

Oro-Motor Speech (OMS) and Total Language Score (TLS) in Children with Stuttering (CWS) and Children with No Stuttering (CWNS)

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Abstract

Stuttering is probably the best known speech disorder; it is a multifaceted disorder which has been the area of interest for the researchers since two decades or more. It is perhaps the most difficult to define or explain and to treat (Yairi & Ambrose, 2005). The disorder being a complex clinical population is present in around 1% of adults in the world and about 2.5 % in children (Proctor, Craig & Peters, 2002). It was also observed that the age of 3 to 5 years is the most critical period for the beginning of stuttering, because it is during this time that children accomplish the task of learning the transformations of adult language and their motor structures and function develops. The present study aims to compare the language abilities and oro-motor speech abilities in CWS and CWNS. Participants were children between age ranges 5 – 7 years. They were divided in two groups. Group I will consist of 20 CWS and Group II will have 50 CWNS. Objective was to find the difference between total language abilities and oro-motor speech abilities in CWS and CWNS. The results reveal that CWS were poorer in total language abilities than CWNS, though this difference was not statistically significant { $F=2.15$ (1), ($P>0.05$)}. There is a significant difference { $F=7.708$ (1), ($P<0.01$)} in oro-motor speech abilities in between CWNS and CWS, majorly with oro-motor speech task which includes repetition of word, phrases, sentence and diadochokinetic rate. This shows that CWS faces difficulty in speech coordination tasks. The results support the notion that speech motor tasks in CWS are a problem area, which is neglected by most of the speech therapists. Implications of the present study will help in planning better treatment for CWS.

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As the population considered for the present study was very limited, so the results cannot be generalized. Future researches can be done on larger population to see whether the difference in oro-motor speech tasks varies with gender, severity and age.

Keywords: Speech disorder, stuttering, total language abilities, oro-motor speech abilities.

Introduction

Speech is the most effective medium of communication. When the medium of communication gets affected it results in social disturbances. Amongst all the disorders affecting social interaction, stuttering has received most attention (Van Riper, 1971). Children who start stuttering are at great risk for social isolation too. They prefer to keep to themselves and avoid social interactions. They also experience cognitive and emotional reactions like anxiety, fear, anger and helplessness because of their speaking difficulties. This can have a devastating effect on their interpersonal communication in complex ways, stuttering is interwoven with the language development of the children. Stuttering typically begins between 3-5 years of age, which is a time of rapid syntactic, morphological and lexical development, when children acquire the ability to produce complex utterances (Owens, 2012).

Language development is important for any individual to communicate properly, especially during the year of adolescence when the social life starts to develop. During the development process, when the internal or external demands for fluency exceeds the child's capacity in one or more developing areas like motoric or emotional, then stuttering is likely to occur. It can be due to a dis-coordination of activity within the speech motor subsystems involved in speech production.

Development of both the sub-systems goes in agreement with each other, between the age ranges of 3-5 years (Peters & Starkweather, 1990). During the process of development,

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whenever these two systems involved are not able to work in cohesion, the fluent flow of speech is interrupted. So if the competence level of language is normal but the performance of motor system is not matching, it can lead to disruption in the fluency of speech in getting started i.e. on the execution of an identifiable segment of language, and that the children modify their articulatory movements to meet the prosodic and linguistic demands, which leads to dysfluencies (Bloomstein, 1993; Starkweather, 1987; Peters & Starkweather 1990).

Recently, various researches have been conducted to study the interactions between the speech motor planning and language abilities, the results indicated that CWS score low on speech motor planning and language when compared to their peers (Pushpavathi, 2004). There are studies which show that increased linguistic complexity, as measured by length of utterance and increased motor complexity, as measure by speech rate variability are associated with increased stuttering frequency (Michael & Alexander, 2007).

Method

Research on correlation between language and oro-motor speech abilities of CWS and CWNS has yielded ambiguous results. Few studies have supported this notion that there is a correlation between language and oro-motor speech abilities and few have refuted. In order to explore the correlation between language and oro-motor speech abilities, the current study was taken up with the aim of finding out the correlation between language abilities and oro-motor speech abilities in CWS and CWNS.

CWS included a heterogeneous group with varied severity because of less availability of participants meeting the inclusion criteria in the given time frame. Figure 1 shows the distribution of severity of stuttering among subgroups. In age group I, 40% of the participants were diagnosed with very mild stuttering, 30% with mild stuttering, 10% with moderate stuttering and 20% with severe stuttering. In age group II, 30% participants had very mild stuttering, 30% had mild stuttering, 30% had moderate stuttering and 10% had severe

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stuttering. Varied percentage of degree of severity among the subgroups made it difficult to compare the groups statistically, depending on the degree of severity.

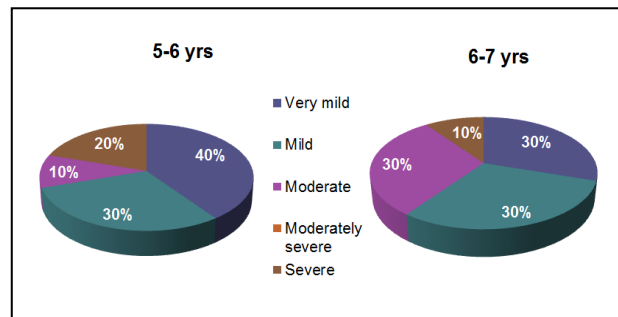


Figure 1: Distribution of Severity of stuttering in CWS

Participants

The following were the inclusion and exclusion criteria while selecting the children for the present study.

Table1: *Inclusion and Exclusion criteria while selecting children:*

Inclusion criteria	Exclusion criteria
Children with Normal intelligence	Children with the history of any neurological speech disorder.
Children in between age range 5-7 were selected.	Children without therapy from last 1 year
Children with both genders will be included.	Children with any psychological issues were excluded from the study
Children with mother tongue as Hindi.	
Children with parental education of higher secondary school	

A total of 70 participants between 5-7 years of age were selected for the study. They were divided in two groups, consisting of 20 children with stuttering (CWS) and 50 children with no stuttering (CWNS). These groups were again sub-divided into two age groups I: 5-6 years and age group II: 6-7 years with equal number of participants in each group. The groups could not be matched for gender, because female participants reported less in number than males to the speech therapy centers in the available time frame.

Secondly, stuttering is commonly observed in males than females (3:1). Hence the female participants were less. For CWS, age group I included 7 males and 3 females and age group II included 9 males and 1 female. For CWNS, age group I included 12 females and 13 males and age group II included 12 females and 13 males. Figure 2 shows the details and distribution of the participants across group.

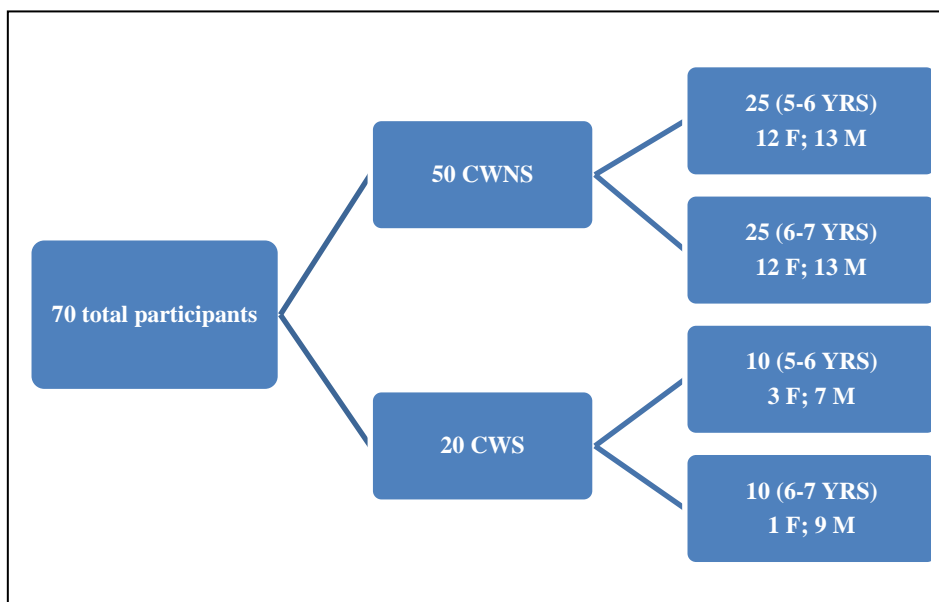


Figure 2: Distribution of Severity of stuttering in CWS

Material

For psychosocial assessment

The Pediatric symptom checklist given by Murphy, Jellinek and Pagano (1996) was taken. It is a screening checklist designed to recognize cognitive, emotional and behavioral problems. It consists of 35 items. Scoring was done as 1, 2 and 3 as never, sometimes and often respectively.

For assessment of language

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Linguistic profile test (LPT) in Hindi developed at AYJNIHH, Mumbai (1995) , as the project of UNICEF was used. LPT was originally developed by Karanth in Kannada language. Later it was developed in various Indian languages like Gujarati, Hindi, Marathi, Oriya, and Bengali. This test basically measures individual's receptive and expressive language skills in two parts. Part I tests Semantics & Part II tests Syntax. Semantic section contains 12 categories with 66 test items; it includes categories like naming, semantic discrimination, lexical categories, similarity, semantic anomaly, semantic contiguity, paradigmatic relations, syntagmatic relations, polar questions, antonymy, synonymy, and homonymy. Syntax section contains 10 sub categories which consist of 60 test items. It includes categories like plurals, tenses, P.N.G. markers, case markers, conditional clauses, transitive/ intransitive/ causative, sentence type, conjunctive and quotative, comparatives and participle construction. The stimulus book of LPT is developed in such a way that individual with language problems and non-readers can respond without difficulty. It is in album form which contains test plates. Total score and sub-section wise score was calculated for each child for further analysis.

For oro-motor speech assessment

Com – DEALL “Oro Motor Checklist” developed by Karanth (2007). It includes 4 sub-sections. In that, the last section checks the oro-motor speech coordination, it includes repetition of words, phrases and calculation of diadochokinetic rate. Scoring was done according to the responses as 0 (no response), 1 (only spontaneously) and 2 (on demand).

Procedure

The children for the present study were randomly selected from different Hindi medium schools in Pune. Informed consent was taken from the Principal/ HOD/ Parents of the children included in the study. The data was collected during the school hours in quite, empty classroom. The child was made to sit comfortably. Brief history was collected from the

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children/class teacher. PSC (Pediatric symptom checklist) was administered. Clinician filled the questionnaire with the help of teachers. Total score was calculated. Any child scoring more than 24, between age group 5-6 yrs and more than 28, between age group 6-7 yrs were excluded from the study, as it indicated psychological impairment.

Oro-motor speech assessment was done. The child was asked to follow the instruction. For oro-motor speech assessment the child was asked to repeat vowels, words and phrases. Diadochokinetic rate was calculated for assessing speech coordination. For all this, instructions were given as mentioned in the test. The score was added and calculated for further analysis.

For Language assessment, LPT was administered in Hindi. Instructions were given as mentioned in the LPT manual. Child was shown the LPT test plates and scoring was done simultaneously in the LPT scoring sheet.

Statistical analysis:

Statistical analysis was done with SPSS software (Version 20). Descriptive statistics was done to compare the language and oro-motor speech abilities in CWS and CWNS. MANOVA was carried out to find the effect of age on oro-motor speech and language abilities. The results of the study have been tabulated and discussed in the following chapter.

Results and Discussion

The main aim of the present study was to assess the relationship between language ability and oro-motor speech ability of CWS and CWNS. Standardized tests for assessing language

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abilities and oro-motor speech abilities were administered on 70 participants. Scores were obtained and added for each of the tests and then tabulated for further statistical analysis.

Though present study did not consider the parameter of degree of severity for statistical calculation, future studies can be planned with the aim of studying effect of degree of severity on the language and oro-motor abilities in CWS.

Descriptive analysis was done to achieve the objective of comparing language and oro-motor speech abilities in CWS and CWNS. The mean scores of CWS and CWNS for language and oro-motor speech test was compared to observe the difference in scores for each. MANOVA was carried out to study the age and gender wise difference in all the parameters selected for the study.

Language and oro-motor speech abilities in CWS & CWNS:

Mean values for language and oro-motor speech was calculated for CWS & CWNS. The mean values were graphically represented in Table 2. For CWNS, the mean total language score (TLS) was 103. For CWS the mean total language scores (TLS) was 99. Similarly, in CWNS mean of oro-motor speech score (OMS) was 11.10. In CWS mean oro-motor speech score (OMS) was 9.95 (Refer Table 2).

Table 2: *Manova results of Language and Oro-motor Parameters*

Parameters	CWNS		CWS		df	F	P-Value
	Mean	SD	Mean	SD			
TLS	103.18	12.26	99.10	14.04	1	2.15	0.147
OMS	11.10	1.54	9.95	2.13	1	7.708	0.007**

** . Correlation is significant at the 0.01 level (2-tailed).

The mean score for language was lower for CWS than CWNS, to see if there is any statistically significant difference in mean values, MANOVA was carried out. MANOVA result reveals that there is no statistical significant difference in mean total Language score (F=2.15(1),P>0.05) between CWS and CWNS.

Results of the present study suggest that CWS, when compared with CWNS did not have quantifiable difference between the measures of language abilities. Though the CWS performed lower, the difference was not statistically significant. The result of the present study was in support with the study done by Kalehne and Johannsen (2000) who stated that the receptive and expressive language abilities of CWS were within normal limits.

There have been studies documenting contradicting results about disordered or weak language skills in CWS which may have played a causal role in the onset of stuttering (Anderson & Conture, 2000; Arndt & Healey, 2001; Bloodstein, 2005). The differences in the results could be due to relatively small sample size and large variability in speech disfluencies within the group of CWS, which may have appreciably reduced the chances for finding significant results.

The mean scores for oro-motor speech abilities differed in CWS and CWNS. MANOVA was carried out to see whether the difference was statistically significant. The result revealed that there is a statistically significant difference in oro-motor speech abilities { $F=7.708(1)$, $P<0.01$ } between CWS and CWNS. Since CWS performed poorer on oro-motor speech abilities, it can be assumed that their co-ordination in oro-motor abilities may be lower than CWNS. The result of the present study supports the assumptions stated by Freeman and Ushijima (1978), that stuttering can occur due to a dis-coordination of activity within the speech motor subsystems involved in speech production.

The hypothesis given by Max et al., (2004); Laucks and Nil (2007), postulated that stuttering arises from unstable or insufficiently activated internal models. It also suggests that CWS do not internalize appropriate relationship between motor commands and sensory consequences for speech production. Hence, further studies can be conducted to check the sensory motor integration, oral proprioceptive limitation and motor control deficits in CWS.

MANOVA was carried out to check the developmental trends of language and oro-motor speech abilities with CWS and CWNS. The result reveals statistically significant { $F(8) = 3.223$, ($P<0.01$)} difference in between age group I and age group II showing that language and oro-motor speech abilities develops in between age 5-7 yrs. Study done by Watkins (2005), Nippold (2012), and Owens (2012) showed similar developmental trends.

Effect of age on language abilities in CWS and CWNS:

Total language score:

The mean and standard deviation values for all the language and oro-motor speech parameters across the groups are shown in Table 3 and Figure 4. CWS scored poorer than CWNS on language abilities. The mean total language scores for CWNS was 96.40 and 111.68 in age group I and age group II respectively. And for CWS, it was 90.30 and 109.01 in age group I and age group II respectively. Result of the present study showed that total

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language scores increased significantly {F (1) =31.459, (P<0.01) as the age increases in CWNS as well as in CWS. There are enough evidences in literature about language development occurring markedly in the age range of 5-7 yrs. The school, home environment helps the child to improve the vocabulary, syntax, semantics and pragmatics levels (Owens, 2012). Result of present study also showed that CWS and CWNS did not differ significantly in total language scores. Both the groups improved their language levels individually and equally.

Table 3: Mean and standard deviation of total language score (TLS)

Age group	CWNS		CWS		df	F	P-value
	Mean	SD	Mean	SD			
I	96.40	11.28	90.30	12.74	1	31.49	.000**
II	111.68	8.38	109.01	8.86			

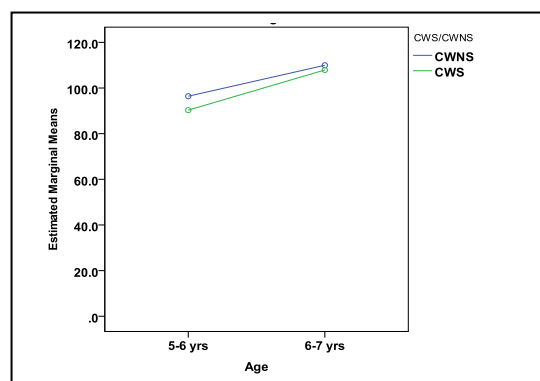


Figure 4: Total language score for CWS and CWNS

Effect of age on oro-motor speech abilities in CWS and CWNS

As shown in table 4 and figure 5, the oro-motor speech for CWS & CWNS differed across the subgroups. The mean total oro-motor score for CWNS was 10.32 and 11.91 in age group I and age group II respectively. And for CWS, it was 9.20 and 10.56 in age group I and age group II respectively. Result of the present study showed that oro-motor speech scores increased significantly {F (1) =13.64, (P<0.01)} as the age increases in CWNS as well as in CWS. Result shows that the speech motor coordination abilities increases with age.

Literature also has evidence that speech motor control and speech production abilities go hand in hand. Nip and Green (2006)., concluded that the maximum speeds of the articulators are slower for speaking tasks as compared to tasks requiring more cognition and language formulation such as retelling a story. Appropriate speech motor ability requires a relationship between motor commands and sensory sequences for fluent speech production. Maz (2004) stated that fluent speech production is obtained by 8 years of age which supports the notion that oro- motor control for speech develops and shows typical developmental trends.

Table 4: Mean and standard deviation of oro-motor speech (OMS)

Age group	CWNS		CWS		df	F	P-value
	Mean	SD	Mean	SD			
5-6 yrs	10.32	1.86	9.20	2.30	1	13.64	.000**
6-7 yrs	11.91	0.29	10.56	1.81			

**significant at the 0.01 level (2-tailed).

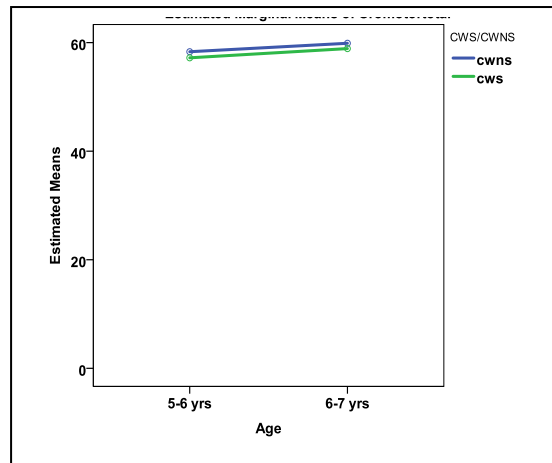


Figure 5: Oro-motor speech score for CWS and CWNS

To summarize, the results revealed that CWS were not significantly poor in language abilities than CWNS. But, there was a significant difference in oro-motor speech abilities (repetition of word, phrases, sentence and diadochokinetic rate) in between CWNS and CWS.. Hence, the result supports the notion that CWS face difficulty in speech coordination tasks. Implications of the study will be helpful in planning better treatment for CWS. However the results of the present study cannot be generalized as the population considered for the present study was very limited. The results support the notion that speech motor tasks in children with stuttering are a problem area, which is neglected in most of the speech therapy sessions. Further researches can be done on larger population to see whether the difference in oro-motor speech tasks varies with gender, severity and age.

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