A Comparative Study Of Stroop Test Performance Between Elderly People (65 & Above Yrs) And Adolescent People (13-18yrs).

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Abstract

The present study is about to assess the ability to inhibit cognitive interference (stroop colour and word test) that occurs when the processing of a stimulus feature affects the simultaneous processing of another attribute of the same stimulus (Stroop,1935) between elderly people (65 years and above age) and adolescent people (13-18 years). The main objectives of the present study is, “to find out the descriptive statistics of number of responses (NOR), incorrect responses (IR) and time responses (TR) in second between elderly people and adolescence; to compare the significance difference of elderly people and adolescence on the stroop colour and word test (SCWT) i.e., number of responses (NOR); incorrect responses (IR) and time responses (TR) in second; to compare the mean bar diagram of number of responses (NOR); incorrect responses (IR) and time responses (TR) in second between elderly people and adolescence people. Trying to fulfill these objectives, the investigators randomly selected forty six participants from the normal Mizo population of elderly people (fifteen sample) and adolescence (thirty one sample). Results are evaluated by means of mean, standard deviation, one way analysis and mean bar diagram of both participants on stroop colour and word test (SCWT) to assess the ability to inhibit cognitive interference. The results have indicated that measures of number of responses (NOR in colour and word test), Incorrect responses (TR in second on colour and word test) on elderly people and adolescence people are found to be statistically significant. From the bar diagram, elderly people has found more mean values on number of responses, incorrect responses and time responses (in second) on colour and word test than adolescence.

Keywords: elderly people, adolescence, colour word, number of responses, Incorrect responses.

Introduction:

The stroop colour and word test (SCWT) is widely used to evaluate attention, information processing speed, selective attention and cognitive flexibility.

Only frontal lesions produced significant impairment. Patients with posterior lesions were not significantly deficient in any condition. Damage to the left dorsolateral frontal lobe resulted in increased errors and slowness response speed for colour naming. Bilateral superior medial frontal damage was associated with increased errors and slowness in response time for the incongruent condition. Proper performance of stroop word-color interference task requires both attention and impulse control (i.e., the role of functional connectivity in the neural systems that sub serve attention and impulse control).

Researchers like Scarpina F and Tagini S (2017) reviewed the stroop colour and word test (SCWT) is a neuropsychological test extensively used to assess the ability to inhibit cognitive interference that occurs when processing of a specific stimulus feature impedes the simultaneous processing of a second stimulus attribute, well known as the stroop effect. Other researchers like Stuss D’ Floden D; Alexander MP; Levine B; Katz D (January 2001) has reported that only frontal lesions produced significant impairment. Patients with posterior lesions were not significantly deficient in any condition. Damage to the left dorsolateral frontal lobe resulted in increased errors and slowness in response speed for colour naming. Bilateral superior medial/frontal damage was associated with increased errors and slowness in response time for the incongruent conditions. The role of the anterior cingulated cortex on performance of the stroop task is likely to task and patient context.

Another researchers like Peterson BS; Skudlarskip; Gatenby JC; Zhand H; Anderson AW; Gore JC (May 1999) have studied the model of functional connectivity of the neural systems that observe attention and impulse control. Proper performance of the stroop word colour interference task requires both attention and impulse control. Their findings support a parallel distributed processing
model for word-colour interference in which portions of the anterior cingulated cortex modify the strength of multiple neural pathways used to read and name colours. Allocation of attentional resources is thought to modify pathway strengths by reducing cross-talk between information processing modules that subserves the competing demands of reading and colour naming. The functional topography of these neural systems observed within the cingulated argues for the presence of multiple attentional subsystems each contributing to improve task performance. The topography also suggests a role for the cingulated in coordinating and integrating the activity of these multiple attentional subsystems.

Objectives of the study:
The main objective of the present study is to compare the verbal comprehension between children and early adulthood.
1. To study the descriptive statistics of number of responses (NOR); Incorrect responses (IR) and Time responses (TR) in second between elderly people and adolescence.
2. To compare the significance difference of elderly people and adolescence on stroop test, i.e., number of responses (NOR); Incorrect responses (IR) and Time responses (TR in second).
3. To compare the mean diagram of number of responses (NOR); incorrect Reponses (IR) and Time responses (TR in second) between elderly people and adolescence people.

Methods:
The present study has been designed to investigate: “A Comparative Study Of Stroop Test Performance Between Elderly People (65 And Above Age) And Adolescent People (13-18 Yrs)”. For this study, a sample of forty-six participants are randomly selected from Aizawl area. All the participants are administered stroop test (i.e., number of responses,(NOR): incorrect responses (IR) and Time responses (TR in second) of colour and colour word.

Participants:
Sample (N= 46; elderly people=men and women=15 and adolescence=men and women=31) for the present study was drawn randomly from Aizawl area. The selected participants are administered stroop test to measure stroop interference. The testing is made in individual setting.

Instruments:
The following test is used for the present study:
The stroop color and word test (SCWT) is a neuropsychological test extensively used to assess the ability to inhibit cognitive interference that occurs when the processing of a specific features impedes the simultaneous processing of a second stimulus attribute, well known as the stroop effect. In the stroop test, subject has to name the color of color words which are congruent or incongruent, is much used as a selective attention test.

In the stroop test, it measured stroop interference, which occurred when naming the ink color of the incongruent color word stimuli (for instance the word red printed in blue ink), and the reverse-stroop interference, which occurred when reading the stimuli.
The stroop interference decreased with age, whereas the reverse stroop interference increased with age.

Variables:
Independent: Age of elderly people and adolescence people;
Dependent variable: response of the stroop stimuli.

Instructions:
The following instruction is given to the subject:
The experimenter gives the following instruction to the subject, “placing a form C stimulus sheet in front of the subject, on this page are some words. I would like you to read these words aloud as
quickly as you can, starting at the top of this first column. When you finish this column, go to the top of the next column and so on. Read the words aloud as quickly and as accurately as you can. If you can make a mistake, just correct yourself and keep on going. Ready? Begin.

Then, the colour word task is then administered. Place a form C-W stimulus sheet in front of the subject and said the following instruction to the subject:

“Here is a page like you words on it. This time, I would like you to name aloud the colour of the ink—red, blue, green or tan—in which the word is printed. Go as quickly as you can, going down the columns just as you did before. For this first one you would say, “RED” understand? If you make a mistake, just correct yourself and keep on going. Name the colour of the ink as quickly and as accurately as you can. Ready? Begin.

Procedure:
After giving instructions, using a stopwatch, allow the subject 120 seconds to respond. Record the correct responses by making a check mark next to the item as shown on the second page of the record form. Record incorrect responses by entering an X next to the item. If the subject gives an incorrect response and correct it spontaneously mark a C next to that item. After 120 seconds have elapsed, terminate the task and remove the form C stimulus. Then give the C-W stimulus in the same manner. Before doing such thing rapport to the subject has to be established. After clearing the procedures and instructions, the conduction has been started.

Scoring of the test:
Scoring: The colour and colour-word scores are calculated by the following formulae:
Colour score = number of correct responses, or number of items completed minus incorrect responses, on the colour task.
Colour-word score = number of correct responses, or number of items completed minus incorrect responses, on the colour-word task.

Cut off scores:
For subjects: 18-49 age group, scores below 99 (i.e., 98 and below); & 50+ age group, a score below 62 (i.e., 61 and below) lie above the horizontal line and suggest the presence of brain damage. The fourth page of the record form also contain probability values for every score. These values constitute the probability of brain damage associated with each score and are the posterior probabilities in the discriminant analysis.

Statistical Analysis:
Data can be analyzed quantitatively. The obtained data is processed to obtain the following information:
1. Mean and standard deviation of the elderly people and adolescence of the variables included in the study;
2. One way analysis for the comparison of elderly people and adolescence included in the study;
3. Mean bar diagram comparison of elderly people and adolescence included in the present study.

Result:
The result tables for the present study are as follows:
Table-I
Mean and Standard deviation of elderly people and adolescence on stroop test i.e., number of responses (NOR); incorrect responses (IR); and time responses (TR in second).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Subjects</th>
<th>N</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOR</td>
<td>Elderly people</td>
<td>15</td>
<td>109.66</td>
<td>8.95</td>
</tr>
<tr>
<td></td>
<td>Adolescence</td>
<td>31</td>
<td>119.838</td>
<td>3.06</td>
</tr>
<tr>
<td>IR</td>
<td>Elderly people</td>
<td>15</td>
<td>6.40</td>
<td>2.58</td>
</tr>
<tr>
<td></td>
<td>Adolescence</td>
<td>31</td>
<td>1.16</td>
<td>1.84</td>
</tr>
<tr>
<td>TR</td>
<td>Elderly people</td>
<td>15</td>
<td>349.60</td>
<td>137.56</td>
</tr>
<tr>
<td></td>
<td>Adolescence</td>
<td>31</td>
<td>159.67</td>
<td>70.94</td>
</tr>
</tbody>
</table>

Table-II
Summary of ANOVA of significance difference between elderly people and adolescence on stroop test i.e., number of responses (NOR); incorrect responses (IR); and time responses in second (TR).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOR</td>
<td>Between groups</td>
<td>1045.951</td>
<td>1</td>
<td>1045.951</td>
<td>32.743</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>1405.527</td>
<td>44</td>
<td>31.944</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2451.478</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IR</td>
<td>Between groups</td>
<td>277.424</td>
<td>1</td>
<td>277.424</td>
<td>62.344</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>195.794</td>
<td>44</td>
<td>4.450</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>473.217</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TR</td>
<td>Between groups</td>
<td>364626.58</td>
<td>1</td>
<td>364626.58</td>
<td>38.573</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>780552.96</td>
<td>45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure:1
(Mean Bar diagram of number of responses (colour and colour word) on stroop test between elderly people and adolescence).

Mean number of responses on colour and colc task of elderly people and adolescence

SUBJECTS

Figure-II
Mean number of incorrect responses on colour task of elderly people and adolescence

![Mean bar diagram on incorrect responses (IR) of stroop test (colour and colour word) between elderly and adolescence people.](image)

Figure –III

Mean number of time (second) responses on colour task of elderly people and adolescence

![Mean Bar diagram of time response (TR) in second of stroop test (i.e., colour and colour word) between elderly and adolescence people.](image)

Discussion:
The results are discussed in the following ways:

The result table-I shows mean and standard deviation and Table II shows F value of all the variables of stroop test i.e., number of responses (NOR), Incorrect responses (IR) and Time responses (TR In second) of elderly people and adolescence included in the present study.

The mean value of number of responses (NOR on colour and colour word) between elderly and adolescence people are found 109.66 and 119.83 respectively and F value between groups (F=32.743) are found to be statistically significant.

The mean value of incorrect responses (IR on color and color word) between elderly and adolescence people are found 6.40 and 1.16 respectively and F value between groups (F=62.344) are found to be statistically significant.

The mean value of Time responses (TR In color and color word) in second between elderly and adolescence people are found 349.60 and 159.67 respectively and F value between groups (F=38.573) are found to be statistically significant.
From the result figure 1 depicts the mean bar diagram of number of responses (NOR) on stroop test between elderly and adolescence people. From the bar diagram adolescence gave more responses on the stroop test (i.e., color and color word) than elderly people.

Figure II reflects mean bar diagram on incorrect responses (IR) of stroop test (i.e. colour and colour word) between elderly and adolescence people. From this figure, elderly people gave more incorrect responses on stroop test.

Figure III reflects mean bar diagram on time responses (TR) in seconds of stroop test (i.e. colour and colour word) between elderly and adolescence people. Here elderly people took more time to respond to colour and colour word than the adolescence people.

The stroop color and word test (SCWT) is a neuropsychological test extensively used to assess the ability to inhibit cognitive interference that occurs when the processing of a specific features impedes the simultaneous processing of a second stimulus attribute, well known as the stroop effect. Stroop test interference, defined as the cost associated with ink-color naming in the incongruous stimulus condition versus in the basic color naming condition, provides positive evidence for a kind of processing qualitatively different than that which is required for color naming or for word reading. (does the pattern of age related differences in stroop interference force the conclusion that the incongruous condition taps a qualitatively different kind of processing than that required for color naming or for word reading?). The stroop color and word test (SCWT) is widely used to evaluate attention, information processing speed, selective attention and cognitive flexibility. (only frontal lesions produced significant impairment. Patients with posterior lesions were not significantly deficient in any condition. Damage to the left dorsolateral frontal lobe resulted in increased errors and slowness inresponse speed for color naming. Contrary to Perret (neuropsychology,1974;12:323-330), lesions of the left frontal lobe did not result in a selective interference deficit on the stroop incongruent condition. Rather, bilateral superior medial frontal damage was associated with increased errors and slowness in response time for the incongruent condition. The results and conclusion are compatible with the prevalent theories of both the stroop effect and the role of the superior medial frontal regions. The role of the anterior cingulate cortex on performance of the stroop task is likely related to task and patient context. In the color-word stroop test (CWST), the basic task is to name the ink color of rows of XXXs, and performance in this condition is compared with performance in naming the ink-color of color words under conditions where word meanings and ink colors mismatch or are incongruent (e.g., the word red printed in green ink). Proper performance of the stroop word-color interference task requires both attention and impulse control (here the role of functional connectivity of the neural systems that sub serve attention and impulse control). The anterior cingulated is coupled functionally with multiple regions throughout the cerebrum (from interregional correlation analysis). The cingulated or related mesial frontal cortices loaded on each of the seven factors identified in the factor analyses. A parallel distributed processing model for word color interference inwhich portions of the anterior cingulated cortex modify the strengths of multiple neural pathways used to read and name colors. The functional topography of these neural systems observed within the cingulated attentional subsystems, each contributing to improved task performance. The topography also suggests a role for the cingulate in coordinating and integrating the activity of these multiple attentional subsystems. In the stroop test, subject has to name the color of color words which are congruent or incongruent, is much used as a selective attention test. It is well known that performance on a given trial of a cognitive task is affected by the nature of the previous trials. For example, conflict effects on interference tasks, such as the stroop task, are reduced subsequent to high conflict trials relative to low-conflict trials. This interaction effect between previous and current trial types is called “conflict adaptation.” And thought to be due to processing adjustments in cognitive control. Cognitive control to be implemented by prefrontal cortex through context-specific modulation of posterior regions involved in sensory and motor aspects of task performance. From the event-related fMRI data on a color-word naming stroop task and found distinct fronto-parietal networks of current trial conflict detection and conflict adaptation through cognitive control. Conflict adaptation was associated with increased activity in left middle frontal gyrus (GFm) and superior frontal gyrus (GFs), consistent with increased cognitive control, and with decreased activity in bilateral prefrontal and parietal cortices, consistent with
reduce response conflict. Psychophysiological interaction analysis (PPI) revealed that cognitive control activation of GFs and GFm was accompanied by increased functional integration with bilateral inferior frontal, right temporal and parietal areas, and the anterior cerebellum. Here cognitive control is implemented by medial and lateral prefrontal cortices that bias processes in regions that have been implicated in high level perceptual and motor processes. Functional imaging has consistently shown that attention-related areas of medial frontal and posterior parietal cortices are active during the attentional conflict induced by color naming in the presence of distracting words (stroop test). In a stroop task, participants can be presented with a color name printed in color and need to classify the print color while ignoring the word. The stroop effect is typically calculated as the difference in mean response time (RT) between congruent (e.g., the word red printed in red) and incongruent (Green in red) trials. (two measures were studied as indicators of ability to name color on the stroop, speed (performance time) and accuracy (number of errors). Researchers have examined the interference between automatic processing of stimuli, such as the meaning of color words, on performance of a controlled processing task such as naming the color in which words are printed. The stroop effect and its many variations provide an ideal test platform for examining the competition between stimulus control and cognitive control of attention, as reflected in behavior. Two response conditions were required in stroop phenomenon, reading the color word or reporting the color in which the word was printed. “reporting the color” had a significantly longer response latency than reading the word. In the stroop test, it measured stroop interference, which occurred when naming the ink color of the incongruent color word stimuli (for instance the word red printed in blue ink), and the reverse-stroop interference, which occurred when reading the stimuli. The stroop interference decreased with age, whereas the reverse stroop interference increased with age. Stroop interference (stroop effect) is the phenomenon observed when naming the color of an incongruent stimulus, such as the word “red” printed in blue ink; typically, this color incongruence causes slower naming compared to a neutral stimulus, such as a blue-square patch. Reverse stroop interference occurs when reading the stimulus takes longer than reading the neutral stimulus. Stroop interference is thought to index reading automaticity and is expected to increase with reading practice and to decrease with improved color naming. The stroop color word test (SCWT; Stroop 1935) is one of the oldest and most widely used tests in psychology for examining attention and response inhibition. In the original form of the task, participants are timed for how quickly they can (a) read words that are the names of colors (i.e., color words) (b) name the color of ink patches, and (c) name the color of the ink in which congruent color words are printed (i.e., say red when the word green is printed in red ink). The effects of response inhibition are indicated by participants’ slower response times when naming the color of the ink of non-congruent color words than when reading words that are the names of colors or naming the color of ink patches. This response slowing presumably occurs because activation of the no congruent color word interferes with the production of the correct name of the color and must be actively inhibited. The SCWT has been used to examine susceptibility to interference and possible deficits in response inhibition in patients with Alzheimer’s disease (Ad). The stroop color and word test (SCWT) is a neuropsychological test extensively used for both experimental and clinical purposes. It assesses the ability to inhibit cognitive interference, which occurs when the processing of a stimulus feature affects the simultaneous processing of another attribute of the same stimulus (Stroop, 1935). In the most common version of the SCWT, which was originally proposed by Stroop in the 1935, subjects are required to read three different tables as fast as possible. Two of them represent the “congruous condition” in which participants are required to read names of colors (henceforth referred to as color words) printed in black ink (W) and name different color patches (c). Conversely in the third table, named color-word (CW) condition, color words are printed in an inconsistent color ink (for instance the word red is printed in green ink). Thus, in this incongruent condition, participants are required to name the color of the ink instead of reading the word. In other words, the participants are required to perform a less automated task (i.e., naming ink color) while inhibiting the interference arising from a more automated task (i.e. reading the word; MaCleod and Dunbar, 1988; Jvnik et al., 1996). This difficulty in inhibiting the more automated process is called the stroop effect. (Stroop, 1935). While the SCWT is widely used to measure the ability to inhibit cognitive interference; previous literature also reports its
application to measure other cognitive functions such as attention, processing speed, cognitive flexibility (Jensen and Rohwer, 1966) and working memory (Kane and Engle, 2003). Thus, it may be possible to use the SCWT to measure multiple cognitive functions.

Conclusion:
In conclusion part, the investigator found very interesting about the colour and colour word test between elderly people and adolescence and suggested to do this test with other test so that it can able to reflect more information in relation to this test.

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