Theory of mind and language development in Japanese children with hearing loss

Hiroshi Fujino a,⁎, Kunihiro Fukushima b, c, Akie Fujiyoshi b

a Department of Special Needs Education, Tokyo Gakugei University, Tokyo, Japan
b Shinkurashiki Ear, Nose, and Throat Clinic, Japan
c Department of Otolaryngology, Fukuoka University, Japan

ARTICLE INFO

Article history:
Received 1 September 2016
Received in revised form 27 February 2017
Accepted 1 March 2017
Available online 6 March 2017

Keywords:
Theory of mind
Language development
Children with hearing loss

ABSTRACT

Objective: This study investigates the development of theory of mind (ToM) in Japanese children with hearing loss (HL) and its relationship with language abilities using the data of a large sample size.

Methods: Participants were 369 children with HL, ranging from 4 to 12 years of age. The mean hearing level of the better ear was 100.7 dB. A “change in location”-type false belief task similar to the “Sally-Anne test” was given to the participants.

Results: The pass rates for the false belief task were in the 20% range for 4 to 6-year-olds, 35.6% for 7-year-olds, 47.6% for 8-year-olds, and 63.6% for 9-year-olds. However, no children, even 12-year-olds, achieved a pass rate of 70%. A logistic regression analysis showed that the significant independent predictors of the false belief task performance were vocabulary age and syntactic comprehension level, and chronological age, hearing level, syntactic production level, and nonverbal intelligence were excluded.

Conclusion: The results demonstrate that there is a delay in the development of ToM in Japanese children with HL. This finding is consistent with findings in English-speaking countries. Additionally, it is suggested that language abilities play an important role in the acquisition of ToM for children with HL.

© 2017 Elsevier B.V. All rights reserved.

1. Introduction

“Theory of mind” (ToM) is a psychological concept that relates to the cognition of mental states, including desires, beliefs, intentions, and feelings. Understanding and predicting another person’s behavior by inferring their mental states is important for reciprocal communication. Although there are various aspects of ToM, false belief tasks have been used in many studies on ToM.

Wimmer and Perner developed a test called the “false belief task” to assess ToM [1]. This task consists of the following scenario. Person A puts an object into Location X. In Person A’s absence, Person B transfers the object from Location X to Location Y. The subjects are asked to indicate where Person A will look for the object upon their return. Wimmer and Perner administered this “change in location”-type false belief task to typically developing children and demonstrated that they acquire the ability to pass the task at around 4 years of age.

Children with autism spectrum disorder (ASD) are known to have difficulty acquiring ToM. Baron-Cohen et al. administered a “change in location”-type false belief task to ASD children and showed they had a significantly lower pass rate compared with typically developing children, even when their intellectual development was equivalent or higher to that of their typically developing peers. Based on these findings, they proposed the ToM deficit hypothesis of ASD [2].

The development of ToM has been studied also in children with hearing loss (HL). Peterson and Siegal administered a “change in location”-type false belief task to 26 Australian children with severe and profound HL, aged between 8 and 13 years (mean age: 10 years), and they reported a pass rate of only 17% [3]. In England, Steeds et al. reported a 70% pass rate for a “change in location”-type false belief task for 22 children with profound HL, aged between 5 and 12 years (mean age: 9 years) [4], which was better than that reported by Peterson and Siegal but lower than that expected for their chronological ages.

Russell et al. also investigated 32 children with profound and
severe HL in England and reported pass rates of 17% for a “change in location”-type false belief task for those aged 4–7 years (mean age: 6 years), 10% for those aged 8–12 years (mean age: 10 years), and 60% for those aged 13–16 years (mean age: 15 years) [5]. They observed no age-related performance improvement until the age of 12 years, although there was marked improvement after the age of 13 years. They suggested that the biggest improvement in deaf children’s performance on the false belief task occurred after the age of about 13 years, and there was little age-related change in false belief task performance from the age of 4–12 years. In the United States, Lundy used “change in location”- and “unexpected contents”-type false belief tasks, and two other ToM tasks, including “appearance-reality” and “misleading picture,” and reported that 14 children with moderate to profound HL do not acquire ToM ability until the age of 7 years [6].

As described above, ToM in children with HL has been mainly studied in English-speaking countries. In Japan, Ohara and Hirota (2014) investigated 12 children with moderate to profound HL, aged 4–7 years (mean age: 5 years), using a “change in location”-type false belief task and “explanation of action task” and reported a false belief task pass rate of 33%, which was significantly lower than that expected according to chronological age [7].

ToM in children with HL has been also studied from the perspective of language development. Jackson reported on the relationship between ToM and receptive language abilities in children with severe to profound HL, and pointed out that a relationship was not found in native signers when age was factored out [8]. They used “change in location”- and “unexpected contents”-type false belief tasks and a false photograph test. Schick et al. investigated 176 children with HL, aged 4–7 years (mean age: 6 years), and showed that the significant predictors of passing the “change in location”-type false belief task were receptive vocabulary and syntactic complement processing ability [9].

To summarize the findings of these studies, we can say that ToM in children with HL is related to language abilities rather than chronological age. There are three hypotheses concerning how language contributes to the solving of false belief tasks. First, children with HL do not have sufficient conversational experience that refers to mental states [3]. Second, they have delays in acquisition of mental state vocabulary and syntactic processing of complex sentences [9]. Third, they do not have enough language abilities to understand task contents and instructions [10].

Furthermore, the problem of cultural differences has been pointed out regarding the development of ToM. It was shown that the development of false belief understanding in Japanese children was delayed compared to that of children in English-speaking countries [11,12]. Is there such a developmental delay also in children with HL?

There are very few studies on ToM in Japanese children with HL. Even from an international perspective, there is little research on the development of ToM and its relationship with language abilities in children with HL using a large sample size involving a wide range of ages from infancy to school age. Based on this background, the purpose of the present study is to investigate the development of ToM in Japanese children with HL and its relationship with language abilities as compared with the findings of studies in English-speaking countries.

2. Methods

2.1. Participants

The subjects for this study were selected from among the participants in the Ministry of Health, Labour and Welfare’s Research on Sensory and Communicative Disorders Project (team leader: Kunihiro Fukushima) [13]. The study design was approved by the ethical review board of the Association for Technical Aids.

The participants in this study were 369 children, who were 4- to 12-year olds. The number and gender of the participants in each age group are shown in Table 1. The mean hearing level of the better ear was 100.7 dB (range: 70.0–135.0 dB, SD: 13.0). The scores of Raven’s Colored Progressive Matrices (RCPM) as a measure of non-verbal intelligence and the use of sign language are shown in Table 2. A comparison with the Japanese children’s standard [14] showed that the participants in the study did not have any intellectual disabilities.

The participants were recruited according to the following inclusion criteria: 1) age from 48 months to 155 months, 2) congenital hearing impairment with a hearing level of greater than 70 dB (on average) appearing no later than 4 years of age. Children were recruited from schools for the deaf, schools for the hard of hearing, mainstream schools, day-care centers, and hospital training rooms.

2.2. Materials

2.2.1. Theory of mind task

An animated ToM test was given to the participants. This is a “change in location”-type false belief task such as the “Sally–Anne test” described in detail elsewhere [15]. The task consists of the following scenario: “Person A put the ball into the box and went out of the room. Then, Person B took ball from the box and put it into the bag. Then, Person A returned to the room.” Following the last scene, three questions were presented: “Where is the ball now?” (reality question), “Where was the ball at first?” (memory question), and “Where will Person A look for the ball?” (belief question). The reality and memory questions are control questions that assess the child’s ability to understand the situation. The task was judged to be passed only if all three questions, including the two control questions, were answered correctly. The animation, including captions and questions, was presented visually and auditorily via a PC monitor and a speaker.

2.2.2. Language and other measures

Receptive vocabulary was measured using the Picture Vocabulary Test-Revised (PVT-R). Syntactic comprehension and production were measured using the Syntactic Processing Test of Aphasia (STA). STA is a test employed to evaluate comprehension and production of syntactic structures [16]. Each level consists of eight and three sentences to test comprehension and production, respectively. The children are asked to choose one of four or six pictures that are appropriate for the tester’s presentation in the comprehension test. When a child correctly comprehends seven of eight sentences of each level, the child is assumed to have passed that level. The children are asked to express a sentence corresponding to the picture that a tester indicates in the production test. When a

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Number of participants in each age group.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>Range (months)</td>
</tr>
<tr>
<td>4</td>
<td>52–59</td>
</tr>
<tr>
<td>5</td>
<td>60–71</td>
</tr>
<tr>
<td>6</td>
<td>72–83</td>
</tr>
<tr>
<td>7</td>
<td>84–95</td>
</tr>
<tr>
<td>8</td>
<td>96–107</td>
</tr>
<tr>
<td>9</td>
<td>108–119</td>
</tr>
<tr>
<td>10</td>
<td>120–136</td>
</tr>
<tr>
<td>11</td>
<td>132–143</td>
</tr>
<tr>
<td>12</td>
<td>144–153</td>
</tr>
<tr>
<td>Total</td>
<td>182</td>
</tr>
</tbody>
</table>
دریافت فوری
متن کامل مقاله

امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات