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THE EFFECT OF CEREBRAL LATERALIZATION ON PSYCHOMOTOR PERFORMANCE IN SEDENTARY YOUTH

ABSTRACT

The aim of this study is to investigate the effect of cerebral lateralization on psychomotor performance in sedentary youth. Our study was designed according to ex post facto experimental design. The manipulative effect of lateralization on psychomotor traits as an unmanipulated independent variable has been investigated. The study involved 60 sedentary male subjects in the 15-18 age group. Lateralization tests and psychomotor performance tests were applied to the subjects within the scope of this study. The obtained data were analyzed in SPSS 22.0 program. After the normality and homogeneity test, the Kruskal Wallis test was applied to analyze the fark between multiple groups (the flatness and distortions of the data that do not show normal distribution were evaluated and those in the range of +/- 2.00 points were assumed to show normal distribution). Values were presented as mean and standard deviation and examined at a significance level of 0.05. According to the results obtained, it is said that while it creates a significant fark in some tests, it does not have a significant effect in some tests. Therefore, the hand preference of sedentary individuals is to be determined on psychomotor performance tests by participants who used the dominant right hand, dominant left hand and both hands no significant farks were seen between participants who used the dominant right hand, dominant left hand, and both hands. However, in the evaluation of reaction and attention test data, it can be said that dominant right-handers perform better than dominant left-handed individuals. At the same time, according to the comparisons between both hand users and dominant left-hand users, it can be said that there is a significant fark in favor of both hand users.

Keywords: cerebral lateralization, psychomotor performance, hand preference.

1. INTRODUCTION

Although hand preference is seen as a functional cerebral lateralisation, the predominance of one brain cell over the other is seen and accepted as an anatomical cerebral lateralisation. It is expressed as functional and anatomical differentiation between the left and right hemispheres of the cerebrum. Today, theories of asymmetry converge on three main ideas. First, asymmetries involve an attentional effect on the opposite cerebral hemisphere (Tan and Çalışkan, 1987: 189-94).

For example, for most verbal functions the dominance is in the right visual field; for other visual actions, the left visual field is more dominant. Second, although one hemisphere is commonly dominant for a particular domain of behaviour, both hemispheres can be found working together for a given task. For example, absolute knowledge about something we cannot see, and information about perception and measurement are received by the left hemisphere. Such hemispheric functional asymmetries may be a common computational criterion (Tan and Çalışkan, 1987: 189-94).

The third is the idea that asymmetries have a general dominance of one hemisphere over the other for unique abilities. For example, while the left hemisphere is involved in verbal functions, the right hemisphere is specialised for visual functions. Some monkeys and birds dominate only one centre in the left hemisphere for certain communication behaviours. Since mice resemble human asymmetries, they are a useful research and study group for understanding the basis of human asymmetries. Mice are neither as close to humans as monkeys nor as distant as (biological) birds in life science (Tan and Çalışkan, 1987: 189-94).

Cerebral lateralisation is the various abilities of the cerebral hemisphere to acquire, manage and control some specific neurological functions. It constitutes the source of the scientific approach necessary for the emergence of high-grade cerebral functions and disorders. In the past, it was assumed that the hemispheres showed a certain asymmetry in the brain, but later, with Broca's discoveries, anatomical asymmetries were described as smooth. In humans, verbal functions are observed to be dominant in the left hemisphere while the spatial function is dominant in the right hemisphere. Cerebral dominance refers to the dominance of one cerebral hemisphere over the other in the performance and control of certain neurological functions (Tan and Çalışkan, 1987: 189-94).

Cortical folding occurs earlier in the right hemisphere. The asymmetry is also noticeable in the rate of development of the hemispheres. The first functional layer (Heschl's gyrus) appears first on the right. In fact, the right side can be at least two weeks ahead. The development of the parts of the language in the left hemisphere is slower, which gives it an advantage in terms of being more complex and having a larger volume. This longer development time also makes this part more susceptible to developmental errors. In developmental dyslexia, disability in the left hemisphere was identified between the 20th and 16th weeks of the fetus (Foundas, Leonard, Gilmore, Fennell and Heilman, 1994: 1225-31).

Lateralisation is defined as the functional and anatomical bias in the human body in which some limbs and organs, limbs, and the cerebral hemisphere of the brain are more dominant than the dominant. Individuals often want to prefer one while using their feet and hands. This preference has social and anatomical bases. When we pay attention to the human population in the world, we see that 80%-90% of them are right-handed. People mostly prefer the right foot and right hand. When the proportion of ambidextrous people is taken as 30 percent, we can predict that the percentage here is 60 percent and left-handed individuals are 5 percent (Şen, 1998).

Considering the previous societies, it was explained that the low number of left-handed people was a symbol of evil and bad luck. The social and physical reasons for the prominence of this idea in modern societies with certain characteristics and diversity have always been a matter of curiosity and have been included in scientific research (Şen, 1998).

In light of this information, it was aimed to examine the effect of dominant right-handers, dominant left-handers, and ambidextrous users on psychomotor performance. Attempts have been made to contribute to the scarce literature on this subject, albeit only to some extent (Şen, 1998).

2. MATERIALS and METHODS

2.1. Desing and Scope

Our study was designed according to an ex post facto experimental design. Laterisation was investigated as a non-manipulated independent variable to investigate its manipulative effect on psychomotor traits. 60 sedentary male subjects aged 15-18 years participated in the study. As inclusion criteria, the subjects were asked not to have any health problems and not to have any sports branch and regular training program. The subjects were subjected to lateralisation test and psychomotor performance tests.

2.2. Collection of Data

2.2.1. Lateralization Test

The Edinburgh Inventory Oldfield Questionnaire was applied to determine hand preference. According to the Geschwind scoring of the frequency of the hand used in each task, all values from 0 to +100 (those who marked all questions as right-handed) and from 0 to -100 (those who marked all questions as left-handed) were determined. The questionnaire included questions about which hand they use more frequently for 10 types of work. The frequency of the hand used in each task was scored. The questions in the questionnaire included questions about (1) writing (2) drawing (3) throwing a ball (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) 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). The results were evaluated according to Geschwind's score (GS). The (-) values obtained after the questionnaire indicated left-handedness, and the increase in the (-) value indicated the degree of dominance in left-handedness. Conversely, (+) values indicated right-handedness and the increase in (+) value indicated the degree of dominance in right-handedness. The given values were analysed as lateralization coefficient (LC) (Menteşe, 2019).

2.2.2. Strength test

Wall squat test:

This test is again designed to assess the strength of the subject. On a blank and flat wall, the subject is asked to rest in the squat position. Then, without distorting the position and separating the waist from the wall, he lifts one foot to a height of 5 cm, and the test is started. During this time, the subject should not receive support from anywhere with his hand and the hip and waist posture should be straight and against the wall. When this specified position is disturbed and the foot is touched to the ground, the test is terminated. The test is done in two legs. time is recorded in seconds (Vaegter, Lyng, Yttereng, Christensen, Sørensen and Graven-Nielsen, 2019: 129-137).

Twisted arm hanging test:

For this test, a bar is needed where the subjects will come out with help and hang out. The subject should be assisted by grasping the bar with his hand from the front, while the shoulders should be wide and the thumb should be at the bottom and the other fingers should be on top. It is helped until the chin rises to bar level. Time is taken when the chin will not go under the bar and the arms will not disturb the 90 degrees. The test is terminated as soon as the eyes go under the bar. The duration is recorded in seconds (Vaegter, Lyng, Yttereng, Christensen, Sørensen and Graven-Nielsen, 2019: 129-137).

2.2.3. Attention Test

In the test developed by Benjamin Bourdon, there are various letters designed as jumble. The individual was asked to find the letters "a, b, d, and g" in the existing letters in 5 minutes. The individual can add various signs to indicate the letter found. There are 660 letters in total in the Bourdon attention test. The test can be applied to any individual, regardless of age, who understands and identifies the letters. The evaluation was based on the letters correctly marked by the test subjects (Kaymak, 2003).

2.2.4. Balance Test

For the stork balance test, the subjects put their hands on their waist, one foot was on the knee of the other and when they felt ready, they started the test by lifting their feet on the floor to the toes. When their balance was disturbed, the time was stopped and the total time was recorded. The same test was repeated with eyes closed (Vaegter, Lyng, Yttereng, Christensen, Sørensen and Graven-Nielsen, 2019: 129-137).

2.2.5. Reaction Time Test

Computational reaction time tests were applied to measure visual reaction time and auditory reaction time (GRT: www.humanbenchmark.com; IRT: cognitivefun.net). In both tests, reaction time was measured 5 times and the mean was recorded in milliseconds (Bisazza, Rogers and Vallortigara, 1998: 411-426).

2.2.6. Flexibility Test

In this measurement with the sit-reach test, the starting point was determined after the subject placed his/her feet on the sit-reach table and then stretched his/her arms forwards. From this point, the subject reached as far as he/she could without bending his/her knees. The test was repeated three times and the best was recorded. The distance was recorded in centimeters (Vaegter, Lyng, Yttereng, Christensen, Sørensen and Graven-Nielsen, 2019: 129-137).

2.2.7. Sprint Test

For maximal sprint performance, a 30 m sprint was measured with a photocell and the time in seconds was recorded when the subjects reached the relevant distance. The test for 30 meters was started after a 20 meter acceleration run (Vaegter, Lyng, Yttereng, Christensen, Sørensen and Graven-Nielsen, 2019: 129-137).

2.3. Statistical Method

SPSS 22.0 program was used for statistical procedures. Following the normality and homogeneity test (kurtosis and skewness of the data that did not show normal distribution were evaluated and those in the range of +/- 2.00 points were assumed to show normal distribution), Kruskal Wallis test was applied to analyse the fark between multiple groups. Values were presented as mean and standard deviation and analysed at a 0.05 significance level.

3. RESULTS

The aim of the study was to investigate the effect of cerebral lateralisation on psychomotor performance in sedentary young people. In this section, the data obtained were analysed.

Table 4.1. Comparison of right leg data of wall squat test according to hand preference

		N	Avg.	S.D.	P	Difference
Wall Squat Test Right (sec.)	a) Dominant Right Handed	47	26,75	17,76	0,100	-
	b) Ambidextrous	9	26,85	24,52		
	c) Dominant Left Handed	7	15,16	18,21		

In Table 4.1, the right leg data of the wall squat test were compared according to hand preference. According to the Kruskal Wallis test results, no significant fark was observed between the dominant right hand, dominant left hand and ambidextrous participants (p>0.05).

Table 4.2. Comparison of left leg data of wall squat test according to hand preference

		N	Avg.	S.D.	P	Difference
Duvarda Squat Testi Sol (sn.)	a) Dominant Right Handed	47	27,87	21,61	0,085	-
	b) Ambidextrous	9	18,24	19,82		
	c) Dominant Left Handed	7	14,92	24,20		

In Table 4.2, the left leg data of the wall squat test were compared according to hand preference. According to the Kruskal-Wallis test results, no significant fark was observed between the dominant right hand, dominant left hand and ambidextrous participants (p>0.05).

Table 4.3. Comparison of eye-open balance test data according to hand preference

		N	Avg.	S.D.	P	Difference
Eye-open Balance Test (sec.)	a) Dominant Right Handed	47	5,70	5,67	0,537	-
	b) Ambidextrous	9	6,43	9,32		
	c) Dominant Left Handed	7	6,69	8,96		

In Table 4.3, a comparison of the eye-open balance test data according to hand preference was made. According to the Kruskal-Wallis test results, no significant difference was observed between the participants using the dominant right hand, dominant left hand, and both hands (p>0.05).

Table 4.4. Comparison of eye-closed balance test data according to hand preference

		N	Avg.	S.D.	P	Difference
Eye Closed Balance Test (sec.)	a) Dominant Right Handed	47	2,99	5,92	0,093	-
	b) Ambidextrous	9	2,68	1,09		
	c) Dominant Left Handed	7	1,65	,80		

In Table 4.4, a comparison of the eye-closed balance test data according to hand preference was made. According to the Kruskal-Wallis test results, there was no significant difference between the participants using the dominant right hand, dominant left hand, and both hands (p>0.05).

Table 4.5. Comparison of twisted arm hanging test data according to hand preference

		N	Avg.	S.D.	P	Difference
Bent Arm Hanging Test (sec.)	a) Dominant Right Handed	47	5,41	3,81	0,512	-
	b) Ambidextrous	9	7,26	4,72		
	c) Dominant Left Handed	7	6,85	5,87		

In Table 4.5, the comparison of the bent arm hanging test data according to hand preference was made. According to the Kruskal-Wallis test results, there was no significant difference between the participants using the dominant right hand, dominant left hand, and both hands (p>0.05).

Table 4.6. Comparison of 30m sprint test data according to hand preference

		N	Avg.	S.D.	P	Difference
30m Sprint Test (sec.)	a) Dominant Right Handed	47	6,16	,64	0,395	-
	b) Ambidextrous	9	6,00	,38		
	c) Dominant Left Handed	7	6,43	,89		

In Table 4.6, the comparison of 30m sprint test data according to hand preference was made. According to the Kruskal-Wallis test results, there was no significant difference between the participants using dominant right hand, the dominant left hand, and both hands (p>0.05).

Table 4.7. Comparison of sit-lie flexibility test data according to hand preference

		N	Avg.	S.D.	P	Difference
Sit-Reach Flexibility Test (cm)	a) Dominant Right Handed	47	17,30	3,78	0,855	-
	b) Ambidextrous	9	18,00	4,80		
	c) Dominant Left Handed	7	17,14	4,14		

Table 4.7. shows the comparison of sit-lie flexibility test data according to hand preference. According to the Kruskal-Wallis test results, no significant difference was observed between the participants using dominant right hand, the dominant left hand, and both hands (p>0.05).

Table 4.8. Comparison of attention test data according to hand preference

		N	Avg.	S.D.	P	Difference
Attention test (score)	a) Dominant Right Handed	47	103,29	7,43	**0,029**	a-c b-c
	b) Ambidextrous	9	99,89	18,56		
	c) Dominant Left Handed	7	93,64	8,61		

In Table 4.8, the comparison of attention test data according to hand preference was made. According to Kruskal Wallis test results, a significant difference was found between the groups (p<0.05). It was determined that there was a significant difference between dominant right-handers and dominant left-handers in favour of right-handers and between both-handers and dominant left-handers in favour of both-handers (p<0.05).

Table 4.9. Comparison of simple visual reaction time data according to hand preference

		N	Avg.	S.D.	P	Difference
Simple Visual Reaction Time (ms)	a) Dominant Right Handed	47	357,64	71,06	**0,032**	a-c b-c
	b) Ambidextrous	9	348,33	71,74		
	c) Dominant Left Handed	7	431,86	85,98		

Table 4.9. shows the comparison of simple visual reaction time data according to hand preference. According to Kruskal Wallis test results, a significant difference was found between the groups (p<0.05). It was determined that there was a significant difference between dominant right-handers and dominant left-handers in favour of right-handers, and between ambidextrous and dominant left-handers in favour of ambidextrous (p<0.05).

Table 4.10. Comparison of simple auditory reaction time data according to hand preference

		N	Avg.	S.D.	P	Difference
Simple Auditory Reaction Time (ms)	a) Dominant Right Handed	47	344,37	68,90	**0,042**	a-c b-c
	b) Ambidextrous	9	346,21	97,59		
	c) Dominant Left Handed	7	545,69	198,82		

Table 4.10. shows the comparison of simple auditory reaction time data according to hand preference. According to Kruskal Wallis test results, a significant difference was found between the groups (p<0.05). It was determined that there was a significant difference between dominant right-handers and dominant left-handers in favour of right-handers and between both-handers and dominant left-handers in favour of both-handers (p<0.05).

Table 4.11. Comparison of lateralisation coefficient data according to hand preference

		N	Avg.	S.D.	P	Difference
Coefficient of lateralisation (score)	a) Dominant Right Handed	47	81,06	13,83	**0,001**	a-c a-b b-c
	b) Ambidextrous	9	25,56	26,51		
	c) Dominant Left Handed	7	-94,29	15,12		

Table 4.11. shows the comparison of lateralisation coefficient data according to hand preference. According to Kruskal Wallis test results, a significant difference was found between the groups (p<0.05). The result between dominant right-handers and dominant left-handers was in favour of right-handers. There was a significant difference between dominant right-handers and dominant left-handers in favour of right-handers and between dominant left-handers and dominant right-handers in favour of both handers (p<0.05).

4. DISCUSSION

The aim of this study was to investigate the effect of cerebral lateralisation on psychomotor performance in sedentary young people. Our study was designed according to an ex post facto experimental design. The manipulative effect of lateralisation as an unmanipulated independent variable on psychomotor characteristics was investigated.

For this purpose, 60 sedentary male subjects aged 15-18 years participated in the study. Laterisation tests and psychomotor performance tests were applied to the subjects within the scope of this study. SPSS 22.0 program was used for statistical procedures. After the normality and homogeneity test (kurtosis and skewness of the data that did not show normal distribution were evaluated and it was assumed that those in the range of +/- 2.00 points showed normal distribution), the Kruskal Wallis test was applied to analyse the difference between multiple groups. Values were presented as mean and standard deviation and analysed at a 0.05 significance level.

Hand preference is defined as using the right or left hand more in performing various hand skills such as writing, drawing, and using forks and knives. Hand preference starts to emerge at the age of 1-1.5 years, becomes established at the age of 3 years, and becomes definite at the age of 8 years. This is also related to myelination of the corpus callosum (Oldfield, 1971: 97-113)

The preferred hand is also called the dominant hand. Similar to hand preference, foot, eye, and ear dominance has also been reported (Tanrıdağ, 1994: 41-45). It is generally accepted that hand and foot preference is related to cerebral dominance and it has been stated that cerebral lateralisation explains the anatomical and functional differentiation between the right and left hemispheres of the brain (Coren and Halpern, 1991: 90, McManus, 1999: 55-92).

A child's hand preference can be determined by observing which hand he/she uses for his/her work and asking him/her questions. Ability asymmetry can be determined by measuring the different and simultaneous behaviour of the left and right hands in a given test mechanism. To make the connection between the functions of the hemisphere and the preferred hand more explicit, it is first necessary to define hand dominance. When there is no significant difference in the strength of one hand relative to the other hand, the difference in the skill of one hand relative to the other hand is referred to as hand dominance. Hand preference in a newborn baby starts to show itself between 12-18 months. A clue to the baby's hand preference in the 12-18 month period is the direction in which the baby turns its head when lying down. The establishment of this condition is at the age of three and its finalisation is by the age of eight. This is related to the myelination of the corpus callosum. The functioning of the corpus callosum ensures the connection of one hemisphere with the other and causes one hemisphere to dominate the other for some functions (Bishop, 1989: 191-9; Gündoğan, Yazıcı and Şimşek, 2007: 99-103).

Preferred hand preference is divided into inconsistent hand preference and consistent hand preference. Performing some of the activities that require skill with one hand and some of the activities that require skill with the other hand while doing a job is called inconsistent hand preference. Performing all activities that require skill with the same hand is a consistent hand preference. A consistent hand that throws and writes only with the right hand is characterised as an inconsistent hand that throws and writes with the right and left hand (Öktem and Sonuvar, 1993: 267-72, McManus, 1999: 55-92).

Peters evaluated a person's consistent and inconsistent handedness as consistent right-handedness if he/she uses his/her right hand while writing and throwing, and consistent left-handedness if he/she performs throwing and writing with the left hand (Gilbert and Wysocki, 1992: 601-8).

At the same time, he was evaluated as inconsistent left-handed when writing with the right hand and throwing with the left hand, and inconsistent right-handed when writing with the left hand and throwing with the right hand (Williams and Walmsley, 2000: 460-75).

In the data obtained in our study, the squat test on the wall according to hand preference was compared with the right leg data. When the Kruskal Wallis test results were analysed, no significant difference was observed between the participants using the dominant right hand, dominant left hand, and both hands ($p>0.05$). At the same time, a comparison was made with the left leg data of the wall squat test according to hand preference. When the Kruskal Wallis test results were taken into consideration, there was no significant difference between the participants using dominant right hand, the dominant left hand, and both hands ($p>0.05$).

In our study, we compared the stork eye open balance test data according to hand preferences. According to the Kruskal-Wallis test results, no significant difference was observed between the participants using the dominant right hand, dominant left hand, and both hands (p>0.05).

Again, when we looked at the Kruskal Wallis test results on the comparison of the stork eye closed balance test data according to hand preference, there was no significant difference between the dominant right and left hand and the subjects using both hands (p>0.05).

When we compared the hand preferences with the bent arm hanging test we applied to the subjects, according to the Kruskal Wallis test results, there was no significant difference between the dominant right hand, dominant left hand, and ambidextrous participants (p>0.05).

When the 30 m sprint test data applied to the subjects in our study were compared, no significant difference was observed between the dominant right hand, dominant left hand, and ambidextrous participants according to the Kruskal Wallis test results (p>0.05).

A comparison of the sit-reach flexibility test data according to hand preference, which we included in our study, was made. According to the Kruskal Wallis test results, there was no significant difference between the participants using the dominant right hand, dominant left hand, and both hands (p>0.05).

The attention test data were compared according to the hand preference of the subjects and according to the Kruskal Wallis test results, a significant difference was found between the groups (p<0.05). It was determined that there was a significant difference between dominant right-handed and left-handed users in favour of right-handed users. In addition, when a comparison was made between ambidextrous and left-handed users, a significant difference was found in favour of ambidextrous users (p<0.05).

In our study, simple visual reaction time data were compared according to the hand preference of the subjects. According to Kruskal Wallis test results, a significant difference was found between the groups (p<0.05). It was determined that there was a significant difference between dominant right-handed and left-handed users in favour of right-handed users. In addition, when a comparison was made between ambidextrous and left-handed users, a significant difference was found in favour of ambidextrous users (p<0.05).

As a result of the comparison of the simple auditory reaction time test data we applied it to the subjects according to hand preference, and Kruskal Wallis test results were examined. According to this test, a significant difference was found between the groups (p<0.05). It was determined that there was a significant difference between dominant right-handed and left-handed users in favour of right-handed users. In addition, when a comparison was made between ambidextrous and left-handed users, it was found that there was a significant difference in favour of ambidextrous users (p<0.05).

Edinburgh Inventory Oldfield Questionnaire lateralisation coefficient data were compared according to hand preference. When Kruskal Wallis test results were taken into consideration, a significant difference was found between the groups (p<0.05). It was determined that there was a significant difference between dominant right-handers and dominant left-handers in favour of right-handers, between dominant right-handers and versatile users in favour of right-handers, and between versatile users and left-handers in favour of ambidextrous users.

This study, it is discussed similar studies in the literature on whether there is a significant difference between dominant hand and psychomotor performance obtained as a result of statistical studies to examine the effect of cerebral lateralisation on psychomotor performance in sedentary young people. Studies on the brain have revealed that the right and left brain hemispheres process information differently (Williams and Walmsley, 2000: 460-75)

Although both hemispheres of the brain are used to learn information, one hemisphere is generally considered to be more dominant than the other. The left hemisphere includes verbal, sequential, and analytical abilities. The right hemisphere contains holistic and visual abilities. Therefore, students with the dominant right hemisphere and students with the dominant left hemisphere have different learning styles (Reiff, 1992)

In a study on hand preference, Seddon and McManus reported that the rate of left-handedness was approximately 8% worldwide (Sedon and McManus, 1993: 168-190)

Spence and Flynn argue that the left cerebral hemisphere is responsible for logical, controlled, planned thoughts and actions (Spence and Flynn, 2001)

Cerebral lateralization causes performance differences in human movement and motor skills (Akça, Çekin, Ziyagil, 2015: 1-8). Even if one hemisphere is larger than the other in anatomical lateralization, hand preference is considered functional cerebral lateralization (Hagmann, Cammoun, Martuzzi, Maeder and Clarke, 2006: 828-35)

Today, studies on hemispheric asymmetry aim to determine the hand, foot, and eye preferences of individuals in order to provide a basis for cerebral lateralization studies. Barut and others. realized that hand preference, foot preference, and eye preference play an important role in the evaluation of cerebral lateralization (Günther, Bürger, Rickert and Schulz, 2008: 144-148)

In a similar study, Annett stated that "the rate of right eye preference among right-handed users was higher than the rate of right eye dominance among left-handed users" (Annett and Turner, 1974: 37-46)

As a result of the research conducted by Yıldız, Açan, Berber, Bulut, and Zalimhan, it was determined that approximately 91% of the students used their right hand and approximately 9% used their left hand while writing. Schwellnus, Carnahan, Kushki, Polatajko, Missiuna, and Chau, in their study with fourth-grade students, found that 93% of the students used their right hand and 7% used their left hand while writing. In addition, Dennis and Smith found that 91.3% of the students preferred the right hand and 8.07% preferred the left hand while writing (Yıldız, Açan, Berber, Bulut and Zalimhan, 2015: 61-71).

These researches also support the results of the research revealing that most students prefer the right hand while writing. It can be argued that the proportional difference is due to the characteristics of the selected study group. Arhan, Soysal, Handan, and Aktürk stated in their studies that the factors affecting hand preferences are genetic and environmental. In the same study, it was stated that one hemisphere of the human brain gains the ability to analyze in time and the other hemisphere gains the ability to analyze in spatial dimensions and that they use these abilities asymmetrically. This situation may explain the proportional differences between the studies (Soysal, Arhan, Aktürk and Handan, 2007: 60-68).

Ornstein and other researchers have stated that the left hemisphere of the brain generally manages verbal, linguistic, analytical, linear and logical functions. In other words, the right hemisphere of the brain deals with non-verbal functions, i.e. the processing of colour, music, imagination, rhythm, shapes and schemes, intuition, spatial awareness, dealing with ambiguity, processing random and open-ended ideas, and visual-spatial processing (Wortock, 2002; Özden, 2003; Penfield ve Roberts, 1959; Demirel, 2003; Gülpınar, 2005: 272-306)

In addition, a significant difference was observed between left-handed and right-handed users in gross and fine motor skills. Two-handed children were found to have lower results than right- and left-handed children. Similarly, Johnston and colleagues, in order to examine the effect of handedness on child development, found that left-handed and ambidextrous children performed significantly lower than right-handed children in all developmental scales and that this situation was more disadvantageous for boys (Johnston, 2009: 94-101).

Some studies have been conducted to examine the effect of hand preference on the sport. One of these is a study conducted by Gürsoy on boxers in 2009. In the study, left-handed boxers lost 19.3 matches in M = 120.6 matches, but right-handed boxers lost 42.3 matches in M = 127.8 matches. This shows that left-handed boxers showed a more successful performance by losing fewer matches than right-handed boxers (Gürsoy, 2009: 142,144).

Again, in a study in which 18 volleyball players were examined by video analysis method, Loffing and others showed that left-handed volleyball players had better visual perception skills than right-handed volleyball players because they were more successful in predicting the direction of shots made from near and far (Loffing, Schorer, Hagemann and Baker, 2012: 446-453).

Çingöz stated in a study that left-handed athletes were at the forefront again. She observed that female left-handed athletes who were interested in karate and taekwondo were more successful in terms of dominant hand preference and medal-winning status (Çingöz, 2017).

Despite some studies, Puterman and others found that right-handed goalkeepers were more successful in saving shots than left-handed goalkeepers in a study conducted on athletes interested in ice hockey. In other words, this situation is in favour of the right hand (Puterman, Baker and Schorer, 2010: 1581-1593).

Ziyagil and Gürsoy also contributed to the studies conducted to learn the effects of hand preference on sports branches. In 2010, they reported that dominant left-handed wrestlers won more matches, more degrees and more medals in two different world wrestling championships (Istanbul and Greece) (Ziyagil, Gursoy, Dane and Yuksel, 2010: 65-70).

When the studies on lateralisation in the literature were examined, it was seen that the studies examining the effect of hand preference on psychomotor performance in sedentary individuals were limited. However, although there was no significant result in favour of dominant right-handed individuals, it was determined that right-handed individuals had better performance. The fact that no significant results were obtained in our study and that there was no effect of hand preference in some of the tests partially supports the literature. However, in our study, in the simple visual and simple auditory reaction time test and in the attention test data, the results were found to be in favour of the right hand. In addition, when left hand comparisons were made, results were obtained in favour of both hands. In conclusion, hand preference and lateralisation do not have a statistically significant effect on psychomotor performance regardless of which hand is measured; however, it can be said that the reaction times and attention levels of left-handed individuals are significantly lower than those of right-handed individuals. Although this result is not statistically significant, it is considered important to detect this difference. The possible reason for this result may be that the performance of the experiment was obtained in the dominant hand, and the non-dominant hand was prevented from making a clear difference due to performance losses during the application. For the data that do not show a significant difference, a more detailed study can be conducted with different sample groups and various experiments.

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