Observed toy preference as a measure of gender behavior in an epidemiological study examining the neurotoxicological effects of environmental exposure

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Introduction

Environmental exposures to a variety of neurotoxins remain a concern in western industrialized countries, as well as in developing countries, especially concerning health problems in vulnerable populations such as the unborn child. PCB's and dioxine-like compounds are regarded to belong to the most ubiquitous developmental neurotoxins [1].

As PCBs and dioxine-like compounds have an endocrine disrupting effect, it is interesting to notice that play behavior is reported to change in boys and girls (less masculine and more feminine play behavior) according to the level of prenatal PCB exposure. Some data in girls suggest that even the postnatal PCB exposure might influence play behavior, although in the opposite direction (more masculine) [2]. Although these data are certainly not conclusive, as the questionnaire (PSAI) which was used was not appropriate for the age of the children and test-retest results were rather poor (0.6) [3]

In addition, this questionnaire was filled in by the mother and is therefore an indirect measure of the child's behavior. To replicate these findings, we used an alternative and more direct method to measure gender behavior in children.

Method

The present study is a part of the Environmental Health Action Program (EHAP) (2002-2006) in Flanders, investigating environmental exposure to e.g. Pb, Cd, PCBs, compounds with 'dioxin-like' , chlorinated pesticides [DDE and hexachlorobenzene (HCB)], and organic solvents in eight selected regions of Flanders. In this part of the EHAP, the relation between neuro-developmental parameters (e.g. IQ, milestones, language development) and the prenatal exposure markers of PCB's and dioxin-like compounds will be studied. Measuring development in the different domains of human brain function is a lengthy and difficult task. Therefore an additional aim is to investigate if behavior (questionnaires, play behavior observations) is a useful bio-effect parameter in follow-up studies in populations exposed to toxic agents.

"Toy preference" is assessed by measuring the time a child is playing with toys which are generally preferred either by girls (feminine) or by boys (masculine), or which is liked by both equally (neutral) [4]. The toys consisted of four feminine toys (a babylike doll, two barbie dolls, a thee set and a hairstyling doll), two neutral toys (a book and a puzzle), and four masculine toys (a firetruck, four little cars, building blocks and a gun). The toys were presented in a standardised way. The objects were arranged in a semi circle around the child in the following order (clockwise): gun, thee set, firetruck, two barbie dolls, puzzle, book, four little cars, hairstyling doll, building blocks and babylike doll. All objects were visible and within reach for the child. A 7 minutes play was videotaped. The total time playing with feminine, masculine and neutral toys respectively and the time spent without playing was calculated.

This task was reported to have a high test-retest reliability [5], which was our own experience (5 videotapes were scored by two different persons and the difference was maximum some seconds per toy and consequently less then ten seconds per category, not changing anything to the percentual preference).

Results

At this moment, the data-analyses are still ongoing. The first preliminary results (N=70) suggested that higher exposed boys played less with boy specific toys.($p<.05$) and more with gender non-specific toys ($p<.01$).

References

1. Guo YL, Lambert GH, Hsu CC, Hsu MML (2004). Yucheng: health effects of prenatal exposure to polychlorinated biphenyls and dibenzofurans. *International Archives of Occupational and Environmental Health,* **77,** 153-158.
2. Vreugdenhil HJI, Slijper FME, Mulder PGH, Weisglas-Kuperus N. (2002). Effects of perinatal exposure to PCBs and dioxins on play behavior in Dutch children at school age. *Environmental Health Perspectives*, **110(10)**, 593-598.
3. Kaufman, AS (2003). Critique of Vreugdenhil et Al.'s Study Linking PCBs to the Play Behaviors of Dutch Girls and Boys. Environmental Health Perspectives, **111**.
4. Connor, J.M., & Serbin, L.A. (1977). Behaviorally based masculine- and feminine-activity preference scales for preschoolers: Correlates with other classroom behaviors and cognitive tests. *Child Development*, **48**, 1411–1416.
5. Henserson, BA, Berenbaum, SA (1997). Sex-typed play in opposite-sex twins. *Developmental Psychology*, **31(2)**, 115-23.