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Gender influences in peripheral and central visual perception for the young

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Abstract

The current study analyses the way the reaction time is different between young males and females. Therefore, the participants were a group of 251 students, University of Bucharest, 127 females and 124 males aged between 19 and 24 years old (M=20.14; S.D.=1.46), rural and urban area from Romania. The instruments were: 1) the peripheral perception test and the DEST test (Schuhfried, 1998). The hypothesis has been confirmed ($p<0.05$). In conclusion, there are gender differences concerning the reaction time for youngsters but there are no statistically significant differences concerning the speed and distances estimation.

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1. Theoretical framework

The perception of movement has a complex character because the movement of objects which come into contact with our body we perceive it through three ways: tactile, kinesthetic and visual, and the movement of objects which are to be found at a certain distance from us we perceive it through two ways visual and auditory. Morrow & Ratcliff (1988) describe the visual and spatial ability as an aggregate of composite aptitudes which allow the individual to perceive and manipulate spatial information. The spatial abilities involved, among others, are: the capacity of perceiving the world visually with precision, of giving attention to the specific areas of the spatial environment, of handling different objects visually or tactile and to immediately organize its environment according to a coherent spatial frame.

The differences between males and females at a cognitive level, and more precisely, to the visual and spatial test, have been the subject of numerous studies in the past 30 years (Voyer, Voyer & Bryden, 1995). The differences observed are the subject of many debates and perspectives connected to the cognitive competences of each gender (Aniţei, 2007). Without doubt that the explanation exposed have consequences on the perception of sexual role and social equality. Signorella, Jamison & Krupa (1989) and Kalichman (1988) explain, after having detailed studies, the fact that the differences between females and males, which are shown through the performances at the visual and

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spatial test and not only, appear due to the advantages given by the genetic factors, personality traits and of performances in the activities of the experience lived.

Klinteberg, Levander & Schalling (1987) examined the strategies used in solving a labyrinth and tried to explain the differences between genders at the level of visual and spatial abilities. After the analysis, he stated that males have a global and impulsive strategy, while females use a sequential and meditative strategy. More precisely, female subjects solve the test in phases and with fewer risks than males. The latter are much faster but less precise than females at the speed involved in choosing between two answers. Finally, the male participants solve the labyrinth much faster than females. A research conducted by Silverman (2003) shows the results of a meta-analysis which consists in the changes concerning the importance of gender differences in simple and visual reaction time which have taken place in time. Two strong points of this meta-analysis are that they included a large number of studies and that the studies cover a period of 73 years. Moreover, the paper includes studies from 11 countries and started from three premises. The first one is that, in time, the tendencies for the performances of athletes are shown in people's performances in general. The second and the third premise are that the reaction time is getting better with practice and that girls and women are more and more involved in activities which offer diverse opportunities for practicing reaction time. The results of the study support the prediction which states that the differences between the two genders for the simple visual reaction time has decreased in the past 70 years. If the magnitude of this difference will continue to decrease maintaining the actual speed, the difference will disappear in 25-30 years for the non-USA samples and in approximately 50-55 years for the samples in USA.

In what the reaction time and practice are concerned more studies (Ando, Kida, & Oda, 2004; Taniguchi, 1999) give proofs in favour of this relation. Here, of particular interest is Blank's study because the subjects have practiced the simple visual reaction time for more than one day. Blank (cited by Woodworth & Schlosberg, 1954) has noticed that the reaction time has decreased with approximately 10%.

In two other studies (Christenson & Winkelstein, 1998; Yandell & Spirduso, 1981) the RT between athletes and normal people has been compared. In both studies, the participants had to give an answer when a visual stimulus was shown. Christenson and Winkelstein (1998) have noticed that the athletes were much faster than the non-athletes, although the results were difficult to be interpreted as there were twice as many males in the athletes' group than in the non-athletes one. Taking into account that males generally have a reaction time faster than females, the reaction time difference between athletes and non-athletes can reflect the fact that the group of athletes is formed out of more males. Yandell and Spirduso (1981) have also noticed that athletes were much faster than non-athletes but only for the first day of evaluation.

In two studies done by Hommel, Li & Li (2004) and Sadeh, Gruber & Raviv (2002), the difference of gender has been in favour of girls/women in more than one age categories. The results of the Silverman's meta-analysis (2003) can be compared with the ones obtained in a recent study of reaction time signal-action (Williams, Ponesse, Schachar, & Logan, 1999) for the differences at different ages. Therefore, for the signal-action task one of the two stimuli was shown at each task and the participants had to give a different answer to each stimulus. The results have shown that the performance to this task is different according to gender (males were faster) and that gender in interaction with age is without importance. Therefore, the conclusion seems to attract the attention that the difference of gender fo the reaction time is constant in time.

The simple reaction time has been approached through another meta-analysis and also by Thomas and French (1985) which reached the conclusion that boys are faster than girls. The results show the importance of the gender difference for the reaction time has not been different during childhood and adolescence. Given this result, is of real interest to determine if the importance of gender difference for the reaction time is constant not only during childhood and adolescence but also during the whole life. Starting from previous researches done in the Experimental Psychology Laboratory of the Faculty of Psychology from Bucharest University investigating the particularities in processing visual stimuli and stereoscopic vision of the human operator (2008a), stereoscopic and peripheral perception (2008b), the influence of energy drinks and caffeine on time reaction and cognitive processes in young Romanian students (Aniţei, Schuhfried & Chraif, 2011), the effects of radio noise in multiple time reaction tasks for young students (Chraif, 2012 b), the influence of energy drinks and caffeine on peripheral perception and estimation of speed and distance for the young Romanian students (Chraif & Aniţei, 2011),

evaluation based on stereoscopic vision test within driving schools assessment center (Chraif, Aniţei, 2012), the current research is focused on gender differences in youngsters' reaction time for the peripheral perception and the central field one of the visual stimuli (Aniţei, 2007; Chraif, 2012a).

2. Objectives and hypotheses

2.1. Objective

The objective of the research is focused on highlighting gender differences in peripheral perception reaction time and central field visual perception reaction time.

2.2. Hypotheses

- There are statistically significant differences for the reaction time at the peripheral perception stimuli between males and females.
- There are statistically significant differences for the reaction time at the stimuli from the central visual field between males and females.

3. Method

3.1. Participants

The participants were 251 young students from the Faculty of Psychology and Educational Sciences, aged between 19 and 24 years old (M=20.14; S.D.=1.46), both male and female, rural and urban area from Romania.

3.2. The instruments

- Peripheral Perception Test (Schuhfried, 1992) cited by Chraif (2012) This task is aimed at evaluating the person's perception and processing of visual peripheral stimuli, highlighting the measurement of reaction times at the fast perception of stimuli which enter the visual field through lateral sides.
- The DEST test for speed and distance estimation (Schuhfried, 1998) cited by Chraif (2012). This test measures the number of answers as underestimations, omitted, the tendency for estimation and the mean for estimation errors. The task consists in visualizing a square which is moving with a certain speed on the computer's screen and the time and distance mental estimation until it reaches the vertical stick after it has disappeared from the screen.

4. Results

By doing the exploratory analysis of the collected data when testing the subjects with the two psychological tests presented and after applying the normality test Kolmogorv-Smirnov ($p>0.05$), the normality conditions for the variables were obtained: underestimations, omitted, approximation tendency, the mean of errors for estimation, the reaction times mean for the left side, the reaction times mean from the left side and the reaction times mean as a whole. Considering the fact that the data resulted are parametrical, the measures of central tendency can be calculated: mean and standard deviation and the t-student test can be applied for independent groups.

Analyzing the data from table 2, it is shown that for no variable underestimations, omitted, approximation tendency, the mean of errors for estimation) which are measured by the test for speed and distance estimation there is a statistically significant difference between males and females ($p>0.05$).

Table 1. Name of the table

Variabile	gen	N	Mean	Std. Deviation	t	p
Mean of the reaction time to the stimuli from right visual field	M	124	2.05	0.49	4.21	.00
	F	127	1.57	0.52		
Mean of the reaction time to the stimuli from left visual field	M	124	2.09	0.52	3.98	.00
	F	127	1.63	0.54		
Mean of the reaction time to the stimuli from left and right visual field	M	124	2.07	0.50	4.18	.00
	F	127	1.60	0.53		
Mean of the reaction time standard deviation for the right visual field	M	124	0.70	0.21	4.05	.01
	F	127	0.54	0.17		
Mean of the reaction time standard deviation for the right visual field	M	124	0.73	0.20	4.18	.00
	F	127	0.56	0.19		
Mean of the reaction time standard deviation for the right and left visual field	M	124	0.71	0.19	4.54	.00
	F	127	0.52	0.17		

Analyzing the data from table 1, it can be noticed that the mean of the right reaction times ($2.05<1.57$, $p<0.01$), left ($2.09<1.63$, $p<0.01$), and total ($2.07<1.60$, $p<0.01$), is different between males and females statistically significant. Moreover, the means of the standard deviation for the reaction times for the left side stimuli ($0.70<0.54$, $p<0.01$), from the right side ($0.73<0.56$, $p<0.01$) and from both sides ($0.71<0.52$, $p<0.01$) is statistically significant different between males and females.

Table 2. Descriptive statistics

Variabile	Sex	N	Mean	Std. Deviation	t	p
Underestimations	M	124	18.71	7.83	-1.05	0.16
	F	127	20.59	8.56		
Omitted	M	124	0.57	1.07	0.87	0.35
	F	127	0.38	0.84		
Apreciation tendency	M	124	-12.63	14.28	1.12	0.15
	F	127	-16.17	12.51		
Mean of the error of the estimation	M	124	28.59	11.47	-1.02	0.27
	F	127	32.48	10.35		

The statistical hypothesis is confirmed only for the variables which measure the reaction time. Therefore, there are statistically significant differences of the reaction times mean for the peripheral visual stimuli which are moving from the left and the right side according to gender ($p<0.05$).

5. Conclusions

Analysing the speed and distance estimation (omitted variables, underestimations, approximation tendency, the average error for estimation), there are difference between females and males but these are not statistically significant ($p>0.05$).

These results highlight the fact that there are no statistical significant differences between males and females from the point of view of mental representation and speed and distance estimation which emphasizes that both males and females adapt themselves in the same way when it comes to speed and distance anticipation. Analyzing the results from table 1 as well as the testing of the hypothesis for the reaction time between males and females can be concluded that Analysing the data from table 1, it can be noticed that the mean of the right reaction times ($2.05<1.57$, $p<0.01$), left ($2.09<1.63$, $p<0.01$), and total ($2.07<1.60$, $p<0.01$) is statistically significant different

between males and females. This discovery comes to strengthen the prevous results confirmed by different researches.

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