Hacettepe Üniversitesi Eğitim Fakültesi Dergisi 22 : 40-45 [2002]

J. of Ed 22

THE RELATIONSHIP BETWEEN LEFT-HANDEDNESS AND APTITUDE IN GEOMETRY

SOLAKLIK İLE GEOMETRİYE YATKINLIK ARASINDAKİ İLİŞKİ

Nezahat ÇETİN*, Nevin MAHİR* ve Şükrü TORUN**

ABSTRACT: The present study aimed at investigating if there is a difference between left-handed and right-handed people in the perception time of numbers represented by geometric shapes. The findings of the study indicated that the left-handed perceived the number of corners in regular polygon in a shorter time compared with the right-handed. This difference reveals that the left-handed shows an aptitude in geometry.

KEY WORDS: Left-handedness, Aptitude in geometry, Perception time of numbers.

ÖZET: Bu çalışmada, sayıların geometrik şekiller ile temsil edilmesi durumunda, bu sayıların algılanma süresinde, sol elini kullanan kişiler(solaklar) ile sağ elini kullanan kişiler arasında bir farklılık olup olmadığı araştırılmıştır. Yapılan deneyler, sol elini kullanan kişilerin, düzgün çokgenlerin köşe sayısını, sağ elini kullanan kişilere göre daha kısa sürede algıladıklarını göstermektedir. Görülen bu farklılık, sol elini kullanan kişilerin "geometriye yatkın" olduğunu düşündürmektedir.

ANAHTAR SÖZCÜKLER: Solaklık, Geometriye yatkınlık, Sayıların algılanma süreleri.

1. INTRODUCTION

Although each hemisphere may be specialized for a particular function, such as linguistic performance, both may, also, co-operate for certain other functions. The reason why the left or the right hand is dominant remains unclear. In addition to hereditary factors, left or right hand dominance is mostly formed in the language development process. In the 96% of the right-handed, the linguistic performance is controlled by the left-hemisphere. Only in the 4% of the right-handed, right hemisphere is dominant, whereas in the 15% of the left-handed, the right is more dominant. (In additional 15% of the left handed the right hemisphere is equally involved.) What's even more interesting is that some of the left-handed use both hemispheres for linguistic performance. Although hemispheric dominance varies in the left-handed or the ambidextrous, dominance of right-hemisphere is more significant in the left-handed compared with the right-handed [1] (Table1).

In some functions, hemispheres play an important role. In the left-hemisphere, pariyeto-temporal part has cognitive functions such as storing, recalling basic symbols (letter, number, colour, name, etc.), reading, spelling, writing, comprehension and production of language. On the other hand, pariyeto-temporal part of right-hemisphere has functions such as recognition of face and objects, ordering and ranking, non-verbal communication, perception of music and geometric language [2].

In an earlier study, 20 students who are

Table 1: The relation between hand-dominance and hemispheric-dominance.

Hand dominance	Left-Hemisphere Dominance (%)	Right-Hemisphere Dominance (%)	Both (%)
Left-handed or Ambidextrous	70	15	15
Right-handed	96	4	0

* Yrd. Doç. Dr., Anadolu Üniversitesi, Fen Fakültesi, Matematik Bölümü, Eskişehir

** Doç. Dr., Anadolu Üniversitesi, Mediko Sosyal Hastanesi, Nöroloji Bölümü, Eskişehir

successful in geometry and 20 students who are successful in algebra, but not in geometry were compared in terms of perception time of numbers represented in geometric shapes. The findings indicated that students who are successful in geometry perceived these numbers in a shorter period of time [3]. The significant difference between these two groups proved that " aptitude in geometry" could be measured. Based on the given information, it is worth investigating the relation between left-handedness and aptitude for geometry. In the present study, the aim is to find out if there is a relation between left-handedness and aptitude for geometry.

2. EXPERIMENTS

In the experiments, two different groups whose ages ranged between 18 to 30 participated. First group consisted of 30 left-handed people and the second group consisted of 30 right-handed people. The second group functioned as the control group. Gender and education level of the two groups were controlled to prevent intervention of these variables on the results. In the experiments, two different sets of tests each of which consisted of groups of objects with maximum 8 elements were used. In the tests, in order to test aptitude in geometry, numbers were represented by regular polygons, and in order to test aptitude for algebra, numbers were represented by bars ordered side by side (Figure 1).

In the first experiment, subjects in both groups were asked to identify the number of bars which appeared on the computer screen randomly each time on a different part of the screen. These bars were presented 80 times, which means that each group represented by bars would appear on the screen 10 times .The perception time of the number of elements in each group was measured by a specially designed circuit. The perception time of each subject was calculated in terms of the average time spent for perceiving the number of elements each time this specific set appeared on the screen. As the percentage of incorrect answers was not more than 1% in all of the tests, in the calculation of the average, these incorrect answers were not taken into consideration .In the second experiment, the objects that form the groups were represented by regular polygons. These were rotated with a 45^0 and 90^0 angle when they appeared on the screen, and they were presented in a random order. These two different tests were first given to the left-handed and average perception time of the groups of objects were calculated. The same process were applied for the control group. In order to compare average of the control and the experimental group, t-test was run.

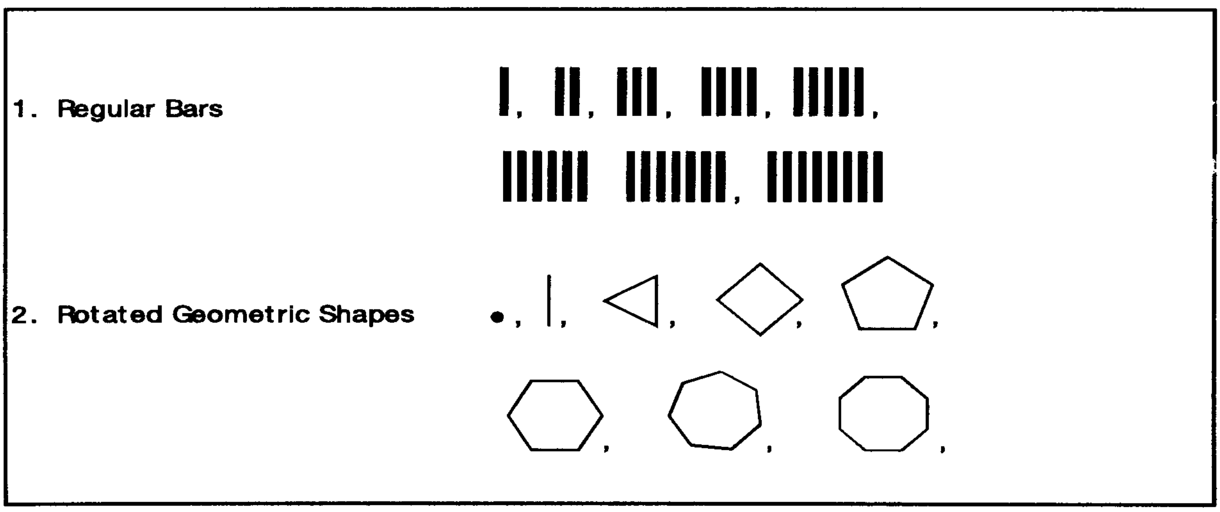

Figure 1: Objects forming the groups

3. RESULTS AND DISCUSSION

The proposed hypothesis was that the left-handed would perceive the groups represented by geometric shapes in a shorter period of time compared with the right-handed. And a one-tailed test was used to test this. When the critical t value of one tailed t-test (1,645) compared with t values found (Table 2), it is found that the left-handed perceive numbers represented by geometrical shapes in a shorter period of time. And, this finding is 95% confident. The findings indicated that the left-handed perceive numbers in a shorter time when represented by geometric shapes. The average perception time of both control and experimental groups when objects are represented by geometric shapes are presented in Table 3 and the graphic representation is presented in Figure2.

In addition to this, the hypothesis "There is no significant difference in the perception time between the left-handed, and the right-handed , when groups are represented by bars" was tested and this was a two-tailed test. When the critical t-value (1,96) compared to the t-values found out (Table 4), a significant difference between the perception time of the left-handed and the right-handed was found, and this finding is 95% reliable. Average perception time of both control and experimental groups are presented in Table 5 and the graphic representation is presented in Figure 3.

Table 2: Calculated t-values when groups are represented by geometric shapes.

t	3.634	3.763	2.698	3.039	3.108	3.176	3.983	3.913

Table 3: The perception times of numbers when groups are represented by geometric shapes.

Number of Elements (in a group)	The Average Of Perception Time Of The Left-Handed When Groups Are Represented By Geometric Shapes(msec.)	The Average Of Perception Time Of The Control Group When Groups Are Represented By Geometric Shapes(msec.)
One	430,1692	557,3733
Two	436,2739	582,4146
Three	457,7914	565,621
Four	464,1017	591,4453
Five	665,1552	961,6037
Six	861,8295	1181,372
Seven	1037,513	1784,814
Eight	983,1337	1540,765

Tablo 4: Calculated t-values when groups are represented by bars.

t	2.774	2.286	1.622	2.441	2.292	1.984	2.455	2.299

Table 5: The perception times of numbers when groups are represented by bars.

Number of Elements (in a group)	The Average Of Perception Time Of The Left-Handed When Groups Are Represented By Bars (msec.)	The Average Of Perception Time Of The Control Group When Groups Are Represented By Bars (msec.)
One	420,5137	488,0283
Two	455,7579	509,2398
Three	524,301	569,3034
Four	607,6381	690,9201
Five	779,8625	953,2593
Six	978,577	1181,483
Seven	1226,194	1516,905
Eight	1316,551	1618,96

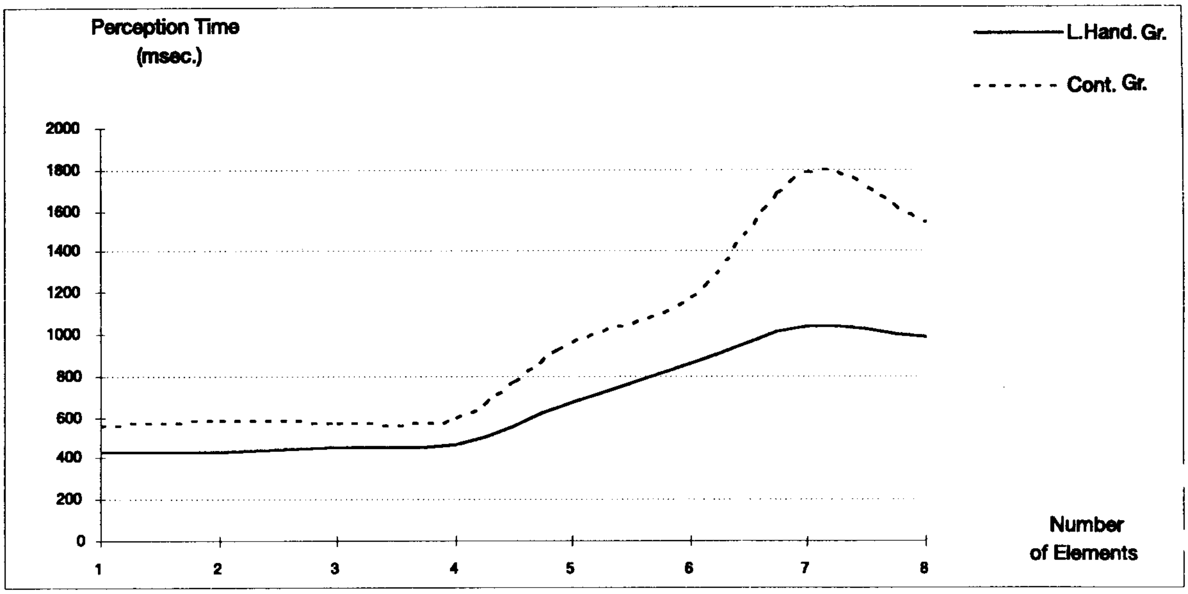

Figure 2: The average of perception time of the left-handed and the control group when groups are represented by geometric shapes.

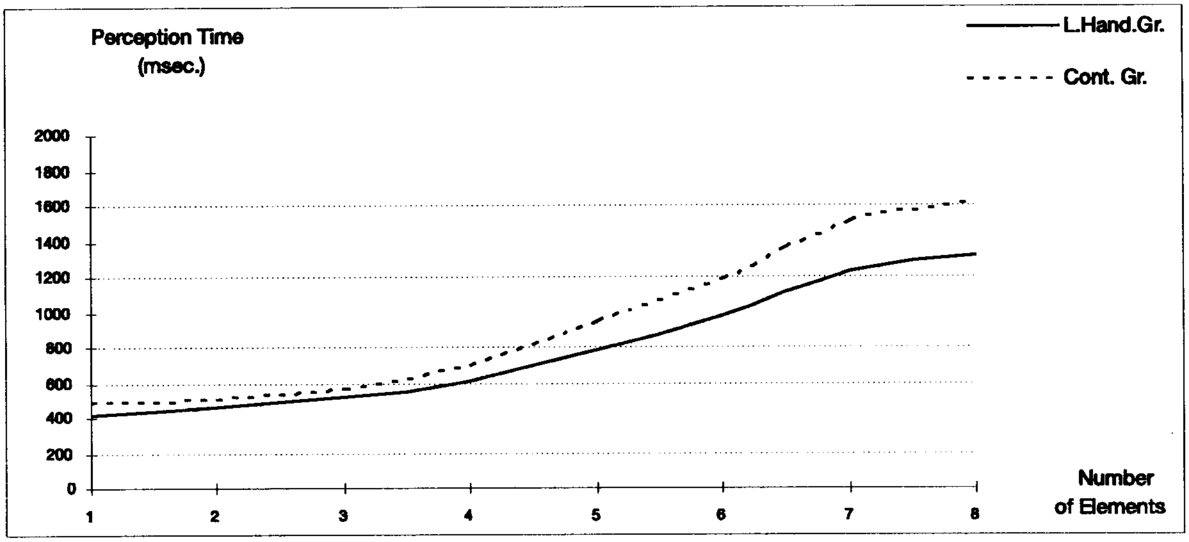

Figure 3: The average of perception time of the left-handed and the control group when groups are represented by bars.

The findings presented above support the hypothesis that the left-handed have on aptitude in geometry.

The findings of the study also indicated that the left-handed perceived the numbers represented by bars in a shorter time compared with the right-handed. The reason of this could be attributed to the attention factor which is central to the mental sorting and selecting required in selection and evaluation of an object and reacting to it. In controlling the attention factor, especially in changing the focus of attention, right hemisphere which is not dominant in the left-handed, plays an important role [4].

In the experiments, it was observed that 4 of the left-handed perceived numbers in a shorter period of time when represented by bars. The graphic representation of perception time of these 4 people were given in Figure 4. The reason of this may be that the left-hemisphere is dominant in a significant proportion of the left-handed. However, the comparison of total perception time of 30 left-handed with recalculated perception time by excluding these 4 people indicated no significant difference (Table 6). This reveals that some of the left-handed, algebraic perception could be faster; however, this does not affect the result that the left-handed may have a superiority in perceiving the geometric shapes. Increasing the number of subjects and using different geometric shapes can be thought to increase the possibility of basing the hypothesis that the left-handed have an aptitude in geometry on a measurable ground. In this study, hemispheric dominance of the subjects was identified according to left or right hand dominance. Conducting experiments with the groups in which hemispheric dominance is identified by more concrete evidence obtained by tests such as wada, and methods like identification of blood flow in brain during speaking [5] would reveal the role of hemispheres (left/right-hand dominance) in algebraic and geometric perception time.

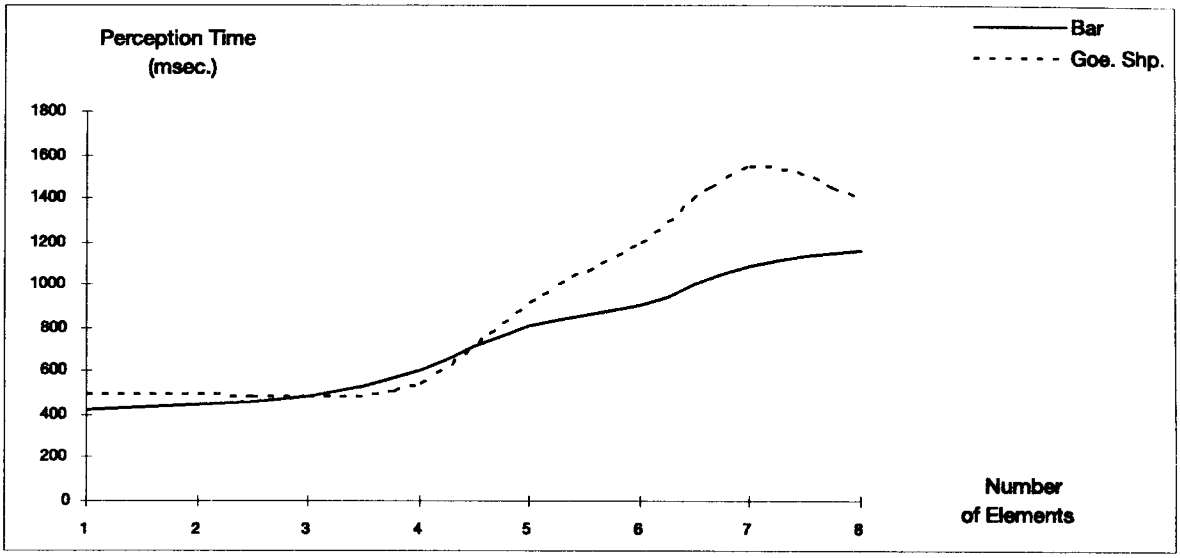

Figure 4: The average of perception time of the four left-handed.

Table 6: The Perception time of 26 left-handed.

Number of Elements (in a group)	The Average Of Perception Time Of The 26 Left-Handed When Groups Are Represented By Geometric Shapes(msec.)	The Average Of Perception Time Of The 26 Left-Handed When Groups Are Represented By Bars(msec.)
One	420,949	420,8418
Two	427,7906	456,5952
Three	454,2353	530,4109
Four	452,5778	607,7689
Five	625,6806	775,1749
Six	810,8199	990,6396
Seven	958,4625	1247,635
Eight	918,1972	1340,812

7. REFERENCES

Rasmussen, T., Milner, B., "The role of early left-brain injury in determining lateralization of cerebral speech functions", **Ann. N. Y. Acad. Sci**, 299, 335-369, (1977).

Elsevier, R. I., **"Handbook of neuropsychology"**, Ed: Segalowitz, S. L., (1992).

Çetin, N., Koçak, Ş., Mahir, N. & Üreyen, M., "Perception Times of Numbers and Detection of Geometrical Talent", **Proceeding of the international conference on mathematics education"**, Ed: Rogerson, A., Vol 1, Cairo, Egypt, 105-110, (1999).

Contwell, D. P., "Attention deficit disorder: A rewiev of the past ten years", **J. Am. Acad. Child Adolese Psychiatry"**, 35(8), 978-987, (1996)

Adams, R., Victor, M., Ropper, A. H., **"Principles of Neurology"**, New York, Mc. Graw Hill, pp: 476, (1997)