

# **Dispelling myths about left-handedness**

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**Abstract:** Recent claims have been made that left-handers reach puberty later than right-handers, are more likely to be born of older mothers, and are more likely to be blue-eyed and/or blond-haired. An extensive survey of over 1000 undergraduate students and their first-order relatives provided no evidence to support any of the claims. Such negative findings have important implications for Geschwind's theory that left-handedness is related to neural crest disorders, and Coren's hypothesis of a distinct group of pathological left-handers who have suffered embryological stress.

## INTRODUCTION

In recent years, major papers on the origins and correlates of human handedness have been published by Geschwind and Galaburda and by Coren and Halpern. Geschwind and Galaburda have suggested that elevated fetal testosterone levels affect the embryological development of the left hemisphere, resulting in an increased incidence of left-handedness and of what they term "anomalous dominance". By their arguments, fetal testosterone levels also affect the development of the immune system, leading to an increased incidence of immune disorders, and of the thymus, leading to changes in melanin production, thereby affecting hair and eye colour. Schacter, Ransil, and Geschwind have claimed a higher incidence of blue eyes and blond hair in left-handers.

Coren and Halpern have a two-factor theory of left-handedness, distinguishing between genetic left-handers and pathological left-handers. They see pathological left-handedness as resulting from embryological distress. In support of their model, they have claimed that left-handers die younger, reach puberty later than right-handers, and are more likely to be born of older mothers.

## PROCEDURE

To provide new data concerning these ideas, we carried out an extensive survey of over 1000 undergraduate students and their first-order relatives.

Students were asked a variety of questions concerning the age of their parents at birth, their hair and eye colour, and their estimated age at pubertal onset.

All students were also given the Steenhuis and Bryden (1989) handedness questionnaire, consisting of 32 items regarding preferred hand usage. For the purposes of this study, subjects were classified as right-handed or left-handed on the basis of their responses to the "skilled hand" item (Factor 1) of the questionnaire. It should be noted that fundamentally identical results were obtained when classification was on the basis of the full questionnaire or on the basis of self-professed hand preference.

## PUBERTAL ONSET

Coren (1992) has suggested that individuals with late pubertal onset are more likely to be left-handed than are those with more normal developmental histories.

Subjects indicated whether they felt their own onset of puberty was earlier than average, about average, or later than average than their same-sex peers. Analysis of the pubertal onset data indicated that age at pubertal onset did not interact with handedness ( $c^2 = 0.30$ ,  $df = 2$ ,  $p > .5$ ), nor was there a sex x handedness x pubertal onset interaction ( $c^2 = 0.66$ ,  $df = 2$ ,  $p > .5$ ).

The present data fail to provide any support for this contention.

## PARENTAL AGE EFFECTS

Coren (1992) has argued that left-handers are the offspring of older mothers on the basis that older mothers are more likely to experience stressful births.

Mother's age at subject's birth was grouped into 5-year categories (16-20, 21-25, 26-30, 31-35, and 36 or over). A loglinear analysis of the data indicated no significant hand by age effect ( $c^2 = 1.19$ ,  $df = 4$ ), but a significant three-way interaction of hand, sex, and maternal age ( $c^2 = 11.12$ ,  $df = 4$ ,  $p < .03$ ). While separate analyses of males and females failed to show significant maternal age by hand interactions, the incidence of left-handedness tends to increase with maternal age in males ( $r = .585$ , 3  $df$ ), and to decrease with maternal age in females ( $r = -.799$ , 3  $df$ ).

Overall analysis of the effects of paternal age also indicate no significant hand by age effect ( $c^2 = 1.71$ ,  $df = 3$ ), but a borderline interaction between handedness, paternal age, and sex ( $c^2 = 6.53$ ,  $df = 3$ ,  $p < .09$ ). As was the case with maternal age, there is a positive relationship between handedness and paternal age for males and a negative one for females.

Basically, the data indicate that younger parents produce more left-handed women and older parents produce more left-handed men. These data do not confirm the notion that left-handers are the offspring of older mothers.

## EYE/HAIR PIGMENTATION

The proposition offered by Geschwind and Galburda was that fetal testosterone affected melanin production, leading to an association between handedness and both hair colour and eye colour. Schacter, Ransil and Geschwind provided data that suggested that blondes, or people with blue eyes, were more likely to be left-handed.

In the present study, subjects described their eye colour in many ways, with a few subjects using categories such as "blue-green" or "blue-grey". However, most individuals classed their eye colour as

blue, green, brown, or hazel. An analysis of these four main categories indicated no eye colour by handedness interaction ( $c^2 = 2.41$ ,  $df = 3$ ,  $p > .4$ ), nor any 3-way interaction of sex, handedness, and eye colour ( $c^2 = 2.50$ ,  $df = 3$ ,  $p > .4$ ).

Subjects categorized their natural hair colour as black, dark brown, light brown, blonde, or red. A loglinear analysis of sex by hair colour by handedness indicated no significant relation between hair colour and handedness ( $c^2 = 6.44$ ,  $df=4$ ,  $p > .10$ ), nor any significant three-way interaction of handedness, sex, and hair colour ( $c^2 = 8.06$ ,  $df=4$ ,  $p = .09$ ).

If we reclassify the subjects on both hair and eye colour as dark (black or dark brown hair, brown or hazel eyes) or light (light brown, blonde, or red hair, blue or green eyes) pigmentation, there is no effect of pigmentation on handedness ( $c^2 = 0.02$ ,  $df=1$   $p > .50$ ), nor any interaction with sex ( $c^2 = 0.22$ ,  $df=4$   $p > .50$ ).

Thus, these data fail to provide any support for the Geschwind-Galaburda hypothesis.

## CONCLUSIONS

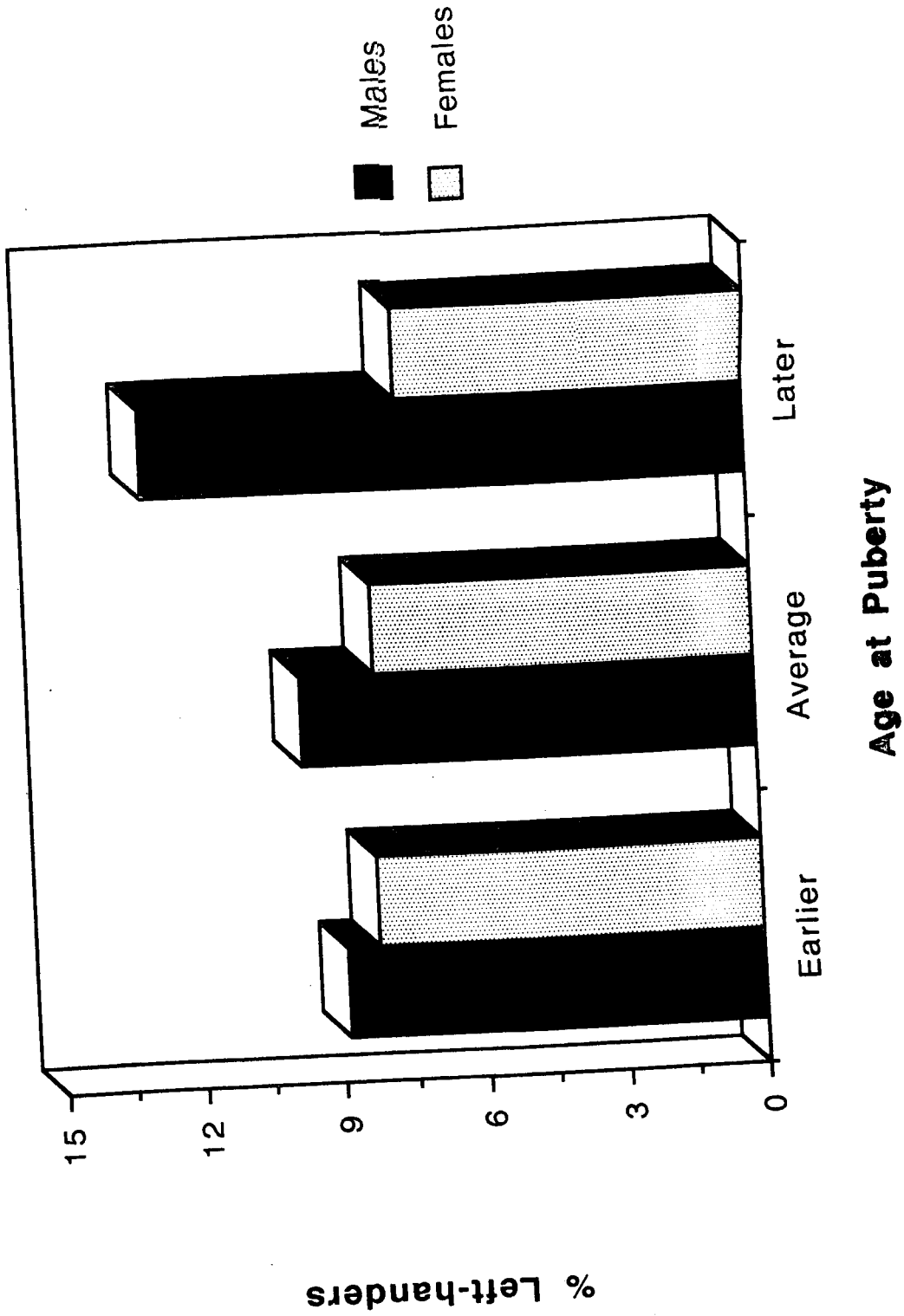
We have examined several of the claims made by Coren and Halpern and by Geschwind and Galaburda regarding the relationship between handedness and other variables and found them lacking. Specifically, we have found

1. No relation between handedness and age at pubertal onset.
2. No relation between handedness and hair or eye pigmentation.
3. A relation between handedness and parental age (as opposed to maternal age) such that older parents produce more left-handed sons and fewer left-handed daughters, while younger parents produce more left-handed daughters and fewer left-handed sons. Although interesting, this effect does not follow from either the Geschwind-Galaburda or Coren-Halpern theories.

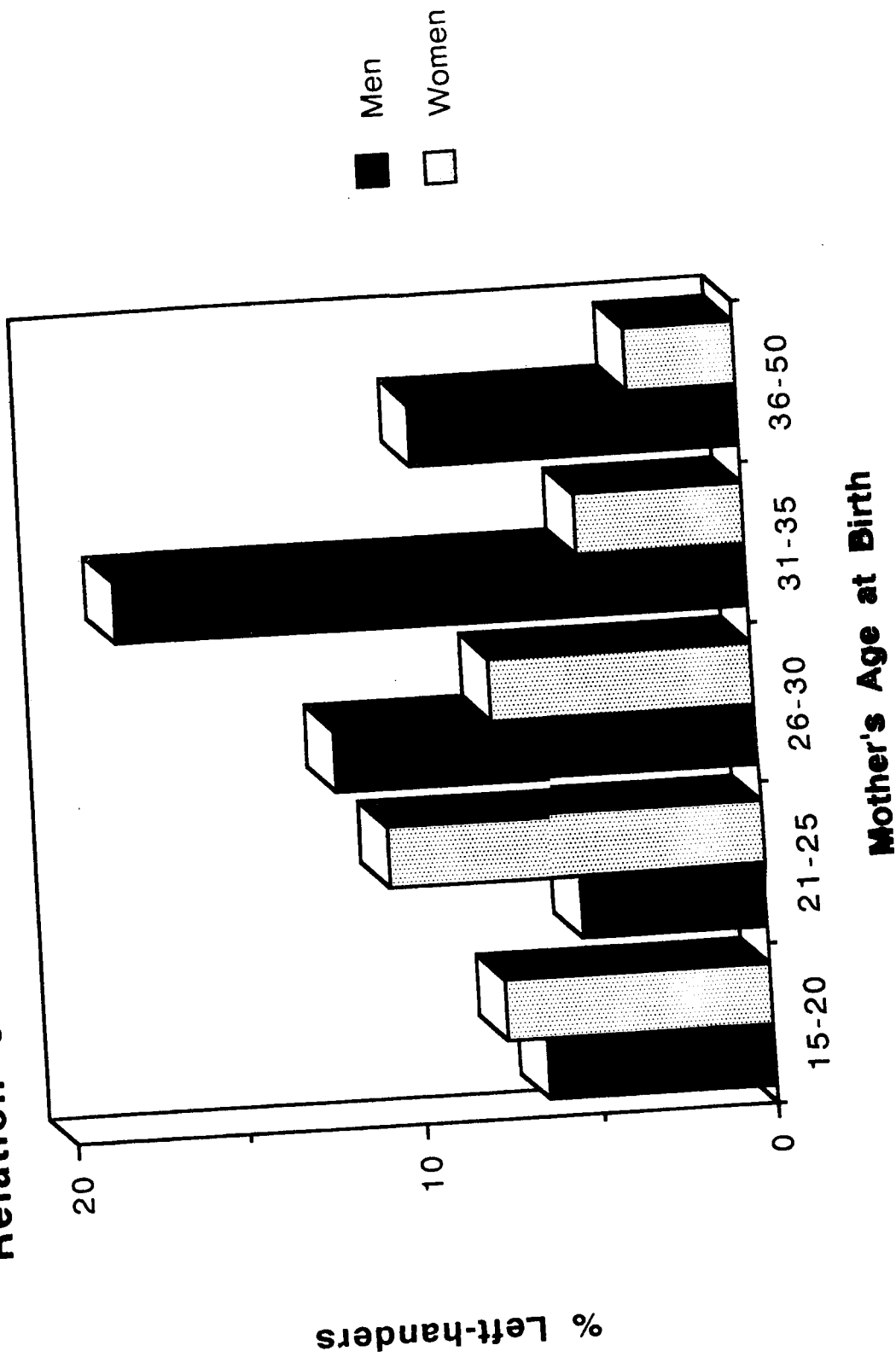
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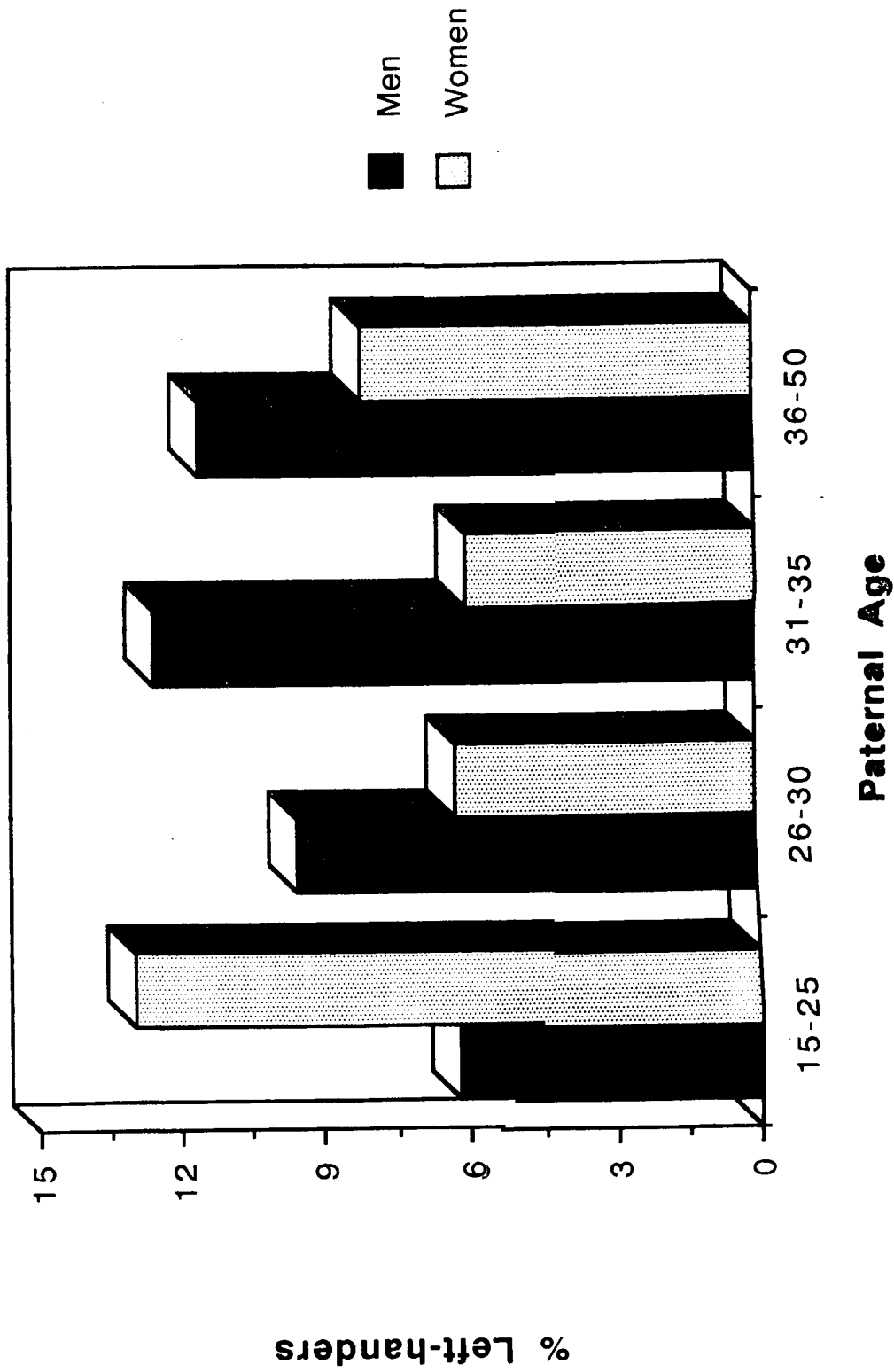
# Handedness and Pubertal Onset



# Relation of Handedness to Maternal Age



# Handedness and Paternal age



# Handedness and Hair and Eye Colour

