# Charting the Impact of Bilingualism on Language and Cognitive Development in Autistic Children

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## Introduction

Autism is a neurodevelopmental condition associated with intellectual disability and language delay is the most common symptom. From the very limited literature, bilingual exposure is unlikely to lead to poorer development of language in autistic children and could provide an advantage in social and communicative domains but the evidence is really weak. Parents are still worried about whether bilingualism may cause confusion and hinder children's linguistic development. I analyze a sample of 89 children aged 5-13, with an average age of 8.67 years. This paper compares the development in language, social cognition and executive function fields between 38 autistic children and 51 non-autistic children by using exploratory data analysis and structural equation models. We hope to better understand which of these factors should be influencing parents' decision.

## Social Cognition

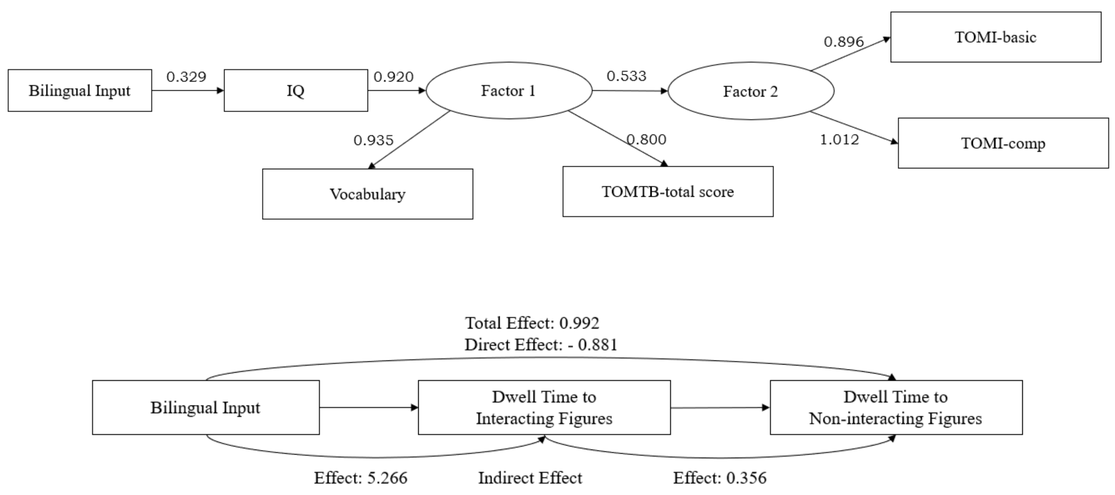


Figure 2. **Language SEM Regression Coefficient**

For every additional point in the bilingual exposure score, the IQ test of autistic children will increase by 0.33 points and we can infer TOMB total score could be slightly higher than before (approximately 0.24). Besides, Latent variable would also increase, as a result, TOMI-basic score and TOMI-comp would increase 0.14 and 0.16 respectively. Although the influence of bilingual exposure on autistic children through latent variables as intermediate variable is weak, it can still show that bilingual exposure has a positive effect on TOMI and TOMB results. Besides, I find that if the time for bilingual input of autistic children increases by 1 point, the dwell time to interacting figures increases by 5.27 ms and to non interacting figures increase by 1 ms. Bilingual education will promote autistic children's interest in social interaction

## Executive Function

- Autistic children CFA Model
  Bilingual Exposure $\sim$ EF1 $\sim$ 0.126 * Inhibit + 0.068 * Self-monitor + 0.131 * Shift + 0.124 * Emotional control + 0.123 * Working memory + 0.124 * Plan organize
  Bilingual Exposure $\sim$ EF2 $\sim$ 14.476* Mean reaction time of correct responses in congruent trials + 15.424 * Mean reaction time of correct responses in incongruent trials

- Non-autistic children CFA Model
  Bilingual Exposure $\sim$ EF1 $\sim$ 0.086 * Inhibit + 0.51 * Self-monitor + 0.077 * Shift + 0.082 * Emotional control + 0.077 * Working memory + 0.084 * Plan organize
  Bilingual Exposure $\sim$ EF2 $\sim$ 14.2* Mean reaction time of correct responses in congruent trials + 15.916 * Mean reaction time of correct responses in in-congruent trials

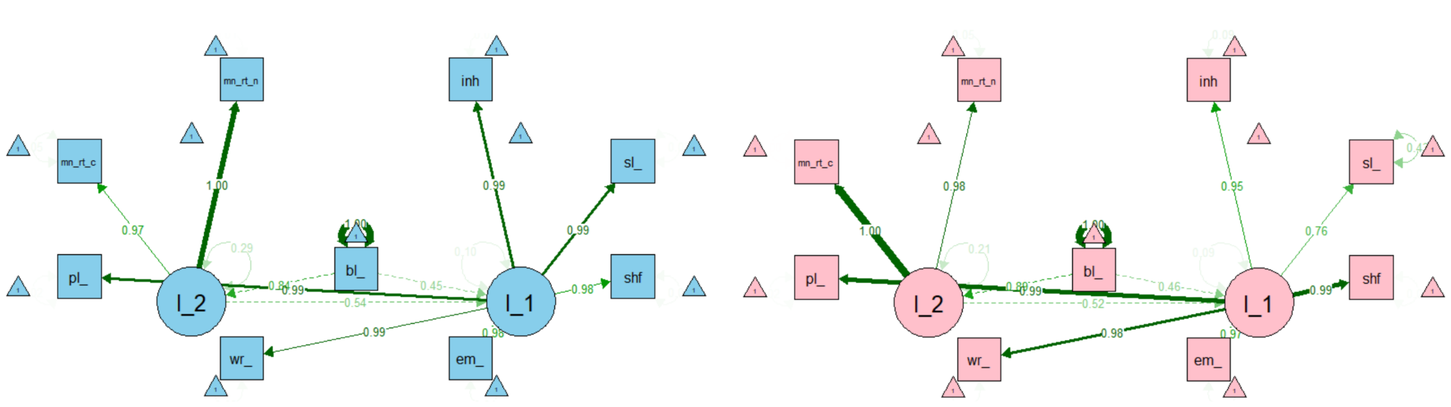


Fig 3. **: Executive Function Model in Autistic and Non-autistic**

Bilingual exposure has a positive effect on autistic children's executive function ability. If the proportion of bilingual input time increases by 1%, the inhibition of the autistic children increases by 0.126 points, and their self-monitor ability increases by 0.31 points.Meanwhile, their emotional control ability, working memory, plan organize ability will also improve 0.124, 0.123 and 0.123 respectively. Bilingual exposure promotes the executive function of autistic children more obviously. And bilingual exposure can greatly increase the mean reaction time of correct responses in both congruent and in congruent trials.

## IQ & Language

There is a positive correlation between bilingual exposure and IQ for autistic children while IQ also has significant positive influence on vocabulary and language processing speed. Therefore, I construct structural equation models in autistic group.

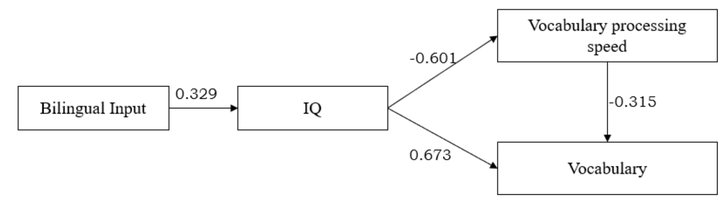


Figure 1. **Language SEM Path Diagram**

| X | | Y | SE | z | p-value | st path coef. |
|---|---|---|---|---|---|---|
| Bilingual | → | IQ | 0.085 | 2.15 | 0.032** | 0.329 |
| IQ | → | Process speed | 1.439 | -4.638 | 0.00** | -0.601 |
| IQ | → | Factor | 0.233 | 7.548 | 0.00** | 0.673 |
| Process speed | → | Vocabulary | 0.021 | -3.533 | 0.00** | -0.315 |

$*p < 0.05, **p < 0.01$

Table 1. **Language SEM Regression Coefficient**

It shows that bilingual exposure can improve language ability through positive influence on intelligence. For every additional point in the bilingual exposure score, the IQ test of autistic children will increase by 0.33 points, so the time to make the first fixation (or look) to the correct picture is shortened by 0.198ms and the language processing speed is increased, English vocabulary score will also increase by 0.412.

## Conclusion

In conclusion, bilingual environment has positive effects on autistic children in IQ, language, social cognition and executive function fields. Early exposure to bilingual autistic children is stronger in inhibit, task monitor an inhibit executive function than later exposure children. With increased bilingual exposure dose level, the language processing speed is increased and the English vocabulary score will also increase. Besides, bilingual environment will promote autistic children's interest in social interaction and can benefit social cognition. Bilingual contact may have an impact on the inhibition of autistic children, but it will not reduce the speed of their correct response but can helps improve the response speed of autistic children to goals.

In executive function field, bilingual contact has a stronger positive effect on autistic children compared with non-autistic children, especially in the aspect of Behavioural Regulation (Inhibit, shift and emotional control). In addition, it can also benefit autistic children's working memory and plan and organize abilities of Metacognition.