Color Recognition Disorder in Bilingual Male Alzheimer Disease Patients as compared to Normal Aging

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Abstract: Alzheimer's disease (AD) affects older people's memory, thought and behavior. AD progresses inevitably, causing individuals with the condition to gradually forget knowledge acquired throughout life. There are many linguistic aspects which get damaged by Alzheimer’s disease. Similarly color recognition gets impaired among AD patients. The present study is an attempt to document Color recognition deficit found in Kashmiri and Urdu language among male Alzheimer's disease (AD) patients using cross-sectional design. Forty mild–moderate–advanced AD patients and 30 controls matched for age, gender and education completed a simple picture recognition task will be considered for the present study. Cross-sectional comparisons in the present study indicated that mild–moderate AD patients produced more errors in color recognition test than control group. Moreover there is a marginal difference between scores of Color recognition tests obtained from males in both Kashmiri and Urdu language when compared with the control group. This paper will attempt to look at the effect of Alzheimer’s disease on the patient’s concept and perception of Kashmiri and Urdu language’s colour recognition system.

Objective.

This paper will attempt to look at the effect of Alzheimer’s disease on the patient’s concept and perception of Kashmiri and Urdu language’s color system and to check whether the disease affects patient’s color recognition system or it is independent of the disease.

Epidemiology.

The most important risk factors for AD are old age and a positive family history. The frequency of AD increases with each decade of adult life, reaching 20–40% of the population over the age of 85. A positive family history of dementia suggests a genetic cause of AD, although autosomal dominant inheritance occurs in only 2% of patients with AD. Female gender may also be a risk factor independent of the greater longevity of women.

Pathology.

At autopsy, the earliest and most severe degeneration is usually found in the medial temporal lobe (entorhinal/perirhinal cortex and hippocampus), lateral temporal cortex, and nucleus basalis of
Meynert. The characteristic microscopic findings are neuritic plaques and NFTs. These lesions accumulate in small numbers during normal brain aging but dominate the picture in AD.

**Methodology.**

A random sample of forty cases of clinically diagnosed Alzheimer’s disease patients and thirty normal people as control group are considered for the present study. The data were collected from Shri Maharaja Hari Singh Hospital, and some of them were met personally at their home. The subjects were in the age group 60 to above 90 years. These forty subjects, upon whom tests were administered, were considered for further study.

This paper deals with the analysis of the forty subjects, who suffered neurodegeneration to the different parts of the brain and were able to respond to the tests, along with the thirty subjects as normal control group. On the basis of the medical reports, all subjects under study are categorized into three groups: Mild AD, Moderate AD, and Advanced AD. Out of forty cases, 15 cases were Mild AD cases, 14 were AD Moderate and 11 were Advanced AD patients.

**Test Batteries for Language Deficit.**

The distance correlation displays Bar graphs based on Case summaries and Proximity matrix of Color Recognition Test:

**Bar Representation of Subtest Results of Male AD Subjects in Color Recognition Test.**

Since the present study is focused on Linguistic Profiling of Alzheimer’s disease rather than Dementia, it was decided to perform a simple Kashmiri and Urdu bilingual Test with focus on language deficit in production, comprehension, picture naming and picture recognition abilities in Kashmiri and Urdu language. Phonologically patterned structures was given to both groups. The bilingual phonological test includes 60 pictures (different shades of color) and 2 marks are allotted for each correct response. The present paper is focused on color recognition system in Kashmiri and Urdu Language among male Alzheimer’s disease patients.

**Statistical Procedure.**

Out of various softwares available for the statistical analysis, SPSS (Statistical software for social sciences) is used for the statistical analysis of data. For the data analysis in present study, SPSS used. The statistical technique namely Distance Correlation is used to determine the association between the variables in the form of distances, more the distance far the variables are from each other and vice versa.

**Discussion on Distance Correlation Results.**

![Fig 1: Percent Scores showing Focal Color difficulty among Mild, Moderate and Advanced Male AD Patients.](image-url)
From the bar chart presented above the following tentative conclusions can be drawn-

1. As compared to Control Group, Mild AD subjects show better performance than the other two groups (Moderate Alzheimer’s disease and Advanced Alzheimer’s disease) in both Kashmiri and Urdu Focal color test.

2. Mild AD group shows a deficit of 16% and 37.4% in Kashmiri and Urdu Focal color test respectively. Moreover, Mild AD subjects show better performance in Kashmiri Focal color test (52.6%) as compared to Urdu Anomia test (32.6%) with a minimum deficit of 20%.

3. As compared with the Mild AD group, Moderate AD group shows a deficit of 11% in Kashmiri Focal color test and 2.1% in Urdu Focal color test and around 27% and 39.5% in Kashmiri Focal color test and Urdu Focal color test respectively while comparing with the performance of Normal Control Group.

From the bar chart presented above the following tentative conclusions can be drawn-

1. The span of the time increases as we move from Control group to Advanced AD subjects.

2. The time taken generally corresponds to the severity of cases. Lesser the severity lesser is the time taken and more the severity more is the time taken.

Statistical Procedure.

Out of various softwares available for the statistical analysis, SPSS (Statistical software for social Sciences) is used for the statistical analysis of data. For the data analysis in present study, SPSS used. The statistical technique namely Distance Correlation is used to determine the association between the variables in the form of distances, more the distance far the variables are from each other and vice versa.

Discussion on Distance Correlation Results.

The distance correlation displays Bar graphs based on Case summaries and Proximity matrix of Anomia Test:
The SPSS Output for Distance Correlation among Male Mild, Moderate and Advanced AD groups and Discussion on Correlation Results.

Proximity Matrix and Case Summaries Showing Distance Correlation in Case of Kashmiri Focal Color Test.

Table 1

<table>
<thead>
<tr>
<th>Case Summaries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Control Group</td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Std. Deviation</td>
</tr>
<tr>
<td>Time</td>
</tr>
</tbody>
</table>

Table 1 indicates that the average score taken by a Control Group in Kashmiri Focal color test is 41.2 while as score taken by the Subjects in Mild, Moderate and Advanced Stage are 41.5, 29 and 0.8 respectively, also the time taken by a Control Group person in this test is 150 seconds while as time taken by Subjects in Mild, Moderate and Advanced Stages are 198, 337 and 600 seconds respectively.

Table 2

<table>
<thead>
<tr>
<th>Proximity matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Euclidean Distance</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Control Group</td>
</tr>
<tr>
<td>Control Group</td>
</tr>
<tr>
<td>Mild AD</td>
</tr>
<tr>
<td>Moderate AD</td>
</tr>
<tr>
<td>Advanced AD</td>
</tr>
</tbody>
</table>

Table 2 is called a Proximity matrix/Distance Matrix/Dissimilarity Matrix which is used to predict the differences in the variables, more value between the variables corresponds to the severity of the case. Whereas, 0 value indicates that variable are same.
Fig 3: Euclidean distance showing difference between Mild, Moderate and Advanced Male AD Patients in case of Kashmiri Focal Color Test.

From the table and the bar chart given above, the following conclusions can be drawn:

1. Mild AD and Moderate AD subjects have almost similar performance in Kashmiri Focal Color test with a minimum Euclidean distance of 6.50 between them as compared to Advanced AD subjects. Hence, it is quite evident that there is a loss of control over Kashmiri color perception.

2. However, in case of Advanced AD subjects there is a drastic fall of result which leads to abrupt increase in Euclidean distance. It is also clear that the Mild AD and Moderate AD subjects have well-kept perception of color but Advanced AD subjects have severely affected color perception.

3. As compared to Control Group, the Euclidean distance shows increase from Mild AD to Moderate AD and from Moderate AD to Advanced AD subjects. The Euclidean distance between Control Group and Mild AD subjects is 10 whereas, the Euclidean distance between Control Group - Moderate AD subjects and Control Group-Advanced AD subjects is 49.9 and 93.5 respectively. The Euclidean distance is least for Mild AD subjects and greater for Advanced subjects.

Proximity Matrix and Case Summaries Showing Distance Correlation in Case of Urdu Focal Color Test.

<table>
<thead>
<tr>
<th>Case Summaries</th>
<th>Control Group</th>
<th>Mild AD</th>
<th>Moderate AD</th>
<th>Advanced AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>42.1667</td>
<td>19.5833</td>
<td>18.3</td>
<td>0.4</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>2.72336</td>
<td>2.41695</td>
<td>4.48051</td>
<td>0.54772</td>
</tr>
<tr>
<td>Time</td>
<td>112</td>
<td>193</td>
<td>453</td>
<td>600</td>
</tr>
</tbody>
</table>
Table 3 indicates that the average score taken by a Control Group in Urdu Focal color test is 42 while as score taken by the Subjects in Mild, Moderate and Advanced Stage are 19.5, 18.3 and 0.4 respectively, also the time taken by a Control Group person in this test is 112 seconds while as time taken by Subjects in Mild, Moderate and Advanced Stages are 193, 453 and 600 seconds respectively.

Table 4

Proximity Matrix

<table>
<thead>
<tr>
<th></th>
<th>Control Group</th>
<th>Mild AD</th>
<th>Moderate AD</th>
<th>Advanced AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Group</td>
<td>0</td>
<td>48.286</td>
<td>52.067</td>
<td>89.974</td>
</tr>
<tr>
<td>Mild AD</td>
<td>48.286</td>
<td>0</td>
<td>13.398</td>
<td>42.181</td>
</tr>
<tr>
<td>Moderate AD</td>
<td>52.067</td>
<td>13.398</td>
<td>0</td>
<td>40.936</td>
</tr>
<tr>
<td>Advanced AD</td>
<td>89.974</td>
<td>42.181</td>
<td>40.936</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4 is called a Proximity matrix/Distance Matrix/Dissimilarity Matrix which is used to predict the differences in the variables, more value between the variables corresponds to the severity of the case. Whereas, 0 value indicates that variable are same.

Fig 4: Euclidean distance showing difference between Mild, Moderate and Advanced Male AD Patients in case of Urdu Focal Color Test.
From the table and the bar chart given above, the following conclusions can be drawn:

1. Mild AD and Moderate AD subjects have similar performance in Urdu Focal Color test with a minimum Euclidean distance of 3.7 between them as compared to Advanced AD subjects. Hence, it is quite evident that there is a loss of control over Urdu color perception.

2. However, in case of Advanced AD subjects there is a drastic fall of result which leads to abrupt increase in Euclidean distance. It is also clear that the Mild AD and Moderate AD subjects have well-kept perception of color but Advanced AD subjects have severely affected color perception.

3. As compared to Control Group, the Euclidean distance shows increase from Mild AD to Moderate AD and from Moderate AD to Advanced AD subjects. The Euclidean distance between Control Group and Mild AD subjects is 48.2 whereas, the Euclidean distance between Control Group - Moderate AD subjects and Control Group-Advanced AD subjects is 52 and 89.9 respectively. The Euclidean distance is least for Mild AD subjects and greater for Advanced subjects.

**Conclusion.**

Our findings support the view that color recognition occurs early in AD but it is difficult to mark at that stage because color recognition disorder also occurs in Normal aging. Patients with Mild AD and Moderate AD showed significant loss of color recognition abilities relative to controls and produced a variety of errors. Whereas, Advanced AD subjects have severely affected color perception in both languages due to severity of disease. Results also demonstrate that time is directly proportional to severity of disease i.e., lesser severity lesser is the time taken and vice-versa. Moreover, results show that male AD subjects show better performance in Kashmiri Color recognition Test as compared to Urdu color recognition test.

**References.**


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