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Running Head: Comprehension of Irony in Cantonese

Role of Sentence Final Particles and Prosody in Irony Comprehension

in Cantonese-speaking Children with and without Autism Spectrum Disorder (ASD)

Abstract

Aim. English-speaking children with Autism Spectrum Disorder (ASD) are less capable of using prosodic cues such as intonation for irony comprehension. Prosodic cues, in particular intonation, in Cantonese are relatively restricted while sentence-final-particles (SFPs) may be used for this pragmatic function. This study investigated the use of prosodic cues and SFPs in irony comprehension in Cantonese-speaking children with and without ASD.

Methods. Thirteen children with ASD (8;3-12;9) were language-matched with 13 typically-developing (TD) peers. By manipulating prosodic cues and SFPs, 16 stories with an ironic remark were constructed. Participants had to judge the speaker's *belief* and *intention*.

Results. Both groups performed similarly well in judging the speaker's *belief*. For the speaker's *intention*, TD group relied more on SFPs. ASD group performed significantly poorer and did not rely on either cue.

Conclusions. SFPs may play a salient role in Cantonese irony comprehension. The differences between the two groups were discussed by considering the literature on theory of mind.

Keywords: Irony, ASD, prosody, sentence-final-particles, Cantonese

Irony is the use of words such that the intended meaning is the opposite of their literal meaning where the speaker has the intention of letting the listener know the truth. For example, a man who says, "You are such a great chef" to his girlfriend, who is not good at cooking, has the intention to tease his girlfriend. It is an example of ironic criticism implying that the dinner was not appetizing. Ironic comments are a vital part in everyday communication given its high frequency (Dews & Winner, 1997). Functionally, ironic criticism is used to convey negative comments in a less face threatening way than direct criticism. For example, ironic criticism (e.g., "You're a real genius!") is perceived as less offensive than literal criticism (e.g., "You are so dumb"). In other words, irony can attenuate the negative sense of an utterance, making the speaker sound more polite when expressing a criticism and the addressee of the remark is less likely to respond hostilely (Leech, 1983). If ironic remarks are interpreted literally instead of figuratively, miscommunication could arise. At its worst, this misunderstanding could affect one's personal relationships and hence his or her social interaction. Therefore, the ability to understand irony forms an important aspect of social interaction and is of particular interest to linguists (e.g., Sperber, 1984), communication psychologists (e.g., Anolli, Ciceri, & Infantino, 2000) and speech-language pathologists (e.g., Green & Tobin, 2009; Laval & Bert-Erboul, 2005).

Cues for Irony Comprehension

To convey the intended message of an ironic remark, ironists utilise a broad array of cues and strategies to indicate their ironic intent. These cues and strategies can be verbal or non-verbal. The role of these cues remains a controversial issue because many are not irony-specific (e.g., Bryant & Fox-Tree, 2005). However, evidence still shows that these cues facilitate listeners' identification of irony (e.g., Gibbs & Colston, 2001; Kreuz & Roberts, 1995). Nonverbal cues include physical cues such as facial expressions like eye-rolling, laughing or blank-faced (e.g.,

Attardo, Eisterhold, Hay, & Poggi, 2003). Verbal cues include (1) prosody changes such as intonation rise, exaggerated stress and slow speaking rate (Kreuz, 1996); (2) lexical choices of words such as use of extreme adjective-adverb collocations like "absolutely-amusing", and interjections (Kreuz & Caucci, 2009; Kreuz & Roberts, 1995); (3) syntactic form such as focus topicalization (Barbe, 1995); and (4) various rhetorical devices such as hyperbole, exaggeration and metaphor (e.g., Utsumi, 2000). Among these cues, prosodic cues have attracted much research interest since ironic statements are frequently expressed with a distinctive prosodic pattern. In the literature, the terms prosody and intonation have been used interchangeably. In this paper, "prosody" is used as a superordinate term that includes the domains of intonation, stress, and rhythm (Culter & Isard, 1980) and the perceptual and acoustic correlates includes pitch (fundamental frequency, F0), intensity (amplitude), and duration and a combination of them. Ironic expression has a few specific prosodic characteristics including slow speaking rate, lengthened rate of articulation, varying pitch, shorter pauses, greater intensity and nasalization (Ackerman, 1986; Anolli et al., 2000; Culter, 1974; Laval & Bert-Erboul, 2005; Rockwell, 2000).

Prosody and Sentence-Final Particles (SFP) in Cantonese

Cantonese is a tone language, in which a change in pitch contour of a syllable can alter the meaning. There are six contrastive lexical tones and three shorter variants in Cantonese. Their contour can be described with five tone levels indicating the relative height and contour (Chao, 1930). In short, the tones are represented by Tone 1: 55 (high level tone), Tone 2: 35 (high rising), Tone 3: 33 (mid level tone), Tone 4: 21 (mid-low falling), Tone 5: 23 (mid-low rising), Tone 6: 22 (mid-low level), Tone 7: 5 (high stopped), Tone 8: 3 (mid stopped), and Tone 9: 2 (mid-low stopped). With the typological feature of lexical tones, it has been suggested that tone and intonation are probably mutually exclusive in the past (e.g., Pike, 1945; 1948).

However, many more recent researchers have claimed that Cantonese speakers exploit "intonation" at the sentence-level to convey different intentions including ironic sense such that lexical-tones are carried on the overall intonation contour of an utterance (e.g., Chan, 2001; Yip, 2002). Chao (1968) used the well-known analogy of "small ripples riding on larger waves" (p.39) to describe the relationship between syllable-level lexical-tone and intonation in an utterance in Chinese. In other words, a change in Cantonese intonation does not vary to an extent that it modifies the lexical tone in a word. Chan (1996) suggested that the tonal system in Cantonese restricted the use of sentential intonation in conveying higher-level pragmatic implication as in English. However, there is no empirical evidence on the perception and its realization of Cantonese intonation and other prosodic properties in relation to pragmatic functions in the literature. Hence, the specific role of prosody in signifying ironic meaning in Cantonese remains not clear.

It is suggested that Sentence-final particles (SFPs) in Cantonese may play a more important role in conveying moods, attitudes, feelings and emotions of a speaker (Matthews & Yip, 1994). There is no known direct grammatical counterpart in English but many of the functions of SFPs are realized in different intonation patterns in English (Matthews & Yip, 1994; Wakefield, 2010). Similarly, Cheung (1986) claimed that SFPs are equivalent to the intonation of non-tone languages, and could almost replace intonation. Yau (1980) (cited in Law, 1990) pointed out that there is a mutual compensation between sentence particles and intonation. Yau suggested that "the more a language relies on the use of sentence particles in expressing sentential connotations, the less significant will be the role played by intonation patterns, and vice versa" (p. 51).

Other than contributing to the overall meaning in terms of mood, SFPs are also responsible for modality, focus and conditional reasoning of utterances (Lee & Law, A., 2001). Hence, the same utterance with different SFPs could be interpreted differently. To illustrate, the meaning of the utterance, "*it will rain today*", changes with the use of different SFPs:

(1) /kɐm55 jɐt2 wui23 lɔk2 jy33 kʷa33/ "It will rain today SFP." (Interpretation: It might rain today). /kʷa33/ is often used to express the suggestion or prediction with uncertainty.

(2) /kɐm55 jɐt2 wui23 lɔk2 jy33 pɔ33/ "It will rain today SFP." (Interpretation: (I am reminding you that) It is going to rain today). /pɔ33/ is often used to remind the listener about some information.

(3) /kɐm55 jɐt2 wui23 lɔk2 jy33 wɔ33/ "It will rain today SFP." (Interpretation: (the weather forecast says) it will rain today). /wɔ33/ is often used to report what someone has said.

Cantonese has approximately 30 forms of SFPs in everyday speech (Kwok, 1984). They exist individually or in clusters of two or three in sentence-final-position (Chan, 2001). Luke (1990) estimated that SFPs were found in continuous talk on average every 1.5 seconds demonstrating their high prevalence daily speech. The pervasiveness of SFPs makes them the "hallmarks" of natural Cantonese conversation (Luke, 1990). Even though SFPs function as "contentless" morphemes, they are reported to be one of the earliest functional categories observed in Cantonese when two-word combinations emerged (Lee, Wong, Leung et al., 1996).

Among the many SFPs in Cantonese, the particle /tsɛk5/ has a "highly affective value" (Matthews & Yip, 1994, p. 340). This particle can be used in declaratives and interrogatives utterances to convey a mixture of different emotions, ranging from being complimentary to exasperated and sarcastic (Chan, 1996). Consider the following example.

/lei23 tsɐn55-hɐi22 tsœn35-si21 tsɛk5/ 'You are (so) on time SFP! '

Both literal and nonliteral interpretations are possible depending on many other factors in addition to the speaking context. If the addressee is late, the use of the same SFP /tsɛk5/ obviously conveys an ironic sense and intensifies the reading of speaker's disapproval when compared with the absence of /tsɛk5/. In contrast, if the address is in fact on time, the use of /tsɛk5/ mainly signals an intimate relationship between the speaker and the addressee and expresses the appreciation of the addressee's punctuality. Its use to express impatience and dismay is more common, especially in conjunction with the intensifying adverb /tsɐn55hɐi22/ 'really', marking a strong sense of contempt in the utterance (Fung, 2000). The present study focused on the SFP /tsɛk5/ given its possible ironic as well as sincere markings. As for prosody, the present study explored the prosodic pattern via lengthening and emphasizing the intensifier located in the middle of the sentence.

There is an extensive literature on Cantonese SFPs describing their nature with reference to semantic, pragmatic and conversational functions (e.g., Fung, 2000; Lee & Yiu, 1998, 1999; Lee & Law, A., 2001; Luke, 1990), syntactic properties (Law, 1990; Tang, 1998) and the developmental acquisition of certain SFPs by children (Lee et al., 1996; Lee & Law, 2001). The present study aims to make use of experimental tasks to examine the comprehension of the irony functions of SFP /tsɛk5/ in Cantonese-speaking children.

Theory of Mind in Irony Comprehension

To truly comprehend an ironic remark, the listener has to recognise that the true belief of the speaker. This alone, however, is not sufficient for ironic interpretation since this judgement does not distinguish an ironic remark from a lie. While both an ironic speaker and a liar are using counterfactual language deliberately, the distinction between irony and lies involves the speaker's *intent* with respect to the listener's *belief* about the statement. The ironic speaker

intends the listener to perceive criticism for his/ her remark while a liar wants to keep the truth from the listener.

An important prerequisite in comprehending verbal irony is a sound theory of mind. Primarily, the presence of theory of mind enables one to recognise and understand thoughts, beliefs, desires, and intentions of others to make sense of other's behaviour (Baron-Cohen, Leslie, & Frith, 1985). Making a judgment on a speaker's *belief* utilizes first-order reasoning about belief states, while making a judgment on a speaker's *intent* calls for a second-order mental state reasoning. In first-order mental state reasoning, an individual simply has to infer the thoughts of another person while in the latter, the individual has to consider what one person thinks about another person's thoughts. To distinguish irony from lie, a listener has to utilize second-order reasoning to identify whether the speaker intents to criticize him/her or only to conceal something from him/her.

Typically developing (TD) children acquire first-order false belief at age four, while the second-order mental state reasoning emerges at a mental age of seven (Winner & Perner, 1983). Children are therefore expected to comprehend the *belief* held in the mind of the speaker, which requires first-order reasoning, before they can comprehend the *intention* behind the speaker's actions or words, which requires second-order reasoning. An understanding of irony generally emerges at seven to eight years old in TD children and this sophisticated act is expected to improve and refine throughout adulthood (e.g., Ackerman, 1982; Creusere, 2000; Dews, et al., 1996, Hancock, Dunham, & Purdy, 2000; Winner & Leekam, 1991). For example, Imaizumi, Furuya and Yamasaki (2009) reported the intention-reading ability through voice in 446 TD children. Children younger than eight years of age were significantly poorer than older children in making intention judgments for praise and blame, but not sarcasms and banter phrases, since

the former two communicative acts demand higher-order reasoning skills than the latter two. The above findings imply that young children and individuals with an immature theory of mind would find it difficult to understand irony.

A lack of or a deficient theory of mind is a core cognitive feature of individuals with ASD. A large number of studies have demonstrated that in first-order false belief tasks, these children have difficulties in reading what someone else might think as opposed to the reality. Instead they simply report what they themselves know from their own perspectives (e.g., Baron-Cohen et al., 1985; Leekam & Perner, 1991; Perner, Frith, Leslie, & Leekam, 1989; Reed & Peterson, 1990; Swettenham, 1996; Swettenham, Baron-Cohen, Gomez, & Walsh, 1996). The pioneer study on the development of the theory of mind made use of the well-known "Sally-Anne" test, in which participants were requested to identify the false belief of the story character, to investigate the first-order mental state reasoning in three groups of children, TD, ASD, and Down Syndrome groups (Baron-Cohen et al., 1985). The ASD group performed significantly worser than the Down Syndrome group even though they showed higher verbal mental age. The researchers therefore claimed that failure in the first-order mental-state reasoning was not just a matter of intellectual disability in ASD. In a subsequent study, Happé (1995) investigated the role of age and verbal ability in the theory of mind task performance of children with ASD. By analyzing data pooled from previous studies on theory of mind studies, verbal ability was found to be a good predictor and a high correlate of theory of mind performance in TD and ASD children. The results also suggested that children with ASD required a higher verbal mental age to pass first-order false belief tasks than TD children, about five years lagging behind the TD children.

As a result of a delay in acquiring first-order theory of mind competence, some children with ASD would be expected to have a delayed second-order false belief reasoning skills. They would pass the second-order false belief tests at some point but late in their teenage years. However, some may not acquire such advance mindreading skills at all (Bowler, 1992; Happé, 1993; Ozonoff, Pennington, & Rogers, 1991). As such, metaphor, irony, and jokes are often not well understood by these individuals (Dennis, Lazenby, & Lockyer, 2001; Happé, 1993; Martin & McDonald, 2004) and suggested to be a sensitive test to identify high-functioning individuals with ASD who passed the first-order false belief test (Happé, 1995). In the study by Imaizumi et al. (2009), a group of children with ASD was compared with a group of children with attention deficit/hyperactivity disorder as well as a group of age-matched TD children in a task examining the ability to judge a speaker's intent. It was found that children with ASD performed significantly weaker than the other two groups.

Besides behavioural data, evidence supporting the claim that children with ASD showing disproportionately poor performance in comprehension of irony also comes from brain studies. Wang, Lee, Sigman, and Dapretto (2006) compare TD children and ASD children on comprehension of verbal irony using functional MRI. Behaviourally, children with ASD were found to be less accurate than TD children in comprehending irony. Significantly increased activation in the inferior frontal gyrus and bilateral temporal poles in children with ASD during the task was recorded, reflecting that verbal irony comprehension tasks taxed more brain resources in this population than their TD counterparts.

In terms of manipulating cues for comprehending irony, it was suggested that children with ASD faced difficulties in extracting meaning from voices from a very early age. Unlike their TD peers and those with learning disabilities, young children with ASD do not show a

preference for listening to their mother's voice in infancy (Klin, 1991, 1992) and may even prefer a non-speech analogue to motherese (Kuhl, Coffey-Corina, Padden, & Dawson, 2005). Older children with ASD, ranging from preschool to school-age, are unable to identify emotions expressed through the communication partner's tone of voice (Loveland, Tunali-Kotoski, Chen, Brelsford, & Ortegon, 1995). Given the above findings, it is predicted that these problems may persist in later years and manifested in difficulties in advanced figurative language comprehension, including comprehension of irony.

The Present Study

Building on previous studies on English-speaking children, the present study examined the role of SFPs and prosody in the comprehension of irony in Cantonese-speaking children with ASD and their TD language-matched peers. It is predicted that children with ASD would be less accurate than TD children in comprehending verbal irony, both in judging speaker's belief and speaker's intent. In addition, the presence of both prosodic cue and SFP would be most facilitative in the comprehension of verbal irony for both groups of participants.

Method

Participants

Given that TD children were found to be able to understand irony by eight years old (Ackerman, 1982; Hancock, Dunham, & Purdy, 2000; Happé, 1995, Imaizumi et al., 2009; Winner & Leekam, 1991), the target age group to be examined was eight years or above. Thirteen individuals with ASD were recruited through the Parent Association of Autistic Children in Mainstream Education in Hong Kong. All the participants received formal diagnosis of ASD by a paediatrician or a clinical psychologist. All participants were male and native Cantonese speakers, aged between 8;3 and 12;9. The language ability of the participants was

determined using the Test of Hong Kong Cantonese Grammar (HKCG), a subtest of the Hong

Kong Cantonese Oral Language Assessment Scale (HKCOLAS) (T'sou et al., 2006) which

includes assessment of comprehension and production of complement structures. All the children

demonstrated age-appropriate language skills with a standard score above -1.25SD. The 13

children with ASD were then matched with 13 TD children according to their language

performance in HKCG. Participants' characteristics, including chronological age, age range,

mean age and language score are presented in Table 1.

Table 1 about here

Materials

The variables of interest, i.e., SFP and prosody, were manipulated and resulted in four

experimental conditions, (1) "Prosody-only", (2) "SFP-only", (3) "Both", and (4) "Neither". In

the "Both" condition, both the ironic prosody, in the form of stronger emphasis and lengthening

of syllables of the intensifier, and the SFP were present to aid the interpretation of the speaker's

communicative intent. In the "Prosody-only" condition and "SFP-only" condition, only prosodic

cues and only the SFP were provided respectively. In the "Neither" condition, neither SFP nor

intonation cue was embedded. Four story scenarios were created. Each story scenario included

two characters, engaged in events familiar to Hong Kong culture. Each story scenario was

presented four times to include the four possible experimental conditions yielding a total of 16

test stories. Each story finished within four sentences, ending with a potentially ironic remark

addressed by a speaker to a listener. Some changes were made to the names of the characters and

setting of the stories to sustain participants' interest.

The present study mainly focused on the perceptual correlates of ironic interpretation. Therefore, stimuli were verified perceptually by a panel of five native Cantonese adult speakers. They listened to the scenarios and ranked the four conditions from the most to the least ironic. Modification to the stories were made until all the adults' ranked the "Both" condition as the most ironic and the "Neither" condition as the least ironic. Examples of the stimuli are presented in Appendix. All the stories were read aloud and recorded onto a MP3 recorder to be presented to the participants in order to minimize any potential variation of the stimuli presented by the investigator. Drawings for the story scenarios were prepared to sustain the participants' interest and provide contexts to support children's comprehension. In addition to the 16 experimental stories with ironic remarks, five *complimentary* stories, having story characters who were truly sincere were prepared in order to minimize the possibility of giving habitual responses to the second questions concerning the speaker's belief (see below). The five complimentary stories involve one remark in the "Both", "SFP-only" and "Prosody-only" conditions, and two in the "Neither" condition (see Appendix).

Procedures

The procedures for assessing the comprehension of verbal irony in children were adapted from Ackerman (1983). Participants were tested individually. They listened to a total of 23 stories, consisting of two practice stories, 16 ironic stories and five complimentary stories. The auditory stimulus was presented to the participants at the same time with the pictures. The participants answered three questions after listening to each stories. The first question, a factual question about the truth, e.g., "Do you think that A was a good dancer?" was used to examine whether participants understood the factual content of the story. The second question was a first-order false belief question assessing the child's ability to judge the speaker's *belief*, e.g., "Did [B]

believe that the [A] dance well?" The third question was a second-order false belief question which assessed the child's comprehension of speaker's pragmatic *intent*. An example was "Did [B] intend for [A] to think that [A] was a good dancer?" The order of stories was randomized. All the responses from the participants were recorded onto a MP3 recorder and were transcribed verbatim. Each correct response scored one mark and the total scores for each type of question were used as the outcome measures.

Results

All the participants in both groups were able to identify the sincere sense of the five complimentary stories and answered the three questions of the stories accurately.

Identification of Factual Content

All participants in both groups also answered this control question correctly suggesting that they understood the content of the stories.

Judgment of Speaker's Belief

A majority of the participants from both groups were able to comprehend the speaker's belief. Table 2 shows the mean proportions and standard deviations of the correctly attributed speaker belief responses across four experimental conditions in the two groups.

A 2 (group) x 4 (condition) two-way Analysis of Variance (ANOVA) with repeated measures was conducted, with group as the between-group variable and condition as the within-group variable. Neither the main effects of condition (F (3, 78) = 1.9, p= .14), group (F (1, 26) = 0.27, p = .61) nor the interaction between group and condition (F (3, 78) = 0.706, p = .55) was significant. That means, both groups of participants gave similar judgment of speaker's belief in all conditions and the various conditions of the potentially ironic remarks did not influence their judgment of speaker's belief.

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Table 2 about here

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Judgment of Speaker's Intent

Only those participants who correctly responded to the second question concerning the speaker's belief were required to answer the third question regarding speaker's intent. One of the children in the ASD group failed to accurately respond to all of the second questions in the stories and was excluded from the analysis along with his language-matched TD peer. This resulted in 12 TD participants and 12 participants with ASD in this task. Table 2 also summarizes the results for this question. The TD participants performed well above chance levels in the 'Both' and "SFP-only" conditions; slightly above chance level for the condition of "Prosody-only" and below chance level for the "Neither" condition. In contrast, the ASD group performed below chance level in all conditions, and gave more correct responses in the "Both" and "SFP-only" conditions.

Another two-way (group x condition) ANOVA with repeated measures was conducted to test the difference. There was a significant main effect of group: TD group performed significantly better than the ASD group (F (1, 22) = 7.57, p = .012, *partial η^2* = .26). There was also a significant main effect of the remark condition (F (3, 66) = 40.9, p < .001, *partial η^2* = .65) suggesting that regardless of the groups, the presence or absence of prosodic cue and/or SFP in the potentially ironic remarks affected all of the participants' judgment of the speaker's intent significantly. There was also a significant group x remark condition interaction (F (3, 66) = 16.47, p < .001, *partial η^2* = .43), indicating that the judgment of speaker's intent based on the different conditions significantly differed in the two groups as represented graphically in Figure 1. Contrasts analyses with "Neither" condition as the reference group suggested that the

significant interaction effect was due to the significantly better performances of the TD group in the "Both" ($F(1, 22)=36.38$, $p<.001$, *partial* $\eta^2=.62$), "SFP-only" ($F(1, 22)=30.13$, $p<.001$, *partial* $\eta^2=.58$) and "prosody-only" ($F(1, 22)=7.55$, $p=.012$, *partial* $\eta^2=.26$) conditions and the lack of significant difference between the two groups in "Neither" condition (see Figure 1) .

Figure 1 about here

Within the TD group, a follow-up one-way ANOVA and post-hoc analyses using Tukey Tests were conducted. Results showed that the participants' judgment of a speaker's intent for the "Both" and "SFP-only" conditions was not significantly different. The proportion of correct responses given under these two conditions was significantly higher from those given under the "Prosody-only" and "Neither" condition. Finally, the performance in "Prosody-only" condition was also significantly better than the "Neither" condition. As for the children with ASD, ANOVA confirmed that conditions did not impose any significant effect on children's responses.

Discussion

This study aimed to examine the role of prosody and SFPs in the comprehension of verbal irony in Cantonese. Children with ASD and their language and gender matched peers participated in this study.

Identification of Factual Content

All children were able to answer the factual questions (e.g., "Do you think A was punctual or late?") accurately in both the ironic and complimentary stories. This performance was within the expectation since the questions only utilized language decoding skills and did not require the ability to make assumptions about another person's thought. Children with age-appropriate language skill should be able to respond to this question accurately.

Judgment of Speaker's Belief

Children in both groups obtained more than 80% accuracy in answering the speaker's belief questions (e.g., "Did [B] believe that [A] was punctual or late?") in stories with ironic remarks and 100% in those with complimentary remarks. For example, participants were able to infer that the story character believed that her friend was late even though she commented "You are (so) on time!" The children understood that the characters had thoughts that may not be congruent to their utterances. By considering the factual situation of the story together with the remark, the children managed to suppress the literal interpretation of the utterance when it was incongruent to the situation.

The ASD group performed similarly to the TD group. This was not a surprising result. This attribution of the mental status to the speaker in this "speaker's belief judgment" task only requires first-order false belief theory of mind which is acquired at about age of four in TD children. In the literature, it has been reported that a large number of children with ASD, in particular those at the high-functioning end, pass the first-order false belief theory of mind task, even though their mastery may be slightly delayed (Happé, 1995). In the present study, the language skills of all the participants had been controlled for by matching. The intellectual ability of the ASD group was assumed to be close to the typical peers. Therefore, it is likely that they had mastered the first order false belief theory of mind skills (Happé, 1994).

Judgment of Speaker's Intent

TD children

TD children were able to judge the sincere intent of the speakers in the complimentary stories correctly. For ironic remarks, their judgment of the speaker's *intent* varied across the conditions implying that they needed to engage in another level of processing which was

determined by the availability of prosodic and SFP cues. Without any cues (i.e., the "Neither" condition), children tended to interpret the remark as a (white) lie (i.e., "Yes, May wanted John to think that he was on time") in response to the third question ("Did May want John to know that he was punctual or late?). Some post-hoc observations also suggested that children were making good-intent white lie interpretation: for example, one child said, "She doesn't want to hurt John's feeling", and another said, "If she told John directly, he would be upset". With the prosodic cues, about half of the responses were white lies interpretation and half ironic. It may be possible that children were starting to be aware of the prosodic cues may mark verbal irony based on the presence of the cues. In the conditions of "Both" and "SFP-only", more than 90% of the TD children's responses concluded that the speaker was ironic (i.e. "May intended for John to think that he was late"). The significant difference in irony interpretation across conditions indicates that prosodic cues and SFPs were crucial to support Cantonese irony interpretation, at least in typical children at school age.

Use of prosodic cues and SFP cues

Prosodic cues, in particular intonation, have been found to be important in the comprehension of irony in the English-speaking children (Ackerman, 1982, 1986; Capelli, Nakagawa, & Madden, 1990; Laval & Bert-Erboul, 2005; Winner & Leekam, 1991). Cantonese, on the other hand, with its lexical tone system, has relatively less flexibility to use intonation to convey mood and attitudes. Therefore, even though acoustic studies have demonstrated some prosodic characteristics of irony in Cantonese (Cheang & Dell, 2009), these characteristics may not be sufficient at a perceptual level for school-age children to appreciate the ironic sense as indicated in the chance level of irony interpretation in the "Prosody-only" condition. The presence of a SFP at the end of an utterance was more facilitative in guiding the children in

judging the speaker's intent to be ironic. As previously mentioned, this SFP can convey negative affect such as sarcasm and exasperation (Fung, 2000). With the incongruent contextual background knowledge, the children were able to perceive the sarcastic sense of the remarks.

It is also noteworthy that the "Both" and "SFP-only" conditions exerted a similar degree of facilitative effect on the interpretation of irony. In other words, SFPs alone may be sufficient to facilitate the children's ironic interpretation. This pattern was somewhat inconsistent with the original prediction that the "Both" condition could strengthen the explicitness of the ironic sense when compared to the single-cue condition. In order to account for this pattern, we can take a closer look at the mechanism of sentence or utterance level intonation in Cantonese or Chinese. Chao (1968) pointed out that intonation in Chinese is additive, which means that it is added onto the lexical tones of the utterance. He quoted a typical example of imposing intonation onto an utterance: when a final rising intonation tone is added onto a final lexical *falling* tone, it will result in a lengthened syllable, which is realized as a *fall-rise* sequence and will give rise to an intonation variation. Fox, Luke and Nancarrow (2008) provided empirical evidence that when intonation was imposed on a sentence with different implications (e.g., questions, assertive, neutral), the lexical tone of the final syllable was somewhat obscured. Given the "content-less" nature of SFPs, they provide more room for pitch variations. This evidence suggests that the most crucial location for the realization of prosodic or intonational features is the final syllable(s) of the utterance in Cantonese. In other words, syllables in other parts of the utterance body may not be as salient as those in the utterance-final position in contributing to the overall prosodic pattern of the sentence (Fox et al., 2008).

In the present study, prosodic cues were mainly realized in sentence medial position via lengthening and emphasizing the syllables of the intensifier adverb. Even though intonation

would be embedded into the *medial* position of the utterance, the pitch contour of the whole utterance would still be restricted by the lexical tone boundaries of the individual syllables as mentioned above. Therefore, strictly speaking, in the two conditions with SFPs, the remarks possessed the prosodic feature of "sentence-final" intonation, which is inherently connected to SFPs. In other words, intonation and SFPs in Cantonese are not really mutually exclusive.

ASD group

The accuracy for all the four conditions in the ASD group was below chance level with statistically insignificant differences across the conditions. Unlike the TD children, the ASD group did not make use of the "SFPs" to infer the speaker's intention of being ironic. They tended to think that the characters in the story were being nice by telling a white lie so as to make the listener feel better. These children may have acquired the first-order mental state, as seen in their ability to judge the speaker's belief; but to fully understand the speaker's intention, these children still have to acquire more advanced theory of mind (Happé, 1995; Leslie, 1987; Papafragou, 1998). The children with ASD have to correctly deduce the affective value embedded in the SFP and integrate it with the literal meaning of the speech as well as the factual information to understand the implicit underlying intention of the speaker. It may be concluded from the present study that children with ASD have difficulty in processing such advanced incongruent expressions which may be due to their limited theory of mind skills in attributing mental status at advanced level and/or their insensitivity to the linguistic cues that encode the ironic meaning. However, the current study cannot tease apart the contribution of these possibilities and further studies are necessary.

One post-hoc observation worth mentioning was that the ASD group tended to interpret the irony remarks as "good-intent" white lies (as shown in their below-chance level responses in

the judgment of speaker's intent task in all conditions). Such a "white-lie" inclination adds to our knowledge about the complexity of various kind of figurative language. There has been empirical evidence stating that among the different types of figurative language, comprehension of irony required higher order theory of mind skills, while comprehension of metaphors required a lower level of such skills and the comprehension of similes required no theory of mind skills at all (Happé, 1993). This implies that comprehension of non-literal language actually requires different levels of mental state reasoning. In the case of lies, the words are "deceptive" means by which the speaker intentionally hides the truth from the listener with or without good intention. As for irony, the words are considered to be "fictional" (Anolli et al., 2000). The ironic speaker does not deliberately hide the truth, but attempts to convey the message implicitly without compromising (Anolli et al., 2000). Based on these cognitive assumptions, it appears that comprehension of white lies would be easier than irony and may lie in-between irony and similes. Again such a developmental hierarchy may require stronger acquisitional data to support.

Conclusions and Future Studies

Children with ASD were just as capable as the TD children in identifying the contextual cues and comprehending speaker's belief when their language ability was controlled for if their language ability is similar to the TD children). However, their ability in using relevant cues to read the ironic sense was significantly weaker than the TD children (Peppé, McCann, Gibbon, O'Hare, & Rutherford, 2007). Languages may vary in how verbal irony is conveyed. Cantonese relies more on SFPs than utterance-medial prosodic pattern. Understanding this language specific pattern would be useful in designing future assessment tools to detect subtle communication problems in children with high functioning ASD speaking the language (Peppé, 2011).

This present study only made use of a panel of native speakers as the reference for

prosodic variation and SFPs. Future studies can also include acoustic evidence to demonstrate the acoustic differences between the utterances used in the four experimental conditions and reveal the complex relationship between intonation and SFPs.

Acknowledgments

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Appendix

An example of a story scenario

Story Scenario - Punctuality (Stories 1 to 4) and a complimentary story

1. "Both" Condition

May asked her friends to go play at the playground at four in the afternoon. The other children arrived early and John was the last one to join the group. When May saw John, she said to him, 'You are (so) (with stress and syllable lengthening) on time (with the SFP /tsɛk5/).'

美美約咗幾個朋友仔四點鐘去遊樂場玩。其他小朋友一早都去到，而俊俊係最後一個去到遊樂場。美美見俊俊嘅時候，就同佢講："你<u>真</u>係準時/tsɛk5/。"

Question 1: Do you think John was on time? 你認爲俊俊係唔係好準時？

Question 2: Did May think that John was on time? 咁美美係唔係認爲俊俊好準時？

Question 3: Did May want John to know that he was on time or late? 咁美美想俊俊知道俊俊自己係準時定遲到呢？

2. "SFP-only" condition

Toni goes to painting class every Wednesday at five in the afternoon. Today is Wednesday. The other children arrived early and Toni was the last one to join the class. When she sat down, her classmate said to her, 'You are (so) (without stress and syllable lengthening) on time (with the SFP /tsɛk5/)'.

形形逢星期三，五點都去學畫畫。今日星期三，其他小朋友一早都去到畫班，而形形係最後一個去到畫畫班。形形坐低嘅時候，佢隔離嘅同學仔就同佢講："你真係準時/tsɛk5/。"

Question 1: Do you think Toni was on time? 你認爲形形係唔係好準時呢？

Question 2: Did her classmate think that Toni was on time? 咁同學仔係唔係認爲形形好準時呢？

Question 3: Did her classmate want Toni to know that she was on time or late? 咁同學仔想形形知道形形自己準時定遲到呢？

3. "Intonation-only" condition

"During the summer holidays, the teacher and the children went on a picnic. The teacher asked the children to gather at the school by eight in the morning on the picnic day. On the picnic day, the other children arrived early and Mandy was the last one to join the group. The class monitor said to her, 'You are (so) (with stress and syllable lengthening) on time (without the SFP /tsɛk5/).'"

放暑假嘅時候，老師安排成班同學去郊遊。佢叫大家朝頭早八點到學校集合。出發嗰日，其他同學一早返到學校，而小明係最後一個上車。小明上車嘅時候，班長就同佢講："你真係準時。"

Question 1: Do you think Mandy was on time? 你認為小明係唔係好準時呢？

Question 2: Did the class monitor think that Mandy was on time? 咁班長係唔係認為小明好準時呢？

Question 3: Did the class monitor want Mandy to know that she was on time or late? 咁班長想小明知道小明自己準時定遲到呢？

4. "Neither" condition

"Today is Wendy's birthday. She invited all her classmates to have a party at her house. Edmond was the last one to come. When he arrived, Wendy said to Edmond, "You are (so) (without stress and syllable lengthening) on time (without the SFP /tsɛk5/)."'

今日係詠詠嘅生日，佢請咗成班同學一點鐘去佢屋企開生日會。其他同學一早去到，而志明係最後一個去到詠詠嘅屋企。志明去到嘅時候，詠詠對佢講："你真係準時。"

Question 1: Do you think Edmond was on time? 你認為志明係唔係好準時呢？

Question 2: Did Wendy think that Edmond was on time? 咁詠詠係唔係認為志明好準時呢？

Question 3: Did Wendy want Edmond to know that he was on time or late? 咁詠詠想志明知道志明佢自己準時定遲到呢？

5. Complimentary story

"Calvin decided to watch a movie with his girlfriend at 2pm. Calvin arrived at the cinema at 1pm. He bought the tickets and snack and waited for his girlfriend at the main door of the cinema at 2pm. When his girlfriend arrived and saw Calvin, she said, "You are (so) (with stress and syllable lengthening) on time (with the SFP /tsek5/)."'

家輝約咗女朋友兩點鐘去戲院睇戲。家輝一點鐘就去到戲院，跟住買埋飛同嘢食，兩點鐘就喺戲院門口等女朋友，佢個女朋友去到戲院，見到家輝就話："你真係準時/tsɛk5/。"

Question 1: Do you think Calvin was on time? 你認為家輝係唔係好準時呢？

Question 2: Did his girlfriend think that Calvin was on time? 咁個女朋友係唔係認為家輝好準時呢？

Question 3: Did his girlfriend want Calvin to know that he was on time or late? 咁個女朋友想家輝知道家輝佢自己準時定遲到呢？

Table 1

Summary of Subject Characteristics

Age range	Mean age (SD)	HKCG raw mean (SD)
8;05 – 12;9	10.42 (1.20)	55 (3.80)

Table 2

Mean (SDs) of Positive Answers to the Speaker's Belief and the Speaker's Intent Questions in

Ironic Stories

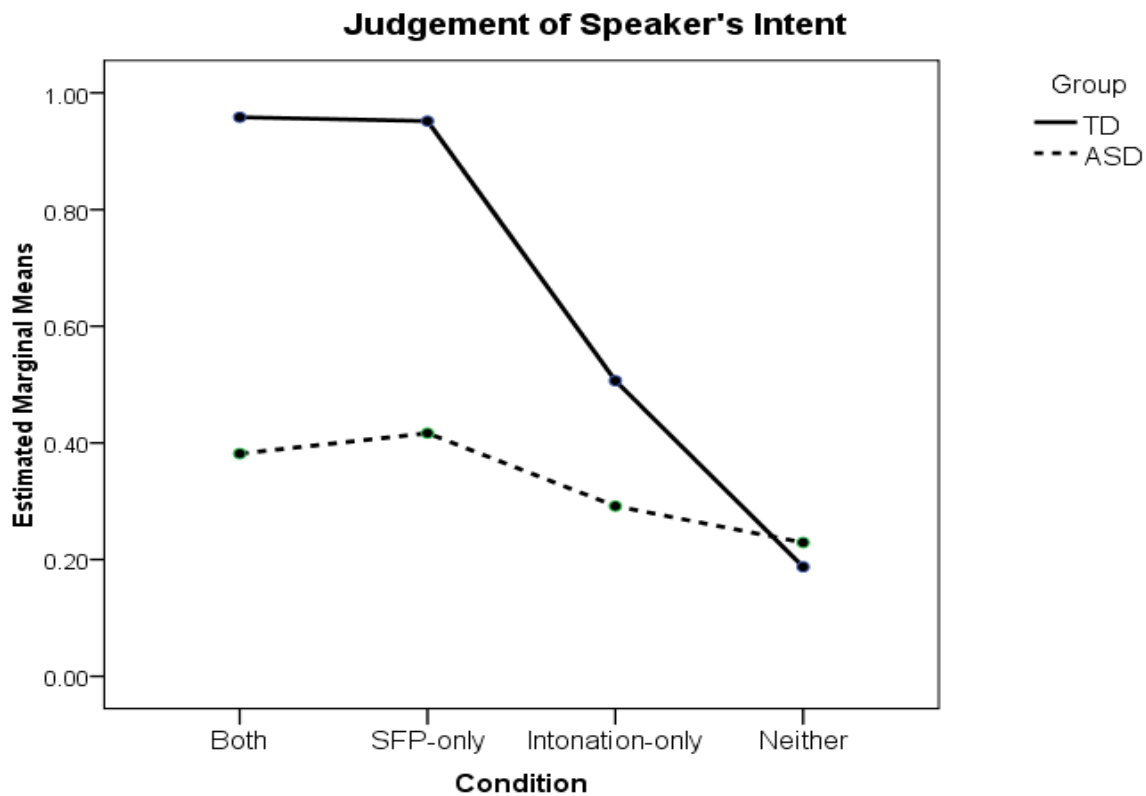| Group	Both	SFP-only	Prosodic-only	Neither
Speaker's Belief				
TD ($n = 13$)	0.83 (0.36)	0.82 (0.36)	0.77 (0.32)	0.78 (0.37)
ASD ($n = 13$)	0.86 (0.32)	0.88 (0.32)	0.84 (0.36)	0.86 (0.36)
Speaker's intention				
TD ($n = 12$)	0.96 (0.10)	0.95 (0.11)	0.51 (0.33)	0.19 (0.30)
ASD ($n = 12$)	0.38 (0.38)	0.42 (0.40)	0.29 (0.41)	0.23 (0.39)

Figure legend

Figure 1. Group performance on the task of judging speaker's intent.

Figure 1. Group performance on the task of judging speaker's intent.