NORTHWESTERN MEDICAL JOURNAL

Northwestern Med J. 2024;4(3):176-180
DOI: 10.54307/NWMJ.2024.138

RESEARCH ARTICLE

Examining the concordance between dominant eye and hand preference in healthy adults

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Cite as: Soydan A, Kürtül İ, Ray G, Ray A. Examining the concordance between dominant eye and hand preference in healthy adults. Northwestern Med J. 2024;4(3):176-180.

ABSTRACT

Aim: This study was designed to reveal the relationship between dominant hand and dominant eye and to present the dominance rates of the population.

Methods: 160 healthy subjects (80 females, 80 males) between the ages of 18-60 were included in the study. While the determination of the dominant hand was based on the answers of the participants, the Dolman test was used to determine the dominant eye. The chi-squared test was used to determine the relationship between the variables.

Results: Of the sample, 91.3% (146 subjects) predominantly used their right hand and 68.8% (110 subjects) used their right eye. The right eye and hand were dominant in 106 subjects, and the left eye and hand were dominant in 10 subjects. As a result of the chi-square test, there was a statistically significant difference between the dominant hand and the eye.

Conclusion: Since the right hand and right eye were highly dominant in the study, it is thought that the left hemisphere of the participants was dominant in terms of functional lateralization. Additionally, it is thought that the repetition of the study in patients with presbyopic cases and in patients before cataract surgery will be clinically beneficial.

Keywords: cerebral lateralization, Dolman method, dominance, eye, hand

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Received: 28.07.2023 **Accepted:** 03.11.2023 **Published:** 12.07.2024

INTRODUCTION

Anatomical and functional asymmetry of the right and left cerebral hemispheres is defined as the cerebral lateralization. Anatomically, symmetrical hemispheres work counter laterally on controlling the body (1). Organs such as the hands, feet, eyes, and jaw, which are anatomically symmetrical but functionally side-dominant in the body, can be used to determine the dominant hemisphere (1,2). Likewise, several studies have documented that the connection between the dominant hand and the hemisphere attracts attention (1-4). Yet, other researches have indicated that the usage of dominant hand varies according to family, education, and other environmental factors (3,4), suggesting that the dominant hand alone may be insufficient to determine the natural lateralization of the hemispheres.

The brain receives images from both eyes, but the eye that is used primarily is known as the dominant eye, which is most often used while looking through a keyhole or aiming. Since the dominant eye is not affected by the external environment, it reflects more accurately the functional asymmetry between the hemispheres. When calculating the intraocular lens adjustment for cataract surgery or when applying contact lenses in presbyopia patients, the adjustment of the dominant eye to see distance and the other eye to see near is called monovision. This implementation is used in the treatment process in the clinic (1,5).

Literature extensively documents hand and eye dominances in determining interhemisphere lateralization across various populations, but the concordance relationship and linkage between the two organs in this context have not been fully clarified yet (5,6). Therefore, this study, conducted in healthy adults of different age groups has focused on determining the dominant hand-eye ratio of the population and revealing the possible correlation between them. It was designed with the hypothesis that the dominant hand and the eye would be statistically highly correlated.

MATERIALS AND METHODS

The study began after receiving approval number 2023/49 from the Clinical Research Ethics Committee of Bolu Abant İzzet Baysal University, Türkiye. The study was cross-sectional and was conducted on participants attending the Department of Ophthalmology, Bolu Abant İzzet Baysal University Training and Research Hospital. A total of 160 participants aged between 18 and 60 years were included in the study. They were informed about the study and voluntarily signed the consent form. Those with a history of diseases related to the upper extremities and eyes were excluded from the study.

The Edinburgh Dexterity Questionnaire was used to determine the dominant hand. It is a valid and reliable questionnaire that allows us to determine the most frequently used hand activities in daily life, as underlined in the literature (7). Participants were asked which hand they used most often for writing, brushing teeth, using a spoon, and throwing something. A scale ranging from one (always right) to five (always left) was used for each activity. The left hand was recorded as dominant for those scoring higher than three, and the right hand was recorded as dominant for those scoring lower than three, as pointed out in the literature (8).

The Dolman method was applied to determine the dominant eye. In this test, participants were asked to sit with their arms stretched and parallel to the body. They were then asked to hold a 25x15 cm card with a 3 cm diameter hole in the middle with both hands and look at a target 6 meters away with both eyes. After closing the right and left eyes, respectively, and looking at the target, whichever eye was closed, the eye on that side was recorded as dominant when the target was not visible, just as explained in the literature (9).

Statistical analysis

Statistical analyses were performed using the Minitab® 21.2 (64-bit) package program. After the descriptive statistics of the variables were calculated, the chi-squared test was applied to analyze the correlation between the dominant hand and the eye. $P<0.05$ was considered statistically significant.

Table 1. Descriptive statistical results of the variables

		Dominant Eye		
		Right	**Left**	**All**
Dominant hand	Right	106 (96.4%)	40 (80%)	146 (%91,3)
	Left	4 (3.6%)	10 (20%)	14 (%8,7)
	All	110 (68.8%)	50 (31.2%)	160 (%100)

RESULTS

The study was conducted on 160 participants, 80 women and 80 men. The mean age of the women was 37.7 years and that of the men was 37.5 years. The statistical analysis revealed that the right eye was dominant in 106 right-handed individuals, the left eye was dominant in 40 right-handed individuals, the right eye was dominant in 4 left-handed individuals, and the left eye was dominant in 10 left-handed individuals. While the number of right-handed individuals constituted 91.3% of the participants, the number of left-handed individuals was determined to be 14 (8.7%). The number of individuals with dominant right eye was 110 (68.8%) and the number of individuals with dominant left eye was 50 (31.2%) (Table 1).

The majority of right-handed individuals have a right dominant eye (106 out of 146), suggesting a strong preference or coordination between the dominant hand and eye on the same side. Among left-handed individuals, more have a left dominant eye (10 out of 14), indicating a similar coordination but with fewer individuals (Tables 1 and 2).

Table 2. The result of the Chi-Square test

	Chi-Square	**DF**	**P-Value**
Pearson	11.528	1	P<0.001
Likelihood Ratio	10.542	1	P<0.001

p<0.05 was considered statistically significant

DISCUSSION

This study has revealed the dominant hand to eye ratio of the healthy adult participants and has explained the correlation between them, since the concordance relationship and link between the two organs have not been fully documented as indicated in the literature (5,6). As a result of the current study, 91.3% of the participants were right hand dominant and 68.8% were right eye dominant. The chi-squared test indicated a statistically significant difference between dominant hand and dominant eye.

Research has extensively documented hand, foot, and eye dominance in various communities. A study investigating the relationship between hand, eye, and foot dominance and motor learning ability in 107 healthy young people (91 females, 16 males) with an average age of 21.81 years, found that 84.1% of the sample group used their right hand and 72% used their right eye dominantly (1). The study found no relationship between hand, eye and foot dominance and motor learning skills. Additionally, no statistical relationship was found between dominant hand and dominant eye. A similar result was found in another study that investigated the dominant hand, eye, and foot of 160 patients who presented to the clinic for refraction (2). This study found that 88.8% of the sample group used the right hand and 81.5% used the right eye predominantly but emphasized that there was no statistical relationship between the dominant hand and the dominant eye. Likewise, another research investigating the dominant eye rate and related factors in a sample group of 300 men in Türkiye, revealed that right-hand dominance was 95% and right-eye dominance was 80%, again showing no statistical relationship between the dominant eye and the hand (5). However, another study examining the relationship between dominant hand and eye preferences and certain systemic pathologies including respiratory and urogenital diseases in 95 university students found that 67.5% of the right hand and 49.5% of the right eye were dominant, while there was no statistically significant relationship between the dominant hand and the eye (6). In a study comparing visual reaction

times in 30 swimmers with and without the dominant eye and the dominant hand, the dominant hand and eye were determined using the same methods as in the current study. As a result of the study, it was emphasized that the dominant eye on the same side and the dominant hand did not affect the visual reaction time (7). In the present study, the dominance rates were consistent with the literature, and the dominant hand and eye rates were determined to be 91.3% and 68.8%, respectively. In addition, unlike the data in the literature, a statistically compatible result was obtained between the dominant hand and the eye. It is possible that the wide age range and equal number of genders in the current study sample may have influenced the results.

One study investigating eye dominance in adults has concluded that the dominant hand and the dominant eye are not always compatible (8). However, several other researches with different materials and methods have reported that the dominant hand and eye are consistent, as is the case with the data from the current study (9-11). Another study, reporting similar results to the literature, has compared methods and found the hand preference and dominant eye to be consistent (3).

Another research focusing on the relationship between ocular dominance and macular structure has included 144 patients without ophthalmic anomaly. The results of this study have found the dominant eye rate to be 68.75%, and no relationship was observed between the macular vascular asymmetry and ocular dominance (12). In another study investigating the relationship between the macular thickness and dominant eye in 89 healthy children, 64.7% of the right eye was dominant, but no significant correlation was found (13). Considering that the determination of the dominant eye is essential in cataract or presbyopia cases, it is thought that paying attention to the dominant eye is also necessary in the design of clinical studies, as indicated in the literature (14).

Reviewing the literature, we think that the limitations of the current study include the exclusion of the dominant lower extremity, the small number of left-handed participants, and the lack of a relationship between the dominant eye and the clinical cases.

The study results are expected to provide a database on the dominant hand and eye within the current population. Furthermore, for patients scheduled to undergo presbyopic and cataract surgery, identifying the dominant eye may provide more visual acuity and comfort to the patient after surgery.

Ethical approval

This study has been approved by the Clinical Research Ethics Committee of Bolu Abant İzzet Baysal University (approval date 14/03/2023, number 2023/49). Written informed consent was obtained from the participants.

Author contribution

Concept: AS, GR; Design: GR, AR; Data Collection or Processing: GR, AR; Analysis or Interpretation: GR, AR; Literature Search: AS, İK, GR, AR; Writing: AS, İK, GR, AR. All authors reviewed the results and approved the final version of the article.

Source of funding

The authors declare the study received no funding.

Conflict of interest

The authors declare that there is no conflict of interest.

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