



EVALUATION OF RELATIONSHIP BETWEEN COGNITIVE AND EMOTIONAL DEFICITS IN PATIENTS WITH PARKINSON'S DISEASE

Psychology

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ABSTRACT

AIM: The objective of the study is to evaluate the relationship between cognitive and emotional deficit in patients with Parkinson's disease (PD).

METHODS: A sample of 30 patients with PD and 32 healthy control was recruited out of which 22 of them are matched on gender, age and education. NIMHANS Emotion Perception Test (NEPT) was used to assess emotion from facial and prosody expression. Neuropsychological tests to measure attention and executive functions were chosen.

RESULTS: Chi-square, student t-test, Pearson's product moment correlation, Mann-Whitney U test, z-score of cumulative proportion (Van der Waerden's formula) and Multivariate Analysis were used for analysis of the data. PD shows significant impairment in cognitive function and emotional perception.

CONCLUSION: PD shows significant impairment in recognizing and discrimination of emotion which is correlated with cognitive deficits.

KEYWORDS

Parkinson, Cognitive, Attention, Prosody, Facial, Emotion

INTRODUCTION

Parkinson's disease (PD) is a neurodegenerative disorder which is characterized by a loss of dopaminergic neurons in the ventral striatum, subthalamic nucleus and other basal ganglia structures. It is a chronic and progressive neurodegenerative disorder which has an average age of onset at 50 years and there is increase prevalence in the aging population (Zillerman et al, 2001).

It is diagnosed on the basis of the presence of motor and non-motor symptoms. Motor symptoms are characterized by bradykinesia, rigidity and resting tremor, which is the main consequence of the degeneration of dopamine neurons in the substantia nigra (Hughes et al, 1992). The non-motor symptoms are characterized by hyposmia (Doty et al, 2007), sleep disorders, anxiety, depression, memory, language, executive function impairments and even dementia (Domell et al, 2009, Rodriguez-Ferreiro et al, 2009, Aarsland et al, 2009).

Cognitive impairment in PD show deficit in planning, visuo-spatial encoding, set-shifting abilities and memory even in the early phase of the illness. The pathology behind these deficits have drawn attention to the potential role of the basal ganglia in the cognitive processes as PD predominantly involves sub cortical structures (Svenningsson et al, 2012). Frontal deficits include impaired ability to reproduce a series of gestures, impaired performance on conditioned associative tasks, and impaired performance on Wisconsin Card sorting test (Bowen et al, 1975).

The emotional recognition deficits could be due to the involvement of cortical and subcortical regions of the brain including the occipito-temporal cortex, the amygdala, the orbito-frontal cortex, the amygdala and the right parietal cortex which resulted in difficulty recognizing emotions from facial expressions. Patients with PD have difficulty recognizing emotions such as anger and fear but not in happy and sadness as compared to healthy controls (Madeley et al, 1995). Involvement of the basal ganglia leads to changes in emotional prosody processing in patients with PD (Christine et al, 2010). Degeneration of dopaminergic neurons predominantly in the nigrostriatal systems (Benke et al, 1998) and alteration of the orbitofrontal loop (Alexander et al, 1986; Cumming et al, 1993) which is seen in patients with PD leads to changes in emotional prosody. When evaluated for emotional cues (happy, sad, neutral, puzzled and anger) and linguistic cues (declarative or interrogative intonation), patients with PD have impaired performance as compared to healthy controls in both the emotional and linguistic domain (Blonder et al, 1989). Patients with PD have no deficits in discriminating non-

emotional prosodic contrasts but had impairment in judging the emotional features of those sentences (Scott et al, 1984)

METHODS

The present study aims is to examine the relationship between cognitive and emotional deficits in patients with Parkinson's disease. The sample consist of 30 patients diagnosed with PD which was recruited from the inpatient and outpatient Neurology service of NIMHANS. 32 normal healthy controls were recruited from the community. Out of these, 22 patients with PD and 22 healthy controls were matched on age, gender and education.

Tools and Scales:

Socio-demographic and clinical data sheet was used to record details of the participant.

Unified Parkinson's disease rating scale (Fahn S et al, 1987) is an overall assessment scale that would quantify the signs and symptoms of PD which allows for both an overall measure of disability and individual sub scores.

NIMHANS Emotion Perception Test ((Rani et al., 2009): This tool assesses six subtests of emotion perception namely facial expression identification, prosody identification, facial expression discrimination, prosody discrimination, facial expression-prosody discrimination and verbal-prosody discrimination subtests. NEPT is a tool which was validated in the Indian socio-cultural context to assess perception of emotions across facial and prosody communication channels in patients with brain damage.

Cognitive Functions:

The cognitive functions assessed were focused attention, verbal and visual working memory, immediate memory, response inhibition and verbal fluency.

Procedure:

The study was conducted in two phases, pilot and main study. The pilot study was conducted with the intention to familiarize with the assessment and measurement tools by the researcher. In the main study, 30 patients with PD and 30 healthy controls was recruited. Written informed consent was taken. The sample was assessed on the previously mentioned assessment tools. The tests were administered in individually, on one to one basis. The test was carried out in a noise attenuated room. Testing was carried out in individual session/s. The emotion recognition of prosody was presented using 2.1 speakers

using appropriate software to present the audio stimulus. Volume was kept at comfortable levels for each patient.

Statistical analysis:

The scores on each of the administered measures/ tools/ test were calculated. The scores were coded for statistical analysis using the Statistical Package for Social Sciences (SPSS- version 20.0). Descriptive statistics was used to examine the demographic details of the PD and the HC group. Independent sample t-test was used to examine the difference between the two groups on the various measure. Pearson Product Moment Correlation was used to examine the relationship between the cognitive functions and the emotion perception test. Multivariate analysis was used to examine group difference in the cognitive and emotion perception test.

RESULTS:

There was significant difference at $p < 0.05$ level between the two groups in color trails 1 and 2, Verbal N-back 1 and 2 in both hit and error, stroop effect, spatial span forward, composite attention and composite executive function. The PD group perform poorly as compared to the HC group.

There was significant difference between the two groups in Facial expression identification with mean of -0.30 ± 1.09 in PD and 0.28 ± 0.81 in HC. The two groups also differ in Prosody identification with mean of -0.31 ± 0.90 in PD and 0.29 ± 1 in HC. In Facial expression discrimination, there was significant difference between the two group with mean of -0.27 ± 0.98 in PD and 0.25 ± 0.95 in HC. Also, there was significant difference in Prosody discrimination in both the groups with mean of -0.30 ± 0.92 in PD and 0.28 ± 0.99 in HC.

The two groups differed significantly in the performance on Facial Expression Identification, Prosody Identification, Facial Expression discrimination and Prosody Discrimination which are the subtests of the NEPT.

Pearson product moment correlation was used to identify the relationship between the cognitive tasks and emotion perception in NEPT among the PD group. There was positive correlation between Facial Expression Identification and Spatial span forward. Spatial span backward was positively correlated with Facial Expression Prosody Discrimination, Verbal Prosody Discrimination and the Grand total of NEPT. Verbal Prosody Discrimination was also positively correlated with Verbal N-back 1 Hit and negatively correlated with N-back 1 Error.

DISCUSSION:

The current study has shown that Facial expression identification is positively correlated with Spatial span forward while spatial span backward was positively correlated with the grand total of NEPT. A study has shown that PD have impairment in processing facial configuration which is the processing of the spatial relations between facial features. Facial emotion recognition requires facial configuration (Narme et al, 2010). Since spatial span measures the visuospatial working memory, the relation between FEI and SPF is supported by previous study. FE-PRD is positively correlated with spatial span backward. Previous studies have shown the correlation between ability to perceive emotional expressions and visual form. Perceiving of visual form requires encoding of the orientation information and then retrieving it, which is assessed in spatial span backward (Marneweck, 2014; Loffler, 2008). The reason could be due to the involvement of the cortical regions which includes the fusiform face area, inferotemporal cortex and lateral occipital cortex which is known to be impaired in PD (Gallant et al, 2000; Geday et al, 2006; Rainville, 2005). A study however revealed that the level of impairment seen in PD when discriminating facial expression of emotion was not due to slower visual processing times or working memory as impairment was seen when the stimulus was presented for short duration as well as long duration (Marneweck et al, 2014). Verbal working memory was found to be positively correlated with V-PRD discrimination and negatively correlated with Verbal N-back 1 error. The reason could be that both are presented in the verbal domain. Working memory depends on the integrity of the dorsolateral prefrontal cortex (Carlson et al, 1998; Jansma et al, 2000) and the striatum (Lewis et al, 2005, Owen et al, 1997). Also, deficits in prosodic production in PD could be due to the dysfunction of the cingulate gyrus which initiates prosody (Jurgens et al, 1977., Ross et al, 1981). Thalamic dysfunctions lead to expressive prosodic deficits

(Qualieri et al, 1977). Studies have shown the correlation of executive function in PD with the recognition of emotional prosody (Breitenstein, 2001; Pell, 2002). While the present study reported the relation between cognitive deficits and emotion recognition, some other study reported that emotion recognition deficits in the absence of cognitive deficits (Herrera et al, 2011).

CONCLUSION:

This study showed PD had significant impairment in recognizing and discrimination of emotion which is correlated with cognitive deficits.

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