



# Development of a neurobehavioral test for Thai children: a preliminary study



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## Abstract

Children living in agricultural area can expose to pesticide residues via inhalation, ingestion and dermal contact. In Thailand, there has been used many pesticides for crop protection purposes. Organophosphate insecticides have been heavily used and known as a neurotoxicant. Children living agricultural area may have more deleterious effects on health, especially in neurodevelopment. The objective of this study is to be a preliminary study of neurobehavioral battery test for children age between 6-8 years old who living in agricultural area, Pathum Thani Province, Thailand. Fifteen healthy children (7 girls, 8 boys) were recruited and tested. The Behavioral Assessment and Research System (BARS) and non-computerized tests including (1) finger tapping, (2) symbol-digit, (3) match to sample, (4) continuous performance, (5) divided attention, (6) digit span, (7) visual motor integration, (8) Purdue pegboard, and (9) object memory tests were used to assess the neurobehavioral performance in children. Overall of the results, most of children completed all the tests. Age showed significantly different of testing results. These cognitive tests revealed the memory and attention performance of the children. The future study should be suggested to develop and evaluate subtle health effects among children exposed to neurotoxicants. As well as, the cross-cultural development of the neurobehavioral tests should be adjusted to be more suitable for Thai children.

Keywords: Neurobehavioral tests, Behavioral Assessment and Research System (BARS), Thai children

## Introduction

Children can be exposed to pesticides and other hazardous chemicals through multiple pathways and by multiple routes (Hore et al., 2005; Lu et al., 2000). Farm children were likely high exposure to pesticide spraying in dry season more than wet season (Petchuay et al., 2006). Many studies showed the association between children and neurobehavioral deficits (Landrigan et al., 1999; Rasoul et al., 2008). The Behavioral Assessment and Research System (BARS) has been used and developed to assess the neurobehavioral performance in children (Rohlman et al., 2001; Rohlman et al., 2009).

The objective of this study is to be a preliminary study of neurobehavioral battery test for children age between 6-8 years old who living in agricultural area, Pathum Thani Province, Thailand.

## Methodology

### Participants

Fifteen healthy children (7 girls, 8 boys), ages between 6 to 8 years old were recruited from Khlong 7 agricultural area, Pathum Thani province, Thailand. Most of them were in farmer's families and resided nearby the paddy fields. Both parent and child were agreed and signed in the consent and assent form prior study. This study was approved by the institutional review board of Chulalongkorn University.

### The neurobehavioral battery tests

The battery test was assembled by combining tests from the Behavioral Assessment and Research System (BARS) and other non-computer based tests. The lists of the neurobehavioral battery test were as follow;

- Response and coordination tests were used Finger Tapping, Symbol-Digit, Purdue Pegboard and Visual Motor Integration.
- Memory tests were used Digit Span, Match-to-Sample and Object Memory Test.
- Attention span tests were used Continuous Performance and Divided Attention Test.

The tests and instructions were translated into Thai words. All testers were trained to be standardized. In divided attention test, Chang song (elephant song) was used. As well as object memory test, some items were modified to be suitable for Thai children.



Figure 1) The Behavioral Assessment and Research Systems (BARS), 2) Purdue Pegboard, 3) and 4) Test administration for BARS and Object Memory Test

## References

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## Result

Most of subject can complete all the tests. Boys showed higher score in the tests than girls and these scores were increased by age, except for response speed tests. The response speed and coordination were shown in Figure 5. Number of finger tapping was reduced by age in both male and female. The tapping rates were significantly decreased in divided attention which child must sing a song while tapping.

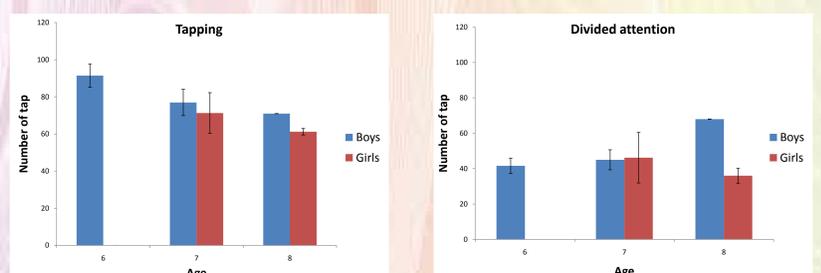


Figure 5) The response speed and coordination performance for male and female by age.

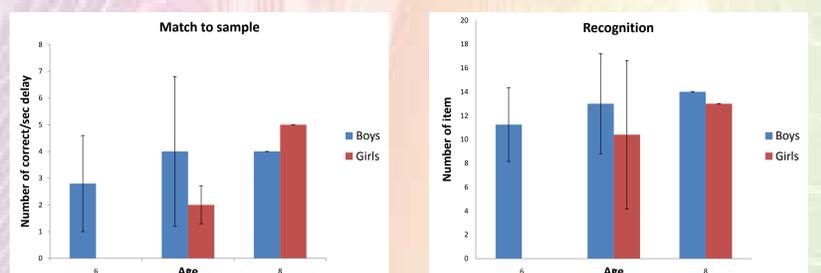


Figure 6) Cognitive and memory scores for male and female by age.

Boys performed better score in match to sample and object memory tests. The memory skill slightly increased by age in both gender (Figure 6). Overall results from Thai children were comparable to other population with same age range (Rohlman et al., 2007; 2008). The preliminary result will be used to develop the neurobehavioral tests in future.

## Conclusion

In this preliminary study, the relationship between neurobehavioral score and pesticide exposure need to be more explored. The testing tools for neurobehavioral functions will be modified and applied for the further project. However, the cross-cultural development need to be well adjusted for Thai population.

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