



Effects of Bilingualism on the Attention Network Test: Its significance and Implications

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Introduction

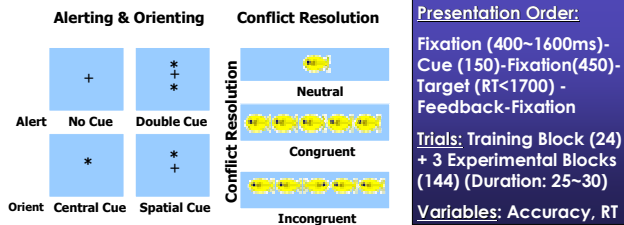
Recent research (Bialystok 1999) has suggested a specific advantageous link between executive attention and bilingualism in 4 and 5 year olds in a behavioral Dimension Change Card Sort (DCCS) task (Zelazo & Frye, 1998). However, the results deserve replication to ensure bilingual advancement in executive attention because the task requires not only conscious control of behavior but also representation ability of complex rule systems. Accordingly, we use a new cognitive task to test positive cognitive consequences among bilingual children along with the DCCS. We hypothesized that if bilingualism was beneficial to the development of executive attention, bilinguals would outperform monolinguals in the ANT. Additionally, if the DCCS and the ANT's subcomponent of 'executive control' tested the same processing variance, we hypothesized that children's performance in the DCCS task and their ANT performance on 'executive control' would correlate.

Method

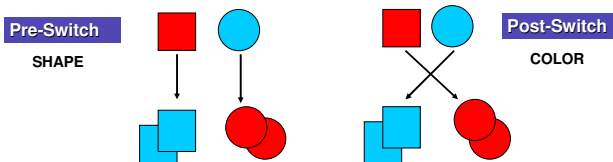
We tested 19 English monolinguals and 18 Korean-English bilingual children, averaged 56 month olds each, on the DCCS and the ANT. Before the tasks, the Peabody Picture Vocabulary Test (PPVT) and a parental Multilingualism Questionnaire were administered to all children to measure their English lexical development. ** Randomized (PPVT+DCCS) + ANT

Attention Network Test (ANT)

The present study took the initiative in testing bilinguals' cognitive performance in a computerized attention networks test (ANT) (Rueda, Fan, McCandliss, Halparin, Gruber, Lercari, & Posner, 2004), which has been used in brain imaging studies (Posner & Fan, in press). The ANT consists of four cue and three flanker conditions and is designed to probe developmental differences in attentional networks of 'alerting, orienting, and executive control' in terms of percentage accuracy and reaction time.



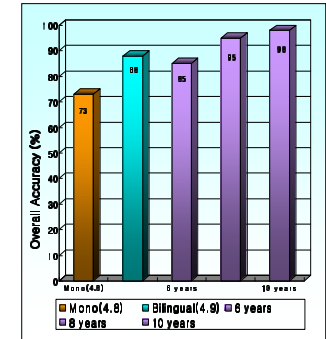
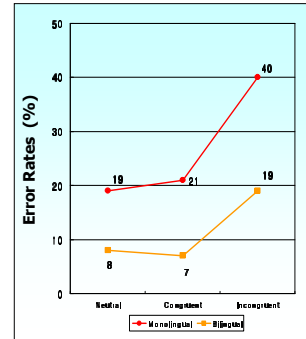
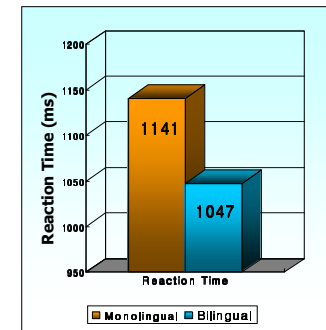
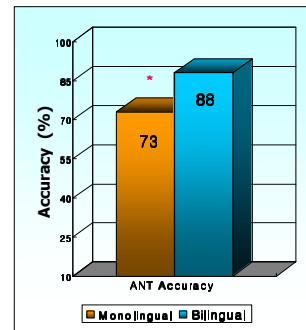
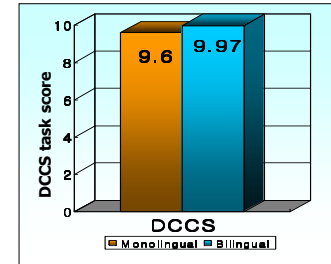
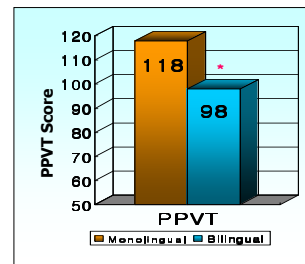
Dimension Change Card Sort (DCCS)



Participants are required to sort cards into two groups based on the sorting criterion (Color vs. Shape) and Children need to refocus their attention to a new rule while inhibiting their focus on the previous dimension. Variables: Inhibitory Control Ability + Representation Ability of Higher-Order Rule

Results

Bilingual children in our study had significantly lower English proficiency than monolinguals according to the PPVT results, $F(1, 33) = 24.033, p = .0000$. However, they showed significant cognitive advantages in percentage ANT accuracy data, $F(1, 22) = 13.673, p = .001$, across all conditions. Overall reaction times for correct responses were faster for bilinguals but did not reach significance. Contrary to the previous results (Bialystok, 1999), the DCCS task failed to predict the ANT performance, $r = .126, p = .541$.



Discussion

These results support a positive relation between early childhood bilingualism and executive attention despite the difference in English proficiency. At the same time, they raise issues about the relation between tasks assumed to test executive attention, since these did not correlate. Reasons can be attributed to monolingual children's high linguistic competence, studied age ranges, or age-inappropriate task difficulty.

Reference

Bialystok, E. (1999). Cognitive complexity and attentional control in the bilingual mind. *Child Development*, 70, 636-644.

Rueda, M.R., Fan, J., McCandliss, B.D., Halparin, J.D., Gruber, D.B., Lercari, L.P., & Posner, M.I. (2004). Development of Attentional Networks in Childhood. *Neuropsychologia*, 42, 1029-1050.

Zelazo, P.D., & Frye, D. (1998). Cognitive complexity and control:II. The development of executive function in children. *Current Directions in Psychological Science*, 7, 121-126.