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EFFECT OF CEREBRAL LATERALIZATION ON VISUAL AND AUDITORY SIMPLE REACTION TIME AND REACTION ASYMMETRIES[i]

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Abstract:
The aim of the study is to examine the effect of cerebral lateralization on visual and auditory simple reaction time and reaction asymmetry in young adults. For this purpose, 52 individuals were divided into 3 groups according to hand preference and their audio-visual reaction times were measured and compared in both hands. The obtained data were analyzed in SPSS 22.0 program. After testing for normality and homogeneity, one-way analysis of variance and LSD correction were performed for multiple groups. According to the data obtained, it was determined that hand preference had no effect on reaction time and reaction asymmetry ($p>0.05$). As a result, it can be said that lateralization has no effect on reaction time and reaction asymmetry.

Keywords: reaction, asymmetry, lateralization

1. Introduction

Concentration is the tendency to be aware of stimuli and manage attention. He says that a person can be defined by two types of attention to a situation. The first of these is the width (breath) and the second is the internal-external (inward-outward) distinction. While breadth describes the distribution of the clues that the individual pays attention to, listening to the internal clues in himself/herself expresses internal attention, and paying attention to what other people are saying expresses external attention. While it is more important to pay attention to internal cues in closed skills, it is more important to pay attention to external cues in open skills situations. In cases of hyperarousal, fear and anxiety, the person's attention is narrowed (narrowing attention). Another attention-related feature is the flexibility of attention. That is, a person should be able to both

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narrow and widen his attention. A reaction is a person's response to a stimulus. The short duration of this means that the level of attention is higher and the neural conduction speed is more efficient (1).

Brain asymmetry or cerebral asymmetry refers to the anatomical, physiological or behavioral differences between the two brain hemispheres. The larger, more active, or superior in performance is hemisphere dominant. The asymmetry of brain function and its evolutionary origins is an important topic of modern neuroscience. The brain is considered asymmetrical if one hemisphere is structurally different from the other and/or performs different functions. For example, language and speech in humans is a function controlled by the left hemisphere in the vast majority of individuals. The right hemisphere, on the contrary, appears to be involved in various emotional and spatial functions (2).

According to the information above, the effect of brain asymmetry on reaction time and asymmetry, which are important components of attention, is unknown. For this reason, it is concluded that the study is important. The aim of the study is to examine the effect of cerebral lateralization on visual and auditory simple reaction time and reaction asymmetry in young adults.

2. Method

52 individuals between the ages of 25-35 participated in the study (Table 1). GPower 3.1 for determining the number of subjects. The a priori test was applied with the program.

After applying the lateralization test, the subjects were divided into three groups as right hand, left hand and both hands. Then, we applied visual and auditory simple reaction time tests to all subjects and determined the effect of lateralization between groups.

Table 1: Descriptive values

Group		**N**	**Mean**	**Std. Dev.**
Dominant right	Age (years)	23	33.30	9.970
	Height (cm)	23	176.74	5.864
	Weight (kg)	23	70.65	10.421
Ambidextrous	Age (years)	20	30.10	5.693
	Height (cm)	20	174.60	9.167
	Weight (kg)	20	69.20	14.152
Dominant left	Age (years)	9	29.67	7.762
	Height (cm)	9	173.78	5.449
	Weight (kg)	9	65.33	12.052

2.1 Lateralization Test

We applied the Edinburgh Inventory Oldfield Questionnaire to individuals to determine their hand preference (3). According to the Geschwind score for the frequency of the hand used in each task (4), all values from 0 to +100 (who marked all questions as right-handed) and 0 to -100 (who marked all questions as left-handed) were determined. In this survey,

there were questions about 10 types of work related to which hand they use the most. We made scores on the frequency of the hand used in each job. Questions in the survey; (1) writing (2) painting (3) throwing balls (4) holding scissors (5) brushing teeth (6) holding a knife (7) holding a fork (8) holding a shovel handle (9) striking a match and (10) It covers questions about which hand is used to open the lid of a box. The answer options are "always with the right hand" (+ 10 points), "usually with the right hand" (+ 5 points), "with both hands" (0 points), "usually with the left hand" (-5 points), and " always with the left hand" (-10 points). We evaluated the results according to the Geschwind score (GS).

The (-) values obtained after the survey indicated left-handedness, and the increase in (-) values indicated the degree of dominance in left-handedness. On the contrary, the (+) values indicated the deafness, and the increase in the (+) values indicated the dominance in the health status (3, 4).

2.2 Simple Reaction Time Measurements and Determination of Hand Reaction Asymmetry

Computerized reaction time tests were performed to measure visual reaction time and auditory reaction times (GRZ: www.humanbenchmark.com; IRZ: www.cognitivefun.net). In both tests, the reaction time was measured 5 times and the average was recorded in milliseconds (5). Both hands will be tested separately and the differences between the hands were evaluated as hand asymmetry.

2.3 Statistical Method

SPSS 22.0 program was used for statistical operations. After testing for normality and homogeneity, ANOVA and LSD tests were used to analyze the difference between groups. Values were presented as mean and standard deviation, and were analyzed at a significance level of 0.05.

3. Results

Table 2 shows the comparison of parameters between hand use groups. According to the results of the one-way analysis of variance, no significant difference was found between the groups in auditory reaction time (right-left hand), visual reaction time (right-left hand), and reaction time asymmetries ($p>0.05$). As a result of these data obtained, it was not determined that there was a significant difference between hand preference, reaction times and reaction asymmetries.

Table 2: Comparison of obtained parameters between hand use groups

		N	Mean	Std. Dev.	p
Auditory reaction time (right hand) (msec)	1) Dominant right	23	412.85	101.37	0,204
	2) Ambidextrous	20	412.17	84.59	
	3) Dominant left	9	352.39	70.85	
Auditory reaction time (left hand) (msec)	1) Dominant right	23	423.16	120.40	0,128
	2) Ambidextrous	20	386.92	86.15	
	3) Dominant left	9	341.58	84.23	
Visual reaction time (right hand) (msec)	1) Dominant right	23	353.52	66.72	0,137
	2) Ambidextrous	20	340.63	46.61	
	3) Dominant left	9	305.20	70.40	
Visual reaction time (left hand) (msec)	1) Dominant right	23	342.94	64.14	0,056
	2) Ambidextrous	20	318.80	53.73	
	3) Dominant left	9	289.78	34.94	
Auditory reaction time asymmetry (msec)	1) Dominant right	23	-10.31	57.71076	0,158
	2) Ambidextrous	20	25.24	46.87826	
	3) Dominant left	9	10.81	86.45889	
Visual reaction time asymmetry (msec)	1) Dominant right	23	10.58	55.24171	0,761
	2) Ambidextrous	20	21.83	37.89683	
	3) Dominant left	9	15.42	57.13820	

4. Discussion

The aim of the study is to examine the effect of cerebral lateralization on visual and auditory simple reaction time and reaction asymmetry in young adults. As a result of our study, it was not determined that there was a difference between hand preference and reaction time.

Reaction time is one of the important components for demonstrating performance. Reaction speed, which is known as a part of the movement speed, is known as the time between the initiation of conscious movement immediately after a signal is given and is related to neurophysiological properties (6).

The "reaction time", known as the time between the onset of the stimulus and the time when the response begins, is a decisive factor for performance. According to some scientists, reaction time has been defined as an internal expression between the receipt of the stimulus and the response to it. Movement time includes the time from the start of the movement to the end of the movement immediately after the reaction time. Movement time follows the reaction time in sports activity (6). Since the reaction tests we used in our study were capable of measuring simple reaction time, they at least eliminated the delay that would occur in the movement speed from the results, allowing the detection speed and reaction time characteristics to be revealed. It is thought that the results obtained thus reveal the reaction time of individuals independently from other factors. According to many studies, it has been reported that the sports status of the athletes (7, 8, 9) affects the reaction time.

It is thought that the result that we obtained in our study, which appeared in favor of left-handed individuals but was not statistically significant, may be due to cross-

transfer adaptation (10). As a result, it can be said that hand preference does not have a significant effect on simple reaction time, but the results are in favor of left-handed individuals.

Conflict of Interest Statement

There are no potential conflicts of interest on this article.

About the Authors

Mr. Kısak and Mr. Vural have Master of Science degree in sport science research field. Dr. Özdal is Associate Professor Doctor at Gaziantep University, Turkey.

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