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Audio-visual reaction and fine handling errors – a pilot study

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Abstract

Present study is focused on highlighting the effects of fine motor coordination errors in multiple reactions tasks to stimuli measured as correct, incorrect and omitted audio-visual stimuli. The hypotheses assume possible statistically differences in the stimuli reactivity between the group with less fine motor errors and the group with high number of errors (left and right hand and total errors). The instruments were the Labyrinth test B19 and the Determination test (Dt test), both from Vienna Tests System (2012). The results confirm only the hypotheses regarding the differences in stimuli reactivity by the influence of total number of errors.

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Keywords: fine motor coordination, correct reactions, incorrect reactions, omitted reactions;

1. Introduction

Investigating the laterality was a predilection for psychophysiology researchers (Oldfield,1971, Ellis & Ellis, et.al., 1998, Porac & Coren, 1981; Bendixen, SanMiguel & Schroger, 2012; Wilkinson, 1990). Audio-visual reaction is a very important concept and is studied in areas such as: attention and memory (Grimes, 1990), emotions (Collignon, et. al.,2008) and neurosciences (Schroger & Widmann, 1998;Molholm, et. al.,2006;Senkowski, et. al., 2006; Harrar & Harris, 2008). The preference for one side of the body (handedness, footedness, eye, ear) was investigated and the results can be displayed as following: favouring right hand: 88.2%; favouring right foot: 81.0%; favouring right eye: 71.1%; favouring right ear: 59.1%; same hand and foot: 84%; same ear and eye: 61.8% (Kohfeld, 1971; Porac & Coren, 1981). The reason for this is supposed to be the dominance of the left cerebral

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hemisphere that controls the right part of the body. There are evidences that laterality, based on brain asymmetry, influence a great number of cognitive processes, for example self-face identification. The data show that when the right hemisphere is preferentially active (Geffen, Bradshaw & Nettleton, 1973), participants have a tendency to refer images to self, as well as it shows further support for a preferential role of the right hemisphere in processing self-related material (see Keenan et. al, 2000; Salejarvi, et. al, 2006). We try to bring in the same experimental environment motor coordination and audio-visual response to see if there is a connection between the performances on two tests that measures the above mentioned characteristics.

2. Objective and Hypotheses

2.1. Objective

The objective of this research is to highlight the differences in multiple audio-visual stimuli reaction in connection to the number of left hand, right hand and total (left and right) errors in fine handling abilities.

2.2. Hypothesis

- There are statistically significant left hand errors in fine handling abilities regarding the correct/incorrect/omitted reactions in undergraduate students at Psychology.
- There are statistically significant right hand errors in fine handling abilities regarding the correct/incorrect/omitted reactions in undergraduate students at Psychology.
- There are statistically significant total (left and right) errors in handling abilities regarding the correct/incorrect/omitted reactions in undergraduate students at Psychology.

3. Method

3.1. Participants

The participants were a number of 63 undergraduate students at Faculty of Psychology and Educational Sciences, University of Bucharest, ages between 19 and 25 years old (M= 22.41; S.D.= 2.1), 18 male and 45 female, from rural and urban areas.

3.2. Instruments

Instruments and software: The Labyrinth test B19 and the Determination test, both from Vienna Tests System (2012).

- The Labyrinth test B19 (Vienna Tests System, 2012) test is a fine motor abilities psychological test measuring the fine manipulation of both hands in a double labyrinth computerized psychological test (figure 1). There are three variables measured by labyrinth 19 test: the number of left hand errors, the number of right hand errors and the number of both hands errors. The participants have to follow the double labyrinth and to avoid touching the double labyrinth walls.

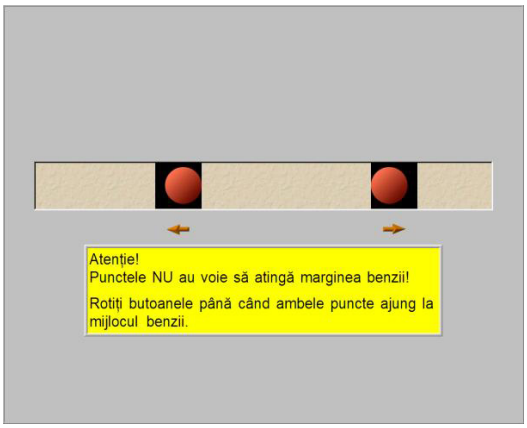

Fig. 1. An item sample from the test B19 double labyrinth (Vienna Tests System, 2012)

- Determination test (Dt) measure the reaction time from the point of view of the variables: correct reactions, incorrect reactions and omitted reactions. The items are colored circles (red, yellow, white, green and blue), sounds (high and low frequency) and two grey rectangular forms for the left and right feet answers. (Figure 2). The test presents three phases: the instructions, exercise phase and testing phase.

Fig. 2. A figural item from the test NVLT (Vienna Tests System, 2012)

3.3. Procedure

All participants have completed a consent form. The instruction phase was clearly and simply presented, in Romanian language, as well as the exercise and testing phases. The application was completed in silence, in a controlled laboratory environment.

3.4. Experimental design

In figure 3 can be analyzed the experimental design to test the hypotheses.

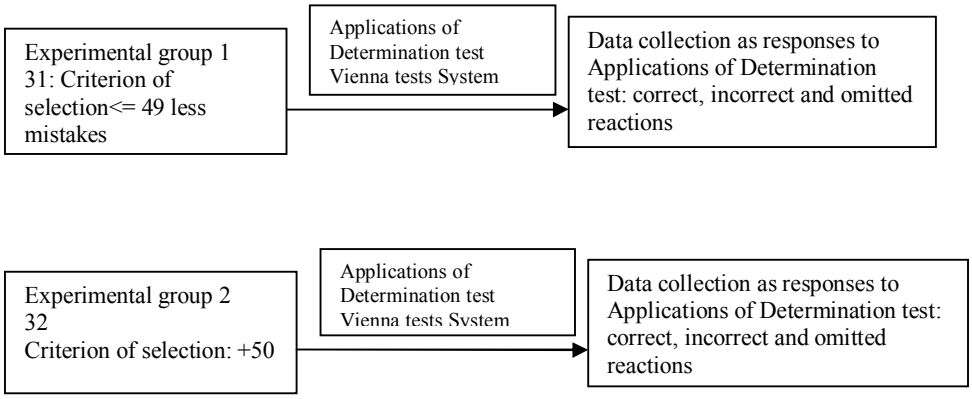

Fig. 3. Experimental design for testing the hypotheses

The dependent variables are the following: the number of correct reactions, the number of incorrect reactions, the number of omitted reactions in Dt test.

4. Results

In table 1 can be seen the mean and standard deviation for the variables the number of correct reactions, the number of incorrect reactions, the number of omitted reactions Dt test for the first hypothesis regarding the number of right hand mistakes.

Table 1. Descriptive statistics for the variables: correct reactions, incorrect reactions and omitted reactions

	Number of mistakes right hand (Binned)	N	Mean	Std. Deviation	Std. Error Mean
Correct reactions	<= 49 less mistakes	31	48.3548	26.23426	4.71181
	50+	32	49.1563	22.89402	4.04713
Incorrect reactions	<= 49 less mistakes	31	25.3548	23.21142	4.16889
	50+	32	29.6875	23.86175	4.21820
Omitted reactions	<= 49 less mistakes	31	21.8710	24.57335	4.41350
	50+	32	16.9688	15.53660	2.74651

As it can be observed in Table 1 there are two groups binned with binning variable statistically procedure using SPSS 15 on the variable right hand mistakes distribution.

Table 2. Independent Samples Test

		t-test for Equality of Means		
		Sig. (2-tailed)	Mean Difference	Std. Error Difference
correct	Equal variances assumed	.898	-.80141	6.19777
	Equal variances not assumed	.898	-.80141	6.21131
incorrect	Equal variances assumed	.468	-4.33266	5.93332
	Equal variances not assumed	.468	-4.33266	5.93067
omitted	Equal variances assumed	.346	4.90222	5.16246
	Equal variances not assumed	.350	4.90222	5.19830

In table 2 can be seen the t-test result as statistically significance. Hence, the first hypothesis of the research has not confirmed (There are statistically significant left hand errors in fine handling abilities regarding the correct/incorrect/omitted reactions in undergraduate students at psychology).

In order to test the second research hypothesis we binned the variable left hand mistakes distribution using binning variable statistically procedure, SPSS 15.

Table 3 Independent Samples Test

	Number_of_mistakes_left_hand (Binned)	N	Mean	Std. Deviation	Std. Error Mean
correct	<= 47 less number of mistakes with left hand	32	45.1875	24.96247	4.41278
	48+ high number of mistakes with left hand	31	52.4516	23.63449	4.24488
incorrect	<= 47 less number of mistakes with left hand	32	25.2500	23.96099	4.23574
	48+ high number of mistakes with left hand	31	29.9355	23.06937	4.14338
omitted	<= 47 high number of mistakes with left hand	32	18.0000	19.79736	3.49971
	48+ high number of mistakes with left hand	31	20.8065	21.37197	3.83852

In table 3 can be seen the mean and standard deviation for the variables correct, incorrect and omitted reaction corresponding to the number of mistakes with left hand independent variable.

Table 4 Independent Samples Test

		t-test for Equality of Means		
		Sig. (2-tailed)	Mean Difference	Std. Error Difference
correct	Equal variances assumed	.240	-7.26411	6.12844
	Equal variances not assumed	.240	-7.26411	6.12304
incorrect	Equal variances assumed	.432	-4.68548	5.92892
	Equal variances not assumed	.432	-4.68548	5.92530
omitted	Equal variances assumed	.591	-2.80645	5.18804
	Equal variances not assumed	.591	-2.80645	5.19444

In table 4 can be seen the p-value statistically significance after applying t-student test for independent groups. The second research hypothesis has not confirmed (p□0.05) (There are statistically significant right hand errors in fine handling abilities regarding the correct/incorrect/omitted reactions in undergraduate students at psychology).

Table 5 Group Statistics

	Number_of_mistakes TOTAL (Binned)		N	Mean	Std. Deviation	Std. Error Mean
correct	dimension1	<= 76	31	45.5484	25.52886	4.58512
		77+	32	51.8750	23.22644	4.10589
incorrect	dimension1	<= 76	31	21.3548	21.32064	3.82930
		77+	32	33.5625	24.18069	4.27458
omitted	dimension1	<= 76	31	18.5161	19.89451	3.57316
		77+	32	20.2188	21.29476	3.76442

In table 5 can be seen the mean and standard deviation for the variables correct, incorrect and omitted reaction corresponding to the total number of mistakes independent variable.

In order to test the third research hypothesis we binned the variable total mistakes distribution using binning variable statistically procedure, SPSS 15.

Table 6 Independent Samples Test for variable total mistakes (t-value)

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	df
correct	Equal variances assumed	1.081	.303	-1.029	61
	Equal variances not assumed			-1.028	60.041
incorrect	Equal variances assumed	1.267	.265	-2.123	61
	Equal variances not assumed			-2.127	60.475
omitted	Equal variances assumed	.298	.587	-.328	61
	Equal variances not assumed			-.328	60.922

In table 6 can be seen the t-test values after applying the parametric t-test for independent groups.

Table 7 Independent Samples Test for variable total mistakes (p-value)

		t-test for Equality of Means		
		Sig. (2-tailed)	Mean Difference	Std. Error Difference
correct	Equal variances assumed	.307	-6.32661	6.14546
	Equal variances not assumed	.308	-6.32661	6.15481
incorrect	Equal variances assumed	.038	-12.20766	5.75056
	Equal variances not assumed	.037	-12.20766	5.73895
omitted	Equal variances assumed	.744	-1.70262	5.19590
	Equal variances not assumed	.744	-1.70262	5.19021

In table 7 can be seen the p-value statistically significance for the three dependent variables: correct, incorrect and omitted reactions. The results confirm the third research hypothesis only for the dependent variable incorrect stimuli (p=0.038□0.05). (There are statistically significant total (left and right) errors in handling abilities regarding the incorrect reactions in undergraduate students at Psychology).

5. Conclusions

This pilot-study tries to highlight the way fine handling as a skill influences motor response to audio-visual stimuli. The independent variables are: right-handed number of errors, left-handed number of errors and total number of errors. These variables show the capacity of the subject to control the trajectory of a ball inside of a labyrinth. The general research question was if a low performance in fine handling can influence the reaction time on audio-visual stimuli? From the three statistical hypotheses we advanced, only one, the third, has been confirmed: there are statistically significant total (left and right) errors in handling abilities regarding the incorrect audio-visual reactions in undergraduate students at Psychology. It means that participants with poor handling (big number of errors) obtain incorrect responses on audio-visual tasks (number of errors <= 76, mean of omitted reactions=21.3548 □33.5625, corresponding to number of errors interval 77+). The general aspect of laterality researches are preserved in this paper also (is laterality influencing cognition?). We could not prove that left or right handed errors influence audio-visual responses, but we could prove that a general poor motor performance can be related to incorrect responses at sensorial tasks. So some aspects of cognitive life are influenced by laterality and others are not. Research directions can be multiple: continue research on a larger sample, with different ages, different professions, different education levels or conducting experiments where subjects can be trained on motor and handling tasks to see if the sensorial response is improving.

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