

Utilization of ICF Framework for Assessment of Speech and Non-Speech Characteristics of Individuals with Parkinson's disease

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ABSTRACT

Parkinson Disease (PD) is a common neurodegenerative disorder exhibiting 36% of hypokinetic dysarthria affecting motor speech coordination among people throughout the world. A gamut of speech and non-speech problems due to Parkinson's disease can have an impact on the functions of everyday life also affecting participation in life situations. However, standardized tests are unable to fully reflect individuals functioning in everyday life. The present study aims at utilizing the ICF framework for the assessment of speech and non-speech characteristics in individuals with Parkinson's disease within age range of 50-70 years using an ICF framed questionnaire. The results were suggestive of a significant differences in terms of respiration, articulation and speech intelligibility, phonation and prosodic problems as observed in both the groups i.e. Group I (mild-moderate category) and Group II (severe category).

In all 3 domains of Body function, 6 domains of Activity and Participation and single domain under Environmental Functions, a significant difference within Group II having higher scores suggesting individuals in severe group face more difficulties in day to day life as compared individuals in mild-moderate group i.e. Group I. The nature of impact which these speech problems may have on activity and participation as well as other domains is not assessed, highlighted and focused upon which also has an impact on the quality of life of these individuals. Hence the need of the hour is thus to use the ICF framework for assessing of input of speech and non- speech characteristics in individual with Parkinson disease.

Key Words: Parkinson Disease (PD), ICF framework, Speech and non-speech characteristics

INTRODUCTION

Parkinson's disease (PD) is named after the London general practitioner (GP), James Parkinson, who vividly described many of the clinical features of the condition in his essay on the shaking palsy. [1] Parkinson's disease (PD) is the second most common neurodegenerative disorder. Seven to ten million individuals suffer from Parkinson's disease (PD) worldwide, out of which 89% individuals have communication disorder. [2-4] However, India, with one of

the world's lowest incidence of PD (70 out of 100,000), has world's highest incidences of PD in the Parsi Community of Mumbai, where, 328 out of every 100,000 people were affected. [5] The ability to communicate has been reduced, considered as one of the most difficult aspects of PD by many people with the disease and their families. [6, 7] It has also been observed, that individuals with Parkinson's disease exhibit a gamut of speech problems affecting their speech intelligibility and non-speech

characteristics which include psychological, psychosocial etc. factors affecting individual's functioning in daily living activities. However, most of them are affecting the speech and language skills which can have a negative impact upon individuals with PD during their participation in everyday life situations along with their family- for a life time. [7,8] Affected individuals often become disabled or retire early, are forced to give up activities they enjoy, incur substantial medical costs and have increased mortality. [7,9-11]

Although, the speech characteristics can be assessed using standardized test batteries, these test batteries are unable to fully reflect individuals functioning in everyday life.

For assessment of speech of the individuals with PD, a medical model was followed till date. However, a medical model views disability as a problem of the person, directly caused by disease, trauma or other health condition, which requires medical care provided in the form of individual treatment by professionals. Although medical treatments, including neuropharmacological as well as neurosurgical methods, may be effective in improving limb symptoms, their impact on speech production remains unclear. [7, 12-19] At the same time, in a medical model, numbers of aspects such as speech task, activities and participation of daily living as well as the environmental factors affecting the individual are not assessed and this can have an impact on holistic rehabilitation of individual with PD.

On the other hand, a social model which sees the issue mainly as a socially created problem, and basically as a matter of the full integration of individuals into society. The social model focuses on overall and holistic integration of individual into society. ICF belongs to the "family" of international classifications developed by the World Health Organization (WHO) which provides a framework to code a wide range of information about health (e.g.

diagnosis, functioning and disability, reasons for contact with health services) and uses a standardized common language permitting communication about health and health care across the world in various disciplines and sciences. It offers a conceptual framework for information that is applicable to personal health care, including prevention, health promotion, and the improvement of participation by removing or mitigating societal hindrances and encouraging the provision of social supports and facilitators. [20,21]

There are studies using ICF classification for assessment of speech/non speech characteristics including activity limitation and restrictions in participation of individuals with Parkinson's disease. The results of a study conducted by Leonardi, Raggi Ajovalasit et al., (2011), [22] where it has been found that there is activity limitation and participation restriction performance connected with both presence of severe body function symptoms and relevant barriers in environmental function in individuals with Parkinson's disease.

Rangasayee, Mukundan, Dalvi et al., (2010), [23] presented an overview of ICF in terms of its conceptualization and application. The various components and domains after being described, the use of ICF as a social policy tool, clinical tool, educational tool, and research tool is specified. Third party disability in ICF framework: A study of Aphasics family was done by Banik, Renuke, Rangasayee et al.,(2016). [24]

ICF framework was applied for assessment of speech and activities and participation in individuals with sub-mucous cleft palate by Patil (2005). [25]

A gamut of speech and non- speech problems due to Parkinson's disease can have an impact on the functions of everyday life. These problems can also affect participation in life situations. In India, there are a number of centers, where assessments of speech of individuals with Parkinson's disease are conducted. However, there has been a dearth of published studies

investigating use of ICF framework in assessment of speech, activities and participation in individual's with Parkinson's disease. Hence, the need for the study.

MATERIALS AND METHODS

The participants comprised of 30 individuals within an age range of 50-70 years having hypokinetic dysarthria diagnosed by an SLP along with Parkinson's disease as diagnosed by neurologist.

The aims and the objectives of the study were explained to the participants and their written consent was sought. Informal assessment of speech was done which was followed by the assessment using Frenchay Dysarthria assessment version 1. [26] The participants were then instructed to read the Rainbow passage (English) and standardized Hindi passage which was recorded. Three ASLPs, with experience of 25 years, listened to the recorded speech and rated the speech intelligibility of the participants' speech using the speech intelligibility rating scale of AYJNISHD (2003). As per the speech intelligibility ratings, all the subjects were divided into two groups. Group I: 15 subjects having speech intelligibility rating from 2 to 3 i.e. Mild to Moderate group. Group II: 15 subjects having speech intelligibility rating from 4 to 6 i.e. Severe group.

A questionnaire based on ICF framework was constructed and validated by three ASLPs, each with experience of not less than 25 years.

The validated questionnaire was translated from English into Hindi by a team comprising of an Audiologist and Speech and Language Pathologist and two native speakers of Hindi language. Reverse translation was done to check for intactness of the meaning by two other non-professionals who were not involved in the translation. The questionnaire comprised of questions regarding to different domains of ICF. The distribution of each domain under ICF Components is as presented in table 1.

Table 1. Distribution of each domain under ICF components.

Components	ICF Domains
Activities and Participation	General tasks And Demand
	Communication
	Domestic Life
	Interpersonal Interactions And Relationship
	Community, Social And Civic Life
	Major Life Areas
Body function	Mental and emotional function
	Fluency and rhythm of speech function
	Voice function
Environmental	Attitude

The subjects were instructed to read the questions carefully and put a "√" mark against the options (never, sometime and always) which best described the nature of their problem. If they faced the problem addressed in the question "all the time" then put '√' mark against 2, if "at times but not always" then put a '√' against 1 and if "do not face the problem" then put a '√' mark against 0. They were also instructed to feel free to ask any questions to clear their doubts.

The researcher then further collected the duly filled questionnaire from the participants of the groups and noted down their responses. The responses were further compiled for statistical analysis.

Statistical Analysis:

A comprehensive analysis was done using Mann-Whitney test to analyze the response for various ICF domains in order to assess whether there exists a significant difference in the responses of each group with respect to different domains.

RESULT

An assessment of oral peripheral mechanism of face and lips, jaw, tongue and soft palate was done for both the groups. The results were significantly different for both the groups. A marked deviation and limitation in range of movements of the lips and tongue was present in Group II (Severe) as compared to Group I (mild-moderate group). Jaw was in open position in most subjects of Group II (i.e. severe). The Frenchay Dysarthria assessment result indicated that the functions of various parts of oral-peripheral mechanism were severely

affected in Group II when compared to those of Group I.

The speech characteristics of subjects in Group II (i.e. severe) in terms of respiration, phonation and prosody, articulation and speech intelligibility were more affected both in capacity and responses as compared to Group I (mild-moderate). The responses to the domains under the component of Body function, Activities and Participation and

Environmental Factors relating to the speech problem of individuals with Parkinson Disease, were evaluated and each of them is given in detail which depicts the speech problems of an individual with Parkinson Disease.

The descriptive statistics for responses under speech, activity and participation domain of ICF are depicted in table 2.

Table. 2 Descriptive Statistics for responses under Speech, Activity and Participation domain of ICF.

Components and Domains	Group	N	Minimum	Maximum	Percentiles		
					25	50(Median)	75
Body Function							
Voice Function	I	15	0	6	1	2	3
	II	15	1	6	4	5	6
Fluency and rhythm of speech	I	15	0	8	2	2	4
	II	15	3	8	5	6	7
Emotional function	I	15	0	5	0	1	2
	II	15	0	10	4	9	9
Activities and Participation							
Communication	I	15	0	12	0	3	10
	II	15	6	14	8	11	12
General Tasks and Demands	I	15	0	7	0	2	4
	II	15	2	7	4	6	6
Domestic life	I	15	0	3	0	1	1
	II	15	0	4	2	3	4
Interpersonal interactions & relationship	I	15	0	12	1	3	7
	II	15	3	15	9	11	13
Community, Social and Civic Life	I	15	0	5	0	1	1
	II	15	2	6	4	4	5
Major Life Areas	I	15	0	1	0	0	0
	II	15	0	2	1	2	2
Environmental Factors:							
Attitude	I	15	0	9	1	5	7
	II	15	3	13	8	10	11

As seen in the Table. 1, Group II, subjects with speech intelligibility within severe range, are having more number of individuals with problem in all domains because of their speech difficulty. Moreover, it is also found that in Group I, subjects with mild to moderate speech intelligibility range, there are few individuals having only some problem in all the domains. This descriptive statistics for responses are illustrated in Boxplots Figures. 1, 2, 3 and 4.

Boxplots: Interpersonal Interactions and Relationships Score by Group

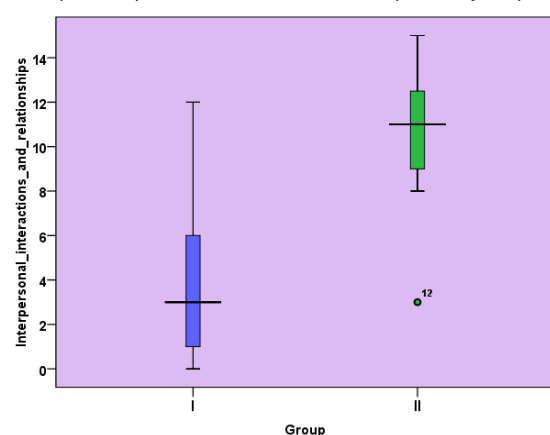


Figure 1. Boxplots: Interpersonal Interaction and Relationship.

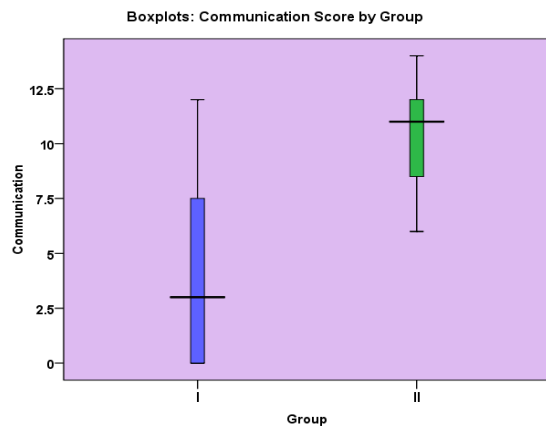


Figure 2. Boxplots: Communication.

Figure. 1, clearly indicates that in Group I, 50 percent of the subjects have scores between 3 & 12. In Group II, 50 percent of the subjects have scores either 11 or 15, i.e. not below 11. There is only one subject who scored '3' which is shown as outlier in the box plot. Thus, the distributions of Interpersonal Interactions and Relationship scores for these groups are clearly different.

Figure.2, clearly indicates that in Group I, 50 percent of the cases have scores in between 3 to 12. In Group II, there are 50 percent of the subjects have scores either 11 or 14, i.e. not below 11. Thus, the distributions of communication activity scores for these groups are clearly different

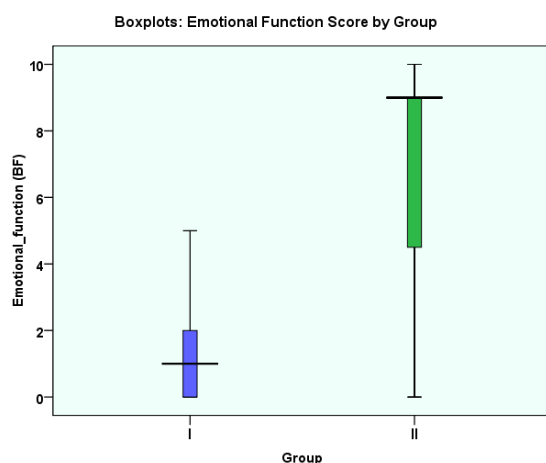


Figure 3: Boxplots: Emotional Function Score by Group

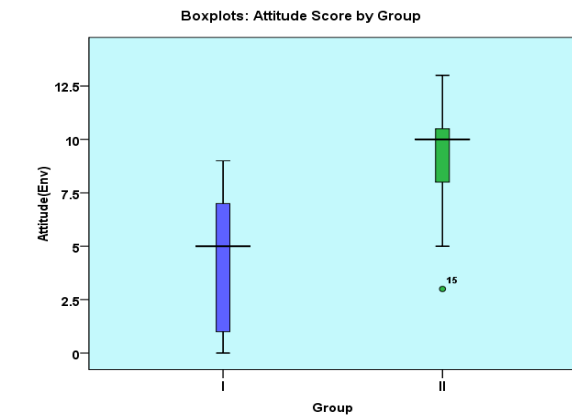


Figure 4: Boxplots: Attitude Score by Group

Figure.3, clearly indicates that in Group I, 50 percent of the subjects have scores in between 1 to 5, whereas, in Group II there are 50 percent of the subjects having scores either 9 or 10, i.e. not below 9. Thus, the distributions of Emotional function scores for these groups are clearly different.

Figure 4, clearly indicates that in Group I, 50 percent of the subjects have scores in between 5 to 9.

In Group II, there are 50 percent of the subjects having score 10 to 13, i.e. not below 10. Thus, the distributions of Attitude scores for these groups are clearly different. Thus, from the tables (1 and 2) and boxplot figures (1,2,3 and 4), it is clearly observed that there are more adverse effects on their Interpersonal Interaction and Relationship; Communication; Emotional functional in patient of Group II. A similar trend is observed for the domain of attitude as well.

A non-parametric Mann-Whitney test was applied in order to compare the various domains in Activities and Participation, Body function and Environmental factors amongst the two Groups.

The results of the Mann-Whitney test are depicted in Table 3.

Table 3: Mann- Whitney Results

Components and Domains	Group	N	Mean rank	Sum of ranks	Mann- Whitney Results		
					U value	Z value	p value
Body functions							
Voice Function	I	15	10.9	163.5	43.5*	-2.903	0.004
	II	15	20.1	301.5			
Fluency and rhythm of speech	I	15	10.3	154.5	34.5*	-3.271	0.001
	II	15	20.7	310.5			
Emotional function	I	15	9.33	140	20*	-3.88	<0.0005
	II	15	21.67	325			
Activities and Participation							
Communication	I	15	10.1	151.5	31.5*	-3.38	0.001
	II	15	20.9	313.5			
General Tasks and Demands	I	15	10.37	155.5	35.5*	-3.242	0.001
	II	15	20.63	309.5			
Domestic life	I	15	9.4	141	21*	-3.874	<0.0005
	II	15	21.6	324			
Interpersonal interactions and relationship	I	15	9.13	137	17*	-3.981	<0.0005
	II	15	21.87	328			
Community, Social and Civic Life	I	15	8.97	134.5	14.5*	-4.121	<0.0005
	II	15	22.03	330.5			
Major Life Areas	I	15	9.1	136.5	16.5*	-4.26	<0.0005
	II	15	21.9	328.5			
Environmental Factors							
Attitude	I	15	9.5	142.5	22.5*	-3.759	<0.0005
	II	15	21.5	322.5			

Note: *indicates that the U value is statistically significant at .05 level.

The mean ranges, percentiles ‘U’ and ‘Z’ value calculated, determine that the two groups differed significantly for the various domains i.e. Communication, General Tasks and Demands, Domestic life, Interpersonal Interactions and Relationship, Community, Social and Civic Life and Major Life Areas under Activities and Participation between two groups. Group II (severe category) had higher scores on the three percentiles. The difference in the mean ranks of the two groups was found to be statistically significant revealing that Group II faces more difficulties in each domain than Group I.

Group II has higher score in Voice Function, Fluency and rhythm of Speech and Emotional function domains under Body function with a statistically significant difference as compared to Group I, indicating more problems faced by severe category than mild-moderate category. Environmental factors in terms of Attitude were more affected in subjects in severe category as compared to mild-moderate category.

DISCUSSION

The result of the present study are in congruence with the study by Leonardi et

al., (2009), where the prevalence of restrictions in Activities and Participation, for all the domains, the performance indexes are lower than those of individuals with Parkinson's disease. [22]

It was observed that all the subjects in the severe category had higher scores in Activities and Participation domains than those in mild and moderate category. Also, Group II (Severe) had lesser capacity which led to a decrease in their performance whereas the mild category had more capacity, therefore, showed better performance. This is similar to the observations made by Leonardi et al., (2009). [22]

The results obtained for body function are in agreement with the study of Leonardi et al., (2009) [22, 27] in which the authors have emphasized on analysing speech and non-speech problems in individuals with Parkinson's disease using ICF framework.

In the study of Leonardi et al., (2009), [22] a no. of environmental factors have been enlisted. Some of them are similar to those included in the present study viz. immediate family, friends, peers and colleagues, health professionals, individual attitudes of family members,

Individual attitudes of friends and individual attitudes of health professionals. It was observed that attitudes of family were most prevalent as facilitators or barriers. In the present study, the Group II had higher scores in this domain indicating family attitude etc. can be either prominent facilitator or barrier.

One of the most effective aspects of utilisation of ICF framework is the possibility of defining patients' functional profiles on a continuum. According to the ICF model, disability does not correspond only to symptoms severity or only to limitations in performing a limited number of activities. Rather it arises out of the interaction between a health condition and the environmental factors of the context in which the person lives, and it should be evaluated both at the level of the body, in terms of impairments, and at the level of the person, in terms of limitations, and also at the societal level, in terms of restrictions to participation. [20, 21]

CONCLUSION

The present study aimed to utilize ICF framework for the assessment of speech and non-speech characteristics in individuals with Parkinson's disease within age range of 50-70 years.

The following conclusions can be made from the study as per the expectation there are significant differences in terms of respiration, articulation and speech intelligibility, phonation and prosodic problems as observed in both the groups i.e. Group I (mild-moderate category) and Group II (severe category).

In all domains of Body function, Activity and Participation and Environmental Functions, a significant difference within Group II having higher scores suggesting individuals in severe group face more difficulties in day to day life as compared individuals in mild-moderate group i.e. Group I.

The results of the study have provided insight into the problems faced by individuals with Parkinson's disease in their

day to day life situation. The results also indicate that not only speech problems but also non speech problems have an effect on participation in activities and restriction in participation in daily living activities. If only routine assessment standardized test are used for assessment of speech problems. The nature of impact which these speech problems may have on activity and participation as well as other domains are not assessed, highlighted and focused upon. This also has an impact on the quality of life of these individuals. Hence the need of the hour is thus to use the ICF framework for assessing of input of speech and non-speech characteristics in individual with Parkinson disease.

Thus, in the present study assessment of speech and selected non-speech characteristics has been done both traditionally and by employing the ICF framework. The severity (i.e. mild-moderate or severe) of speech intelligibility in individual with Parkinson's disease appears to show varied impact on personal, socio-economic and civic life. These aspects which cannot be measured by traditional methods are assessed by utilizing the ICF mapped questionnaire.

The ICF framework as applied to the assessment of speech and activity and participation of individual with Parkinson's disease. Thus, it gives us a universal, systematic and holistic approach towards the evaluation and thereby interventions of a number of health conditions (in this case it is Parkinson's disease).

The limitation the present study is that it included less number of subjects with no gender differences. There has been no instrumental analysis on the patients with Parkinson's Diseases. Further it has been recommended that such similar study can be conducted using more number of subjects in both the group and a longitudinal study can be done on same group pre and post interventions using ICF framework to access the degree of efficiency of intervention.

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