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AN ASSESSMENT OF MEASURED AND SELF-PERCEIVED FORCED EXPIRATORY VOLUME PER SECOND AND PEAK EXPIRATORY FLOW LITER PER MINUTE AMONG HEARING AND VISUALLY IMPAIRED CHILDREN

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Abstract:

The present situation people with hearing and visual impairment need more support in their physical and psychosocial improvement. Child with visual and hearing impairment is not only face a lot of individual hardships during his premature developing years but also face a many problems and challenges to the responsible adults in his life. The intention of the current examination was to measure the lung capacity of hearing and visually impaired special school children of Karnataka state. Further the level of perception on forced expiratory volume per second and peak expiratory flow volume per minute was also correlated with their actual status. The present study was conducted on four hundred and fourteen (N=414) hearing and visually impaired special school children selected through purposive random sampling technique. The study included adolescents with hearing impairment one hundred and seventy one (N=171) and vision impairment two hundred and forty three (N=243) in male group. Complete subjects were residents of special schools within Karnataka state. Their age ranged between 13 to 18 years. The forced expiratory volume per second and peak expiratory flow volume per minute measurement was done by following the standard procedure. The level of perception on forced expiratory volume per second and peak expiratory flow volume per minute of hearing and visually impaired school children was done using a 3 point likert scale. The forced expiratory volume per second of 13 to 14 years with 2.01 ± 0.48; 2.39 ± 0.46 in 15 to 16 years; and 2.58 ± 0.52 in 17 to 18 years. The peak expiratory flow volume per minute was 290.36 ± 68.99 in 13 to 14 years; 326.95 ± 75.09 in 15 to 16 years; and 352.18 ± 87.00 in 17 to 18 years. On the basis of the findings of the current examination it is concluded that the hearing and visually impaired school going children poor forced expiratory volume per second and peak expiratory flow volume per minute is an indication of lower lung capacity level. Since hearing and visually impaired school going children require to perform their everyday physical exercise at their own, it is imperative to have enough lung capacity. Further, the hearing and visually impaired school children under examination are unable to significantly weak positive linear relationship their lung capacity precisely.

Key Words: Lung Capacity, Hearing Impaired, Visually Impaired, Peak Expiratory Flow & Forced Expiratory Volume.

Introduction:

The assessment of respiratory system of an individual the pulmonary function tests are one of the best test. So many tests are there in pulmonary function tests, peak expiratory flow rate test is preferred as it is a simple and reliable prognostic and diagnostic test procedure diagnoses pulmonary obstructive diseases and Bronchial Asthma. Peak expiratory flow rate test is preferred among other pulmonary functions tests because of the advantages like easy to use, easy to take the reading, low cost of instrument, easy to explain the procedure even to the illiterates (Babu, Mohit and Kolekar, 2015). In childhood days asthma is one of the most common chronic diseases. Asthma disease characterized by reversible, repeated, airway obstruction occurring frequently because of bronchial hyper responsiveness and inflammation of the pulmonary airways with eosinophilic infiltration. Approximately 4.5 per cent of asthma patient is anticipated in the world. In India, the prevalence of asthma in adults varies from 2.05 to 3.5 per cent it means seventeen to thirty million patients suffering from asthma disease. Peak flow meter is a most useful tool to supervise airway patency mainly in those children who have a family background of bronchial asthma. Asthmatic family child, having significantly low peak expiratory flow rate values than its age and height matched peers, can be considered under impending asthma category (Mehta *et. al., 2016*). The identification of bronchial obstruction, the early diagnosis of lung

diseases, the functioning of the human lung growth and turn down in lung function over time are all main characteristics to consider in the clinical management of respiratory sickness. An evaluation and supervision of respiratory diseases require reliable spirometry reference points for both dynamic and static lung volumes. Accomplish this, the effects of sickness and of environmental influences on lung development must be understood to avoid misdiagnoses. The ventilator parameters observed in dimensions of respiratory mechanics should be compared with spirometric reference values by ethnicity, height, age and sex in accordance with the recommendations of the Respiratory Society of European and the Thoracic Society of American (Messan, *et. al., 2013*).

The Objective of the Study:

The investigator conduct the present study was investigated to evaluate the forced expiratory volume in one second and peak expiratory flow liter per minute of visually impaired as well as hearing impaired residential school children of Karnataka State. Further the level of perception on forced expiratory volume in one second and peak expiratory flow liter per minute was also correlated with their actual status.

Methodology:

Visually and hearing impaired residential school children four hundred and fourteen (N=414) students of Karnataka state included in this current investigation all the way through purposive random sampling method. The current investigation elected visually impaired two hundred and forty three (N=243) and hearing impaired one hundred and seventy one (N=171) in male category. All the subjects were residents of differently abled school's within Karnataka state. The subjects age range interpolated in 13 to 18 years. The present investigation was performed as per standard method (Miller, *et. al*., 2005; and Moore, 2014). In this present study using Microlife digital peak flow meter. The forced expiratory volume in one second and peak expiratory flow liter per minute test was performed on every individual during the study in a sitting position by using micro life digital peak flow meter. During the test, an individual was asked to take deep breath and the researcher has put nose clip to prevent the escape of air from the nose. Then, the mouth piece of the peak flow meter was kept in the mouth and asked him to hold the mouth piece tightly with the lips. Then, the tester was asked to release the air forcefully and completely to the peak flow meter. A total of three trails were performed on every individual with a gap of thirty seconds and the maximum score was recorded in litre per second and liter per minute as individual score**.** Further the levels of perception on forced expiratory volume in one second and peak expiratory flow liter per minute of visually and hearing impaired subjects was done using a three point likert scale. The subject was asked to rate his lung capacity 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).The investigator gave a brief general idea of lung capacity in order to make them familiar and express their levels of perception. The data from visually impaired students was collected through dictation and response record method. Similarly, data from hearing impaired 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. Figure 1 and 2 shows that assessment of forced expiratory volume per second, peak expiratory flow per minute and self-perceived questionnaire test.

Figure 1 & 2: Assessment of Forced Expiratory Volume per Second, Peak Expiratory Flow per Minute and Self-Perceived Questionnaire Test

Findings of the Study:

Interpretive investigation including mean and standard deviation were employed to the raw data collected on forced expiratory volume in one second and peak expiratory flow liter per minute of the subjects selected for the study. The results are provided in table 1.

Table 1: Interpretation of Results on Characteristics of Hearing and Visually Impaired Children's

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
Height	in meters	1.50 ± 0.09	1.56 ± 0.08	1.59 ± 0.07
Weight	in kilograms	38.46 ± 7.47	44.56 ± 8.98	47.93 ± 9.82
Body Mass Index	As per formula	17.08 ± 2.52	18.21 ± 2.81	18.94 ± 3.15
Forced expiratory volume	per second	2.01 ± 0.48	2.39 ± 0.46	2.58 ± 0.52
Peak expiratory flow	Liters per minute	290.36 ± 68.99	326.95 ± 75.09	352.18 ± 87.00

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

Interpretation of the table 1 reveals that the age of visually and hearing impaired 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 height was 1.50 ± 0.09 in 13 to 14 years; 1.56 ± 0.08 in 15 to 16 years; and 1.59 ± 0.07 in 17 to 18 years. The weight was 38.46 ± 7.47 in 13 to 14 years; 44.56 ± 8.98 in 15 to 16; years and 47.93 ± 9.82 in 17 to 18years. The body mass index was 17.08 ± 2.52 in 13 to 14 years; 18.21 ± 2.81 in 15 to 16 years; and 18.94 ± 3.15 in 17 to 18years. The forced expiratory volume per second was 2.01 ± 0.48 in 13 to 14 years; 2.39 ± 0.46 in 15 to 16 years; and 2.58 ± 0.52 in 17 to 18 years. The peak expiratory flow volume per liters was 290.36 ± 68.99 in 13 to 14 years; 326.95 ± 75.09 in 15 to 16 years; and 352.18 ± 87.00 in 17 to 18 years. Table 2 provides results on forced expiratory volume per second of visually and hearing impaired school children's with reference to available norms.

Table 2: Norms Based Results on Forced Expiratory Volume per Second of Visually and Hearing Impaired Children

Normative Values	Normative Category	13 to 14 Years		15 to 16 Years		17 to 18 Years	
		F	%	F	%	F	%
4.71 & above	Excellent	0	0	0	0	0	0
4.22 to 4.70	Good	0	0	0	0	0	0
3.71 to 4.21	Average	0	0	2	1.34	1	0.91
3.20 to 3.70	Fair	1	0.78	3	1.70	11	10
3.19 & below	Poor	127	99.22	171	97.16	98	89.09
TOTAL		128		176		110	

F= frequency, %=Percentage

It is clear from the table 2 depicts that in visually and hearing impaired children of 13 to 14 years 99.22 per cent were poor forced expiratory volume in one second; fair forced expiratory volume in one second 0.78 per cent and none of the subjects was average, good and excellent in forced expiratory volume in one second.

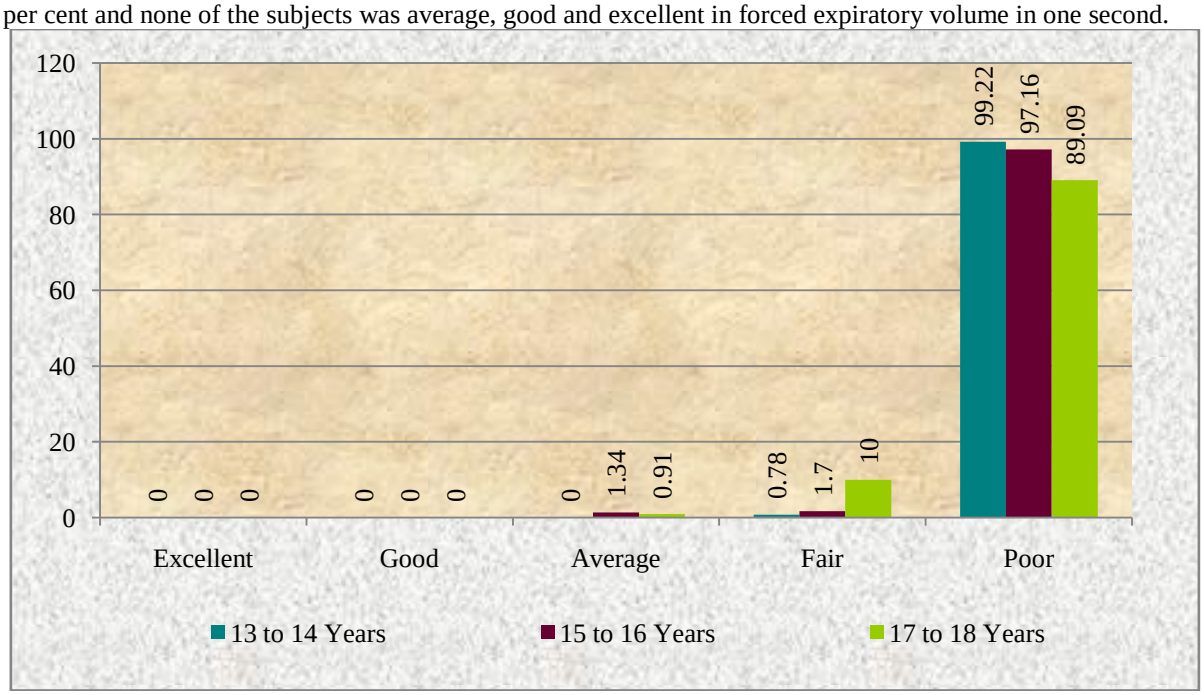

Figure 3: Norms Based Results on Forced Expiratory Volume per Second of Visually and Hearing Impaired Children

In visually and hearing impaired children of 15 to 16 years it is observed that 97.16 per cent were poor forced expiratory volume in one second; fair forced expiratory volume in one second 1.70 per cent; average forced expiratory volume in one second 1.34 per cent and none of the subjects was good and excellent in forced expiratory volume in one second. Further, in visually and hearing impaired children of 17 to 18 years it is found that 89.09 per cent were poor forced expiratory volume in one second; fair forced expiratory volume in one second 10 per cent; average forced expiratory volume in one second 0.91 per cent and none of the subjects was good and excellent in forced expiratory volume in one second. The norms for the present per cent analysis were obtained from (Feng, *et. al.*, 2011). Table 3 provides information on peak expiratory flow liter per minute of visually and hearing impaired children under investigation. The above results are graphically depicted in figure 3.

Table 3: Norms Based Results on Peak Expiratory Flow Liter per Minute of Visually and Hearing Impaired Children

Normative Values	Normative Category	13 to 14 Years		15 to 16 Years		17 to 18 Years	
		F	%	F	%	F	%
650 & Above	Excellent	0	0	0	0	0	0
563 To 649	Good	0	0	0	0	3	2.73
477 To 562	Average	1	0.78	4	2.27	6	5.45
390 To 476	Fair	11	8.59	26	14.77	24	21.82
389 & Below	Poor	116	90.63	146	82.95	77	70
TOTAL		128		176		110	

F= frequency, %=Percentage

Introspection of table 3 reveals that in visually and hearing impaired children of 13 to 14 years 90.63 per cent were poor peak expiratory flow liter per minute; fair peak expiratory flow liter per minute 8.59 per cent average peak expiratory flow liter per minute 0.78 per cent and none of the subjects was good and excellent in peak expiratory flow liter per minute. In visually and hearing impaired children of 15 to 16 years it is observed that 82.95 per cent were poor peak expiratory flow liter per minute; fair peak expiratory flow liter per minute 14.77 per cent; average peak expiratory flow liter per minute 2.27 per cent; and none of the subjects was good and excellent in peak expiratory flow liter per minute. Further, in visually and hearing impaired children of 17 to 18 years it is found that 70 per cent were poor peak expiratory flow liter per minute; fair peak expiratory flow liter per minute 21.82 per cent; average peak expiratory flow liter per minute 5.45 per cent; good peak expiratory flow liter per minute 2.73 per cent and none of the subjects was excellent in peak expiratory flow liter per minute. The norms for the present per cent analysis were obtained from (Feng, *et. al.*, 2011). Table 4 provides information on association between perceived and actual forced expiratory volume per second and peak expiratory flow liters per minute of visually and hearing impaired children in the age group 13 to 14 years. Table 4 provides information on results related to correlation between perceived and actual forced expiratory volume per second and peak expiratory flow liter per minute of hearing and visually impaired school children in the age group 13 to 14 years. The above results are graphically depicted in figure 4.

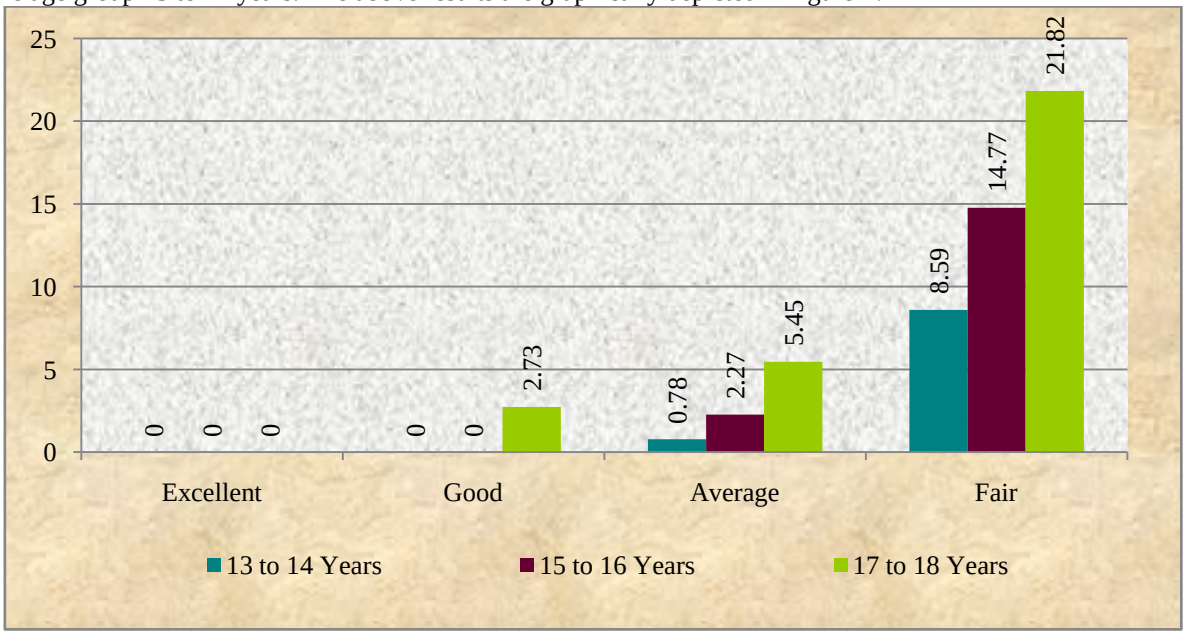

Figure 4: Norms Based Results on Peak Expiratory Flow Liter per Minute of Visually and Hearing Impaired Children

Table 4: Correlation between Perceived and Actual Forced Expiratory Volume per Second and Peak Expiratory Flow Liters per Minute in 13 to 14 Years

		Actual Forced Expiratory Volume per second	**Actual Peak Expiratory Flow liters per minute**
Perceived Respiratory Capacity	Pearson Correlation	.419**	.326**
	Sig. (2-tailed)	.000	.000
	N	128	128
**. Correlation is significant at the 0.01 level (2-tailed).			

Introspectively table 4 reveals that the levels of perception on Forced expiratory volume per second and peak expiratory flow liters per minute showed significantly moderate positive linear relationship when correlated with actual forced expiratory volume per second in visually and hearing impaired children of age 13 to 14 years. Table 5 provides information on association between perceived and actual forced expiratory volume per second and peak expiratory flow liters per minute of visually and hearing impaired children in the age group 15 to 16 years.

Table 5: Correlation between Perceived and Actual Forced Expiratory Volume per Second and Peak Expiratory Flow Liters per Minute in 15 to 16 Years

		Actual Forced Expiratory Volume per second	**Actual Peak Expiratory Flow liters per minute**
Perceived Respiratory Capacity	Pearson Correlation	.477**	.461**
	Sig. (2-tailed)	.000	.000
	N	176	176
**. Correlation is significant at the 0.01 level (2-tailed).			

Perusal of table 5 reveals that the levels of perception on forced expiratory volume per second and peak expiratory flow liters per minute showed significantly moderate positive linear relationship when correlated with actual forced expiratory volume per second in visually and hearing impaired children of age 15 to 16 years. Table 6 provides information on association between perceived and actual forced expiratory volume per second and peak expiratory flow liters per minute of visually and hearing impaired children in the age group 17 to 18 years.

Table 6: Correlation between Perceived and Actual Forced Expiratory Volume per Second and Peak Expiratory Flow Liters per Minute in 17 to 18 Years

		Actual Forced Expiratory Volume per second	**Actual Peak Expiratory Flow liters per minute**
Perceived Respiratory Capacity	Pearson Correlation	.235*	.298**
	Sig. (2-tailed)	.013	.002
	N	110	110
*. Correlation is significant at the 0.05 level (2-tailed).			
**. Correlation is significant at the 0.01 level (2-tailed).			

It is clear from the table 6 that the levels of perception on forced expiratory volume per second and peak expiratory flow liters per minute showed significantly weak positive linear relationship when correlated with actual Forced expiratory volume per second in visually and hearing impaired of age 17 to 18 years.

Discussion:

In 13 to 14 years, 99.22 per cent of visually and hearing impaired children's in Karnataka had forced expiratory volume per second were below 3.19 liters and were considered poor. In 15 to 16 years, 97.16 per cent were poor and in 17 to 18 years, 89.09 per cent were poor. In 13 to 14 years, 90.63 per cent of visually and hearing impaired children's in Karnataka had peak expiratory flow between below 389 liters/ minute. In 15 to 16 years, 82.95 per cent were poor and in 17 to 18 years, 70 per cent were poor. The oxygen consumption of legally blind adolescents and their sighted controls were compared for treadmill walking and running. The oxygen consumption of the visually impaired subjects averaged 24.4 per cent and 10.8 per cent higher than those of their same sex age matched controls, and 42.8 per cent and 11.2 per cent higher than the American College of Sports Medicine norms for walking respectively (Kobberling, Jankowski and Leger, 1989). (Al-Rahamneh, Dababseh and Eston, 2013) assessed the endurance level of 10 to13 year old deaf students in Jordan. Males performed better in 1 mile run tests. Hearing students performed better in than deaf students. Effective engagement of sports among students with hearing impairment has physiological benefits (Riungu, 2002). But the subjects under investigation seem to be away from physical activity and its benefits. Hence, the physical activity levels of subjects have to be studied in detail. (Jalili, *et. al.* 2011) examined the effectiveness of an aerobic training on physical self-concept, heart rate and body fat in 8 to10 years old of forty children's with mental and physical disabilities and they were exposed to a twelve week aerobic training. These results indicated that an aerobic training could not positively affect the physiological variables. In the present study the low levels of endurance capacity may interfere in day to day activities if not addressed on time. The concerned

authorities have to take suitable measures positively at the earliest. Levels of perception on forced expiratory volume per second showed significantly moderate positive linear relationship when correlated with actual forced expiratory volume per second in visually and hearing impaired children's of Karnataka in most of the age groups under investigation. Levels of perception on peak expiratory flow liters per minute showed significantly moderate positive linear relationship when correlated with actual peak expiratory flow liters per minute in visually and hearing impaired children's of Karnataka in most of the age groups under investigation. The results make it clear that the subjects with low aerobic capacity in total are aware of their condition and will consciously try to improve upon. Opportunities have to be created for hearing as well as visually impaired students to participate in activities related to improvement of aerobic capacity.

Conclusion:

Visually and hearing impaired school children's of Karnataka State 94.93 per cent had lower respiratory capacity. Further, the levels of perception on forced expiratory volume per second and peak expiratory flow liter per minute showed that there was significantly moderate positive linear relationship between actual and perceived forced expiratory volume per second and peak expiratory flow liter per minute in Karnataka state within the age group 13 to 14 years. 90.06 per cent had lower respiratory capacity. Further, the levels of perception on forced expiratory volume per second and peak expiratory flow liter per minute showed that there was significantly moderate positive linear relationship between actual and perceived forced expiratory volume per second and peak expiratory flow liter per minute in Karnataka state within the age group 15 to 16 years. 79.55 per cent had lower respiratory capacity. Further, the levels of perception on forced expiratory volume per second and peak expiratory flow liter per minute showed that there was significantly weak positive linear relationship between actual and perceived forced expiratory volume per second and peak expiratory flow liter per minute strength in Karnataka state within the age group 17 to 18 years.

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