

Effects of Perceptual and Contextual Enrichment on Visual Confrontation Naming in Young and Older Adults

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Abstract

Aim: The aim of the study was to find out the effects of perceptual and contextual enrichment on visual confrontation naming in young and older adults.

Method: A total of 80 participants, 40 younger adults and 40 older adults (20 males and 20 females in each group) were selected for the present study. Boston naming test materials were used to obtain the visual confrontation naming in young and older adults.

Results and Discussion: There was a significant difference between young and older adults in line pictures and there was no significant effect observed for perceptual and contextual enrichments.

Summary and Conclusion: Significant correlation elicited between the reaction time and accuracy of response only in line pictures but there was no significant correlation between reaction time and accuracy of response for perceptual and contextual enrichments. Hence, it suggests that reaction time and accuracy of response were not dependent on each other. Thus, it indicative that age and gender are plays a critical or major role in visual confrontation naming.

Key Words: Perceptual Enrichment, Contextual Enrichment, Confrontation Naming.

Introduction

Confrontation naming is a complex process involving few stages. In first stage (perceptual), following the presentation of a picture, the pictorial image is analyzed for correct identification of the stimulus. In middle stage (semantic), the information is transmitted, where its semantic

representation is activated. In final stage (label retrieval), the phonological representation corresponding to the semantic representation is retrieved (Toshiko, Yoko, Hisako & Sumiko, 1990).

Processing of visual confrontation naming occurs at higher level, the parietal lobe receives new visual information, this visual data is fired to the visual cortex where symbols are recognized and organized, and this organized visual data is sent to the inferior parietal lobe where sounds connect to the letters. The sound or letter blends are fired to the superior parietal lobe where speech patterns are pre-organized and fired to the oral language center in the left temporal lobe. The Broca's area further organized the speech material. This refined speech material is then fired to the Wernicke's region, which puts the final touch on spoken stimuli, the speech organs are triggered to say what the eyes have seen on the page (Shaywitz, 1996).

Confrontation naming is a multifaceted process. Due to this one should give more attention towards the activity. In disorder population confrontation naming is one of major aspect affected due to their processing or comprehension deficits. This difficulty observed even in older adults because of aging effect. In aging population, structural, functional, cognitive and emotional changes tend to reduce the abilities of individuals.

Older adults experience word-finding difficulty with advancing age, as reflected by decrease in accuracy and increase in the amount of time needed to name items, even in the absence of pathological conditions (Feyereisen, Demaeght & Samson, 1998; Tsang & Lee, 2003). Given the cognitive complexity and many operations required for successful object picture naming, identifying a clear locus for age-related naming deficits has proven challenging. Most models of visual confrontation naming agree that naming a picture requires perceptual recognition of the object (attending to it in the visual field and processing its physical properties), semantic activation of the concept, and lexical selection from among competing alternatives, and retrieval and expression of the phonological word form (Dell, Schwartz, Martin, Saffran, & Gagnon, 1997).

The clearest evidence for age-related difficulties in picture naming comes from studies of visual confrontation naming, in which participants asked to name pictures of individual items. At a basic level, older adults were typically found to name fewer items correctly and produce more errors

compared with young adults (Nicholas, Obler, Albert, & Good glass, 1985; Albert, Heller, & Milberg, 1988; Au, Joung, Nicholas, Obler, Kass, & Albert, 1995; Barresi, Nicholas, Tabor Connor, Obler, & Albert, 2000). In addition, even when naming pictures correctly, older adult require more processing time to respond (Feyereisen, Demaeght, & Samson, 1998; Hodgson & Ellis, 1998). Changes in accuracy and/or response latency suggest that naming is less efficient in older adults than in young adults. Age-related changes are not limited to visual acuity but also include operations such as processing low spatial frequencies that may be important for identification of picture stimuli (Sekuler, Hutman, & Owsley, 1980).

Need for the Study

Most models of visual confrontation naming agree that naming a picture requires perceptual recognition of the object (attending to it in the visual field and processing its physical properties (Dell, Schwartz, Martin, Saffran, & Gagnon, 1997). If perceptual and contextual enrichment is applied in naming then older adults might get benefit with this enrichment. Hence there is a need to study the effect of enrichments on visual confrontation naming in normal individuals. Thus, it can be implied for the disorders in both assessment and treatment.

Aim of the study

1. To find out the effect of perceptual and contextual enrichment on visual confrontation naming in young and older adults.
2. To compare the performance on visual confrontation naming between groups and gender within the groups and
3. To correlate between the reaction time and accuracy of response in young and older adults.

Method

Participants: A total number of 80 healthy individuals (40 young and 40 older adults) in which younger adults age range from 20 – 30 years and older adults from 50 – 60 years were taken for the study. The demographic data is given in table 1. All the participants should be native Telugu speakers. Participants were selected based on no issue of health problems, no disorders and no abnormalities like visual problems (the peoples who have scored above 75% in Ishihara colour

blindness test), neurological problems, oromotor structural abnormalities, eye surgeries, and no cognitive deficits.

Table 1.

Demographic data for participants

Groups	Age range	Gender		Total
		M	F	
Younger	20 – 30 yrs	20	20	40
Older	50 – 60 yrs	20	20	40

Materials

Boston naming test (Kaplan and Goodglass, 1983) was used and it consists of 60 line diagram pictures. Out of 60 pictures, 30 pictures were made into a colour pictures dependence on the perceptual skills and two environmental scenes were used for contextual enrichment such as home and zoo.

Procedure

In this study, Boston naming test materials were used for the stimuli in all the three conditions (line pictures, perceptual and contextual enrichments) to check the reaction time and accuracy of response in young and older adults. 30 line pictures were selected from Boston naming test. Colour pictures of the previous task stimuli were used for perceptual enrichment, these colour pictures were taken from various recourses for e.g. internet. For contextual enrichment line pictures were selected which are related to home and zoo, pictures of home and zoo were given as a priming for respective target stimuli.

For all of the experimental conditions, Participants has been asked to sit in quiet room. Prior written consent was taken from all the participants. The stimuli were presented on the centre of the computer monitor and by using DMDX software program. Line pictures, perceptual enrichment (colour pictures) and contextual enrichment (zoo and home pictures) were used in the procedure.

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Each picture was displayed for the duration of 4 sec to identify the picture and inter stimulus interval will be 2 sec between each stimuli. Through DMDX Software measured the reaction times using a voice key response box and Digital audio recorder was used for offline accuracy scoring.

Three experimental conditions were used. In first condition, only line pictures were used. In second condition (perceptual enrichment) colour pictures were used instead of line pictures of the same item. In third condition (contextual enrichment), pictures related to zoo and home categories were separated from Boston naming test material, home and zoo pictures were used as priming before the target items. All the pictures were presented using DMDX software and participants were asked to name the pictures as quickly and accurately as possible (within 4 sec). If there was no response in a given duration, it was considered as no response. Then next stimulus was displayed through DMDX automatically. Reaction times were elicited from the Check vocal software for each stimuli and accuracy of response were checked through the audio samples of digital recorder. Quasi experimental design was used to measure between groups and gender of reaction time and accuracy of response.

Results and Discussion

To find out the effect of enrichments (perceptual and contextual) on visual confrontation naming in young and older adults.

Table 2 demonstrates the mean and standard deviation values of reaction time for line pictures, perceptual enrichment and contextual enrichments for both the groups. The mean reaction time was less in younger adults than older adults. Hence, it suggests that young adult's performance was better than older adults indicating of quicker processing in young adults.

Table 2.

Mean and standard deviation values in reaction time of both groups

Groups	Gender	Line pictures		Perceptual Enrichment		Contextual Enrichment	
		Mean	SD	Mean	SD	Mean	SD
Younger	Male	0.972	0.22	0.911	0.15	1.259	0.66

adults	Female	1.008	0.22	1.075	1.03	1.051	0.18
Older adults	Male	1.138	0.25	0.983	0.22	1.225	0.25
	Female	1.137	0.14	0.902	0.12	1.117	0.20

In younger adults, the mean reaction time values for males were less compared to females in line pictures and perceptual enrichment whereas in contextual enrichment mean values were less for females compared to males. It indicates that performances in different genders vary depending on the type of stimuli. On the other hand, mean values for females were less compared to males in older adults for all the three conditions such as line pictures, perceptual and contextual enrichment stimuli.

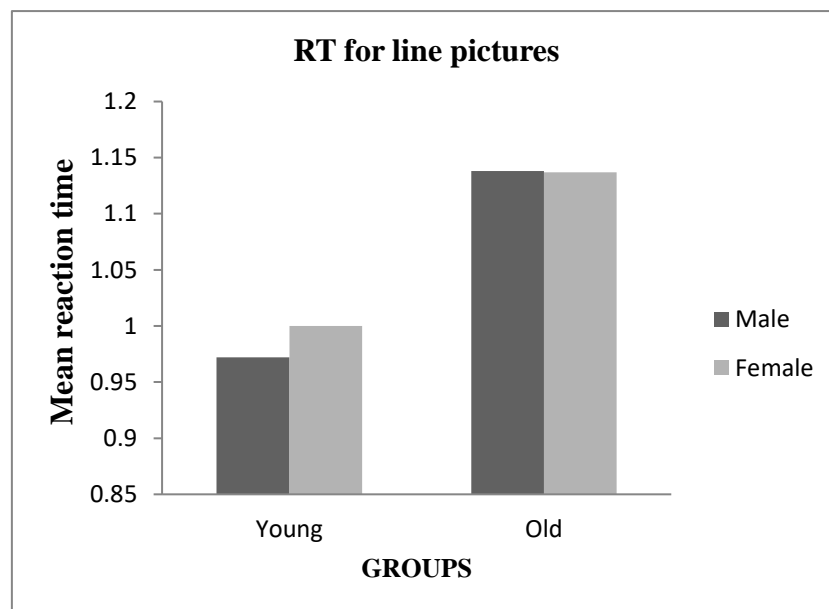


Figure 1. Mean reaction time (RT) for line pictures in two groups

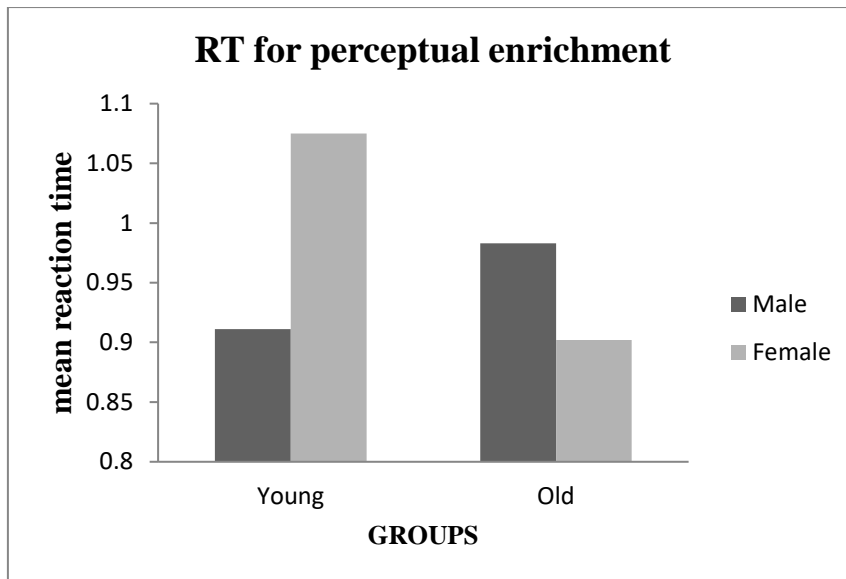


Figure 2. Mean reaction time (RT) for perceptual enrichment in two groups

Figures 1, 2 and 3 illustrate mean reaction time in young and older adults for line pictures, perceptual and contextual enrichment respectively. Clearly showing the differences in the performance in males and females of two groups.

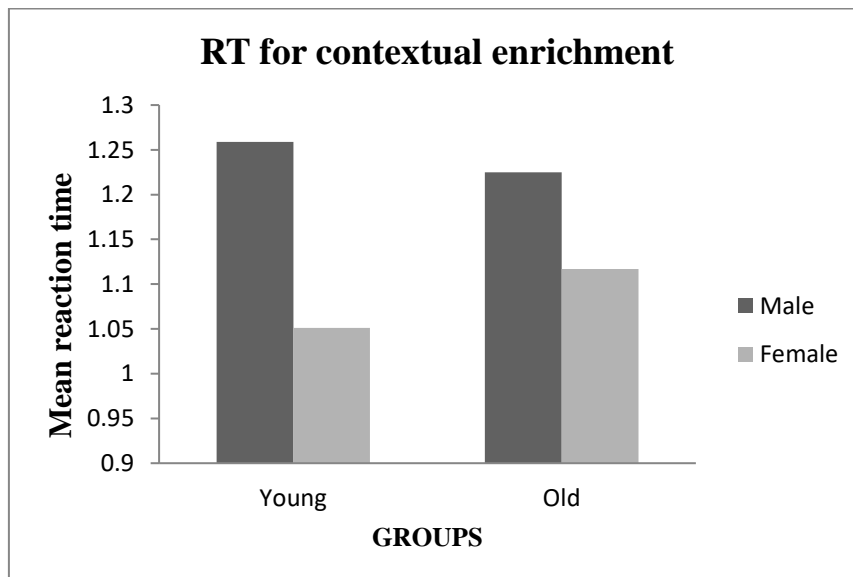


Figure 3. Mean reaction time (RT) for contextual enrichment in two groups.

Table 3 illustrates the mean and standard deviation values of accuracy of responses for line pictures, perceptual and contextual enrichments for both the groups. The mean values were higher for younger adults compared to older adults in line diagram and the enrichments (perceptual and contextual). In younger adults, the mean values were better for females compared to males in all the three conditions. In older adults, the mean values were slightly higher for males compared to females in line pictures. But perceptual and contextual enrichments of mean values were little higher for females compared to males.

Table 3.

Mean and standard deviation values of accuracy of responses in both groups.

Groups	Gender	Line pictures		Perceptual Enrichment		Contextual Enrichment	
		Mean	SD	Mean	SD	Mean	SD
Younger adults	Male	96.25	5.59	98.00	4.70	95.65	4.46
	Female	99.25	1.83	99.75	1.11	96.08	4.86
Older Adults	Male	83.75	8.25	98.00	4.70	84.73	10.47
	Female	82.00	8.33	99.75	1.11	85.21	9.09

Thus, it is clearly representing that the number of correct responses (accuracy of response) were better in younger group compared to older group. Whereas, the performance in older group increased when stimuli was presented in a perceptual enrichment, the mean accuracy values were similar in both the groups. However, in contextual enrichment condition, improvement was observed but not like in perceptual enrichment. Overall, the accuracy of response increased with enrichment conditions (perceptual and contextual). In both the groups, for all the conditions females performed better than males which point out that correct response percentage was better in females compared to males irrespective of the condition.

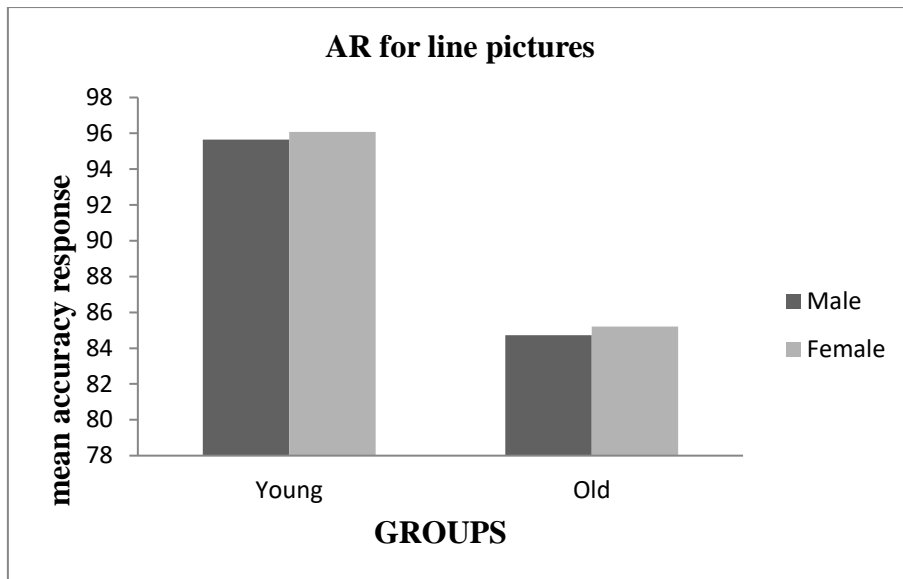


Figure 4. Mean accuracy response (AR) for line pictures in two groups.

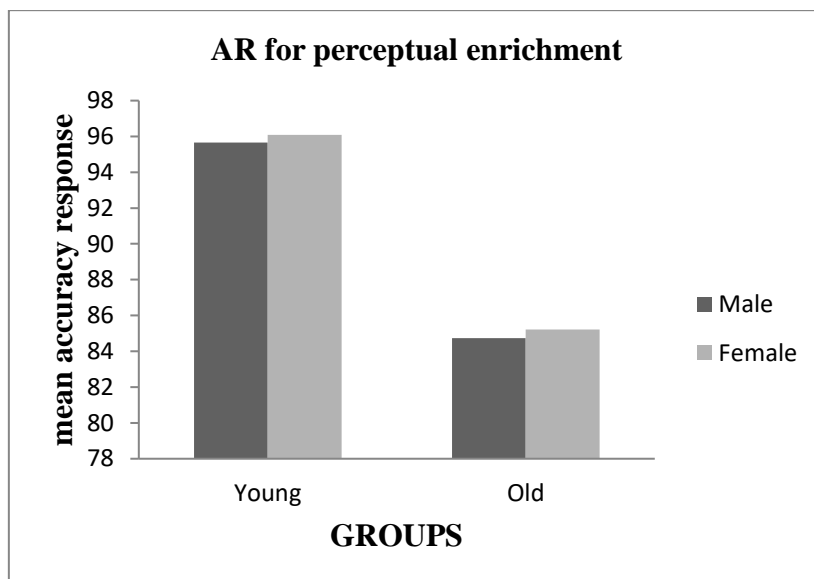


Figure 5. Mean accuracy response (AR) for perceptual enrichment in two groups.

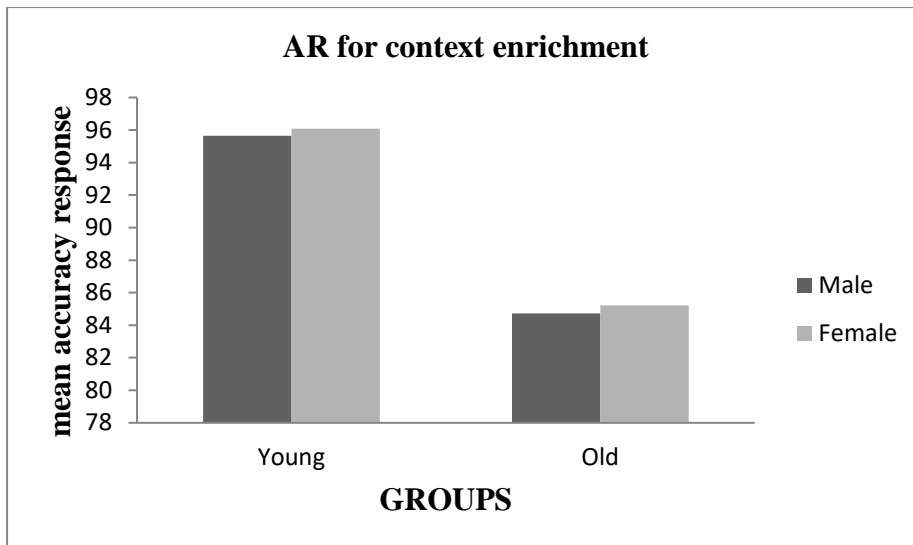


Figure 6. Mean accuracy response (AR) for contextual enrichment in two groups.

Accuracy of responses in males and females of two groups for line pictures, perceptual and contextual enrichment were depicted in figures 4, 5 and 6 respectively. Overall, performance for reaction time and accuracy of response on line pictures, perceptual and contextual enrichment in younger group was superior in comparison to older groups. Mean values shows that perceptual and contextual enrichments improved their performance in both the groups and more so in older group.

To compare the performance on visual confrontation naming between groups and gender within the groups.

Table 4.

Results of multiple analysis of variance in reaction time for line pictures, perceptual and contextual enrichments

Source	Dependent variables	df	F	p (sig.)
Corrected model	Line pictures	3	3.171	0.029*
	Perceptual	3	0.443	0.723
	Contextual	3	1.276	0.289
Groups	Line pictures	1	9.238	0.003*
	Perceptual	1	0.174	0.678

	Contextual	1	0.034	0.854
Gender	Line pictures	1	0.128	0.721
	Perceptual	1	0.118	0.732
	Contextual	1	3.447	0.067
Groups*gender	Line pictures	1	0.147	0.703
	Perceptual	1	1.038	0.312
	Contextual	1	0.348	0.557

**indicates $p < 0.01$ significance level; *indicates $p < 0.05$ significance level

In order to find out the difference between groups and gender statistical analysis was done. Multiple analysis of variance was used to check the differences in reaction time for line pictures, perceptual and contextual enrichment measurements. F and p values were given in table 4 for line pictures, perceptual and contextual enrichments between the groups and gender.

For groups, the main effect for reaction time of line pictures was observed between groups [$F(1, 79) = 9.238, p < 0.01$] however there was no significant difference was observed in perceptual and contextual enrichment between the groups. In gender, there was no significant difference observed in line pictures, perceptual and contextual enrichment measures; no interaction effect was found between the groups and gender for three conditions.

Thus, it shows that the performance on perceptual and contextual enrichment improved in older adults therefore statistical difference was not observed between young and older adults. However, the performance on line pictures was poor in older adults compared to young adults. Males and females performed similarly in all the three conditions indicating that no gender effect on naming task especially with respect to enrichments.

Kozora and Munro (1995) study reported significant group differences were found on the majority of category fluency tasks, older subjects produced fewer exemplars per subcategory, and generated more category names in relation to specific exemplars. Schmitter, Vesneski and Jones (2000) reported that older adult group produced more word retrieval errors than younger adults. In

contrast, results from the picture-naming test surprisingly revealed higher naming accuracy by the older adult groups.

Evrard (2002) also compared naming in younger adults with elderly people, reported that elderly people experienced more tip-of-the-tongue states for proper names, but not for common names. These results are in support to the present study where it shows that older adults are taking long time for even ordinary names. Tsang, Tatia and Lee (2003) indicated that younger people performed much better than older people on the test in terms of accuracy as well as response latency. No gender difference in performance on the test was observed. In another study, random-effects modelling revealed significant linear and quadratic change in lexical retrieval with age (Connor, Spiro, Obler & Albert, 2004).

Significantly poorer mean Boston naming test scores and increasing variability (measured in standard deviations) were found with successively older age groups and with lower educational levels and there was no significant development for males to score slightly higher than females which is in contradiction to the present study results with respect to gender (Zec, Burkett, Markwell, & Larsen, 2007).

Verhaegen and Poncelet (2013) reported decline in naming performance and reflected as increase in naming latencies (50 years participants) , whereas in 60 and 70 years participants showed both a decrease in accuracy and an increase in latency. In addition, the increase in naming latencies remained significant even after controlling for odd/even judgment latencies, suggesting a degradation specific to the picture naming task. These results are supporting with the present study results.

Table 5.

Results of multiple analysis of variance in accuracy of response for line pictures, perceptual and contextual enrichments.

Source	Dependent variables	Df	F	P (sig).
	Line pictures	3	35.205	0.000**
Corrected model	Perceptual	3	19.506	0.000**

	Contextual	3	13.422	0.000**
Groups	Line pictures	1	102.812	0.000**
	Perceptual	1	56.476	0.000**
	contextual	1	40.196	0.000**
Gender	Line pictures	1	2.621	0.110
	Perceptual	1	1.985	0.163
	Contextual	1	0.071	0.791
Groups*gender	Line pictures	1	0.182	0.671
	Perceptual	1	0.055	0.815
	Contextual	1	0.000	0.989

*indicates $p < 0.05$ significance level, **indicates $p < 0.01$ significance level

Multiple analysis of variance was used to determine the difference in groups and gender for accuracy of response for line pictures, perceptual and contextual enrichment measurements. For line pictures [F (1, 79) = 102.81, $p < 0.01$], perceptual [F (1, 79) = 56.476, $p < 0.01$] and contextual [F (1, 79) = 40.196, $p < 0.01$] enrichments significant main effect was observed between the groups although there was no significant difference between genders in addition no interaction effect was seen between groups and gender for line pictures, perceptual and contextual enrichments in accuracy of response.

Table 6.

t values between three conditions in younger and older adults

Measures	Conditions	Younger		Older	
		Males	Female	Male	Female
Reaction time	L-P	0.92	0.27	2.06**	6.09**
	L-C	1.97	0.62	1.18	0.37
	C-P	2.13*	0.09	4.25**	4.51**

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	L-P	1.42	2.89**	4.46**	6.37**
Accuracy of response	L-C	4.62**	0.90	0.36	1.48
	C-P	2.15*	3.28**	2.27*	3.46**

*indicates p<0.05 significance level, **indicates p<0.01 significance level

(L= line pictures, P= perceptual enrichment, C= contextual enrichment)

The above table shows the t values between line pictures, perceptual and contextual enrichment in two groups. In reaction time, significant difference was observed between line pictures and perceptual enrichment in older adults but not in younger adults. Also, difference was seen between contextual and perceptual enrichments in young and older adults except young females. In accuracy of response, significant difference was observed between line pictures and perceptual enrichment in younger and older adults apart from younger adult males. Though, significant effect was observed between contextual and perceptual enrichments in younger and older adults. In addition, between line pictures and contextual enrichment significant difference was seen only in younger adult males.

Hence, it concludes that performance was enhanced in perceptual enrichment in comparison to line pictures as well as contextual enrichments but no difference was identified between line pictures and contextual enrichment. These findings with respect to contextual enrichment, the participants might get confused with the priming and target items. It can be highlighted that colour pictures (perceptual enrichment) giving advantage for both reaction time and accuracy of response in two groups.

The results revealed that younger adults performed much better than older adults on the test in terms of accuracy as well as response latency. There was no significant male and female effect observed in performance on visual confrontation naming. This age related changes has been reported in literature (Kozora & munro,1995; Schmitter, et al., 2000; Eward, 2002; Taylor et al., 2002; Tsang, et al., 2003; Zec, et al., 2007; Verhaegen & Poncelet, 2013).

The present study results were similar to Tsang and Lee (2003) study. They stated that younger adults performance was better compared to older adults on the confrontation naming test for

accuracy and as well as response latency. There was no significant gender difference observed in performance on the test.

Albert, Heller and Milberg (1988) proposed that naming ability remains fairly stable across the adult life span until individuals are in their 70 years, at which there was a significant decline in performance which differs with the present study results. Other studies obtained naming abilities decline only slightly with advancing age, it suggests more variation in performance in higher age groups. They reported that naming abilities decline only slightly with advancing age; it suggests more variation in performance in higher age groups (Van Gorp, Satz, Kiersch & Henry, 1986; Hadgson & Ellis, 2003; Markwell & Larsen, 2005).

Palmer (1975) found the probability of being correct was highest in the appropriate context condition and lowest in the inappropriate context condition. Boyce, Pollatsek and Rayner (1989) stated in three experiments that more difficult to identify when located in an episodically inconsistent background even when the same diagnostic objects are present in both inconsistent and consistent backgrounds whereas consistent episodic background information facilitated object identification and inconsistent episodic background information did not interfere relative to nonsense backgrounds roughly equated on visual characteristics.

Precious literatures are consistent with present study findings. Thus, younger adult's performance was much better compared to older adults in terms of reaction time and accuracy of response for line pictures, perceptual and contextual enrichment. Although, the older adults tends to capture more time to respond even in the absence of any pathological conditions.

To correlate between the reaction time and accuracy of response in young and older adults.

Pearson correlation was used to compare between the reaction time and accuracy of response in all the three conditions.

Table 7.

R and p values of reaction time and accuracy of response for line pictures, perceptual and contextual enrichments in younger adults

Accuracy of response

	Line pictures	Perceptual	Contextual
Reaction time	r 0.068	0.011	0.171
	p 0.675	0.948	0.290

Table 7 represents the correlation values between reaction time and accuracy of response for line pictures, perceptual and contextual enrichments in younger adults. Pearson correlation (p, r values) results showed that no correlation was observed between the reaction time and accuracy of response in line pictures, perceptual and contextual enrichments.

Table 8.

R and p values of reaction time and accuracy of response for pictures, perceptual and contextual enrichments in older adults

	Accuracy of response		
	Line pictures	Perceptual	Contextual
Reaction time	r 0.314	0.204	0.279
	p 0.048*	0.207	0.081

Pearson correlation reveal that there was a correlation between the reaction time and accuracy of response only in line pictures but there was no correlation between reaction time and accuracy of response for perceptual and contextual enrichments in older adults. Hence, it suggests that reaction time and accuracy of response were not dependent on each other.

Overall, the present study results revealed that there was a significant difference between young and older adults in line pictures and there was no significant effect observed for perceptual and contextual enrichments. This might be due to the fact that these enrichments (perceptual and contextual) enhance the quality of the processing as well as support to the word finding abilities. Thus, the impact was shown in both reaction time and accuracy of response in young and older adults however greater benefit was observed in older adult. On other hand, contextual enrichment didn't elicit the same amount of benefit like perceptual enrichment. Participants were confused in

contextual enrichment task intern led to slightly poorer performance. In the literature it has been reported that males and females perform similar in naming related tasks (Tsang & Lee, 2003) and present study report also supporting the literature. The present study results also stated that there was no significant correlation between reaction time and accuracy of response. The reaction time is not dependent on accuracy of response. In human beings as their age increases their processing abilities might be decreased and the aging require more time to react to given stimuli. While presenting enrichments, the older adults performed much better in perceptual enrichment compared to line pictures so it indicative that older adults naming skills were improved.

Summary and Conclusion

For reaction time, the mean values for males were less compared to females in line pictures and perceptual enrichment but in contextual enrichment mean values were less for females compared to males in younger adults. Mean values for females were less compared to males for all the three conditions such as line pictures, perceptual and contextual enrichment in older adults.

For accuracy of response, the mean accuracy values were higher for females compared to males in all the three conditions in younger adults. The mean values were somewhat higher for males compared to females in line pictures. Whereas, in perceptual and contextual enrichments mean values were slightly higher for females compared to males in older adults. So, the mean values show that there were changes in reaction time and accuracy of response due to aging. Significant correlation elicited between the reaction time and accuracy of response only in line pictures but there was no significant correlation between reaction time and accuracy of response for perceptual and contextual enrichments. Hence, it suggests that reaction time and accuracy of response were not dependent on each other. Thus, it indicative that age and gender are plays a critical or major role in visual confrontation naming.

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