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A study on self-perceived and measured right and left-hand tip pinch strength of differently abled children

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Abstract
The current modern society we are considering many people are suffering various types of disability. Indian constitution provides for justice, social, economic and political liberty of thought, expression, belief, faith and worship, equality of status and of opportunity to all its citizens. Part-3 of the Indian constitution guarantees of 6 fundamental rights like Right to equality, Right to freedom, Right against exploitation, Right to freedom of religion, Cultural and Educational rights and Right to constitutional remedies which are available to all the citizens including to the persons with disabilities.The reason of the current study was to measure the right and left hand tip pinch strength of vision and hearing loss differently abled children's of Karnataka state. Further the level of perception on tip pinch strength was also correlated with their actual status. The current study was conducted on 414 vision and hearing loss school going children selected through purposive random sampling technique. The study included two hundred and fourty three vision loss children's and one hundred and seventy-one hearing loss children's in male category. All the subjects were residents of special schools within Karnataka state. Their age ranged between 13 to 18 years. The right- and left-hand tip pinch strength was done by following the standard procedure and level of perception on tip pinch strength of vision and hearing loss school children was done using a 3-point likert scale. The right-hand tip pinch strength of 13 to 14 years with 4.22 ± 0.99; 4.66 ± 1.09 in 15 to 16 years; and 4.78 ± 1.10 in 17 to 18 years. The left-hand tip pinch strength was 3.86 ± 0.93 in 13 to 14 years; 4.15 ± 1.07 in 15 to 16 years; and 4.24 ± 1.24 in 17 to 18 years. On the basis of the conclusion of the current examination it is concluded that the vision and hearing loss school going children below average and low tip pinch strength is an sign of low physical fitness level. Since vision and hearing loss school going children required to perform their everyday tasks at their own, it is imperative to have enough strength. Further, the 13 to 18 years vision and hearing loss school children's under investigation are unable to significantly moderate positive linear relationship their right hand tip pinch strength and 13 to 14 yeras and 17 to 18 years vision and hearing loss school going children's under investigation are unable to significantly weak positive linear relationship their left hand tip pinch strength precisely.

Keywords: differently abled, vision loss, hearing loss, tip pinch strength and self-perceived

Introduction
Participation of physical activity is broadly recognized as a serious component of health and development for disabled and non-disabled children. Emergent literature reflects a paradigm shift in the conceptualization of childhood physical activity as a multi-dimensional construct, encompassing aspects of physical performance, and self-perceived engagement (Ross, *et. al.*, 2016) [7]. The perception of disability a condition of the body, mind, or senses of a person of any age that may affect the ability to work, learn or participate in community life also is in transition. With the recognition that disability is not an illness, the emphasis increasingly is on continuity of care and the relationship between a person with a disability and the environment at the physical, emotional and environmental levels. Tip pinch strength are significantly important attributes and standard parameters associated to the functional integrity of the finger. It is required to produce enough tip pinch strength to manage activity of daily life.

The capacity of tip pinch strength is simple and low-cost method to evaluate hand finger function. Assessing tip pinch strength is helpful to assess the status of people in different fields (Tajika *et. al.*, 2015) [8]. Tip pinch and hand grip strength may influence performance in a variety of childhood tasks. The fine motor assignment that dominates a children's school day is handwriting. Children's handwriting is a complex task, and many fundamental skills contribute to the growth of legible penmanship. Handwriting remediation is as complex as the talent itself, and there is quite a bit of variety in the activities included in a handwriting remediation program (Alaniz *et. al.*, 2015) [1].

The objective of the study
The current study was investigated to evaluate the right- and left-hand tip pinch strength of vision and hearing loss disabled residential school children of Karnataka State. Additionally, the level of perception on tip pinch strength was also correlated with their actual status.

Methodology

Vision and hearing loss disabled residential school's 414 students of Karnataka state included in this current study through purposive random sampling method. The present study selected vision loss children's (N=243) and hearing loss children's (N=171) in male group. All the subjects were residents of differently abled school's within Karnataka state. The subjects age range interpolated in 13 to 18 years. Purpose of this test to measure the finger strength and pinching capabilities. The test was performed as per standard procedure (Mathiowetz V, *et. al.,* 1985; and Villafane, J.H and Valdes, K, 2014) [4, 9] was followed. The pinch test was performed by using Jamer hydraulic pinch gauge. During the present study Tip pinch were performed on every individual included in the experiment. An individual was made to sit on the chair with straight body position and the feet flat on to the floor, the arms at right angles and the elbow on either side of the body. During the tip pinch test, the tip of the index and thumb finger was squeezed with pinch gauge, by keeping the wrist in straight position. A total of three trials was performed on every individual during the study. The reading was recorded in kilograms and the average was taken.

Levels of perception on right- and left-hand tip pinch strength of vision loss and hearing loss subjects was done using a three-point likert scale. The subject was asked to rate his tip pinch strength on a questionnaire wherein he was given to tick one of the three options viz a) Higher than the normal b) Normal or c) lower than the normal. The response given by the subject was purely based on the perception of the subject under investigation (Rahmani-Nia, *et al*., 2011) [6]. The researcher gave a brief overview of tip pinch strength in order to make them familiar and express their levels of perception. The data from vision loss students was collected through dictation and response record method. Similarly, data from hearing loss students was collected through sign language method with help of a skilled assistant. The data was collected at the residential schools with earlier intimation and permission. Pearson product moment correlation was used a statistical tool apart from descriptive statistics like mean and standard deviation.

Picture 1 and 2: assessment of tip pinch strength

Findings of the study

Interpretive analysis including mean and standard deviation were employed to the raw data collected on right- and left-hand tip pinch strength of the subjects selected for the study. The results are provided in table 1.

Table 1: interpretation of results on characteristics of vision and hearing loss childrens

Variable	Units	13 to 14 years	15 to 16 years	17 to 18 years
		Mean ± S. D	Mean ± S. D	Mean ± S. D
N		128	176	110
Age	in years	13.45 ± 0.50	15.45 ± 0.50	17.45 ± 0.50
Right hand tip pinch strength	in kilograms	4.22 ± 0.99	4.66 ± 1.09	4.78 ± 1.10
Left hand tip pinch strength	In kilograms	3.86 ± 0.93	4.15 ± 1.07	4.24 ± 1.24

$\bar{x}$= Mean, S.D = Standard Deviation

Analysis of the table 1 reveals that the age of vision and hearing loss children's under investigation was 13.45 ± 0.50 in (the first score indicates mean followed by standard deviation) 13 to 14 years; 15.45 ± 0.50 in 15 to 16 years and 17.45 ± 0.50 in 17 to 18 years. The right-hand tip pinch strength was 4.22 ± 0.99 in 13 to 14 years; 4.66 ± 1.09 in 15 to 16 years; and 4.78 ± 1.10 in 17 to 18 years. The left-hand tip pinch strength was 3.86 ± 0.93 in 13 to 14 years; 4.15 ± 1.07 in 15 to 16 years; and 4.24 ± 1.24 in 17 to 18 years. Table 2 provides results on right hand tip pinch strength of vision and hearing loss school children's with reference to available norms

Table 2: Norms Based Results on Right Hand Tip Pinch Strength of Vision and Hearing Loss Childrens

Normative values	Normative category	13 to 14 Years		15 to 16 Years		17 to 18 Years	
		F	%	F	%	F	%
8.35 & above	Strong	0	0	0	0	0	0
6.99 to 8.34	Above average	1	0.78	5	2.84	1	0.91
5.63 to 6.98	Average	11	8.59	27	15.34	30	27.27
4.27 to 5.62	Below average	46	35.94	84	47.73	41	37.27
4.26 and below	Weak	70	54.69	60	34.09	38	34.55
TOTAL		128		176		110	

F= frequency, %=Percentage

Introspection of table 2 reveals that, as per available norms (Mathiowetz, Wiemer and Federman, 1986) [5] the right hand tip pinch strength in vision and hearing loss children's of 13 to 14 years, (54.69%) were weak right hand tip pinch strength; below average right hand tip pinch strength (35.94%); average right hand tip pinch strength (8.59%); above average right hand tip pinch strength (0.78%) and none of the subjects was strong in right hand tip pinch strength. In vision and hearing loss children's of 15 to 16 years it is observed that (34.09%) were weak right hand tip

pinch strength; below average right hand tip pinch strength (47.73%); average right hand tip pinch strength (15.34%); above average right hand tip pinch strength (2.84%) and none of the subjects was strong in right hand tip pinch strength. Further, in vision and hearing loss children's of 17 to 18 years it is found that (34.55%) were weak right hand tip pinch strength; below average right hand tip pinch strength (37.27%); average right hand tip pinch strength (27.27%); above average right hand tip pinch strength (0.91%) and none of the subjects was strong in right hand tip pinch strength. Table 3 provides information on left hand tip pinch strength of vision and hearing loss children under investigation. The above results are graphically depicted in figure 1.

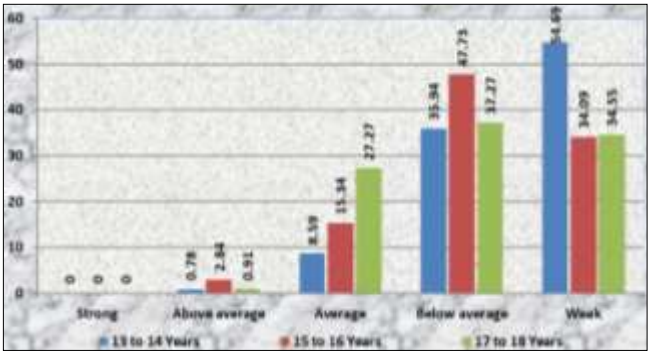

Fig 1: Norms Based Results on Right Hand Tip Pinch Strength of Vision and Hearing Loss Childrens

Table 3: Norms Based Results on Left Hand Tip Pinch Strength of Vision and Hearing Loss Childrens

Normative values	Normative category	13 to 14 Years		15 to 16 Years		17 to 18 Years	
		F	%	F	%	F	%
7.94 & above	Strong	0	0	0	0	0	0
6.59 to 7.93	Above average	0	0	3	1.70	6	5.45
5.26 to 6.58	Average	7	5.47	19	10.80	16	14.55
3.91 to 5.25	Below average	54	42.19	80	45.45	37	33.64
3.90 and below	Weak	67	52.34	74	42.05	51	46.36
TOTAL		128		176		110	

F= frequency, %=Percentage

Table 3 reveals that in vision and hearing loss children's of 13 to 14 years (52.34%) were weak tip pinch strength of left hand; below average tip pinch strength of left hand (42.19%); average tip pinch strength of left hand (5.47%) and none of the student was above average and strong in tip pinch strength of left hand. In vision and hearing loss children's of 15 to 16 years it is observed that (42.05%) were weak in tip pinch strength of left hand; below average tip pinch strength of left hand (45.45%); average tip pinch strength of left hand (10.80%); above average tip pinch strength of left hand (1.70%) and none of the student was strong in tip pinch strength of left hand. Further, in vision and hearing loss children's of 17 to 18 years it is found that (46.36%) were weak tip pinch strength of left hand; below average tip pinch strength of left hand (33.64%); average tip pinch strength of left hand (14.55%); above average tip pinch strength of left hand (5.45%) and none of the student was strong in tip pinch strength of left hand.

The norms for the present per cent analysis were obtained from (Mathiowetz, Wiemer and Federman, 1986) [5]. The above results are graphically depicted in figure 2.

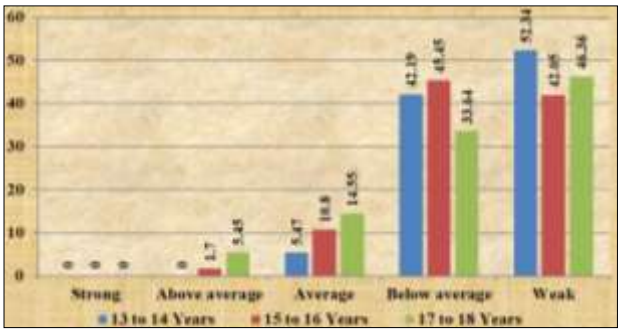

Fig 2: Norms Based Results on Left Hand Tip Pinch Strength of Vision and Hearing Loss Childrens

Table 4: Interrelation Between Self-Perceived and Measured Right and Left-Hand Tip Pinch Strength in 13 To 14 Years

		Actual right-hand Tip pinch strength	Actual left-hand Tip pinch strength
Perceived Tip Pinch Strength	Pearson Correlation	.425**	.297**
	Sig. (2-tailed)	.000	.001
	N	128	128
**. Correlation is significant at the 0.01 level (2-tailed).			

Introspection of table 4 reveals that the levels of perception on right hand tip pinch strength showed significantly moderate positive linear relationship when correlated with actual right hand tip pinch strength and levels of perception on left hand tip pinch strength showed significantly weak positive linear relationship when correlated with actual left hand tip pinch strength in vision and hearing loss children's of age 13 to 14 years. Table 5 provides information on association between perceived and actual right- and left-hand tip pinch strength of vision and hearing loss children's in the age group 15 to 16 years.

Table 5: Interrelation Between Self-Perceived and Measured Right and Left-Hand Tip Pinch Strength In 15 to 16 Years

		Actual right hand Tip pinch strength	Actual left hand Tip pinch strength
Perceived Tip Pinch Strength	Pearson Correlation	.469**	.419**
	Sig. (2-tailed)	.000	.000
	N	176	176
**. Correlation is significant at the 0.01 level (2-tailed).			

Introspectively table 5 reveals that the levels of perception on right- and left-hand tip pinch strength showed significantly moderate positive linear relationship when correlated with actual right- and left-hand tip pinch strength in vision and hearing loss children of age 15 to 16 years. Table 6 provides information on association between perceived and actual right- and left-hand tip pinch strength of vision and hearing loss children's in the age group 17 to 18 years.

Table 6: Interrelation Between Self-Perceived and Measured Right and Left-Hand Tip Pinch Strength In 17 to 18 Years

		Actual right hand Tip pinch strength	Actual left hand Tip pinch strength
Perceived Tip Pinch Strength	Pearson Correlation	.392**	.252**
	Sig. (2-tailed)	.000	.008
	N	110	110
**. Correlation is significant at the 0.01 level (2-tailed).			

Perusal of table 6 reveals that the levels of perception on right hand tip pinch strength showed significantly moderate positive linear relationship when correlated with actual right hand tip pinch strength and levels of perception on left hand tip pinch strength showed significantly weak positive linear relationship when correlated with actual left hand tip pinch strength in vision and hearing loss children's of age 17 to 18 years.

Discussion

In 13 to 14 years, (35.94%) of vision and hearing loss children's in Karnataka had right hand tip pinch strength between 4.27 kgs to 5.62 kgs and considered below average; (54.69%) had 4.26 and below considered as weak; In 15 to 16 years, (47.73%) were below average; and (34.09%) were weak; In 17 to 18 years, (37.27%) were below average and (34.55%) were weak. In 13 to 14 years, (42.19%) of vision and hearing loss children's in Karnataka had left hand tip pinch strength between 3.91 kgs to 5.25 kgs and considered below average; (52.34%) had 3.90 and below considered as weak; In 15 to 16 years, (45.45%) were below average; and (42.05%) were weak; In 17 to 18 years, (33.64%) were below average and (46.36%) were weak. Tip pinch strength may be considered a measure of functional ability of subjects. The low levels of tip pinch strength have to be addressed as early as possible in order to avoid consequences. (Chintapalli, Samuel and Raj, 2013) [2] established the reliability and normal value of grip and pinch strength by hydraulic dynamometer in the children with Down's syndrome. (El-Shemy, and El-Fattah, 2017) [3] investigated the relationship between grasp and lateral pinch strength after vestibular stimulation in children with hemi paretic cerebral palsy and provided evidence that grasp and lateral pinch strength have significantly direct correlation as a result of vestibular stimulation. Establish normative data for 6 to 19-year olds on four tests of hand strength and the results indicated that increases in grip and pinch strength coincide with increases in chronological age that males are stronger than females in all age groups, and that hand dominance does not significantly affect hand strength scores. Normative data collected were slightly higher than norms from previous American and Australian studies. The situation with regard to levels of perception about their functional capacity in terms of pinch strength is encouraging. The subjects under study are aware of their status. This situation makes it easy to overcome the problem.

Conclusion

Vision and hearing loss school children of Karnataka State (90.63%) had below average and low in right hand tip pinch strength and (94.53%) had below average and low left-hand tip pinch strength. Further, the levels of perception on right hand tip pinch strength showed that there was significantly moderate positive linear relationship between actual and perceived right hand tip pinch strength and and levels of perception on left hand tip pinch strength showed significantly weak positive linear relationship when correlated with actual left hand tip pinch strength in Karnataka state within the age group 13 to 14 years. (81.82%) had below average and low in right hand tip pinch strength and (87.50%) had below average and low left-hand tip pinch strength. Further, the levels of perception on right- and left-hand tip pinch strength showed that there was significantly moderate positive linear relationship between actual and perceived right and left-hand tip pinch strength in Karnataka state within the age group 15 to 16 years. (71.82%) had below average and low in right hand tip pinch strength and (80%) had below average and low left-hand tip pinch strength. Further, the levels of perception on right hand tip pinch strength showed that there was significantly moderate positive linear relationship between actual and perceived right hand tip pinch strength and and levels of perception on left hand tip pinch strength showed significantly weak positive linear relationship when correlated with actual left hand tip pinch strength in Karnataka state within the age group 17 to 18 years.

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