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SPATIAL ABILITY, HANDEDNESS, AND HUMAN SEXUAL ORIENTATION

BRIAN A. GLADUE¹ and J. MICHAEL BAILEY²

¹Department of Psychology, North Dakota State University, Fargo, North Dakota 58105, USA
and ²Department of Psychology, Northwestern University, Evanston, Illinois, USA

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SUMMARY

We investigated the relations among mental rotations and spatial perception abilities, handedness, and sexual orientation in both men and women. The present study included a relatively large sample and attempted to control statistically for important covariates such as general intelligence. Significant sex differences were obtained for mental rotations and spatial perception, but not for handedness. None of these measures was significantly related to sexual orientation within either sex.

Keywords—Homosexuality; Mental rotations; Spatial ability; Psychosexual development; Sex differences; Handedness.

MODERATE TO LARGE sex differences exist for some kinds of spatial abilities, especially on measures of mental rotation, but also on tests of spatial perception (Linn & Peterson, 1985). These differences have remained stable over the past two decades despite rapid social changes (Masters & Sanders, 1993). Research has suggested that the organizational effects of early androgen exposure contribute to some spatial sex differences. Experimental studies have provided strong evidence for the importance of such effects for sex differences in rodents (Williams & Meck, 1991). Regarding humans, women with congenital adrenal hyperplasia (CAH) outperformed their normal relatives on some spatial tasks (Resnick et al., 1986).

We have argued elsewhere (Bailey et al., 1994; Gladue & Bailey, 1995) that the study of within-sex differences can illuminate the development of sex differences. Briefly, early androgen exposure is likely to have effects that are relatively general. High levels are likely to masculinize more than one particular brain site. If so, and if differences in androgen exposure contribute to within-sex variation, then traits that are masculinized during similar developmental periods should be correlated within the sexes. If, on the other hand, two sexually dimorphic traits are uncorrelated within sexes, this suggests that they differentiate independently. Although this would not necessarily be inconsistent with the possibility that early androgens contribute to both sex differences, it would constrain developmental hypotheses.

Address correspondence and reprint requests to: Brian A. Gladue, PhD, Institute for Policy Research, Department of Psychology, University of Cincinnati, Cincinnati, OH 45221-0376.

The study reported here focuses on the relationship among sexual orientation, handedness, and two kinds of spatial ability. Before proceeding to the study, we first briefly review theoretical linkages between these characteristics, and prior empirical studies of their association.

THEORY AND PRIOR STUDIES

Most studies have found more left-handedness among males than females. Some theorists have suggested that these findings are related to the sex difference in spatial ability and reflect sex differences in cerebral organization, with female brains being less lateralized (hemispherically specialized; see Halpern, 1992, Chapter 5 for a review). The sex difference in lateralization has been hypothesized to result from the organizational effects of early androgens. However, not only the explanatory theory but the fact of sex differences in lateralization is controversial (Halpern, 1992).

Sexual orientation has also been hypothesized to depend on early androgen exposure (Ellis & Ames, 1987; Gladue, 1994). Several studies have examined the relationship between sexual orientation and either handedness or spatial ability. Lindsay (1987) reported a higher incidence of left-handedness among homosexual compared to heterosexual men. McCormick, Witelson, and Kingstone (1990) found a significantly higher rate for 32 homosexual women compared to published norms. McCormick and Witelson (1991) found a significantly higher rate of nonconsistent right-handedness among 38 homosexual men compared to published norms. Götestam, Coates, and Ekstrand (1992) found a significantly higher rate of left-handedness among homosexual men compared to published norms. Tkachuk and Zucker (1991) found an increased rate in male and female homosexual groups, combined, compared to heterosexual controls. In contrast, three large studies using HIV patients found either no association (Marchant-Haycox et al., 1991; Satz et al., 1991) or a weak association (Becker et al., 1992) between male sexual orientation and handedness. Clearly, it is premature to accept an association between sexual orientation and handedness for either males or females.

Five studies have examined the relationship between mental rotation ability and male sexual orientation (Gladue et al., 1990; Hall & Kimura, 1993; McCormick & Witelson, 1991; Tkachuk & Zucker, 1991; Tuttle & Pillard, 1991). Three of the studies found homosexual men significantly to score significantly worse than heterosexual men (Gladue et al., 1990; McCormick & Witelson, 1991; Tkachuk & Zucker, 1991) and the other two found no significant differences. None of the studies comparing homosexual and heterosexual women on mental rotations tasks found a difference (Gladue et al., 1990; Tkachuk & Zucker, 1991; Tuttle & Pillard, 1991), although even the largest of these had only 34 heterosexual and 34 homosexual women (Tuttle & Pillard, 1991).

Of studies examining the relationship between sexual orientation and spatial perception, two found homosexual men significantly worse than heterosexual men (McCormick & Witelson, 1991; Sanders & Ross-Field, 1986), one (Gladue et al., 1990) found equivocal results (i.e., significance depended on the scoring method; significant results showed heterosexual to outperform homosexual *S*'s), and one found no difference (Tkachuk & Zucker, 1991). Of the two studies examining female sexual orientation, one study found equivocal results (Gladue et al., 1990) and one found no difference (Tkachuk & Zucker, 1991).

On balance, prior studies suggest an association between high mental rotations and spatial perception ability and a heterosexual orientation for males. (The number of female

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