

# Sensitivity of the Means-End Problem Solving Assessment Tool (MEPSAT) for Discriminating Among Children with Varying Levels of Motor Delay

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## Introduction

Means-end problem-solving (MEPS) tasks can serve as early indicators of children's cognitive development. Delays in MEPS performance have been demonstrated in infants at risk for developmental delays [1,2]. The Means-End Problem-Solving Assessment Tool (MEPSAT) was recently developed for early assessment of MEPS.

The purpose of this study was to verify whether the MEPSAT is sensitive to distinguish developmental trends and differences among children with varying levels of motor delay.

## Methods

- 30 children with motor delays, 7-16 months of corrected age (Mean=10.4, SD=2.4 months).
- Children were classified by the severity of their motor delay (n=10 mild; n=10 moderate; and n=10 severe) based on a scale incorporating Gross Motor Functional Classification System (GMFCS) level [3], distribution of motor deficit, and active movement observed [4]
- Children were assessed longitudinally at 5 visits across 1-1.5-years in their homes.
- At each visit, infants engaged in a MEPS task: pulling a towel to retrieve a distant, supported toy (Figure 1).



Figure 1. Experimental setup for the means-end problem solving assessment.

The MEPSAT was used to score from videos: 1) Means-end learning (Figure 2A); and 2) level of performance (Figure 2B).

Linear mixed modeling was used to evaluate developmental trends and differences among the children with motor delays.

## Results

- The interaction between time and severity was not significant for both outcome variables, meaning that developmental trajectories for different severity groups had approximately the same rate of change: children starting the study with severe delays did not seem to catch up with children having mild or moderate delays by the end of the study (in 12 months).
- There was a significant main effect of severity for means-end learning [ $F(2,26)=4.22$ ,  $p=.026$ ] and level of means-end performance [ $F(2,27)=9.07$ ,  $p=.001$ ].

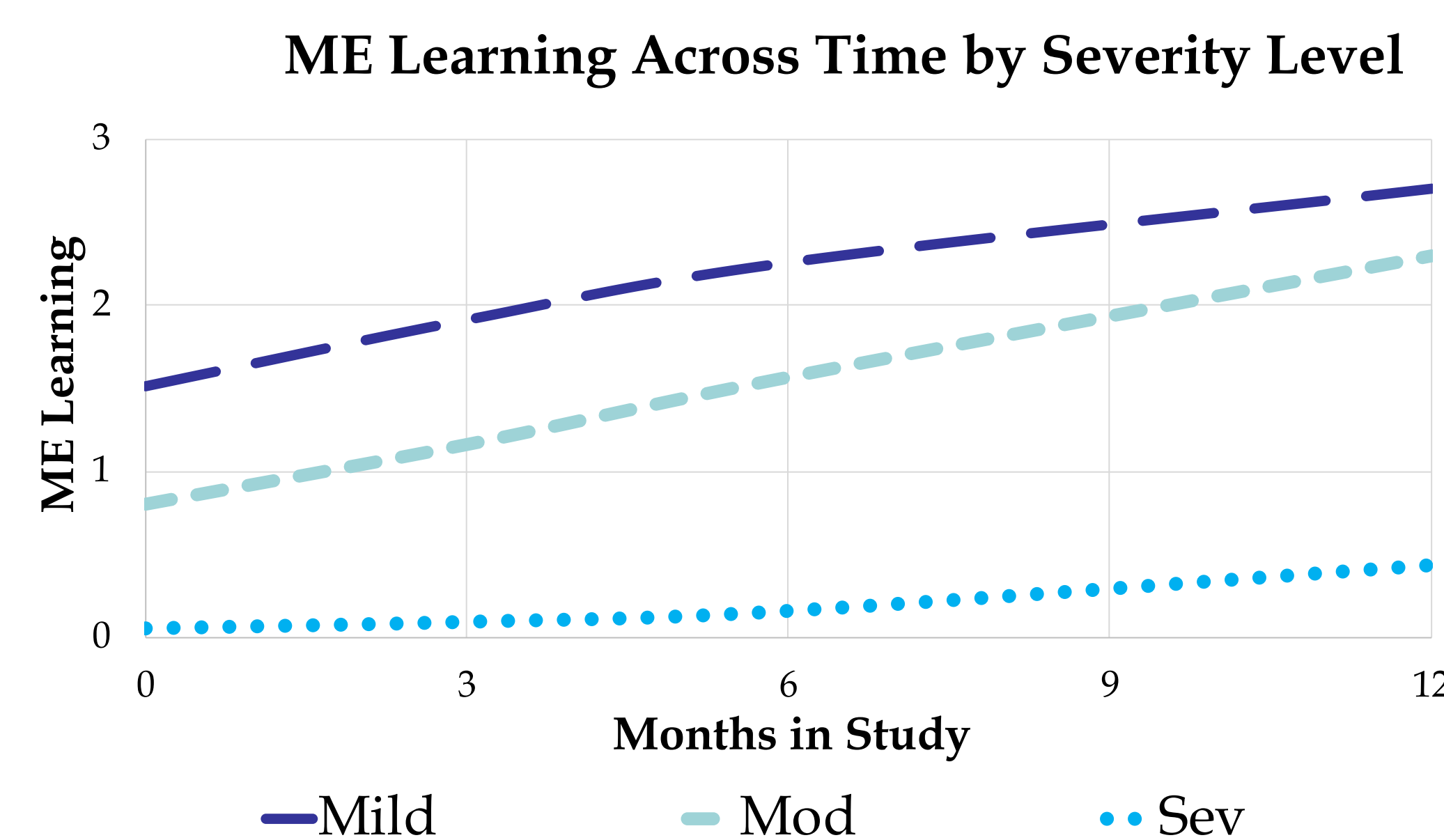


Figure 3. Means-end (ME) learning trajectory of infants with severe motor delay differed significantly from those with mild ( $\beta=3.98$ ,  $SE=1.37$ ,  $p=.007$ ) or moderate motor delay ( $\beta=2.96$ ,  $SE=1.42$ ,  $p=.048$ ). Learning could be demonstrated on anywhere from 0-3 trials per visit.

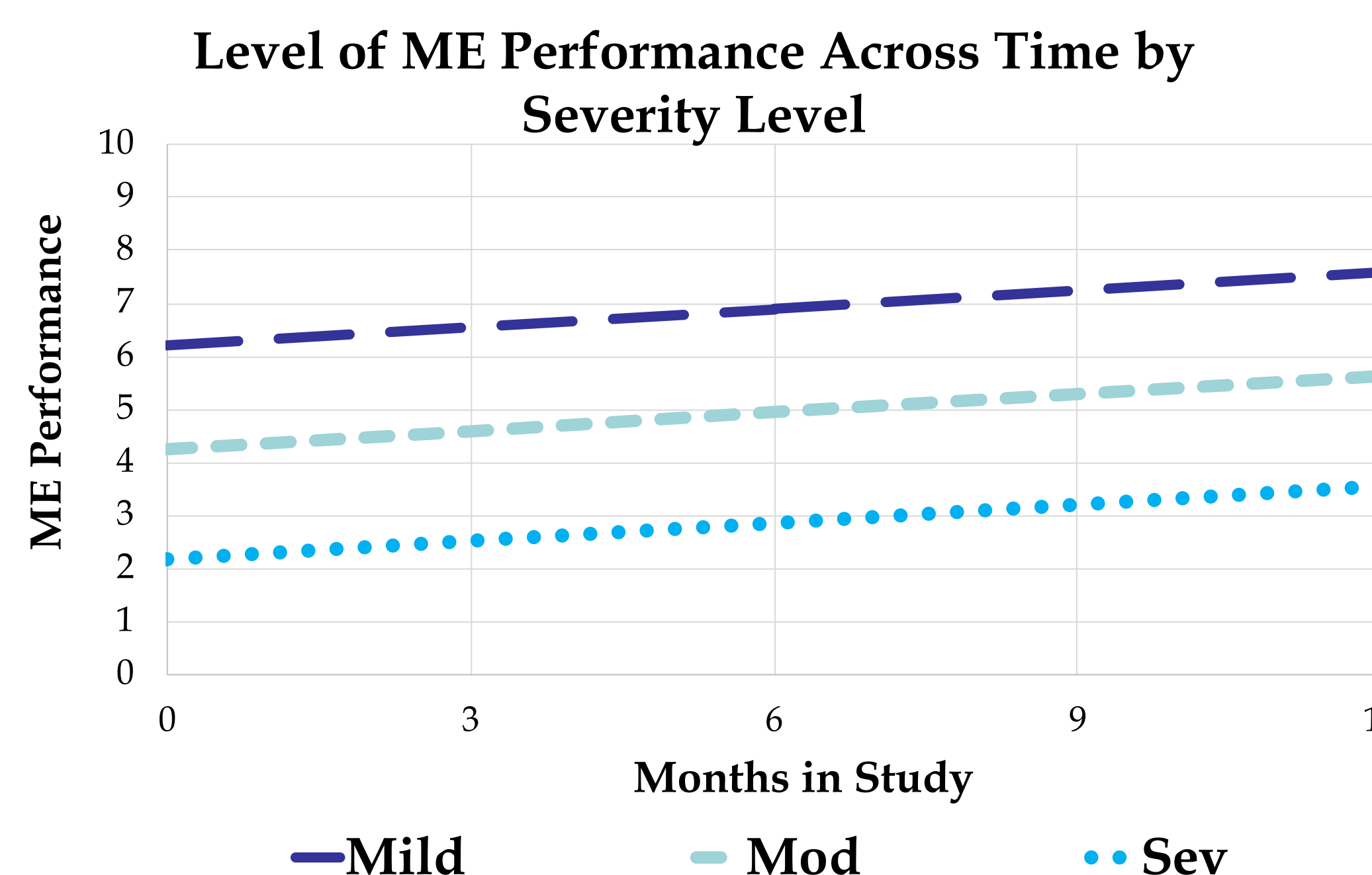


Figure 4. There were significant differences between all group combinations for the level of means-end (ME) performance, with the less severely delayed group always out-performing the more severely delayed one (mild vs. moderate:  $\beta=1.96$ ,  $SE=0.95$ ,  $p=.048$ ; mild vs. severe:  $\beta=4.03$ ,  $SE=0.95$ ,  $p<.001$ ; and moderate vs. severe:  $\beta=2.07$ ,  $SE=0.95$ ,  $p=.037$ ). Level of performance could range from 0-9.

Figure 2A. MEPSAT: Determination of learning

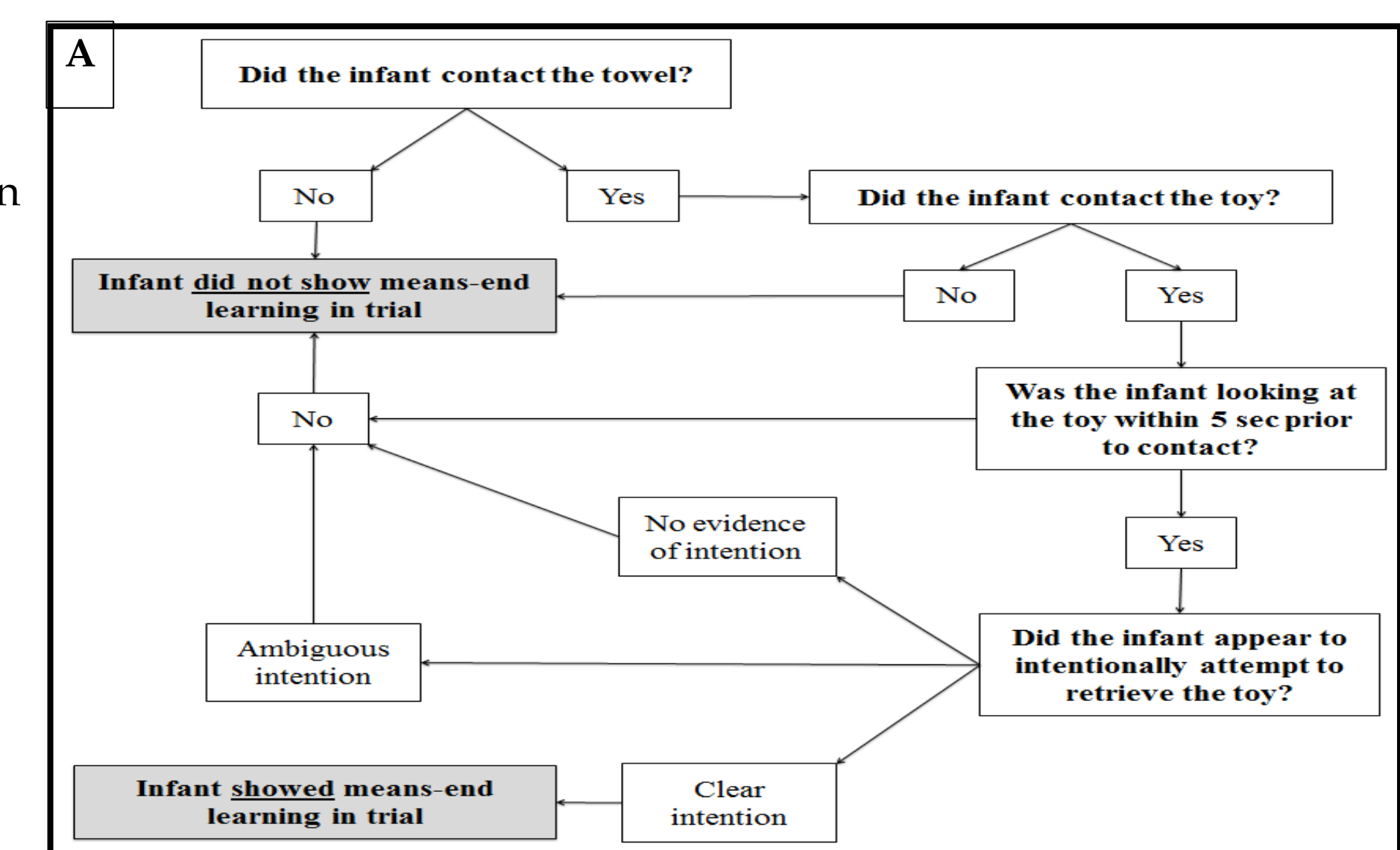
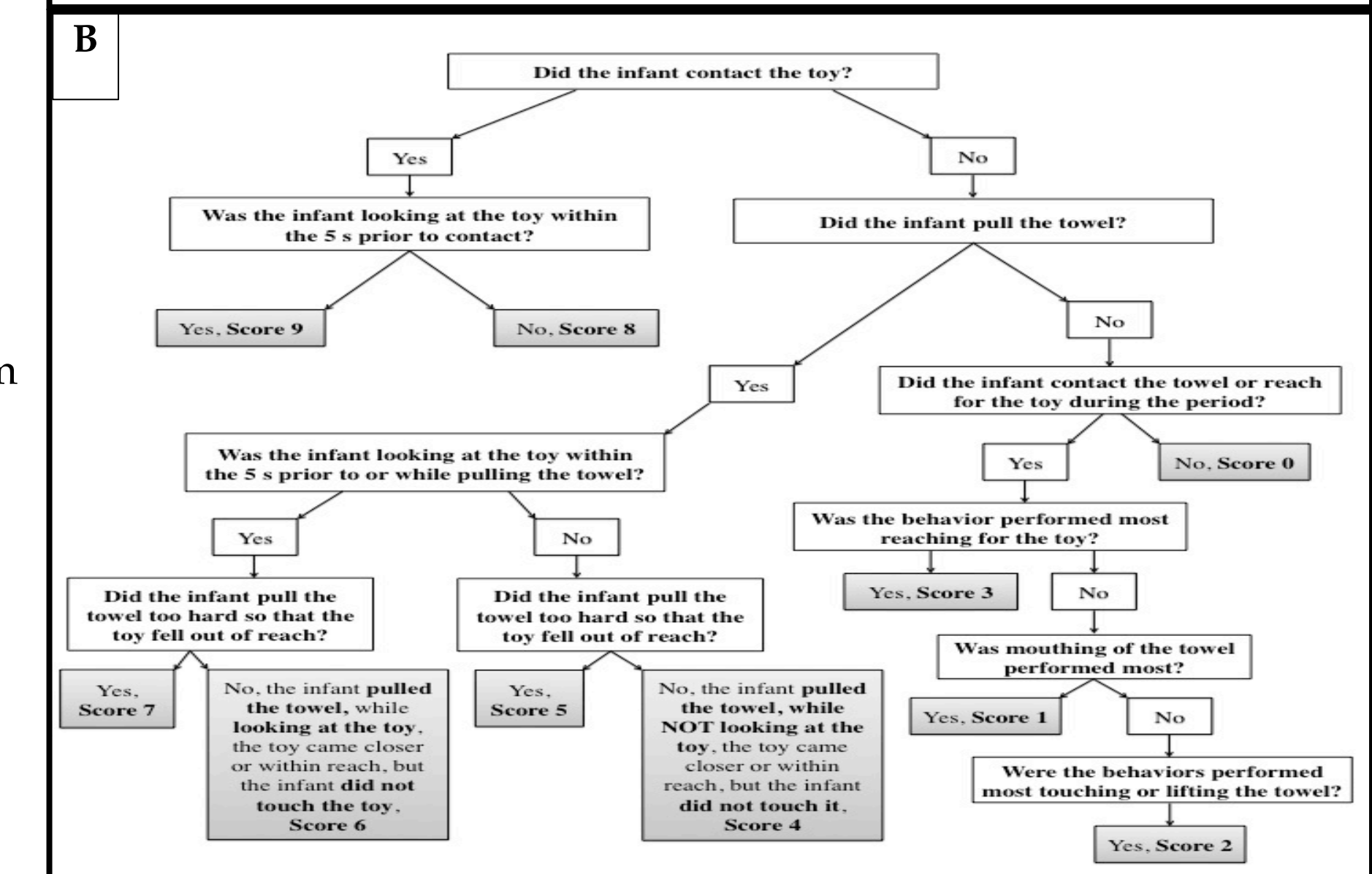


Figure 2B. MEPSAT: Rating the level of means-end performance on a scale from 0 through 9.



## Conclusions

The MEPSAT was sensitive to identify differences in MEPS among children with varying levels of motor delay.

The MEPSAT might be simple, effective, and sensitive tool for screening early problem-solving delays in children with a range of developmental abilities and for evaluating change across time.

The MEPSAT might be used in clinical and research settings to assess the efficacy of interventions aimed at advancing problem-solving skills, motor ability, and cognitive outcomes in children at risk for delays.

## References

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