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Effect of Parkinson's Disease on Action Verbs and Tenses Identification Skill

Pooja, V., B.Sc. (Speech and Hearing)
Krupanidhi, P., B.Sc. (Speech and Hearing)
H. N. Shilpashri, Ph.D.

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Abstract

Traditionally, Parkinson's disease was defined as presenting only motor deficits. However, recent studies have highlighted the effects of Parkinson's disease on various language skills. The present study was designed to evaluate the performance of individuals with Parkinson's disease on action verbs and tenses identification skill. 20 Kannada speaking healthy elderly individuals (10 Males; 10 Females) in the age range of 65 – 75 years and 10 Kannada speaking non-demented individuals with Parkinson's disease (5 Males; 5 Females) in the age range of 65 – 75 participated in this study. The findings highlighted the language skills in individuals with Parkinson's disease.

Key words: Parkinson's disease, Kannada speakers, action verbs and tenses

Introduction

Parkinson's disease (PD) is a neurodegenerative disorder, caused by degeneration of midbrain dopaminergic neurons mainly in the *substantia nigra* and functional impairment of the basal ganglia. Motor symptoms of tremor, bradykinesia, and rigidity are the clinical hallmarks of PD (Wolters and Bosboom, 2007).

Several imaging studies have demonstrated that damage to frontostriatal circuits impact both language and cognitive functions. Crosson (1985) suggested that basal ganglia damage results in deficit of both motor programming and language formulation. Disruption of large

cortico-striato-pallido-thalamocortical circuits impair aspects of language production is reported (Copland, Chenery, and Murdoch, 2000; Copland, 2003). Lieberman et al. (1992) reported that speech motor deficits accompanied the grammatical and cognitive deficits in PD patients. The common neurological basis for these deficits was suggested to be the disruption of the circuits between subcortical structures and prefrontal cortex.

Illes, Metter, Hanson, and Iritani, (1988) reported that the language production of people with Parkinson's disease differed both acoustically and linguistically for parameters: speech rate, fluency, syntactic complexity, lexical production, and the relative distribution of content and grammatical phrases from healthy older adults. Studies report that, Parkinson's disease leads to the suppression of grammatical rule application / grammaticality judgment skill (Ullman, et al. 1997; Longworth, et al. 2005; Colman, et al. 2009). Zanini, Tavano, & Fabbro, (2010) studied spontaneous speech in bilingual individuals with PD, reported significantly more grammatical errors in 9 individuals with PD compared to age and education matched healthy adults. Furthermore, this difference was limited to performance in the first language of participants. Impaired production of rule-generated (regular) past tense verb form (Ullman, et al. 1997) and present tense verb form are well reported in individuals with PD during sentence completion task.

Recent studies suggest that early stage PD patient's show deficits in action-verb identification (Boulenger, et al. 2008). Deficit in Action-verb production (Crescentini, et al. 2008), generation of semantically similar verbs (Herrera, Cuetos, 2013) during picture-naming task is reported. Bertella, et al. (2002) showed that early stage PD patients had specific difficulty generating action-verbs. Cotelli, et al. (2007) studied picture-naming in PD patients; results indicated that early PD patients showed a general deficit in both action naming and object naming. Rodriguez-Ferreiro, et al. (2009) reported that PD patients showed a significant impairment in action naming compared to object naming.

Need for the Study

Research supports the assertion that both cortical and subcortical structures contribute to cognitive processing and language use. In summary, the studies described here provide

converging evidence regarding the types of language impairment found in individuals with Parkinson's disease. The studies reported are more of western studies. Hence, the present study was taken to investigate performance of Kannada speaking individuals with Parkinson's disease on action verbs and tenses identification skills. This helps in early identification of the clinical condition and for planning suitable treatment strategies for individuals suffering from Parkinson's disease.

Aim of the Study

1. To study the performance of individuals with Parkinson's disease on action verbs and tenses identification skill.
2. To find the gender difference, if any.
3. To compare the performance of individuals with Parkinson's disease with healthy elderly subjects on action verbs and tenses identification skill.

Method

Participants

Group-1 (G1) Reference group: 20 Kannada speaking healthy elderly individuals (10 Male; 10 Female) in the age range of 65 – 75 years (M=69.7) participated in this study. Participants were screened for speech, language, hearing, cognition, medical / neurological problem and vision by qualified professionals in the respective field. Participants were from upper middle class family with education level ranging from under graduation to post graduation.

Group-2 (G2) Clinical group: 10 Kannada speaking non-demented individuals with Parkinson's disease (5 Male; 5 Female) in the age range of 65 – 75 (M = 70.8) at the time of testing, participated in this study. A diagnosis of Parkinson's disease was confirmed by the neurologist and clinicalpsychologist, based on standard clinical criteria. The duration of illness ranged from 5 to 10 years (M=7.1). All were under medication to control PD symptoms. Participants were from upper middle class family with education level ranging from under graduation to post graduation.

Research Design

A Standard group comparison design was used.

Materials

Twenty picture cards depicting different action verbs (Appendix: 1). A list of fifteen Kannada sentences depicting tenses; Past, Present and future (5 sentences each) were used for this study (Appendix: 2).

Procedure

Informed consent was obtained from the participants of both the groups. Each participant was tested individually in a noise free room. For action verb identification task: examiner presented the picture cards depicting different action verbs one by one. Participants were instructed to name the action verbs in each picture. For tenses identification task: examiner presented each sentence orally one after the other. Participants were instructed to identify the type of tense in a given sentence. No time limits were considered for both the tasks.

Scoring

A score of '**1**' was assigned for each correct response. Score of '**0**' for each incorrect response.

Results and Discussion

The data obtained were subjected to statistical analysis using SPSS-17 software. Statistical test used were Independent sample t test. The results of this study are presented below:

A. *The results for action verb identification*

Table 1: Performance of individuals with Parkinson's disease for action verb identification

Clinical group	N	Mean	SD	Sig
Male	5	14.20	3.56	.411
Female	5	12.60	2.07	

As shown in table: 1, Males' performance indicated mean=14.20; SD=3.56, females; performance indicated mean=12.60; SD=2.07. Mean value for males were slightly higher than for females. However, performance among the genders was not statistically significant at 0.05 level of significance for action verb identification skill.

Table 2: Performance of healthy elderly individuals for action verb identification

Reference group	N	Mean	SD
Male	10	20.00	.00
Female	10	20.00	.00

As shown in table: 2, males had mean=20.00; SD=.00, females had mean value of 20.00 SD=.00. No gender difference was seen on action verb identification skill in healthy elderly individuals.

Table 3: Performance between reference and clinical group for action verb identification

Groups	N	Mean	SD	Sig
Reference group	20	20.00	.00	.004
Clinical group	10	13.40	2.05	

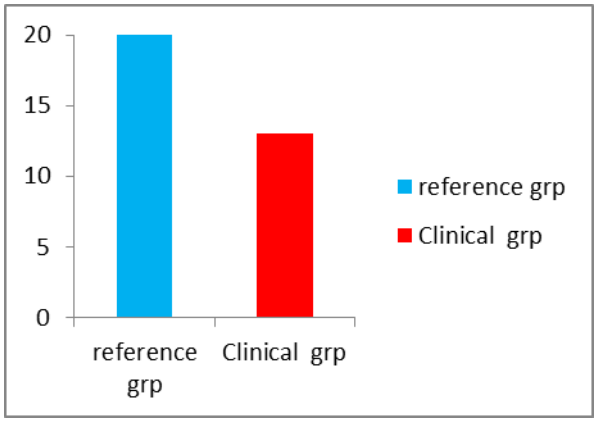

Fig 1: Performance between reference and clinical group for action verb identification

Results in Table 3 and fig 1: indicates that, normal elderly individuals had mean value of 20, SD=.00. Individuals with Parkinson's disease performance indicated mean=13.4, SD=2.05. The performance between the two groups indicated significant differences at 0.05 level of

significance. Individuals with Parkinson's disease performed poorly on action verb identification in comparison with normal elderly individuals.

B. The results for tenses identification

Table 4: Performance of individuals with Parkinson's disease for tense identification

Tenses	gender	Mean	SD	Sig
Past	Male	2.60	1.14	.421
	female	3.20	1.09	
Present	Male	2.80	1.30	.187
	female	1.80	.83	
future	Male	1.60	.89	.273
	female	1.00	.70	

As indicated in table: 4, Males' performance for past tense (M=2.60, SD=1.14); present tense (M=2.80, SD=1.30); and future (M=1.60, SD=.89). Females' performance for past tense (M=3.20, SD=1.09); present tense (M=1.80, SD=.83); and future (M=1.00, SD=.70). The mean value for past tense was more for females. The mean value for present tense was more for males. Performance of both the genders was poor for future tense. However, gender difference was not statistically significant at 0.05 level of significance for tense identification.

Table 5: Performance of healthy elderly individuals for tense identification

Tenses	gender	Mean	SD
Past	male	5.00	.00
	female	5.00	.00
Present	male	5.00	.00
	female	5.00	.00
future	male	5.00	.00
	female	5.00	.00

As shown in table: 5, Males' performance for past tense (M=5.00, SD=0.00); present tense (M=5.00, SD=0.00); and future (M=5.00, SD=0.00). Females' performance for past tense (M=5.00, SD=0.00); present tense (M=5.00, SD=0.00); and future (M=5.00, SD=0.00). Performance among the genders was not statistically significant at 0.05 level of significance.

Table 6: Performance between reference and clinical group for tense identification

Tenses	Group	Mean	SD	Sig
Past	CG	2.90	1.10	.00
	RG	5.00	.00	
Present	CG	2.30	1.15	.00
	RG	5.00	.00	
future	CG	1.30	.82	.00
	RG	5.00	.00	

CG: clinical group, **RG:** reference group

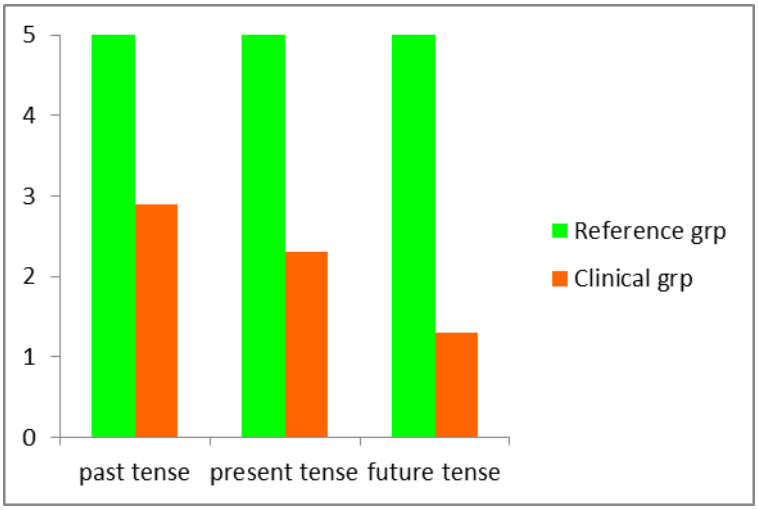

Fig 2: Performance between reference and clinical group for tense identification

The results (see table: 6 & fig: 2) indicate the healthy elderly individuals' performance for past tense (M=5.00, SD=0.00); present tense (M=5.00, SD=0.00); and future (M=5.00, SD=0.00). The results also indicate the performance of individuals with Parkinson's disease for past tense (M=2.90, SD=1.10), present tense (M=2.30, SD=1.15), and future (M=1.30, SD=.82).

Individuals with Parkinson's disease performed poorly on tense identification task in comparison with normal individuals. Performance was very poor in identifying future tense in comparison to past and present tense. The results between two groups indicated significant differences at 0.05 level of significance for all the three category of tenses.

The results of the present study indicated that individuals with Parkinson's disease (PD) performed poorly on both action verb and tenses identification in comparison with healthy elderly individuals. Results also indicated that there was no significant difference in performance among the genders for action verb and tense identification task in both the group. These results are in support with the earlier studies (Lieberman et al. 1992, Ullman et al. 1997; Longworth, et al. 2005; Colman, et al. 2009; Zanini, Tavano, & Fabbro, 2010) indicating that individuals with PD are known to manifest linguistic impairments. The findings are also in support with various studies indicating tenses and action verb errors in individuals with Parkinson's disease (Ullman, et al. 1997; Bertella, et al., 2002; Crescentini, et al. 2008). These errors in individuals with Parkinson's disease may be due to disruption of large cortico-striato-pallido-thalamocortical circuits which impair aspects of language production (Copland, Chenery, and Murdoch, 2000; Copland, 2003), Crosson (1985) damage to basal ganglia could result in deficits of both motor programming and language formulation. Thus, the results of the study highlight the importance of identifying language errors in PD and its importance in incorporating these parameters in clinical assessment and rehabilitation for individuals suffering from Parkinson's disease.

Conclusion

Language deficits in individuals suffering from PD have now been extensively reported in the literature (Cummings, et al. 1988). The progressive degeneration of the cortico-striato-cortical circuits due to PD disturbs executive functioning and thus contributes to deficits in language production, language comprehension and grammatical judgment skills. Importantly, early identification of such deficits could play a crucial role in the diagnosis, treatment, and to provide rehabilitation strategies and communication guidelines that would guarantee a better quality of life for patients suffering from Parkinson's disease.

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Appendix: 1

Action verb

Playing

Brushing teeth

Combing

Drinking

Washing face

Bathing

Running

Meditation

Cycling

Writing

Singing

Reading

Painting

Hand washing

Sweeping

Dancing

Eating

Drawing

Washing cloth

Washing vessels

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Appendix: 2

Sl.No	IPA	Meaning in English
A	**/bhu:ʈʌka:la/**	**Past tense**
1.	/sʌngi:ʈʌga:rʌru/ /ha:ɖʌñu/ /ha:ɖuʈi͡ɗʌru/	Singers sang the song.
2.	/mʌisu:rʌñu/ /ra:jʌru/ /a:ɭuʈi͡ɗʌru/	Mysore was ruled by princes.
3.	/ra:mʌnu/ /ka:ɖige/ /ho:dʌnu/	Rama went to forest.
4.	/lʌkʃmi/ /sunɖʌrʌva:gi/ /bʌrijuʈi͡ɗʌɭu/	Lakshmi wrote beautifully.
5.	/kʌl͡a/ /tʃiñʌvʌñu/ /kʌd͡ida/	Thief had stolen the gold.
B	**/vʌrʈʌma:nʌka:la/**	**Present tense**
6.	/si:ʈa/ /u:ʈa/ /ma:ɖuʈi͡ɗa:ɭe/	Sitha is eating.
7.	/rʌvi/ /sʌikʌl/ /oɖejuʈi͡ɗa:ne/	Ravi is riding the bicycle.
8.	/su:rjʌnu/ /pʌʃtʃimʌdʌl͡i/ /muɭuguʈi͡ɗa:ne/	It's sunset time.
9.	/mʌk͡ʌɭu/ /ʃa:lege/ /ho:guʈi͡ɗa:re/	Children are going to school.
10.	/ɛl͡ʌru/ /u:ʈa/ /ma:ɖʈi͡ɗa:re/	Everyone are eating.
C	**/bhaviʃjʌʈka:la/**	**Past tense**
11.	/na:ɭe/ /ʃa:lege/ /rʌdʒa/	Tomorrow is holiday to school.
12.	/rʌvi/ /ka:ɖige/ /ho:guvʌnu/	Ravi will go to forest.
13.	/indu/ /mʌɭe/ /dʒo:ra:gi/ /bʌruʈ͡ʌde/	Today it's going to rain heavily.
14.	/mʌk͡ʌɭu/ /u:ʈa/ /ma:ɖuvʌru/	Children will eat food..
15.	/na:le/ /a:ru/ /gʌnʈege/ /su:rjo:dʌjʌva:guʈ͡ʌde/	Tomorrow at 6 sunrises.

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Pooja, V., B.Sc. (Speech and Hearing)
JSS Institute of Speech and Hearing
Mahatma Gandhi Road
Mysore 570004
Karnataka
India
poojavprinces@gmail.com

Krupanidhi, P., B.Sc. (Speech and Hearing)
JSS Institute of Speech and Hearing
Mahatma Gandhi Road
Mysore 570004
Karnataka
India
krupanidhi018@gmail.com

Dr. Shilpashri H. N.
Lecturer
JSS Institute of Speech and Hearing
Mahatma Gandhi Road
Mysore 570004
Karnataka
India
shilpashrihn@gmail.com