Effects of neonatal intensive care on girls’ and boys’ language development

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Jennische and Sedin’s article in this issue of *Acta Paediatrica* reports an interesting departure from the usual pattern of gender differences in language development (1). Their assessment of 6½-y-old children’s speech and language indicates that, among those who have received neonatal intensive care (NIC), speech and language skills are less affected in boys than in girls. Not surprisingly, gender differences in children are consistently observed in populations of normally developing children—at least as far as physical dimensions are concerned. The female and male organisms are anatomically and physiologically different and we therefore expect to see differences in length and weight between age-matched girls and boys. But while such physical dimensions are readily accessible and provide intuitively acceptable descriptions of the body, characterizing language abilities may be a different matter because the central notion of linguistic competence reflects a complex and integrated concept that resists characterization on the basis of a few measurable variables. Indeed, “Language development” is a high-level concept, integrating a wide range of aspects such as performance in speech production and perception, receptive and generative capabilities as well as syntactic and morphological competence and also the ability to structure and interpret information in adequate linguistic terms. This is why assessing language development typically demands sophisticated measuring instruments that are built as compounds of carefully selected subtests and designed to provide general estimates of language development. One such instrument is the Illinois Test of Psycholinguistic Abilities (ITPA), a comprehensive test battery that provides a standardized global estimate of the child’s psycholinguistic age based on a host of auditory, visual, motoric, memory and grammatical measures. Gender differences in language development are measurable by ITPA (2). Our own data from first-grade children attending two public schools in the Stockholm metropolitan area (Lacerda, in preparation) corroborate girls’ psycholinguistic advantage over boys in their school classes. The data, expressed in terms of the quotient between psycholinguistic age and the child’s chronological age, are shown in Fig. 1. Although the difference is small and does not reach significance level (p < 0.106, F(1, 127) = 2.646), it suggests an advantage of psycholinguistic abilities in 7 to 8-y-old girls in relation to boys of the same age. Furthermore, to break down the components of the psycholinguistic age measured by ITPA, a multivariate analysis of variance of the individual variables was performed but, although girls were somewhat better in most of the linguistically relevant variables, it was only in “word flow” that the difference between girls and boys was near a 0.05 significance level (p < 0.064, F(1, 127) = 3.480).

However, a selection of additional data obtained from the same children tested with a diagnostic test designed to assess schoolchildren’s phonological awareness (UMESOL) provides a very strong indication of the girls’ higher level of linguistic development. In this test the children were requested to perform diverse operations with the speech sounds or syllables of Swedish words organized in three levels of increasing phonological complexity. The results displayed in Fig. 2 were pooled across all the difficulty levels and show an overall significant advantage in favour of the girls.
“Segmentation”, \( p < 0.002, F(1, 113) = 9.890; \) “Word synthesis”, \( p < 0.013, F(1, 113) = 6.425; \) “Position analysis”, \( p < 0.013, F(1, 113) = 6.436).\) The only exception was the operation “segment subtraction”, which posed similar difficulties for all the children (\( p < 0.377, F(1, 113) = 0.788).\) Thus, at least by this measure, the 7 to 8-y-old girls of our sample show some linguistic advantage over the boys of the same age. The gender differences observed by Jennische and Sedin in their 6½-y-old children in the control group confirm this pattern of significant differences in favour of the girls for some of the linguistically relevant tasks, such as “word fluency”. Interestingly, as Jennische and Sedin’s data reveal, the girls in the control group are significantly better than the boys not only in terms of grammar, interaction and word fluency. They are also significantly more advanced in auditory memory, mouth positions and mouth movements, aspects that although more indirectly connected to the child’s linguistic competence per se, may nevertheless facilitate the child’s speech production ability and thereby boost general speech and language development.

For the NIC children as a group, Jennische and Sedin’s data indicate an even more dramatic advantage of the 6½-y-old girls over the boys for many of the tasks they were tested, while the pooled scores from the NIC group suggest poorer performance than that of the controls. It is therefore interesting to examine Jennische and Sedin’s data to investigate the grounds for their claim that boys in NIC were less affected in language abilities by 6½y of age than NIC girls. On closer examination, the boys’ advantage over the girls is certainly observed but only within the group of very preterm children (born after 23 to 31 weeks of gravidity). This is surprising, because this would be the group for which the most dramatic losses in speech and language abilities for all children might be expected, leaving unchallenged the girls’ advantage over the boys. Therefore, attempting to account for the reported reversal is an important task that it is hoped to lead to a better understanding of the complex interaction between the factors related to speech and language performance.

A possible scenario within which this group of NIC boys’ speech and language superiority relative to that of the girls might be explained concerns a direct consequence of a range effect. In such a scenario both girls and boys would be adversely affected for being very preterm children but the effect would be more visible in girls than in boys because girls usually perform at a higher level than boys. The gender differences would shrink and in some cases may even be reversed. Another possibility is that the girls in this NIC group might have been in more critical situations than the boys. Although this is obviously virtually impossible to disentangle, it may be argued that if such critical situations subsequently impact on language, then the speech and language data would show a disadvantage for the girls, reflecting the girls’ exposure to critical situations rather than the gender component itself. Incidentally, as shown in Table 3 in the paper by Jennische and Sedin, the girls in this NIC group seem to have many more postnatal problems than the boys. But the situation does not seem to be as simple as that and Jennische and Sedin are clearly aware of these aspects and address them adequately in their discussion. Besides, there are tasks in which the boys in this NIC group did in fact get significantly higher scores than the boys in the control group of full-term children. This is a case of “Digital recall” and “Auditory memory”. In face of this outcome and awaiting a better understanding of the details of the language development process, it is amazing to observe the process’s complexity, the impact of the linguistic
environment and the organisms’ ability to cope with a host of adverse situations (3, 4).

References
1. Jennische M, Sedin G. Gender differences in outcome after neonatal intensive care: speech and language skills are less influenced in boys than in girls at 6.5 years. Acta Pædiatr 2003; 92: 000–00

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