

Comprehension of figurative language in Taiwanese children with autism: The role of theory of mind and receptive vocabulary

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Abstract

First-order theory of mind (ToM) is necessary for comprehension of metaphors, and second-order ToM is necessary for comprehension of irony. This study investigated the role of ToM and language ability in comprehending figurative language in 50 Taiwanese children with high-functioning autism spectrum disorders (HFASDs) compared with 50 typically developing children. Results showed that the No-ToM HFASDs group performed worse than the first-order ToM HFASDs group and the second-order ToM HFASDs group in comprehension of metaphors, irony, sarcasm and indirect reproach, but not for indirect request. Receptive vocabulary correlated only with metaphor comprehension. The volatility of results seen among studies in terms of the relationship between ToM and figurative language comprehension is discussed.

Keywords: Autism, irony, metaphor, receptive vocabulary, theory of mind

Introduction

Happé (1993a) postulated that without first-order theory of mind (ToM) reasoning, individuals with autism could not understand metaphors, and without second-order ToM reasoning, they would fail to comprehend irony. Unlike their English-speaking counterparts, however, Japanese children with high-functioning autism spectrum disorders (HFASDs) perform as well as typically developing (TD) children or children with attention-deficit hyperactivity disorder (ADHD) in comprehending metaphors, despite lacking first-order ToM reasoning (Adachi et al., 2006). Furthermore, Japanese children with HFASDs comprehend irony with no evidence of success in second-order ToM reasoning (Adachi et al., 2006). In addition, although Japanese sarcasm and “indirect reproach” appear theoretically to need second-order ToM reasoning, Japanese children with HFASDs without second-order ToM reasoning comprehended these forms of language as well as TD children (Taguchi, Oi, & Takahashi, 2010; Yata & Oi, 2009).

Norbury (2005) showed that for English-speaking children, only children with language impairment, with or without concurrent autistic features, showed impairment on the metaphor

task. Furthermore, possession of first-order ToM skills did not ensure metaphor comprehension. Instead, semantic ability was a stronger predictor of performance on the metaphor task.

Norbury and Sparks (2013) suggested that autism spectrum disorders (ASDs) might be better understood when examined from a cultural point of view. Cross-cultural studies might also help refine cognitive theories of disorder that have been derived exclusively from North American and European investigations.

Although several studies have been conducted for comprehension of figurative language in Japanese-speaking children (Adachi et al., 2006; Oi & Tanaka, 2010, 2011; Taguchi et al., 2010; Yata & Oi, 2009), we would be well served to conduct further investigations in those speaking oriental languages other than Japanese. In the present study, we investigated figurative language comprehension in Taiwanese-speaking children.

Research questions addressed here are as follows: (1) Do Taiwanese children with HFASDs differ from TD children in comprehending figurative language? (2) Does ToM understanding relate to comprehension of figurative language in Taiwanese children? (3) Does verbal ability relate to comprehension of figurative language in Taiwanese children? (4) Do Taiwanese children with HFASDs comprehend figurative language differently from Japanese children with HFASDs? and (5) Do Taiwanese college freshmen evaluate conventionality of figurative language tasks differently from Japanese college freshmen?

Methods

Participants

Two groups of children ranging from grade 2 to 6 participated in this study (groups I and II). Group I included 50 children diagnosed with HFASDs by the child's primary psychiatrist using Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) criteria. Group 2 included 50 TD children. Both groups of children were from monolingual families with Taiwanese-speaking parents, resided in the Taipei or Taitung area, and attended public schools. The two groups of children were matched for (1) the receptive language development using the Taiwanese version of Peabody Picture Vocabulary Test-Revised (PPVT-R), (2) the grade of the children, (3) the gender of the children and (4) chronological age (CA).

Participants with HFASDs included 42 boys and 8 girls, ranging in age from 7.7 to 12.6 years (mean = 10.18; SD = 2.76). All children with HFASDs fulfilled the criteria for at least one pervasive developmental disorder according to the DSM-IV-TR criteria. They also all attended regular classes. They had no marked hearing or other major sensory or physical disabilities. They all lived at home, participated in the study with their parents and were recruited by a local non-profit organisation for autism in New Taipei City or Taitung City. All children were assessed using the WISC-III (Wechsler Intelligence Scale, third edition), 6 months before data were collected and were shown to have normal intelligence. Scores on the full-scale intelligence quotient (FIQ) ranged from 78 to 124 (mean = 94.14; SD = 10.33), on the verbal intelligence quotient (VIQ) ranged from 79 to 115 (mean = 95.66, SD = 8.9) and on the performance intelligence quotient (PIQ) ranged from 78 to 126 (mean = 96.90, SD = 9.7). The 50 TD children (42 boys and 8 girls) were selected individually to match the participants with HFASDs in terms of grade, gender and age. They ranged in age from 7.4 to 12.5 years (mean = 10.60; SD = 2.71). All TD children lived at home and attended regular classes. No TD child received special educational services or had any sensory or motor impairment. IQ information was not collected on TD subjects, but they were all assumed to have normal intelligence. Mann-Whitney *U*-tests revealed no significant difference in CA ($U = 1232$, $p = 0.90$) between the HFASDs and TD groups.

A third group (group III) included Taiwanese university freshmen who were recruited randomly from the Taitung region. The participants were 100 male freshmen (mean age = 19.30 years, $SD = 0.56$) and 100 female freshmen (mean age = 19.60 years, $SD = 0.44$). None of them was diagnosed with HFASDs.

This study was approved by the ethics committee of medical research at Kanazawa University and performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. The parents of the participant children gave their informed consent prior to their inclusion in the study. University freshmen provided their own informed consent.

Procedures

We used the ToM task, the PPVT-R task and 40 figurative language tasks. The ToM battery was administered first. This task consisted of first-order false-belief tasks such as the “Sally-Ann task” used by Baron-Cohen, Leslie, and Frith (1985) and second-order false-belief tasks such as the “Ice-cream van” used by Perner and Wimmer (1985). The tasks are presented in a storybook format. Each page has colour illustrations and accompanying text. Memory control questions are included that must be passed for credit to be given on the test questions. Children with HFASDs and TD children were classified into three groups in terms of ToM achievement level. The No-ToM group included children who passed neither the first-order ToM task nor the second-order ToM task; the first-order ToM group included children who passed the first-order ToM and failed the second-order ToM task; and the second-order ToM group included children who passed both the first-order ToM and the second-order ToM tasks.

Next, all the children were given the Taiwanese version of the PPVT-R and were measured one-on-one by a graduate student in special education or the first author of this study. Last, all subjects were given the figurative language tasks (Appendix). To promote Japan-Taiwan cross-cultural comparison, we used tasks from Japanese researchers that were translated into Taiwanese (Adachi et al., 2006; Taguchi et al., 2010; Yata & Oi, 2009). Although this might lower the linguistic conventionality of tasks, it enabled direct comparisons between the two languages in terms of figurative language comprehension. To check the assumed validity problems of Taiwanese tasks, we asked Taiwanese college freshmen to evaluate the strangeness (unconventionality) of types of figurative language stated in Taiwanese. This version of the figurative language tasks consisted of 40 question combinations. Tasks to test figurative language comprehension in this study included irony, sarcasm, indirect reproach, indirect request and metaphors. Irony was defined as “the expression of one’s meaning by using words of the opposite meaning in order to make one’s remarks forceful”. Sarcasm was defined as “the expression of one’s meaning by using words of the opposite meaning in order to taunt the hearer”. In addition to irony and sarcasm, Japanese researchers (Yata & Oi, 2009) have coined the phrase “indirect reproach”, which is an expression intended to mitigate a face-threatening act towards the hearer by avoiding direct expression of anger or irritation. Indirect reproach has been defined as “criticizing the hearer by referring to any contextual information that relates to the speaker’s intention”. Neither English nor Taiwanese contains a counterpart for this type of phrase.

All children were asked to read five ironic phrases and five metaphors (Adachi et al., 2006). Then, they were asked to read 30 sentences, including 10 with indirect reproaches, 10 with indirect requests and 10 with sarcastic statements (Taguchi et al., 2010; Yata & Oi, 2009). Finally, they were asked to choose one of three or five responses to a question based on the sentences. The responses consisted of literal, non-literal, irrelevant and situational responses as well as a response indicating that the child had not understood the question. In addition, the freshmen rated all the

figurative language phrases including 5 metaphors, 5 ironies, 10 sarcastic statements, 10 indirect reproaches and 10 indirect requests on a five-point scale. The strangest (most unconventional) figurative language phrase was assigned a score of 5 and the least strange (most conventional) figurative language phrases was assigned a score of 1. This was conducted in accordance with Oi, Tanaka, and Ohoka (2013).

Results

Total PPVT-R scores ranged from 92 to 130 (mean = 114.68, SD = 10.79) in children with HFASDs and from 93 to 138 (mean = 116.94, SD = 9.94) in TD children. Mann–Whitney *U*-tests revealed no significant difference in PPVT-R total score ($U = 1240$, $p = 0.94$) between the HFASDs and TD groups.

The correct response rate for each type of figurative language was calculated for each child by dividing the number of correct responses produced by the child by the total number of responses to metaphors, irony, indirect requests, indirect reproaches and sarcasm asked of the child. The correct response rates of the five types of figurative language are shown in Table 1. The Mann–Whitney *U*-test was used for non-parametric variables. HFASDs children produced a significantly smaller correct response rate for metaphors ($U = 637$, $p < 0.01$), irony ($U = 487$, $p < 0.01$), indirect request ($U = 911.50$, $p < 0.05$), indirect reproach ($U = 921.5$, $p < 0.05$) and sarcasm ($U = 430$, $p < 0.01$) than TD children.

As shown in Table 2, intra-participant group comparisons among No-ToM, first-order ToM and second-order ToM groups were conducted for figurative language comprehension. The Kruskal–Wallis tests followed by Dunn’s post-tests were used for non-parametric variables for data shown in the table. For children with HFASD, significant differences were revealed among the No-ToM, first-order ToM and second-order ToM groups concerning the correct response rate for metaphor, irony, indirect reproach and sarcasm.

The correct response rate for metaphor and irony in the No-ToM group with HFASDs was smaller than that in the first-order ToM group with HFASDs and the second-order ToM group with HFASDs. The correct response rate for indirect reproach in the No-ToM group with HFASDs was smaller than that in the first-order ToM group with HFASDs and the second-order ToM group with HFASDs. The correct response rate for sarcasm was significantly smaller in the No-ToM group with HFASDs than in the first-order ToM group with HFASDs and second-order ToM group with HFASDs. No-ToM achievers with HFASDs performed lower for metaphors ($U = 3.50$, $p < 0.05$) and indirect reproach ($U = 1.00$, $p < 0.05$) than TD No-ToM achievers. Similarly, first-order ToM achievers with HFASDs performed lower for metaphor ($U = 93.50$, $p < 0.05$), irony ($U = 42$, $p < 0.01$) and sarcasm ($U = 59$, $p < 0.01$) than TD first-order ToM achievers. Finally,

Table 1. Correct answer rate for the five types of figurative language.

	TD ($n = 50$)	HFASD ($n = 50$)	
Metaphor	0.84 ± 0.15	0.70 ± 0.15	**
Irony	0.83 ± 0.16	0.65 ± 0.15	**
Indirect request	0.84 ± 0.10	0.78 ± 0.12	*
Indirect reproach	0.83 ± 0.10	0.75 ± 0.16	*
Sarcasm	0.81 ± 0.16	0.62 ± 0.15	**

Values are expressed as mean $\pm$ standard deviation. Mann–Whitney *U*-test (* $p < 0.05$, ** $p < 0.01$).

TD, typically developing; HFASD, high-functioning autism spectrum disorders.

Table 2. ToM and figurative language comprehension.

	No-ToM ^a		First-order ToM ^b		Second-order ToM ^c		TD		HFASD	
	TD (<i>n</i> = 4)	HFASD (<i>n</i> = 9)	TD (<i>n</i> = 15)	HFASD (<i>n</i> = 24)	TD (<i>n</i> = 31)	HFASD (<i>n</i> = 17)	Kruskal–Wallis test	TD	Kruskal–Wallis test	Dunn's post-test
Metaphor	0.80 ± 0.16*	0.50 ± 0.17*	0.83 ± 0.14*	0.72 ± 0.10*	0.85 ± 0.15*	0.77 ± 0.10*	$\chi^2(2) = 14.78^{**}$	$\chi^2(2) = 0.89$	$\chi^2(2) = 14.78^{**}$	$b > a^{***}; c > a^*$
Irony	0.60 ± 0.23	0.51 ± 0.12	0.87 ± 0.14**	0.63 ± 0.12**	0.85 ± 0.14*	0.74 ± 0.16*	$\chi^2(2) = 14.37^{**}$	$\chi^2(2) = 5.55$	$\chi^2(2) = 14.37^{**}$	$b > a^{***}; c > a^*$
Indirect request	0.75 ± 0.06	0.73 ± 0.10	0.80 ± 0.11	0.78 ± 0.12	0.87 ± 0.10	0.80 ± 0.13	$\chi^2(2) = 1.86$	$\chi^2(2) = 7.62^*$	$\chi^2(2) = 1.86$	
Indirect reproach	0.78 ± 0.10*	0.52 ± 0.12*	0.79 ± 0.11	0.79 ± 0.13	0.85 ± 0.10	0.82 ± 0.12	$\chi^2(2) = 18.71^{**}$	$\chi^2(2) = 4.38$	$\chi^2(2) = 18.71^{**}$	$b > a^{***}; c > a^{***}$
Sarcasm	0.60 ± 0.34	0.51 ± 0.17	0.80 ± 0.11**	0.63 ± 0.15**	0.84 ± 0.12**	0.66 ± 0.13**	$\chi^2(2) = 6.09^*$	$\chi^2(2) = 3.88$	$\chi^2(2) = 6.09^*$	$b > a^*; c > a^*$

Values are expressed as mean ± standard deviation. Mann–Whitney *U*-test (**p* < 0.05, ***p* < 0.01, ****p* < 0.001).

^aNo-ToM means that the child passed neither the first-order nor the second-order ToM task.

^bFirst-order ToM means that the child passed the first-order ToM task but failed the second-order ToM task.

^cSecond-order ToM means that the child passed both the first-order and second-order ToM tasks.

Table 3. Correlation between verbal ability and comprehension of figurative language.

	TD (<i>n</i> = 50)		HFASD (<i>n</i> = 50)				
	CA	PPVT-R	CA	PPVT-R	FIQ	VIQ	PIQ
Metaphor	0.389**	0.296*	0.202	0.493**	0.113	0.346**	0.256
Irony	0.202	−0.129	0.195	0.190	−0.035	0.026	0.053
Indirect request	−0.072	−0.060	0.107	0.157	0.131	−0.035	0.181
Indirect reproach	0.035	0.005	0.187	−0.020	0.068	0.100	−0.006
Sarcasm	0.213	0.003	0.089	0.022	0.255	0.259	0.151

PPVT-R (Chinese). * $p < 0.05$, ** $p < 0.01$.

Table 4. College freshmen's evaluation of conventionality of figurative language^a.

	Taiwanese college freshmen (<i>n</i> = 200)	Japanese college freshmen (<i>n</i> = 194) ^b
Metaphor	2.86 ± 0.09*	1.72 ± 0.53*
Irony	3.77 ± 0.13	3.87 ± 0.38
Indirect request	2.49 ± 0.22*	1.96 ± 0.52*
Indirect reproach	2.51 ± 0.29**	1.81 ± 0.60**
Sarcasm	3.91 ± 0.15	4.24 ± 0.39

Values are expressed as mean ± standard deviation. Mann–Whitney *U*-test (* $p < 0.05$, ** $p < 0.01$).

^aStrangeness was evaluated using a five-point scale. The strangest (most unconventional) figurative language phrase was assigned a score of 5 and the least strange (most conventional) figurative language phrase was assigned a score of 1.

^bThe Japanese college freshmen evaluated figurative language tasks using the results from Oi et al. (2013).

second-order ToM achievers with HFASDs performed lower for metaphor ($U = 173$, $p < 0.05$), irony ($U = 157.7$, $p < 0.05$) and sarcasm ($U = 87$, $p < 0.01$) than TD second-order ToM achievers.

For TD children, significant differences were seen among the No-ToM group, the first-order ToM group and the second-order ToM group concerning the correct response rate for indirect requests. However, Dunn's post-test showed no significant differences among these ToM groups.

The relationship between verbal ability and figurative language comprehension was analysed using non-parametric Spearman rank correlation test (Table 3). For children with HFASDs, the correct response rate for metaphors significantly correlated with total PPVT-R score and VIQ. For TD children, the correct response rate for metaphors significantly correlated with CA and total PPVT-R score.

As shown in Table 4, Taiwanese college freshmen evaluated metaphors ($U = 0$, $p < 0.05$), indirect request ($U = 23$, $p < 0.05$) and indirect reproach ($U = 10$, $p < 0.01$) as being stranger than did Japanese college freshmen; however, the mean ratings for each of these scores were < 3.0 (neutral).

Discussion

This study addressed five research questions: (1) Do Taiwanese children with HFASDs differ from TD children in comprehending figurative language? (2) Does ToM understanding relate to comprehension of figurative language in Taiwanese children? (3) Does verbal ability relate to comprehension of figurative language in Taiwanese children? (4) Do Taiwanese children with HFASDs comprehend figurative language differently from Japanese children with HFASDs? and

(5) Do Taiwanese college freshmen evaluate conventionality of a figurative language tasks differently from Japanese college freshmen?

The answer to the first question was yes. Taiwanese children with HFASDs performed lower than TD children in comprehending all five types of figurative language investigated. Among the five types of figurative language, other studies have shown that Japanese children with HFASDs performed as well as TD children or children with ADHD for metaphors, sarcasm, indirect reproach and indirect request (Adachi et al., 2006; Oi & Tanaka, 2010; Taguchi et al., 2010; Yata & Oi, 2009). Yata and Oi (2009) investigated children with HFASDs, ranging in age from 8 to 15 years, and TD children matched for age and receptive vocabulary. When these children were presented with five sentences for each type of language (i.e. 10 sentences in total) in the written form, no differences in comprehension were evident between groups. In addition, using another 10 sentences for sarcasm or indirect reproach, Taguchi et al. (2010) investigated children with HFASDs, ranging in age from 8 to 16 years and age-matched TD children. That study had similar findings to those of Yata and Oi (2009) regarding sarcasm and indirect reproach comprehension. Oi and Tanaka (2010) found no intergroup differences in understanding the two examples of sarcasm. These results were not replicated in this study of Taiwanese children. Taiwanese children with HFASDs were not very good at figurative language comprehension. The results in Taiwanese children with HFASDs in this study were consistent with those of the only precedent study (Ling & Chang, 2011).

In terms of indirect requests, Yata and Oi (2009) found no intergroup differences between children with HFASDs and TD children in five tasks. In addition, Taguchi et al. (2010) found no intergroup differences in regard to another five tasks of indirect request comprehension. In contrast, Oi and Tanaka (2010) found intergroup differences between children with HFASDs and TD children in terms of comprehending one of two indirect requests presented. In this study of Taiwanese children, those with HFASDs could not comprehend indirect requests as well as TD children.

The answer to the second question was a partial yes. In regard to the relationship between ToM and figurative language comprehension, Taiwanese children with HFASDs showed lower performance when they have No-ToM compared with when they achieved first-order or second-order ToM in terms of comprehension of metaphors, irony, indirect reproach and sarcasm. However, there was no difference between first-order ToM achievers and second-order ToM achievers in terms of comprehending any figurative language type. Indirect request was similarly understood between No-ToM achievers, order ToM achievers and second-order ToM achievers with HFASDs. These results differ greatly from those of Happé (1993a) and Norbury (2005). Happé (1993a) showed that without first-order ToM, English-speaking children or adolescents could not comprehend metaphors, and without second-order ToM, they could not comprehend irony. Norbury (2005) showed that the possession of first-order ToM did not ensure metaphor comprehension. In this study, there were no differences in Taiwanese TD children who were No-ToM achievers, first-order ToM achievers or second-order ToM achievers in regard to comprehending all five types of figurative language. However, No-ToM achievers with HFASDs performed lower in metaphors and indirect reproach than TD No-ToM achievers. Similarly, first-order ToM achievers with HFASDs performed lower in metaphor, irony and sarcasm than TD first-order ToM achievers. In addition, second-order ToM achievers with HFASDs performed lower in the same types of figurative language than TD second-order ToM achievers. These results suggest that ToM is not the only factor associated with figurative language comprehension. In TD children, ToM did not influence the comprehension of any type of figurative language. This might mean that TD children do not rely on ToM when they comprehend figurative language, but rather on some intuitive reasoning.

As has been shown previously, English-speaking children with HFASDs find irony more difficult to comprehend than metaphors (Happé, 1993a,b). The same appears true for Japanese speakers. Adachi et al. (2006) showed that Japanese children with Asperger syndrome (AS), ranging in age from 7 to 14 years, comprehended irony less well than children with ADHD matched for IQ and age, whereas there was no such intergroup difference in metaphor comprehension. However, these studies differ in terms of ToM development in participants. Unlike the studies of Happé (1993a,b), Adachi et al. (2006) did not test second-order ToM reasoning. Among participants with ADHD, those who failed first-order ToM tests performed as well in comprehending irony as those who passed the test. It is probable that the participants in Adachi's study did not achieve second-order ToM reasoning. If this is the case, results might differ from those of Happé (1993a) with respect to the relationship between ToM and irony comprehension. As for metaphors, Japanese children with AS who failed first-order ToM tests comprehended metaphors well (Adachi et al., 2006), unlike their counterparts in Happé's (1993a) study, which reported that children and adolescents who did not pass first-order ToM tests also failed to comprehend metaphors. These differences suggest that, at least in Japanese children with HFASDs, second-order ToM reasoning is not necessary for irony comprehension, and that first-order ToM reasoning is not necessary for metaphor comprehension. This suggests that a factor other than ToM reasoning might influence figurative language comprehension, accounting for differences between Japanese and English languages. In contrast, no intergroup differences were seen for metaphor comprehension between children with HFASDs and TD children when they were asked to use a five-point scale to rate pictures representing literal comprehension and pictures representing non-literal comprehension (Oi & Tanaka, 2010). That study compared school children with HFASDs (ranging in grade from 2 to 6) and grade-matched TD children in regard to comprehending 50 ambiguous sentences including 10 metaphors. Of the 10 metaphors included, no intergroup differences in understanding were found for 9. These results were not replicated in the present study of Taiwanese children.

Questions also exist regarding the relationship between ToM ability and comprehension of indirect reproach and sarcasm. These two forms of language appear similar to irony in terms of requiring some metacognitive ability for comprehension. Awareness of thought might be required on the part of children, meaning that they would need second-order ToM reasoning to comprehend these two types of language. Of 20 children with HFASDs investigated by Yata and Oi (2009), nine failed second-order ToM tasks and three failed even first-order ToM tasks, although they comprehended indirect reproach and sarcasm as well as TD children. Japanese- and English-speaking children seem to differ greatly in terms of figurative language comprehension from the viewpoint of ToM. This idea is supported by the theory of Hinds (1987) stating that Japanese is a listener-responsible language whereas English is a speaker-responsible language. With less responsibility to make the message as clear as possible for the hearer, Japanese speakers can rely more on figurative language than English speakers. This difference might uniquely influence the development of figurative language comprehension in Japanese children with and without HFASDs when compared with their English-speaking counterparts. The relationship seen in Japanese children in regard to comprehension of indirect reproach and sarcasm was not replicated in this study of Taiwanese children.

As for the third question, verbal abilities were only related to metaphor comprehension. Receptive vocabulary had a significant correlation with metaphor comprehension in Taiwanese children with and without HFASDs. In addition, VIQ also correlated significantly with metaphor comprehension in Taiwanese children with HFASDs. Receptive vocabulary and VIQ did not correlate with any of the other four types of figurative language comprehension. Among the five types of figurative language assessed in this study, only the development of metaphor

comprehension in Taiwanese children seemed to rely more on language development and less on cognitive development, such as that associated with ToM.

The answer to the fourth question was yes. Taiwanese children with HFASDs differed from English adolescents (Happé, 1993a) and Japanese children (Adachi et al., 2006) with HFASDs in terms of showing no differences between irony and metaphors. In both Japanese children and English adolescents with HFASDs, irony was understood less well than metaphors. In contrast, Taiwanese children with HFASDs showed lower performance on irony and sarcasm than on indirect request and indirect reproach. Taiwanese TD children did not show any differences in comprehension between the five types of figurative language. It seems more difficult for Taiwanese children with HFASDs to handle “the expression of one’s meaning by using words of the opposite meaning” compared with handling indirectness of statements.

Finally, in terms of evaluation of strangeness, Taiwanese college freshmen evaluated figurative language tasks differently from their Japanese counterparts. Irony, sarcasm, indirect reproach and metaphor were compared by Oi et al. (2013) in terms of the relationship between comprehension of figurative language by Japanese children with HFASDs and college freshmen’s assessment of the conventionality of usage of these figurative language forms. Figurative language in which no intergroup differences were seen between children with HFASDs and TD children was evaluated as being less strange than figurative language in which intergroup differences were seen. The former included indirect reproach and metaphors and the latter included irony. Sarcasm was evaluated as being very strange, despite the finding that there were no intergroup differences in terms of comprehension. Whether similar results will be obtained when we ask Taiwanese freshmen to evaluate figurative language can be addressed while checking validity problems that might be caused by translating Japanese tasks into Taiwanese. By comparing Taiwanese with Japanese, we could get information meriting further investigation of the relationship between ToM and figurative language comprehension. As for comparisons between Taiwanese and Japanese children, no precedent study exists for autism. However, considerable differences are expected to be seen between the two cultures for autism, as differences have been seen in the maternal conversational style and children’s language development for children with Down’s syndrome (Huang, Kubota, & Oi, 2007). In the present study, no relationship was seen between comprehension of figurative language by Taiwanese children and college freshmen’s assessment of its conventionality of usage. Conventionality did not influence the comprehension of figurative language in Taiwanese children as it did in Japanese children.

Taiwanese college freshmen rated metaphors, indirect request and indirect reproach as being stranger than their Japanese counterparts did. However, the mean scores for these three types of figurative language were <3.0 , which represents the intermediate (neutral) value. Taiwanese college freshmen did not differ from their Japanese counterparts in their evaluation of the strangeness of sarcasm and irony. These findings mean that Taiwanese tasks for figurative language comprehension were not highly unconventional. The findings reported here partly agree with and partly differ from findings of Happé (1993a) in two important respects. First, Happé’s (1993a) model predicted that those with No-ToM would not comprehend metaphors. This was the case in our study. The No-ToM group with HFASDs performed worse in metaphor comprehension than the first- and second-order ToM groups with HFASDs. Second, Happé (1993a) found that without second-order ToM, individuals with autism could not comprehend irony. Our findings did not support this. In this study, the first-order ToM group with HFASDs did not differ from the second-order ToM group with HFASDs in regard to irony comprehension.

Several factors may account for the differences between this study and those of Happé (1993a,b). Participants in Happé’s (1993a) study were considerably older and their VIQ was relatively low. Children in this study might be more competent compared with children and adolescents in Happé’s (1993a) study and may have achieved first-order ToM earlier compared

with the adolescents in Happé's (1993a) study. With respect to the relationship between verbal ability and metaphor comprehension, the results of this study partially agree with the findings of Norbury (2005). Richer receptive vocabulary and better VIQ correlated with better metaphor comprehension. However, ToM skills also predicted performance on the metaphor task, which is in contrast to Norbury's study. While Norbury found that first-order ToM skills did not ensure metaphor comprehension, in the present study, lack of first-order ToM skills meant significantly worse performance on the metaphor task.

Results of the present study indicate that there are great differences between Taiwanese children with HFASDs and their Japanese counterpart in terms of figurative language comprehension (Adachi et al., 2006; Taguchi et al., 2010; Yata & Oi, 2009). Between the two cultures, differences in language development have been reported in children with and without Down's syndrome (Huang et al., 2007). For example, the maternal conversational style differed greatly between the two cultures. Taiwanese mothers gave far more directives to their child than Japanese mothers (Huang et al., 2007). In contrast, Japanese mothers gave far more responses to their children compared with Taiwanese mothers (Huang et al., 2007). The same might be true for children with HFASDs. Figurative language between the mother and child might be reduced in a direct style of conversation and increased in a responsive style of conversation. Japanese children might be exposed to more figurative language than their Taiwanese counterparts, which might lead to better performance in figurative language comprehension. In fact, the rate of non-literal comprehension in TD Japanese children seems higher than that in Taiwanese counterparts. In TD Japanese children, the rate ranged from 0.93 to 0.98 (Taguchi et al., 2010; Yata & Oi, 2009), whereas, in TD Taiwanese children in the present study, the rate ranged from 0.81 to 0.84 (Table 1). In general, Japanese children seem to be performing better than Taiwanese children. Further investigation is needed to examine the maternal use of figurative language between Japanese and Taiwanese mothers.

Finally, the differences seen among other studies (Adachi et al., 2006; Happé, 1993a; Norbury, 2005; Yata & Oi, 2009) and the present study in terms of the relationship between ToM and figurative language comprehension support the notion that pragmatic impairment is a emergent property under which basic cognitive and social factors interact as compensatory adaptations to brain pathology (in this case, HFASDs) (Perkins, 2007).

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Declaration of interest

The authors declare that they have no conflict of interest.

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Appendix

Examples from Adachi et al. (2006)

Metaphor

A boy called Goro always wins sprint races. Taro, another boy, while watching Goro leaving the other runners behind, said “Look, Goro looks like a cheetah!”. Taro thinks of Goro as

- (a) Being a cheetah
- (b) Being handsome
- (c) Being a fast runner
- (d) Leaving other runners behind
- (e) I don't know

Irony

When Jiro's mother got home, she saw clothes left on the floor of Jiro's room. As she looked at this, she said “Jiro always leaves his room in a tidy state”. Does the mother think of Jiro as

- (a) A boy who is organised
- (b) Being messy
- (c) Being a boy
- (d) Taking a bath
- (e) I don't know

Examples from Yata and Oi (2009) and Taguchi et al. (2010)

Indirect request

When a boy had a snack, a friend of the boy told him, “I'm hungry!” What did the friend of the boy actually want to communicate?

- (a) The friend of the boy felt like having a snack too.
- (b) The friend of the boy was hungry.
- (c) The boy had a snack.

Indirect reproach

When a friend of a boy was about to leave a mess behind after having played with many toys, the boy told his friend “Are you leaving without tidying up?” What did the boy actually want to communicate?

- (a) His friend is leaving now.
- (b) His friend has a very bad attitude.
- (c) They have played with many toys.

Sarcasm

When a boy got a very bad mark in an examination, the mother told him “You’re a genius, aren’t you?” while looking at the examination paper. What did the mother actually want to communicate?

- (a) Her son is a genius.
- (b) Her son is not a genius at all.
- (c) Her son got a bad mark in an examination.