

NES2 Continuous Performance Test results obtained by methylmercury-exposed children at ages 7 and 14 years

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Introduction and Objectives The Neurobehavioral Examination System 2 (NES2) has been widely applied as a computer-assisted test system particularly useful for the Continuous Performance Test (CPT). This test appears to be sensitive to developmental methylmercury neurotoxicity at age 7 years, and this study describes the sensitivity at age 14 years.

Methods We used the NES2 CPT when examining members of a birth cohort from the Faroe Islands at ages 7 and 14 years. The degree of prenatal exposure to methylmercury was indicated by the cord-blood mercury concentration. Of the initial 1022 cohort members 903 were tested at age 7 years and 882 at age 14 years. For 819 children a result from both occasions was available. We have previously reported significant mercury-associated decrements on 4-minute CPT results at age 7 years. We now report on the CPT results at age 14 years, where test duration had been extended to 10 minutes. In this study, animal silhouettes were used as stimuli, and the subject had to respond to the 'cat' by pressing the joystick key. Critical stimuli were presented at a rate of 12 per minute, and the first minute was discarded as a practice period. The stimulus duration was 1200 ms, each stimulus being replaced on the screen instantaneously with the succeeding one. A reaction time measure was derived when a positive response was recorded within 1200 ms after appearance of the 'cat' on the screen, i.e., in time before the next stimulus.

Results At age 14 years, the average reaction time was 492 ms (s.d., 45 ms), with an average of 2 missed responses during the full 10-min testing period. A shorter average reaction time of 477 ms was observed during the first 4 minutes of testing. These results may be compared with the average of 750 ms obtained in the same children at age 7, with an average of 6 missed responses during 4 minutes. Ten-minute reaction times at age 14 correlated only slightly better with the results from age 7 ($r = 0.48$) than did the average based only on the first 4 minutes ($r = 0.45$). While girls had shorter reaction times than boys at age 7, the reverse was seen at age 14. Otherwise covariate associations were roughly similar, with age being the most important predictor. The logarithmic transformation of the cord-blood mercury concentration was significantly associated with the CPT 10-minute reaction time ($r = 0.09$; $p = 0.01$), but the association for the 4-minute average was no longer significant ($r = 0.06$; $p = 0.07$). However, the average for minutes 5-10 showed a slightly better correlation ($r = 0.10$; $p = 0.003$). These associations are similar to those obtained at age 7, and covariates seemed to affect these associations only to a limited degree.

Conclusions The CPT is therefore sensitive to developmental methylmercury neurotoxicity even at age 14 years. However, the duration of the test must be extended to at least 10 minutes.