion and the position of the body in space. As hearing impaired children mature, they learn to compensate partially for vestibular[10] damage through the refinement of the visual, proprioceptive, and kinesthetic senses.[8]

METHODOLOGY

Study Setting

Shri Chimanlal Laxmich and Parikh Mamta Mandir, Manav Kalyan Trust, Dist. Navsari, State: Gujarat, India.

Study Design

Pilot study.

Study Sample Size

10 deaf students of Mamta Mandir school of Navsari as per inclusion criteria.

Study Sample Design

Convenient Sampling.

Study Population

Deaf students of Mamta Mandir school of Navsari District.

Study Duration

The study was undertaken for a total of 6 months.

Materials used:

- Pen and pencil
- Stopwatch
- Goniometer
- Weight machine
- Measure tape
- Balance board
- Physioball
- Parallal bar

SELECTION CRITERIA

Inclusion Criteria

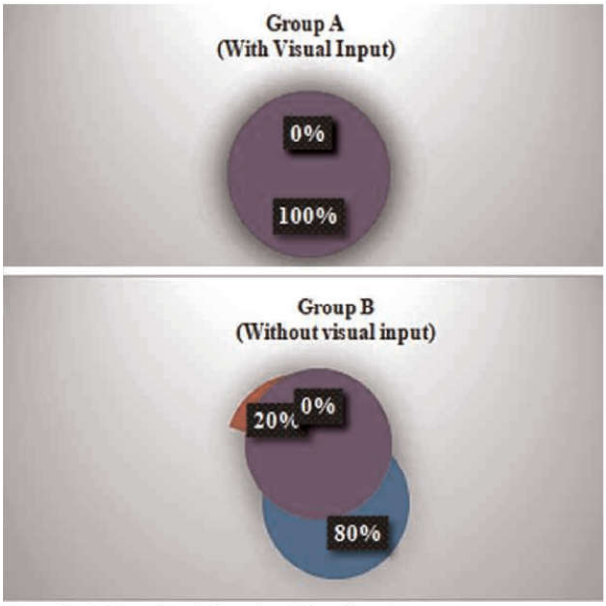
- Age: 14 to 16 years
- BMI(kg/m^2): 18.5 to 24.9
- Hearing range: Greater than 75 decibels

Exclusion Criteria

- Use of any neurological drugs
- Use of cochlear implant
- History of lower extremity injury prior a year before the study
- Any visual disorders
- Any postural deformities
- Surgery or fracture within a year before the study

RESULT

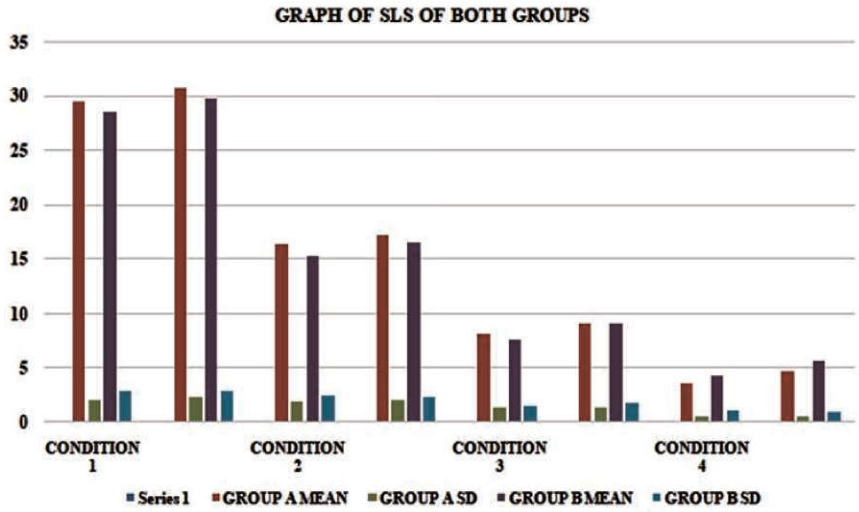
In total, 10 participants were evaluated from which 100% of participants were males in Group A and in Group B-80% were males and 20% were female.



Graph 1: Graph of Gender Distribution

Table 1: Sls for both Groups

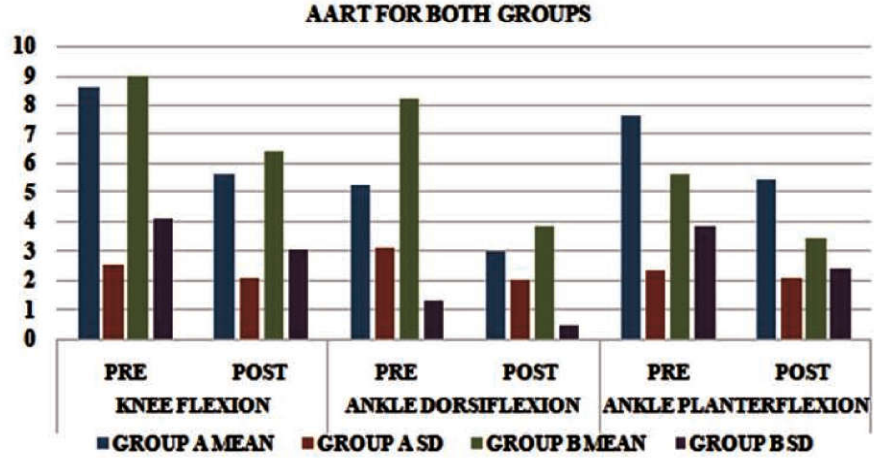
Variables	Level	Group A MEAN±SD	Group B MEAN±SD	P Value	DF	T Stat
Condition 1	Pre	29.562±2.11	28.588±2.93	0.566	7	0.603
	Post	30.696±2.32	29.806±2.93	0.609	8	0.532
Condition 2	Pre	16.424±1.98	15.344±2.45	0.466	8	0.766
	Post	17.238±2.07	16.554±2.37	0.640	8	0.486
Condition 3	Pre	8.158±1.35	7.674±1.57	0.615	8	0.524
	Post	9.162±1.43	9.13±1.72	0.975	8	0.032
Condition 4	Pre	3.636±0.48	4.43±1.13	0.209	5	-1.44
	Post	4.734±0.51	5.742±0.92	0.075	6	-2.15



Graph 2: Graph of Sls for Both Grpoups

Table 2: Aart For Group-A (With Visual Input) and Group-B (Without Visual Input)

Knee Flexion	Pre	8.6±2.51	9±4.06	0.857	7	-0.187
	Post	5.6±2.07	6.4±3.05	0.642	7	-0.485
Ankle Dorsiflexion	Pre	5.2±3.11	8.2±1.30	0.537	5	-0.662
	Post	3±2	3.8±0.45	0.432	4	-0.873
Ankle Planterflexion	Pre	7.6±2.30	5.6±3.78	0.346	7	1.010
	Post	5.4±2.07	3.4±2.41	0.197	8	1.407



Graph 3: Graph of Aart for Both Groups

Between group Comparison of AART was done between pre and post values of Group A and Group B by using unpaired t-test on the basis of outcome measures. In this comparison the result shows no significant difference between pre and post values of the outcome measures ($p > 0.05$).

DISCUSSION

The aim of this study was to determine the effects of 4 weeks of proprioception training with and without visual input on knee and ankle proprioception and single leg balance performance with four conditions in deaf students.

The results of the study are discussed in context of statistical analysis of present data and also compared with the previous studies. The possible explanations for the results are also discussed below according to supporting literature.

The study was carried out on 10 students having severe to profound hearing loss, so this study reveals the results of proprioception training with and without visual input in male and female students having age between 14 to 16 years.

The present study showed that both the treatment groups attained significant improvement in SLS and AART after 4 weeks of proprioception training ($p < 0.05$). However there was no significant difference in SLS and AART between Group A and Group B after 4 weeks of proprioception training ($p > 0.05$). In present study Group A and Group B showed significant improvement in SLS and AART when pre and post values were compared within group using paired t-test. But there was no significant difference in SLS and AART when between group comparison was done.

Proprioception training stimulates propriocep -tion receptors and encourages postural strategies such as hip and ankle strategies, thereby improving single limb standing balance time and the individual's performance at maintaining balance. In proprioception training without visual input, the participants used all their potential somatosensory and vestibular systems to maintain their balance.

CONCLUSION

The present study shows that proprioception training with visual input as well as without visual input improves the proprioception of knee, ankle and single limb balance time. Within group comparison of Group A (with visual input) and Group B (without visual input) shows that there is significant improvement in the proprioception of knee, ankle and single limb balance time in Group B than in Group A. Between group comparison shows less significant difference.

It can be concluded that proprioception training with visual input as well as without visual input is beneficial for the improvement of proprioception and balance in students with severe.

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