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Research report

Does sex influence the age of acquisition of common names? A contrast of different semantic categories

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ABSTRACT

The literature reports a sex-related asymmetry in the ability to process different semantic categories: women are more proficient with biological categories and men with man-made objects. The origin of this asymmetry is still debated. In this study, we directly checked whether the acquisition of names belonging to different semantic categories differs according to sex. We carried out our inquiry on 202 children aged 3–5 years, who were given a coloured picture naming task using a battery of 60 stimuli belonging to different semantic categories. Boys differed from girls only on naming of stimuli belonging to the categories of tools and vehicles, where they showed an earlier name acquisition. No sex differences were found for animals or plant life, notwithstanding evidence in the literature of an overrepresentation of males among patients affected by biological categories impairment.

Our findings suggest that the male advantage for tools and vehicles reported in the literature on verbal fluency and naming tasks is strongly related to the earlier age in males of name acquisition for these categories, and possibly to their higher familiarity. On the contrary, the female advantage for plant life knowledge, which becomes evident later in life, has a still undefined nature and only a dubious relationship to familiarity, although it is sufficient to cause an overrepresentation of males among patients affected by a category specific impairment of biological categories, especially of plant life knowledge.

1. Introduction

The existence in humans of cognitive and behavioral differences between males and females is well known. These differences emerge already in the first or second year of life as different playing habits (e.g., Maccoby and Jacklin, 1974). Accordingly, boys and girls at 19 months prefer playmates of the same sex (Hines and Kaufmann, 1994; Maccoby, 1980). Authors disagree on the relative weight of nature versus nurture as the cause of these differences, and the asymmetrical behavior of parents with respect to sons and daughters is sometimes considered the cause and sometimes the effect of the differences observed in children (Snow et al., 1983). Parents' behavior may tend in any case to reinforce and amplify those differences independently of their cause, even though systematic studies reveal that there may be more affinities

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in boys' versus girls' education than differences in parents' attitude (Lytton and Romney, 1991).

Later in life, some cognitive asymmetries between human males and females are still observed, which cannot be completely explained by cultural factors (Cahill, 2006); the most robust findings are linked to specific domains. A clear male advantage applies to the visuo-spatial domain (Voyer et al., 1995), the strongest case being that for 3-dimensional mental rotation where the sex difference, already detectable at 5 years of age, increases still further with time. Other examples of male advantage are visuo-spatial memory (except that for relative location of objects), spatial perception (line orientation, water-level test), and movement perception. In contrast, on a number of verbal abilities females seem to prevail: verbal fluency, phonological discrimination and articulation and other verbal tasks (Kimura, 1999; Halpern, 1992). However, it should be noted that, though sex differences are often reported, in fact they are not always found even in mental rotation experiments (Jansen-Osmann and Heil, 2007).

Intriguing data have recently been collected from lexical and semantic tasks, and a consistent body of evidence shows a sex-related asymmetry in the ability to process different semantic categories. This asymmetry concerns both normal subjects and patients. Considering the performance of normal subjects on verbal fluency and on speeded naming women are more proficient with biological categories, and men with man made objects (for a summary of the relevant data and a discussion see Laiacona et al., 2005; Capitani et al., 1999; Laws, 1999, 2003). The above asymmetry is consistent with the results of clinical studies. According to review of Capitani et al. (2003), among the single case reports of biological categories impairment males clearly prevail: of 61 cases of disproportionate impairment of biological categories, 43 (70.5%) were males. A complementary asymmetry was not observed for the impairment of the category of artefacts: among 15 cases of disproportionate impairment for artefacts, 7 were females and 8 males. The male prevalence reported above could depend on the fact that males are more subject to the diseases (traumatic brain injury and some types of stroke) most commonly associated with biological-category impairments. However, even restricting the analysis to cases with a sex-neutral aetiology (herpetic encephalitis) the findings are similar: 21/28 (75%) subjects with selective biological impairments were male (Capitani et al., 2003). At variance with single case reports, multiple single case studies of homogeneous etiology confirm not only the male vulnerability for biological categories, but also the female vulnerability for artefacts. Laiacona et al. (1998) studied 26 Alzheimer patients (15 females and 11 males) and found that 8 males (73%) and 1 female (7%) presented a disproportionate impairment of biological categories, whereas 3 females (20%) and no males presented the opposite dissociation. Laiacona et al. (2001), in a similar study on 49 aphasics (34 males and 15 females), found that 6 males (18%) and 1 female (7%) presented a disproportionate impairment of biological categories, whereas 4 females (27%) and no males presented a disproportionate impairment for artefacts.

To explain the robust sex by category interaction, the first approach was to invoke cultural or social factors, such as a different familiarity of males and females with the items of different categories, also because, at closer scrutiny, the advantage of females does not concern the undifferentiated category of living things, and is observed with plant life items and not with animals. To this end, Albanese et al. (2000) collected analytic and multi-faceted familiarity ratings with items of 6 different semantic categories and compared these ratings between males and females. In the above study, normal controls were asked to rate familiarity by means of three separate indices: (1) the frequency with which one thinks or speaks of a given item, (2) the frequency with which one sees it represented in the media, and (3) the frequency with which one is confronted with real exemplars. They observed a significantly higher female familiarity for fruit, vegetables and furniture, but just a marginal significance for the male higher familiarity with tools. Nevertheless, this study prompted a methodological refinement of the investigation of category dissociations, and the published studies can now be retrospectively subdivided into two generations. The first generation did not particularly discriminate within the whole realms of either biological categories or artefacts, and neglected the familiarity differences linked to sex. The second generation of studies, well exemplified by the recent papers by Samson and Pillon (2003) and by Laiacona et al. (2005), operated a finer grain distinction within biological categories and within artefacts, and paid more attention to sex-specific familiarity. The latter generation of studies, in line with the reanalysis of old cases made by Albanese et al. (2000), confirmed with a stringent control of familiarity the reliability of the selective impairment of plant life items observed in some male patients. These studies are problematic for the hypothesis that plant life knowledge is impaired only among male patients simply because males are less familiar with this semantic category.

On the basis of these clinical contributions, the attention of investigators concentrated on the most striking component of the sex by category interaction, i.e., the high male vulnerability on plant life knowledge (or, equivalently, the female protection for the same category). Some authors (Gainotti, 2005) reappraised the familiarity hypothesis, and claimed that males should be protected not only for tools and vehicles, but also for the animals category. At variance, Laiacona et al. (2005) emphasized the fact that patients' data are not entirely consistent with a mere familiarity effect (see, for instance, Samson and Pillon, 2003; Laiacona et al., 2005), and suggested that other factors may be responsible for the male vulnerability or female protection for plant life knowledge.

This debate is still open and at this point a number of questions seem to be potentially relevant. The first is whether the sex by category interaction, not fully explained by familiarity, can be explained by other concomitant variables. The second, linked to the first, is at what age these effects appear, and whether the female advantage for biological items appears at the same time as the male advantage for artefacts.

The literature reports interesting data concerning the age at which differences between semantic categories are appreciated by children. Animals are differentiated from vehicles and furniture at 7 months, and aeroplanes from birds at 9 months. Basic level concepts, which are crucial in naming, emerge at 18 months for artefacts and at 24 months for animals and plants (Bloom, 2000; Mandler, 1998). However, more data are needed to decide whether and how early behavioral asymmetries