

NOTE

HAND POSTURE IN WRITING: POSSIBLE ARTIFACTS FROM SELF REPORT

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INTRODUCTION

Numerous studies have addressed the relationship between hand posture during writing and hemispheric localization of language mechanisms. Most of these studies have been based on the hypothesis (Levy, 1973; Levy and Reid, 1976; 1978) that subjects with an inverted writing posture have speech functions represented in the hemisphere ipsilateral to the writing hand; those adopting a normal posture have speech functions represented in the hemisphere contralateral to the writing hand.

Previous studies have found that 35-72% of left-handed individuals, and 0-30% of right-handed individuals adopt the inverted posture. These estimates have been based on observations during writing or on self-classification by the subject (see Table I). Since writing posture has become a popular grouping variable in neuropsychological studies, it is important to develop methods for accurately categorizing subjects on this dimension.

The variability in the reported incidence of inverted writing posture may depend on the method used to determine whether an individual adopts the inverted or normal posture. Levy and Reid (1976) observed the subjects while writing and designated as adopting the inverted posture those who had one or more of the following characteristics: a) writing hand rotated so that the hand was above the line of writing, b) page rotated so that the hand was to the side or above the line of writing, or c) with the pencil pointing toward the bottom of the page. Using these criteria, 2 of 77 preselected individuals were thought to have ambiguous postures and were excluded from the study. Shanon (1978) also observed the subjects while writing and divided them into groups by whether their wrist was "hooked" or "unhooked" as well as the orientation of the paper. Herron, Galin, Johnstone and Ornstein (1979) used position of the hand relative to the line of writing and the orientation of the pen; 3 of 49

TABLE I

Estimated Incidence of "Inverted" Writing Posture in Left- and Right-Handers

	Left Handers	Right Handers
Levy and Reid, 1976	60% ¹	very rare ¹
Shanon, 1978	39% ²	10% ²
Herron et al., 1979	72% ²	none in 30 subjects ²
Coren and Porac, 1979	45% ³	9% ³
Searleman et al., 1979	36.8% ³	1.8% ³
Strauss et al., 1984	50% ^{3 4}	30% ^{3 4}
U-Michigan Undergraduates	35.3% ⁵	19% ⁵

1. Based on incidence of left-hemisphere speech localization in left-handers and right-hemisphere speech in right-handers and presuming the existence of a close correlation between hand posture and speech localization.

2. Based on observation of subjects while writing.

3. Based on self-classification from prototypical illustrations.

4. Patient population with brain damage.

5. Based on self-classification with "in-between" option.

left-handed and ambidextrous subjects had equivocal postures and were excluded from the study. Coren and Porac (1979), Searleman, Tweedy and Springer (1979) and Strauss, Wada and Kosaka (in press) showed subjects prototypical sketches of the four possible writing postures and used self-report to determine whether individuals adopted the normal or inverted posture. Self-report data collected in the course of another study (Buchtel, Rueckert & Waters, in progress) suggest that hand posture may not be as dichotomous as is commonly assumed and the present report is based on these data.

METHODS AND RESULTS

We asked 740 undergraduate students from the University of Michigan Department of Psychology Subject Pool to fill out a questionnaire concerning the posture of their hand during writing. They were shown four prototypical hand postures (Figure 1) from Coren and Porac (1979) for reference. Because we wanted only subjects with unambiguous writing postures, we gave the respondents the option of indicating that they used a posture somewhere between the illustrated positions. The subjects were also asked whether there were any left-handers in their immediate family (siblings, parents or grandparents).

The results are shown in Table II. Seventeen percent of the left-handed subjects and 46% of the right-handed subjects reported themselves as adopting a posture between the inverted and normal postures as depicted in the sketches. Of the remaining subjects, 47% of the left-handers and 53% of the right-handers classified their posture as normal; 35% of the left-handers and 0.9% of the right-handers classified their postures as inverted.

The division by presence (F+) or absence (F-) of left-handed family members shows that right-handers tended not to have left-handed relatives (F+ =





I AM:	
<input type="checkbox"/> RIGHT HANDED <input type="checkbox"/> I hold my hand above the line and my pen points toward the bottom of the page like this:  <input type="checkbox"/> I hold my pen like this: 	<input type="checkbox"/> LEFT HANDED <input type="checkbox"/> I hold my hand above the line and my pen points toward the bottom of the page like this:  <input type="checkbox"/> I hold my pen like this: 
<input type="checkbox"/> I hold my pen somewhere between the two positions shown above.	

Fig. 1 - Drawings of prototypical writing postures as presented to subjects for self-rating. "Inverted" postures above, "normal" postures below. After Coren and Porac, 1979, with permission.

24%; F- = 76%; z=13.19, p<0.0001) and left-handers were approximately equally divided on this measure (F+ = 48.5%; F- = 51.5%; z=0.201, n.s.). The distribution of hand postures in the males vs. females according to the presence of left-handedness in the family was not significantly different from chance for the right handers and for the left-handers with left-handed family members. For the left-handers without other left-handers in the family, however, there was a sex difference with females tending to adopt the normal posture more than the inverted posture and the males tending to adopt the inverted posture more than the normal posture (chi²=8.84; p<0.001). Other chi² comparisons were statistically non-significant.

TABLE II

Distribution of Hand Postures by Sex, Presence of Left-Handedness in Family and Handedness

		Left-Handers (N = 99)			Right-Handers (N = 641)		
		normal	between	inverted	normal	between	inverted
Females	F+	12 (55%)	2 (9%)	8 (36%)	24 (28%)	61 (72%)	0 (0%)
	F-	18 (66.5%)	4 (15%)	5 (18.5%)	148 (61%)	93 (39%)	0 (0%)
Males	F+	11 (42.5%)	5 (19%)	10 (38.5%)	21 (30.5%)	47 (68%)	1 (1.5%)
	F-	6 (25%)	6 (25%)	12 (50%)	146 (59%)	95 (39%)	5 (2%)
Totals		47	17	35	339	296	6

DISCUSSION

The results indicate that almost 20% of left-handers and almost 50% of right-handers do not perceive their writing posture to be the same as prototypical postures used by researchers to determine the incidence of "normal" and "inverted" writing postures. This finding raises the possibility that previous studies in which writing posture has been used as a dichotomous grouping variable may not be comparable, since subjects with intermediate postures may vary in how they classify their writing posture. Equally important is the possibility that subjects with intermediate writing postures have a different organization of the motor pathways than the subjects whose postures look like those of the prototypes in Fig. 1. A study of the objectively measurable variables that define writing posture is in progress (Luh & Buchtel, unpublished) and it is hoped that the results will allow a more precise characterization to be made of the distribution of postures in the normal population.

ABSTRACT

Seven hundred forty undergraduate students were asked to report the hand posture they used during writing and the presence or absence of left-handedness in the immediate family. Drawings were provided of prototypical "normal" and "inverted" posture and subjects were also given the option of reporting that their hand posture was somewhere between the two illustrated positions. The incidence of reporting "between" was 17% for left-handers and 46% for right-handers. These results suggest that experimenters should exercise caution when categorizing subjects on the basis of self-report forms that include only two choices: normal posture and inverted posture.

Acknowledgements. Supported in part by grants to H.A.B. from the Medical Research Service of the Veterans Administration and from internal funds of the Department of Psychiatry and the Office of the Vice President for Research of the University of Michigan. We are grateful to Bob Zuckernik and Margaret Evans for comments on the manuscript.

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