

BRIEF REPORTS

Is There an Association Between Lateral Preference and Delinquent Behavior?

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Results of recent research suggests an association between left lateral preference and delinquent behavior. In this study the lateral preferences of 881 seven-year-old children were determined using behavioral indicators of hand and foot use. Mixed-handedness was associated with parent-reported problem behavior scores and self-reported delinquency scores at ages 13 and 15. However, preference for left hand and foot use was found to be unrelated to the delinquency measures. The distribution of lateral preferences in an identified delinquent group was not significantly different from the distribution in the sample remainder. The lack of an association between left preference and delinquency may be accounted for by an increased cultural acceptance of individual preference.

The term *sinister* (Latin for left-sided), which suggests something evil or ominous, dates from the time of the Roman augurers, who considered left-handed people to be unlucky. A recent body of research has investigated the relationship between lateral preference and a variety of mental health disorders, including delinquency and antisocial behavior. Porac and Coren (1981) reviewed early studies that examined this relation and concluded there was an association between left-handedness and aggressive, antisocial, and criminal behavior.

Gabrielli and Mednick (1980) investigated the association between lateral preference and antisocial behavior using the Handedness Questionnaire (Annett, 1970) with a Danish cohort of adolescents. They compared hand preference and behavioral measures of foot and eye preference with records for men from the Danish national police register. The results indicated that left lateral preference at age 13 years was significantly associated with delinquency 6 years later.

More recently, Grace (1987) assessed the hand preference of male youths incarcerated in a state school, using a continuous

scale of lateral preference. The results indicated that degree of left-handedness was correlated with ratings of conduct disorder. However, the findings of this study are ambivalent, as the dichotomous variable of preferred writing hand (the most commonly used indicator of lateral preference) was not significantly related to any measures of conduct disorder. Furthermore, when one examines the distribution of preference in this delinquent sample, one finds that only 21 of 254 subjects (8%) were left-handed. This proportion is consistent with the prevalence of left-handedness in the general population (approximately 10%; Nachshon & Denno, 1987).

Hare and Forth (1985) investigated the hypothesized relation between laterality and antisocial behavior in a sample of 258 male prison inmates, comparing their pattern of lateral preferences with that of 1,211 noncriminals. They concluded that the prison inmates had a pattern of preferences similar to that of the normative group. The only significant result related to the proportion of the sample classified as strongly right dominant (consistent right preference for hand, eye, and ear use): 21.3% in the criminal sample and 16% in the control group. This trend is the reverse of that one would expect if left lateral preference were related to delinquency. Hare and Forth concluded there was no support for the hypothesis that antisocial behaviors are associated with lateral preference.

Given these conflicting findings, the evidence for an association between lateral preferences and delinquency remains equivocal. In this study, the lateral preferences of a large sample of New Zealand children from the general population were investigated in relation to delinquency. A variety of measures of antisocial and problem behavior were used to examine the association between the distribution of lateral preferences measured

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at age 7 and delinquent behavior in adolescence (at ages 13 and 15).

Method

Sample

The adolescents were part of a large sample enrolled in the Dunedin Multidisciplinary Child Development Study. The sample and design of the study have been described elsewhere (Silva, in press). In summary, it is a longitudinal investigation of the health, behavior, and development of a sample of 1,037 children born between April 1, 1972 and March 31, 1973 at Queen Mary Hospital, Dunedin. Of the total sample of 1,139 children eligible for inclusion in the study at age 3, 1,037 (91%) were followed up and assessed. Of this group, 954 were seen at age 7 and 855 at age 13. The most recent follow-up was at age 15. Data were obtained from 973 members, 95% of the surviving sample ($N = 1,029$).

When the Dunedin sample is compared with the population as a whole with the use of a socioeconomic status index for New Zealand (Elley & Irving, 1976), the sample is slightly advantaged. The sample is predominantly European, and the 2% of the sample with Maori or Polynesian backgrounds is underrepresentative of those groups in the adolescent population in New Zealand in general (12%).

Procedures

The general procedure at each assessment phase of the study has been the same. The majority of the sample attended the Dunedin unit within 2 months of their birthdays, and a large number of medical, educational, anthropometric, and psychosocial measures were administered during the 1-day assessment. When it was not possible for the sample members to attend the unit, interviews and selected assessment measures were administered at home or school. Written consent was obtained from parents prior to each assessment phase. Background information has been obtained from parents by direct interviews, and for the more recent assessments, by mailed questionnaires. Only the measures used in the present study are described here.

Measures

Lateral preference. The lateral preferences for three modalities (hand, eye, and foot) were obtained at age 7 with behavioral measures taken from the Harris Tests of Lateral Dominance (Harris, 1958). At this age, both the direction and degree of lateralization are reportedly stable (McManus et al., 1988). As eye preference is a poor measure of cerebral dominance (Gabielli & Mednick, 1980; Porac & Coren, 1981), only the measures of hand and foot use are used in the present study. Hand preference was measured by having the child throw a ball and write his or her name. The tasks used to establish foot preference were kicking a bean bag and stamping out an imaginary fire. The lateral preferences obtained for each modality were either *right* (right preference for both trials), *left* (left preference for both trials) or *mixed* (where preference alternated between trials). As the evidence in support of a generalized dimension of lateral preference is weak (Porac & Coren, 1981), the lateral preference measures were not combined into a composite score.

Whittington and Richards (1987) reported that 86% of children were consistent in their choice of hand preference from ages 7 to 11. Lateral preference for handedness was similarly stable in the present study. The preferred hand for the Grooved Pegboard Test (Knights & Moule, 1968) was noted at age 13 during neuropsychological assessment (Moffitt & Silva, 1988a). Only 1.1% of the children who were right-handed at age 7 used their left hand at age 13, and none of the children who were left-handed at 7 used their right hand at 13. The proportion of children who

Table 1

Percentages of the Delinquent Group (n = 94) and Sample Remainder (n = 756) According to Lateral Preference

Group	Hand preference			Foot preference		
	Right	Mixed	Left	Right	Mixed	Left
Delinquents	82.0	12.6	5.3	74.5	22.3	3.2
Remainder	85.8	6.5	7.7	73.8	16.5	9.6

were mixed-handed at 7 and used the left hand at 13 was approximately equal to the proportion of children who were mixed-handed at 7 and right-handed at 13.

Parent report of problem behavior. A parent (usually the mother) of each sample member completed the Revised Behaviour Problem Checklist (RBPC) at the 13- and 15-year assessments. (A full description of the checklist and its psychometric properties is given by Quay & Peterson, 1987.) Of six RBPC subscales, two contain items pertaining to delinquent behavior, Conduct Disorder (CD, 22 items) and Socialised Aggression (SA, 17 items). The parent's report of any contact the child had with police was also obtained.

Self-report of early delinquent behavior. Self-report of delinquent behavior was obtained at ages 13 and 15 years from the Self Report Early Delinquency Scale (SRED; Moffitt & Silva, 1988b). In the present study, delinquency was assessed by a 29-item scale referring to acts selected by three "Youth Aid" constables as being either illegal for children and young people in New Zealand under age 17, or likely to attract intervention from the police. At age 13, each item was scored according to the frequency with which the sample member had exhibited the behavior. The scores were 0 for *never*, 1 for *once or twice*, and 2 for *three or more times*. At age 15, the same codes were used to indicate the frequency of the behavior in the previous 12 months.

At age 13 and age 15, an adolescent was identified as *delinquent* if his or her score on the SRED was above the 80th percentile for same-sex peers and if the self-report was confirmed by a parent. The self-report was confirmed (a) if the parent score was 1.5 standard deviations or more from the mean (separate means were computed for boys and girls) for either the CD or SA subscales of the RBPC, or (b) if the parent reported that the child had had police contact as a result of his or her behavior.

Results

Lateral Preference at Age 7

Of the 954 members followed up at age 7, 880 and 881 had valid lateral preference scores for hand use and foot use, respectively. The distribution of lateral preferences was not significantly different for girls and boys, for either hand use, $\chi^2(2, N = 880) < 1.0$, or foot use, $\chi^2(2, N = 881) < 1.0$, $p > .05$, in both cases. For hand use, 751 members had right lateral preference (85.3%), 63 had left preference (7.2%), and 66 had mixed preference (7.5%). For foot use, 651 had right preference (73.9%), 79 had left preference (9.0%), and 151 had mixed preference (17.1%). The distributions of right lateral preference for the two modalities used in the present study are similar to those reported for the general population by Porac and Coren (1981), namely 88.2% for hand use and 81.0% for foot use.

Lateral Preferences and Later Delinquency

A total of 850 sample members had laterality scores at age 7 and delinquency data at ages 13 or 15 years. The delinquent group represents 11% of the total. The distributions of lateral preferences within the delinquent group and the sample remainder are given in Table 1.

In order to determine if the proportions in the delinquent subsample with each lateral preference differed from the proportions in the sample remainder, two logistic regression analyses were conducted, one for hand preference and one for foot preference. Logistic regression is an analysis of categorical data comparable to regression analyses for continuous data, in that it provides tests for the effects of factors on a dependent variable (Norusis, 1985). In each analysis, the dependent variable was group (delinquent, sample remainder) and the independent factors were lateral preference (left, right, mixed), and gender (girl, boy). There was no significant effect for hand preference, $\chi^2(1, N = 850) < 1.00, p > .05$, gender, $\chi^2(1, N = 850) < 1.00, p > .05$, or for the interaction between these factors, $\chi^2(1, N = 850) < 1.00, p > .05$. Similarly, there was no significant effect for foot preference, $\chi^2(1, N = 850) < 1.00, p > .05$, gender, $\chi^2(1, N = 850) < 1.00, p > .05$, or the interaction, $\chi^2(1, N = 850) < 1.00, p > .05$. That is, the distribution of lateral preferences in the delinquent group was not significantly different from that of the sample remainder.

Lateral Preference and Delinquency Scores

In order to further examine the association between lateral preference and delinquency, four repeated-measures analyses of variance (ANOVAS) were conducted, two for hand and two for foot preference. For the purposes of the analyses, the scores from the two RBPC subscales (CD and SA) were combined into one composite measure of antisocial behavior (CDSA). The two dependent variables were the CDSA and SRED. The between-subjects variables were lateral preference (left, right, mixed) and gender (girl, boy). The within-subject variable was age (13 and 15 years).

For the SRED, a significant main effect for handedness was found, $F(2, 685) = 3.0, p < .05$, along with a significant Hand \times Time interaction, $F(2, 685) = 4.0, p < .05$. This interaction is due to the fact that those with mixed-handedness had higher SRED scores at 13 than the left- and right-handed groups. However, at 15, no significant differences were observed among the groups. For the CDSA, the only significant result was a three-way interaction between the variables of handedness, gender, and age, $F(2, 720) = 4.17, p < .05$. Girls with mixed handedness had higher CDSA scores at age 13 than the other girls, and mixed-handed boys had higher scores at age 15.

In the case of foot preference, no significant effects were found in the analysis of SRED scores. For the CDSA scores, a significant main effect for foot preference was found, $F(2, 719) = 3.3, p < .05$. Those with a preference for the left foot at age 7 had lower CDSA scores than those who were right-footed.

Discussion

The distribution of lateral preferences in the sample was similar to that reported by Porac and Coren (1981), despite the use

of different measures of lateral preference (behavioral indicators versus questionnaires). Although Porac and Coren reported that women exhibit more right preference, they also stated that many studies had failed to report sex differences. More recent studies have also failed to find sex differences in handedness distributions (Schwartz, 1988; Smith, 1987). In particular, Harvey (1988) found no sex differences in the handedness of 838 fifth formers (Grade 10), a sample similar in age and number of subjects to that used in the present study. Comparisons of lateral preference distributions between studies should be made cautiously, with due consideration of differing methods of obtaining and scoring preferences. Nevertheless, the pattern of lateral preference within the Dunedin cohort appears to be representative of the distribution in the adolescent population as a whole.

The findings of this study do not provide evidence for the hypothesized association between left lateral preference and delinquent behavior. Using categorical measures of lateral preference, we obtained distributions of lateral preferences that were not statistically different between the delinquent group and the sample remainder. For foot preference, the trend was actually away from left lateral preference in the delinquent group. This is similar to the predominance of right-handers in Hare and Forth's (1985) sample of prison inmates. The ANOVA results were comparable to those of the categorical analyses; no significant effect was due to left lateral preference. However, statistically significant effects were found for lateral preference and self- and parent-reported problem behavior, because of mixed, as opposed to left, lateral preference. It may also be noted that a higher proportion of delinquents showed mixed hand preference (13%) than in the sample remainder (6%). Overall, these findings suggest an association between mixed hand preference (rather than left hand preference) and delinquency. The results for footedness were either not significant or in the direction away from an association between left preference and delinquency. The lack of a left-preference association with delinquency contrasts with the results of Gabrielli and Mednick (1980) and Grace (1987), but would be in agreement with Hare and Forth (1985).

Past research conducted with the Dunedin sample has suggested that lateral preference is unrelated to cognitive abilities (Clymer & Silva, 1985). The present study with the same sample suggests that left lateral preference is unrelated to delinquent behavior. This finding conflicts with Porac and Coren's (1981) conclusion of an established association between left-handedness and criminality and antisocial behavior. However, there is some evidence to suggest that mixed-handedness may be related to delinquency. It should be noted that this association was significant only for the analysis of continuous scores, but was not statistically significant in the analysis of the number of identified cases. This association may have been masked in previous studies of laterality and psychopathology, in which mixed-handed individuals have usually been classified within the left preference group (Chapman & Chapman, 1987; Porac & Coren, 1981).

It is also possible that the significant associations for left-handedness reported with some adult samples reflect the influence of cohort effects, where teachers and other socializing agents in the past opposed the use of left lateral preference. As

Brackenridge (1981) suggested, cultural relaxation in New Zealand and Australia has promoted an increase in sinistrals with time. The children in the Dunedin sample are less likely to have experienced insistence on right-handed performance, and appropriate resources (e.g., left-handed sports equipment and musical instruments) would have been more freely available to them. The findings of the lateral preference studies of the Dunedin sample lend support to the view of Hare and Forth (1985) that it may be inappropriate to make global inferences about dysfunction on the basis of lateral preference.

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