

# ACADEMIC ACHIEVEMENT AND LEARNING ABILITIES IN LEFT-HANDERS: GUILT OR GIFT?

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## ABSTRACT

The main purpose of this cross-sectional study was to compare the acceptance rate (AR) of left-handers (LHs) with that of right-handers (RHs) in the college entrance examination (CEE) for the national universities in Iran. During 5 successive years, fifty thousand participants in this exam were randomly sampled. We evaluated the relationships between AR and hand preference, sex, college admission (CA), entrance exam score (EES) and study areas: Mathematics, Natural Sciences, Humanities and Art. The acceptance rate of the LHs over the entire study period was significantly higher than that of the RHs (27.3% versus 24.3%,  $p < 0.0001$ ). The mean score attained on examination by LHs was significantly higher than that of RHs in all study areas ( $p < 0.002$ ). The acceptance rate of LHs in all study areas was higher but the difference reached statistical significance in the Art area only ( $p < 0.01$ ). It is concluded that left-handers may be regarded as a heterogeneous large group consisting of different subgroups. Those who are able to compete for the college entrance examination score are even more successful than right-handers in terms of average EES and the rate of CA.

Key words: handedness, academic achievement, cerebral lateralization, specific learning abilities

## INTRODUCTION

The nature of handedness has not been completely elucidated, despite the fact that it is the most common behavioural index of speech lateralization. Data from aphasia drawn from sodium amytal testing suggests that left-handers are less biased towards left hemispheric speech lateralization (Milner et al., 1966; Adams et al., 1997). Nevertheless, approximately 65% of left-handers are left hemisphere dominant for speech, which leaves their left-handedness unexplained. Some authors consider left handedness a pathological phenomenon consequent to untoward influences during brain development (Adams et al., 1997; Bakan, 1971), others as a normal variation (Satz, 1973) and still others emphasize the superiority of left-handers (LHs) in artistic, mathematical and sporting abilities (Aggleton et al., 1994; Benbow, 1986; McLean and Ciurzac, 1982). These two forms of

argument suggest two populations of left-handers: a group with mild left hemisphere pathology and a group with superior development of abilities usually linked to the right hemisphere.

In the present investigation, we addressed the question of the relationship of handedness to the development of intellectual skills. More precisely, we assessed the college admission rate (CAR) over 5 successive years of right-handed and left-handed Iranian students who took the college entrance examination (CEE), required to be admitted to university. Since 1993 the participants in this exam have had to state in the registration form of CEE which hand they use in writing, in order to be assigned an appropriate armchair in the examination session. The availability of these data afforded us the opportunity to compare the CAR and the mean scores of an extremely large sample of right-handed and left-handed students.

#### MATERIALS AND METHODS

About one million Iranian high school graduates take part each year in the CEE concerning four major fields of study, namely, Mathematics, Natural Sciences, Humanities and Art. An entrance examination score (EES) is obtained for each participant, based on a formula devised by the Ministry of Sciences, Research and Technology (MSRT) of Iran, which has a mean of 5000 and a standard deviation of 100.

In an analytic cross-sectional study a comprehensive list of all the participants of 5 successive years (1993-1997) was obtained, containing hand preference in writing, sex, college admission (CA), EES and study area. Out of one million CEE participants at each year, 10000 were chosen randomly. To calculate the sample size, we considered expected rate of acceptance among participants as 30 percent (according to the recorded acceptance rate in previous years), confidence of 95 percent and 1 percent precision. The minimal sample size for each field of study was 8400, which was increased to 10000 in order to achieve more accuracy. In total 50000 participants were selected.

Hand preference, in this study, was exclusively defined as writing preference. Although, this may not be regarded as an exhaustive test of hand preference, it is a very important index, as shown by different studies (Bishop, 1990). Sex was ascertained by a specific question of the CEE.

The percent acceptance rate (AR\*) of right-handed and left-handed students and their mean scores were computed for each of the five successive years and compared with Chi-square and Student's t-test, respectively.

#### RESULTS

As Table I shows, the prevalence of LHs did not differ significantly across the five years taken into account and ranged from 6.6 to 6.7, a finding in keeping with the prevalence of 5-10% reported in other studies (Coren, 1990; Hardyck and Petrinovich, 1976).

As shown by Table II, the distribution of LHs and RHs did not differ significantly in males and females.

Table III reports the CAR of RHs and LHs over the five years. LHs were mildly, but significantly superior to RHs.

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\*AR =  $\frac{\text{Admitted RHs} / \text{LHs}}{\text{Total Sample (RHs+LHs)}}$

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