

HANDEDNESS AND ANXIETY IN NORMAL AND CLINICAL POPULATIONS

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INTRODUCTION

Most neuropsychological theories on handedness agree that left-handedness is associated with a reduced degree of left cerebral dominance (Beaumont, 1983). Consequently, handedness has been studied in various psychopathological populations in order to examine whether these populations are characterized by abnormal patterns of cerebral lateralization (e.g., Taylor, Dalton and Fleminger, 1980; Davidson and Schaffer, 1983).

Following Satz' (1972) notion of "pathological left-handedness", Davidson and Schaffer (1983) suggested that a dysfunction of the left cerebral hemisphere results in non-familial (i.e., genetically based) left-handedness and a greater vulnerability to anxiousness. However, studies on the relationship between handedness and neurotic characteristics such as anxiety and emotional instability have yielded mixed results. Strom et al. (1987) provided some evidence for a higher level of anxiousness in college students with a confused peripheral lateral preference, thereby confirming the earlier findings of Orme (1970), Hicks and Pellegrini (1978), and Davidson and Schaffer (1983). On the other hand, Beaton and Moseley (1984), as well as Wienrich, Well and McManus (1982), failed to find a significant association between anxiety and non-right-handedness. Wienrich et al. showed that both extremely right-handed and extremely left-handed students had higher anxiety scores than mixed-handed students. These authors admitted that their finding might have been a spurious result, caused by a tendency of "mixed-handers" to give more moderate responses on handedness and anxiety questionnaires.

In light of the contradictory evidence of an association between non-right-handedness and heightened anxiety levels and, consequently, of the need for further research in the area, two studies were conducted. The first study was based on a non-clinical sample of students. In the second study, handedness patterns in a clinical sample were compared to those in a normal sample.

STUDY ONE

While previous studies have employed more global measures of anxiety such as "tension anxiety" (Hicks and Pellegrini, 1978) or a dichotomous classifica-

tion of handedness (Davidson and Schaffer, 1983), the present study examined the relationship between handedness as a continuous variable and specific sub-clinical fears in a non-clinical sample.

Materials and Method

Subjects were 167 students (32 men and 135 women) taking courses in the health sciences at the University of Limburg. The higher proportion of women in the sample is a consequence of the skewed sex distribution of the student population taking courses in the health sciences at this university. Their mean age was 21 years (range: 17 – 35).

Tests

Subjects were invited to complete the Edinburgh Handedness Inventory (EHI; Oldfield, 1971), the Fear Questionnaire (FQ; Marks and Mathews, 1979), and the Maudsley Obsessive Compulsive Inventory (MOCI; Rachman and Hodgson, 1980). In addition, subjects were asked to indicate whether they had any first-degree relatives with a strong tendency toward left-handedness.

Procedure

The EHI is based on the assumption that handedness is a continuous variable. It asks subjects to indicate their handedness in 10 habitual everyday acts. On the basis of his or her EHI responses, each subject receives a laterality quotient (Oldfield, 1971), in such a way that a quotient of + 100 corresponds to "pure" right-handedness and a quotient of - 100 corresponds to "pure" left-handedness. Following the criteria of LeBoeuf (1986), subjects in the present study were then classified as right-handers (quotients between + 50 and + 100), mixed-handers (quotients between - 50 and + 50), or left-handers (quotients between - 100 and - 50).

In the present study, the agoraphobia, social phobia, and blood/injury phobia subscales of the FQ were used. Each subscale comprises 5 items which are rated in terms of avoidance on a 9-point continuum, with 0 indicating "would not avoid it" and 8 indicating "would always avoid it". A total phobia score is obtained when the three subscale scores are summed. As Arrindell, Emmelkamp and van der Ende (1984) clearly demonstrated that the subscales yield reliable and valid information, not only the total phobia score but also the separate subscale scores were used.

The MOCI scores were obtained in order to assess obsessive-compulsive tendencies in the sample. The MOCI contains four scales - "washing", "checking", "doubting", and "repetition/slowness" - which, when summed, yield a total obsessiveness score. In the present study, only this latter score was used.

Three types of statistical tests were carried out. First, correlations between handedness quotients and the fear scores were computed. Second, non-parametric statistical analyses and analysis of variance (ANOVA) were carried out to examine whether handedness and familial left-handedness had a significant effect on fear scores. Finally, using t-tests, the differences in mean handedness quotients between subjects with relatively high fear scores and subjects with relatively low fear scores were examined.

Results and Discussion

Pearson product-moment correlations of EHI laterality quotients with FQ and MOCI scores remained low and non-significant, the only notable exception

TABLE I

Mean Scores of Left-handed, Mixed-handed, and Right-handed Subjects on the FQ Agoraphobia Scale, the FQ Social Phobia Scale, the FQ Blood/Injury Scale and the MOCI (Total phobia refers to the summed FQ subscales. Standard deviations are given in parentheses)

	Left (N=17)	Mixed (N=11)	Right (N=139)
Agoraphobia	4.4 (6.7)	1.8 (1.9)	4.1 (4.3)
Social phobia	11.7 (6.9)	12.6 (4.8)	13.3 (5.7)
Blood/injury phobia	7.9 (5.2)	8.9 (7.0)	9.0 (5.8)
Total phobia	24.0 (16.9)	23.4 (8.9)	26.4 (11.9)
MOCI	3.9 (3.8)	2.3 (2.5)	3.8 (3.1)

being the positive correlation of handedness quotients with social phobia, a correlation which approached significance ($r = 0.12$, $N = 167$, $p < 0.06$, one-tailed).

Table I shows the mean scores of left-handed, mixed-handed, and right-handed subjects on the FQ subscales and the MOCI. Separate Kruskal-Wallis analyses were carried out for the FQ subscale scores, the total phobia scores (i.e., summed FQ subscale scores), and MOCI scores. None of the chi-squares thus obtained showed a significant effect of handedness on fear scores.

The variances in fear scores were too heterogeneous and the number of left-handed and mixed-handed subjects, as defined by the above-mentioned criteria, was too small to allow a two-way ANOVA with handedness and familial left-handedness vs. right-handedness as factors. To examine the association between non-familial left-handedness and fear scores, less strict criteria for defining left- and right-handedness had to be used. Two groups were formed, one group consisting of subjects ($N = 87$) with a laterality quotient of $+ 100$ ("pure" right-handers) and the other group consisting of subjects ($N = 80$) with a quotient lower than $+ 100$ (subjects with a slight or strong tendency towards left-handedness). According to these criteria, there were 38 subjects whose left-handedness was non-familial and 42 subjects whose left-handedness was familial. Fifty pure right-handers reported having no left-handed first-degree relatives, whereas 37 pure right-handers indicated having first-degree relatives with a tendency towards left-handedness. A 2 (pure right-handers vs. subjects with a slight or strong tendency to left-handedness) \times 2 (familial left-handedness vs. non-familial left-handedness) ANOVA was performed on the FQ and MOCI data. The only effect reaching significance was a main effect of handedness for the total phobia score ($F = 4.27$; d.f. = 1, 163; $p < 0.005$). Pure right-handers had higher overall FQ scores than subjects with a slight or strong tendency to left-handedness, with means of 27.9 (s.d. = 11.0) and 23.8 (s.d. = 13.3), respectively. Separate ANOVAs for each FQ subscale demonstrated that this effect was largely caused by the scores of pure right-handers on the social phobia subscale of the FQ. While the ANOVAs for the agoraphobia and blood/injury phobia subscales showed no significant main effect of handedness, the ANOVA for the

TABLE II

Mean Handedness Quotients (EHI) of the 25 Subjects Scoring Highest and Those of the 25 Subjects Scoring Lowest on the FQ and MOCI (Standard deviations are given in parentheses)

Group	EHI	t(48)
Low FQ ¹	40.6 (76.4)	-1.8 ²
High FQ ¹	73.7 (52.1)	
Low MOCI ¹	46.6 (76.7)	-1.4
High MOCI ¹	74.6 (55.6)	

¹ N=25.

² p<0.10, two-tailed.

social phobia subscale yielded a marginally significant effect of handedness ($F=3.87$; $d.f.=1, 163$; $p<0.06$), with pure right-handers having higher scores than subjects with a slight or strong preference for the left hand, the means being 14.0 ($s.d.=5.6$) and 12.2 ($s.d.=6.0$), respectively.

To examine whether the handedness quotients of subjects scoring relatively high on the FQ or MOCI differed significantly from those of subjects scoring relatively low on these questionnaires, "extreme" groups were formed. One group consisted of subjects scoring in the lower 15% of the FQ or MOCI distribution, while the other group consisted of all subjects scoring in the upper 15% of the FQ or MOCI distribution. The handedness quotients of these groups were subjected to t-tests. As can be seen in Table II, the low anxiety groups showed a stronger tendency towards left-handedness than the high anxiety groups. However, the differences did not reach the conventional 5% level of significance.

To summarize, the present findings lend no support to the idea that phobic fears and/or obsessional tendencies are more prevalent or more severe among left-handers than among right-handers (Hicks and Pellegrini, 1978). In addition, no evidence was found to suggest that non-familial left-handedness may be particularly associated with anxiety (Davidson and Schaffer, 1983). Finally, in contrast to Davidson and Schaffer's (1983) finding, no significant differences in hand preference were found between low and high anxiety subjects.

Our failure to cross-validate the findings reported by Hicks and Pellegrini (1978) and those reported by Davidson and Schaffer (1983) cannot be attributed to the quality of the data. For example, as was expected, total FQ scores correlated significantly with MOCI scores ($r=0.42$, $N=167$, $p<0.01$, one-tailed). Furthermore, it was found that women had significantly higher total FQ scores than men ($t=2.71$, $d.f.=165$, $p<0.01$, one-tailed), a finding which is in line with numerous studies reporting higher fear levels in women (e.g. Katkin and Hoffman, 1976; Kirkpatrick, 1984). Also, the finding that laterality quotients of women tended to be higher than those of men (the means being 70.2 and 53.0, respectively; $t=1.48$, $d.f.=165$; $p<0.07$, one-tailed) confirms the observation that the incidence of left-handedness is lower among women than among men (Oldfield, 1971).

the handedness quotients. While the main effects of group ($F < 1$, d.f. = 1, 150) and of sex ($F < 1$, d.f. = 1, 150) remained non-significant, the interaction effect of group and sex did reach significance ($F = 5.09$; d.f. = 1, 150; $p < 0.02$). The results were very similar when education was entered into the ANOVA as a covariate. As can be seen in Table III, the significant interaction was due to the fact that the normal pattern of women having higher handedness quotients than men (Oldfield, 1971), was reversed in the patient group. Post hoc t-tests revealed that men with anxiety disorders tended to be more right-handed than control men ($t = 1.62$, d.f. = 150, $p = 0.11$, two-tailed), while women with anxiety disorders tended to be more left-handed than control women ($t = 1.57$, d.f. = 150, $p = 0.12$, two-tailed). These results are clearly at variance with a study by LeBoeuf (1986), in which it was found that agoraphobic men but not women showed a stronger tendency towards non-right-handedness than normals.

GENERAL DISCUSSION

Neither in the analog nor in the clinical sample was an association between left-handedness and anxiety found. The present findings are quite similar to those reported by Beaton and Moseley (1984) and Wienrich et al. (1982) in that they fail to substantiate the hypothesized positive relationship between non-right-handedness and anxiety (Davidson and Schaffer, 1983; LeBoeuf, 1986). In fact, some results obtained in the present study contradict such a relationship: social phobia scores were found to correlate positively with right-handedness, and men with anxiety disorders were found to be more strongly right-handed than normal control men.

It should be noted that some of the studies that did find evidence of an association between non-right-handedness and anxiety can be criticized on statistical or methodological grounds. For example, in the Orme study (1970), an inappropriate statistical test was used to evaluate the data (Hicks and Pellegrini, 1978). Another example is the Davidson and Schaffer study (1983). This study relied exclusively on subjects' self-classification as either right-handed or non-right-handed. It is obvious that with such a method of assessing handedness mis-classifications cannot be ruled out. Considering these shortcomings, the earlier failures to find an association between non-right-handedness and anxiety (e.g., Beaton and Moseley, 1984), and the results from the present study, it is hard to escape the conclusion that the empirical support for the hypothesized relationship between left-handedness and anxiety is very meager.

Although the positive association between social anxiety scores and right-handedness found in the current study is small and clearly in need of replication by future investigations, it is compatible with recent neuropsychological models of emotion.

On the basis of experimental data, Tucker (1981) proposed that anxiety is a left hemispheric operation. According to Levy (1983), individuals with such characteristics as introversion and dysphoria are characterized by a strong left hemispheric reliance (but see also Cohen and Merckelbach, 1987). Assuming that full right-handedness is linked with strong left hemispheric dominance, the

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positive correlation between social anxiety and right-handedness is in line with the models proposed by Levy and Tucker.

ABSTRACT

Previous research has yielded inconclusive evidence as to the relationship between handedness and anxiety. In order to further examine this relationship, two studies were carried out.

In the first study, university students ($N = 167$) completed the Edinburgh Handedness Inventory, the Fear Questionnaire, and the Maudsley Obsessive Compulsive Inventory. No evidence was found to suggest that phobic fears are more prevalent or more severe among individuals with a tendency to left-handedness than among pure right-handers. Statistical tests revealed a marginally significant positive association between social phobia scores and right-handedness.

In the second study, handedness was assessed in 77 anxiety disorder patients and compared with handedness patterns in normal controls. Again, no support was found for the claim that anxiety and left-handedness are related to each other. However, the normal pattern of women being more right-handed than men was reversed in the anxiety disorder group.

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