

On acquiring a complex personal reference system: Experimental results from Thai children with autism¹

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Abstract. Reference of pronouns may be constrained via lexical presuppositions, including marked ϕ -features, implicated presuppositions, and deictic center shifting in certain languages. This paper explores the acquisition of personal reference terms in Thai, a language that has a highly complex personal reference system. The participants of the study were 67 typically-developing children (TD) and 29 children with autism spectrum disorders (ASD), a population which has long been observed to have difficulties with pronouns. The children were asked to complete simple production and comprehension tasks on personal reference terms. Overall, ASD children performed on par in production but significantly poorer in comprehension than TD children. Given the freedom of choice in the production task, ASD children preferred using fixed referential terms for self-reference, whereas TD children opted for personal pronouns. In terms of comprehension, ASD children were shown to generally be able to detect the person features but they seemed to struggle the most with the pragmatic aspects of personal reference terms. Our results support previous literature that lexical presuppositions are acquired earlier than implicated presuppositions. We add to the literature that the types or the amount of implicated presuppositions matter in acquisition.

Keywords: implicated presupposition, pragmatic inference, pronoun, personal reference, acquisition, deixis, Thai

1. Introduction

While certain types of pragmatic inferences have been widely studied in the acquisition literature, implicated presuppositions have received much less attention, with some exceptions such as Yatsushiro (2008) and Legendre et al. (2011). Sauerland (2008b) adopted Heim's (1991) MAXIMIZE PRESUPPOSITION maxim to explain the semantic markedness of ϕ -features in pronouns. Since first and second persons possess a person ϕ -feature, they trigger the lexical presuppositions, referring to the speaker and addressee/participant, respectively. The lack of such a ϕ -feature on third person gives rise to an implicated presupposition that the referent is not the speaker nor the addressee/participant on this account. This study extends the contexts of pragmatically-derived inferences to the issue on deictic and person interpretations of pronouns in Thai, a language that is rich in personal reference terms and consists of not only over 50 personal pronouns, but also kin terms, occupational titles, and personal names (Bandhmedha 2011; Cooke 1968; Iwasaki and Ingkapirom 2009). The populations under examination include both typically-developing children (TD) and children with autism spectrum disorders (ASD),

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a population group which has long been observed to have difficulties with pronouns, such as pronoun reversal errors between ‘I’ and ‘you’ in English (Chiat 1982; Fay 1979).

The present paper begins with two main topics for the background literature on the semantics and pragmatics of pronouns (§2) and on pronouns and autism (§3). Section 4 presents the methods of the study. Results of the experiment are described in Section 5 and discussed in 6. Section 7 concludes.

2. Semantics and pragmatics of pronouns

Distinctions between personal pronouns can be made along various dimensions. In the person dimension, the 1st and 2nd persons are cross-linguistically observed to be different from the 3rd person in various ways, such as their associative plural generalization (See Greenberg 1988; Noyer 1992; Cysouw 2003.) and their bound interpretations (See Heim 1994; Kratzer 2009; Sudo 2012, etc.). While the 1st and 2nd persons are generally defined as referring to the speaker and the hearer respectively, the 3rd person is described as referring to neither (Lyons 1977). This fact led to different proposed sets of features for 1st and 2nd person versus 3rd person pronouns. Sauerland (2008b) proposed that the 3rd person is the most unmarked among the three persons. The verb agreements in Czech (1) is an example of how the 1st and 2nd persons dominate the 3rd person. Further similar evidence was presented in Sauerland (2008b) to support that the 1st person is more marked than the 2nd person as seen in their dominance relationship, e.g., in English (2) and in German (3).

- (1) a. bratr a já se uč-íme hrát na klavír
brother and 1.SG self.acc teach-**1PL** play on piano
‘My brother and I are learning to play the piano.’
b. tvůj otec a ty jste si podobni
your father and you be.**2PL** self.DAT alike
‘Your father and you are alike.’ (Corbett 1991, pp. 262)
- (2) You and I, **we**, are special. (Sauerland 2008b, pp. 26)
- (3) Du und ich sind/*seid etwas besonderes.
you and I be.**1/3PL**/*be.**2PL** something special
‘You and I are something special.’ (Corbett 1991, pp. 262)

For languages without inclusive/exclusive distinctions, e.g., English, Sauerland (2008b) proposed that the 1st person has the most marked feature specifications, containing [participant] and [speaker]. The specification for the 2nd person is only [participant]. For languages with inclusive/exclusive distinctions, including Thai², Sauerland (2008b) proposed the features [speaker]

²Cysouw (2013), basing on the data from Noss (1964), did not list Thai as a language with inclusive/exclusive distinctions. Instead, Cysouw (2013) listed Thai as another category having identical ‘we’ and ‘I’. While this may be true for the pronoun *raw*, which can mean both, it is not representative of the entire Thai personal reference system. The forms /*raw*/ or, with the plural marker, *p^hûak-raw* have no inclusive/exclusive distinctions, just like English ‘we’. However, in Thai, there are also other pronouns that can only mean ‘I’ and not ‘we’, such as *c^hán*. Combining this pronoun with the plural marker for pronouns forms *p^hûak-c^hán* which means ‘I and some others, but not you’. This is comparable to *wōmen* in Mandarin, which was listed as a language with these distinctions.

and [addressee] instead, leaving exclusive 1st person pronouns and 2nd person pronouns undetermined on their rank on markedness scale. In both types of languages, however, the 3rd person lacks a person ϕ -feature altogether.³ The lexical presupposition is, thus, not triggered by the 3rd person. This is where Sauerland (2008b) adopted Heim's (1991) MAXIMIZE PRESUPPOSITION maxim, suggesting that the form with the strongest lexical presupposition must be chosen whenever its presupposition is felicitous. In other words, the use of 3rd person pronouns gives rise to another kind of presupposition: an '*implicated presupposition*' (Sauerland, 2003, 2008a, b) that the pronouns do not refer to either of the participants. Otherwise, according to the maxim, the 1st or 2nd person pronouns would have been used. In sum, instead of having a lexical presupposition for the features [speaker] or [addressee], the 3rd person only has an implicated presupposition of being '*anti-participant*'.

Apart from the person dimension, pronouns may contain other descriptive features, such as, gender and number in English, to denote the properties of the referred individual. The relevant descriptive feature for this paper is gender. Sauerland (2008b) proposed that among all the languages with masculine/feminine distinctions in pronouns, the feminine distinction is cross-linguistically more marked than the masculine. This can be seen in the dominance of the masculine gender over the feminine gender on agreement, e.g., in French (4) and Czech (5). In contrast, the human/non-human gender distinction varies in its markedness across languages. For instance, in Luganda, although not fully acceptable in all circumstances, the gender class 8 which agrees with non-human subjects is preferred over, i.e., dominates, the gender class 2 for human, when the subject consists of a mixed group of humans and non-humans (6). While it seems that the non-human gender in Luganda and other languages, especially the Bantu languages, is more marked than the human gender, there are languages, e.g., Tamil (Corbett, 1991), which has a reversed dominance relationship between human/non-human genders.

(4) un père et une mère excellent-s
a.MASC father and a.FEM mother excellent-MASC.PL
'an excellent father and mother' (Corbett 1991, pp. 279)

(5) Jan a Věra šl-i do biografu
Jan and Vera go-PST-MASC.PL to movies
'Jan and Vera went to the movies.' (Vanek 1977, pp. 31)

(6) a. ? omu-sajja ne em-bwa-ye bi-agwa
1-man and 9-dog-his 8-fall-PST
'The man and his dog fell down.'
b. * omu-sajja ne em-bwa-ye ba-agwa
1-man and 9-dog-his 2-fall-PST
'The man and his dog fell down.' (Corbett 1991, pp. 274)

In this paper, we assume that Thai is a language with inclusive/exclusive distinctions. Certain pronouns, such as *raw*, might be underspecified for the feature [addressee], resulting in the seeming lack of such distinctions.

³Kratzer (2009) had a similar proposal that 1st and 2nd person pronouns contain the features [1st] and [2nd] respectively, while 3rd person pronouns only contain the feature [def] as they merely are definite descriptions, i.e., containing no inherent meanings as other persons. The difference in their proposal is that the features [1st] and [2nd] in Kratzer's (2009) proposal pick out an individual, while Sauerland's (2008b) person features are of the type $\langle e, t \rangle$. To avoid unnecessary complications, Sauerland's system is employed throughout the paper.

Although Sauerland (2008b) proposed that the [female] gender is crosslinguistically marked, we argue that the fact only holds true in 3rd person. In Thai, there are masculine/feminine distinctions in 1st and 2nd person pronouns as well. The epistemic status of male pronouns is restricted such that the referred individuals must only be male, while that of female ones does not. Therefore, we argued that for *1st and 2nd* persons in Thai, the feature [*male*] is marked, while for *3rd person*, the feature [*female*] is marked.

As mentioned above, human/non-human gender distinctions vary across languages. Two markedness tests, namely the dominance test and the epistemic status test, were then applied to Thai 3rd person pronouns. The coordination of a human and a non-human subject in (7) shows the dominance of the non-human gender. The ‘it’-equivalent pronoun *man* is chosen to be a resumptive pronoun for the entire coordination. Note that when this pronoun is used to refer to a person, it is implied that the speaker does not respect him/her. The 3rd person human pronoun *kháw*, on the other hand, cannot be used to refer to a coordination where one of the components is non-human. The epistemic status test in (8) confirms that the non-human gender is less marked as reference to a human is not ruled out as impossible by the use of the pronoun *man*. It is then concluded that the [human] feature in Thai is marked, while the [non-human] feature is not, giving rise to an implicated presupposition.

- (7) a. * câw-k^hɔ̃:ŋ kàp mǎ: *kháw* dɤ:n ma: d̥uaj-kan
owner and dog 3.HUM walk DEI together
- b. câw-k^hɔ̃:ŋ kàp mǎ: *man* dɤ:n ma: d̥uaj-kan
owner and dog 3.NH walk DEI together
‘The owner and the dog walked (towards the speaker) together.’
- c. * mǎ: kàp câw-k^hɔ̃:ŋ *kháw* dɤ:n ma: d̥uaj-kan
dog and owner 3.HUM walk DEI together
- d. mǎ: kàp câw-k^hɔ̃:ŋ *man* dɤ:n ma: d̥uaj-kan
dog and owner 3.NH walk DEI together
‘The dog and the owner walked (towards the speaker) together.’
- (8) a. *man* kam-laŋ kin k^hâ:w jù:
3.NH PROG eat rice PROG
‘It is having a meal.’
i) ✓ referring to an animal ii) ✓ referring to a person
- b. *kháw* kam-laŋ kin k^hâ:w jù:
3.HUM PROG eat rice PROG
‘He/she is having a meal.’
i) * referring to an animal ii) ✓ referring to a person

With regards to the traditional taxonomy, personal pronouns may be inherently deictic, meaning that they have varied referents depending on the extralinguistic contexts of who the speakers and the addressees are in a particular speech event. This property is referred to as ‘person deixis’, a subtype of a broader term ‘deixis’, which covers a range of references that varies by the context of an utterance based on certain important elements: person (e.g., ‘I’ and ‘you’), time (e.g., ‘now’ and ‘later’), place (e.g., ‘here’ and ‘there’), discourse (e.g., ‘this’ and ‘that’),

and social (e.g., honorifics) (Fillmore 1971, 1975; Lyons 1977; Levinson 1984). In addition to involving person deixis, personal pronouns may also be socially deictic, i.e., the choice of a pronoun points to the social status of the participants in the context. This aspect is closely related to their politeness distinctions. Typologically, second person pronouns in 71 languages out of 207 investigated languages encode politeness distinctions in some way (Helmbrecht, 2013). Among these languages, 49 of them encode a binary politeness distinction (e.g., German *du/Sie*, Russian *ty/vy*, French *tu/vous*, etc.), while 15 encode multiple politeness distinctions (e.g., Marathi). The rarest type of politeness distinctions, found in merely 7 languages, is when second person pronouns are avoided for politeness. These languages are all spoken in East and Southeast Asia, including, Burmese, Indonesian, Japanese, Khmer, Korean, Thai, and Vietnamese. Southeast Asian languages, instead, employ other kinds of personal reference terms to politely address the hearer.

This paper focuses on Thai, a language with a highly complex personal reference system. Personal reference system in Thai involves not only personal pronouns, but also kin terms, occupational titles, and personal names (Bandhumedha 2011; Iwasaki and Ingkapirom 2009, among others). According to the list by Cooke (1968), personal pronouns alone comprise 27 first-person pronouns, 22 second-person pronouns, and 8 third-person pronouns. The other three categories combined consist of countless items. Choosing pronouns among these abundant choices requires considering different factors, such as age, sex, societal status. Kin terms, for instance, can be used in an amicable fashion to refer to people *outside of one's family*, depending on the referent's age and relationship with the speaker.

Certain personal reference terms in Thai can refer to more than one person with different pragmatic effects. For instance, in child-directed speech, a female adult can use the male first-person pronoun *p^hǒm* to refer to the hearer who is a boy. This reverses the values between speakers and hearers and the relationship between them; instead of the speaker being male, the hearer is male. This kind of person syncretism is derived from deictic-center shifting. This does not only reverse the values of features between the speaker and the hearer but also the change in the deictic center as seen in abundant cases of other terms in Thai. For example, talking to their younger child, parents can refer to their older child as *p^hî*: 'older sibling'. This is a case where parents shift the deictic center to their younger child who would refer to their older child using that term. Had the parents themselves been the deictic center, the older child would be referred to as *lû:k* 'child'. Since such use of personal reference terms involves stylistic usages, this paper assumes that for certain terms where deictic-center shifting is possible, their features are not underspecified nor unmarked. We, therefore, claim that their meaning is not derived through an implicated presupposition.

The acquisition of implicated presuppositions and pronouns. The acquisition of implicated presuppositions has received much less attention than other pragmatic inferences, with some exceptions such as Yatsushiro (2008) and Legendre et al. (2011). Yatsushiro (2008) investigated the acquisition of lexical presupposition, implicated presupposition, and scalar implicature. She examined the German universal quantifier *jeder* 'every', which both lexically presupposes existence and implicates a presupposition of anti-uniqueness. Consider the sentences in (9): Since the definite determiner *the* lexically presupposes both existence and uniqueness, its use

is felicitous. On the other hand, the universal quantifier *every* has an implicated presupposition of anti-uniqueness. Our encyclopedic knowledge that one can only have one biological father makes the sentence infelicitous.

- (9) a. # I interviewed every biological father of the victim.
 b. I interviewed the biological father of the victim. (Yatsushiro 2008, pp. 667)

Yatsushiro (2008) conducted an experiment with 120 German-speaking children and 21 adult controls. The task is to choose the felicitous sentence(s) from a choice of two sentences for describing the picture that is shown. For instance, sentences in (10) were presented as choices for describing the picture of a girl playing soccer.

- (10) a. Das Mädchen hier spielt Fussball
 the girl here plays soccer
 ‘The girl here is playing soccer.’
 b. Jedes Mädchen hier spielt Fussball
 every girl here plays soccer
 ‘Every girl here is playing soccer.’ (Yatsushiro 2008, pp. 671)

The results show that 6-year-old children accepted (10b) significantly more than other groups of children and adults. This suggests that they have acquired lexical presuppositions, but have not fully acquired implicated presuppositions of anti-uniqueness. Yatsushiro (2008) then argued that implicated presuppositions are acquired later than lexical presuppositions, while having their acquisition path of implicated more similar to that of scalar implicatures.

Legendre et al. (2011) examined the acquisition of pronouns in French by testing the comprehension of 3 singular and 3 plural French pronouns by sixteen 30-month-old toddlers. They found that the comprehension of 3rd person *elle* was at chance level, in contrast with a good performance on 1st person *je* and 2nd person *tu*. All the plural pronouns seem to yield below-chance performance across all persons. They concluded that the results support Heim’s (1991) theory on presuppositions and Sauerland’s (2008b) markedness scale. The result is also in accordance with Yatsushiro’s (2008) claim that implicated presuppositions are acquired later than lexical presuppositions.

3. Pronouns and autism

Autism spectrum disorders (ASD) are characterized with three core features: social deficits, language and communication deficits, and repetitive behaviors (American Psychiatric Association 2000). Since language abilities among children with autism are largely heterogenous, researchers have divided them into autism with language impairment (ALI) and autism with normal or above average linguistic abilities (ALN) (Boucher 2012; Kjelgaard and Tager-Flusberg 2001; Rapin et al. 2009; Tager-Flusberg 2006; Whitehouse et al. 2008; Williams et al. 2008). It is still unclear, however, what the pattern of language impairments in the ALI subgroup is.

Pragmatics and discourse are generally accepted in the autism literature to be central to language deficits in autism (for reviews, see Lord and Paul 1997; Tager-Flusberg 1999; Wilkinson 1998). More recent studies (e.g., Eigsti et al. 2011; Tager-Flusberg and Joseph 2003) have found more fundamental impairments in other areas of language. Current hypotheses (See Walenski et al. 2006; Boucher 2012; Boucher et al. 2008) propose that the grammatical domains of language are impaired in ASD, while the lexical domains are still intact. Further research on language and autism is needed to support or challenge such a claim.

Among pragmatic deficits, difficulties in personal pronoun use have been observed since the beginning of the study of autism by Kanner (1943). Such difficulties with pronouns in ASD were also reported in many of the later studies (see, for instance, Bartak and Rutter 1974; Charney 1980; Chiat 1982; Fay 1979; Loveland 1984). Recent work by Mizuno et al. (2011) explored the neural basis of the personal pronouns *I* and *you*, in comparison with names which denote fixed identity in adults with high-functioning autism. The results show slower and less accurate responses when the task involves personal pronouns rather than names. Moreover, for questions containing the second person pronoun, this study detected an underconnectivity between right anterior insula, primarily involved in self-awareness and self-consciousness, and precuneus, essentially involved in spatial attention. The underconnectivity did not, however, appear with the questions containing first person pronouns.

Interestingly, errors in pronoun usage in autism are not restricted to deixis and the reversal of person features (11), but also involve errors in case markings (12). This leads to further questions on where the difficulties actually lie when it comes to the processing of pronouns in autism.

- (11) a. "You want candy?"
b. "Hurt yourself."
c. "Help you please." (Tager-Flusberg 1994, pp. 185)
- (12) a. "My get it."
b. "Me cool off."
c. "Do down me arm." (Tager-Flusberg 1994, pp. 184-5)

As for Thai personal reference terms and autism, Chanchaochai (2013) observed three children with ASD over a three-month period and found that personal reference terms with lower deictic level, including kin terms, occupational titles, and personal names, were preferred over the ones with higher deictic levels like pronouns. Person deixis avoidance is thus another phenomenon that may play a role in the production of Thai personal reference terms in autism.

This project investigates the performance in both production and comprehension of a subset of common Thai personal reference terms. The goal is to compare between the two groups of participants, ASD and TD, and also between different groups of personal reference terms. The main differences within the personal reference terms include person and gender ϕ -features, deictic level, and deictic-center shifting.

4. Methods

4.1. Participants

Children with ASD ($N=29$; Male $N=24$; Age Range = 6;7-12;2 $M=9;10$ $SD=21.56$) and their age-, gender-, and non-verbal-IQ (NVIQ) matched TD controls⁴ ($N=67$; Male $N=55$; Age Range = 6;1-12;8 $M=9$ $SD=21.42$) were recruited from (1) Kasetsart University Laboratory School, Center for Educational Research and Development and (2) La-or Utis Demonstration School. One ASD participant was classified in his medical records as having Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS), while the remaining are all classified as having Autistic Disorder (AD). The Ravens Standardized Progressive Matrices (Raven et al. 2000) were administered to both groups of participants for the assessment of NVIQ (ASD $M=97.8$ $SD=22.24$; TD $M=112.95$ $SD=15.46$). The scores were converted using the norms in the 1979 British Standardisation of the Standard Progressive Matrices (Raven 2000, pp. 39-40). Children in both groups had normal hearing and normal or corrected-to-normal vision. This study was approved by the Institutional Review Board at the University of Pennsylvania. Having been informed about the study and their rights, the parents of all the participants provided written consent for their child to participate in the study.

4.2. Materials

The main design of the experiment adapts the Fishing Task (Girouard et al. 1997; Legendre et al. 2011). The speech context comprises five participants, including the experimenter (E), the child (C; tested individually), and 20-inch-tall cardboard figures of a boy (B), a girl (G), and a monkey (M; See Figure 1.). The blank space, which each of the cardboard figures are holding, was left for attaching 58 cards with the pictures of different objects using a reusable adhesive.

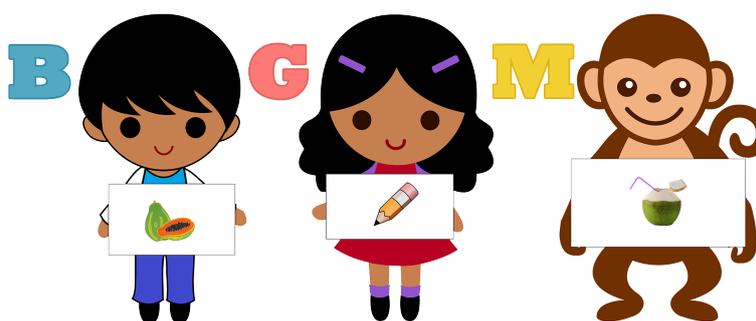


Figure 1: Extra *participants* in the experiment

⁴We attempted to subgroup the TD children into the age-matched group and the NVIQ-matched group. However, the results from different ways of subgrouping remain very similar to those from the entire group. Therefore, this paper only presents the data from the entire group of the TD children.

4.2.1. Tested personal reference terms

For the comprehension task, all of the personal reference terms that are applicable to the context of our experiment were chosen. The test phase included 8 personal reference terms: 1 first-person, 4 second-persons (3 pronouns for each child depending on the child's gender, i.e., *nũ:* for girls and *p^hõm* for boys as highlighted in Table 1), and 3 third-persons. The selected terms are personal pronouns, except for two terms: *p^hî:* 'older sibling' and *nô:ŋ* 'younger sibling', which are kin terms. The order of pronouns in question was pseudo-randomized such that the possible answers of each phase do not refer to all the speech participants, so that they do not leave later referents predictable. The randomization methods make the amount of trials per each pronoun different. Each targeted pronoun was, however, repeated at least twice.

Based on the literature discussed in Section 2, below we provide tentative semantic denotations for the personal reference terms that were used in the experiment in Table 1. The denotations of each pronoun are merely semi-formal so as to clearly illustrate their possible feature bundles to the readers. This table summarizes all the possible denotations of each personal reference term whose target is restricted to only one referent by the context of the experiment. For instance, the first term in the table *p^hî:* 'older sibling' can be used to refer to either the speaker or the addressee as long as the referent is the older one in the situation. Therefore, in the setting of this experiment, when I, the experimenter, used this term to talk to a child, this term always referred to me, the older participant. Likewise, if the child used this term in this situation, it would still refer to me, the older experimenter. This is different from the pronouns *p^hõm* and *t^hγ:*, which have more complex dimensions while being used as different persons. In Section 2, we proposed that deictic-center shifting does not involve unmarked person features. Thus, even though the pronoun *p^hõm* is technically a 1st-person pronoun for men of any age, it is also marked with 2nd as a separate entity since it can be used only in child-directed speech, where deictic-center shifting is employed. As for the pronoun *t^hγ:*, it is generally a 2nd-person pronoun when the addressee is of an equivalent age or social status. The addressee can be younger or in a lower social status as well but that is only used in an unfriendly and distant (almost degrading) sense. Since the experimenter is not the children's peer and also ended each sentence with a polite final particle, the 2nd person reading should not be applicable in this context.

4.3. Procedure

In the beginning of each block, the children were first asked to name pictures of commonly known animals and objects. The pictures were then distributed across participants. Before the production task, no pronouns were used so to avoid priming the children. In the test phase, each participant in the production task or each term in the comprehension task was randomly

⁵Social-deictic features are normally listed in the encyclopedic (non-linguistic) knowledge. It may be possible that in certain languages, some social descriptive features are encoded in the grammar. It is beyond the scope of this paper to discuss the claim. The social descriptive features are only included for the reader's understanding of these pronouns.

⁶Its reduced form *k^háw* (more frequently used) are underspecified for gender. Only the full form was tested.

Table 1: Tested personal reference terms

Participant					
Term	Person		Gender	Social-deictic ⁵	Target
p ^{hi} :	participant	{1st, 2nd}	-	older sibling	E
nǔ:	participant	{1st, 2nd}	-	younger participant	C
p ^h ǒm	speaker	{1st}	male	-	C
	addressee	{2nd}	male	younger participant	
k ^h un	addressee	{2nd}	-	formal	C
nó:ŋ	participant	{1st, 2nd}	-	younger sibling	C
Anti-participant					
Term	Person		Gender/ Social-deictic	Implicated Presup	Target
k ^h ǎw ⁶	-		human	anti-participant, non-feminine	B
t ^h y:	addressee	{2nd}	peer	-	G
	-		human, female	anti-participant	
man	-		-	anti-participant, non-human	M

selected as the expected target at least twice. A different set of 5 objects was changed after every 3 trials. Below are the instructions in the order as they appeared in the experiment.

Preparatory Phase:

E: 'What's (your) name?'⁷

E: 'What is this?' (Repeat for 5 objects per block.)

Production Task:

TEST PHASE:

E: 'Who is holding X?' (Twice for each target.)

C: '___ (is holding X.)'

Comprehension Task:

FAMILIARIZATION PHASE:

E: 'What is Y_{the boy/girl/monkey/child's name} holding?'

C: '(Y is holding) X.'

TEST PHASE:

E: 'What is Y_{tested pronoun} holding?'

C: '(Y is holding) ___.'

⁷Thai is a pro-drop language so pronouns can be avoided here.

5. Results

5.1. Overall accuracy

One ASD child was withdrawn from the experiment because he did not answer to any of the questions. His results were excluded from the calculations. An answer was marked as accurate when it referred to the right referent. The accuracy rate for production is near ceiling for both the ASD (94.6%) and the TD (90.6%) groups with ASD children performing significantly more accurately (Mann-Whitney $U=97595$, $p=0.04$). The accuracy rate for comprehension dropped for both groups (60.4% for ASD; 82.3% for TD) with a much sharper drop for ASD (Figure 2). The comprehension task accuracy thus yields a highly significant difference between participant groups (Mann-Whitney $U=658640$, $p<0.001$).

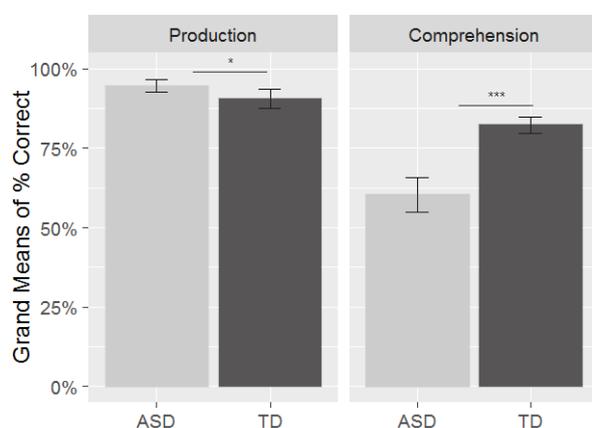


Figure 2: Overall accuracy across tasks

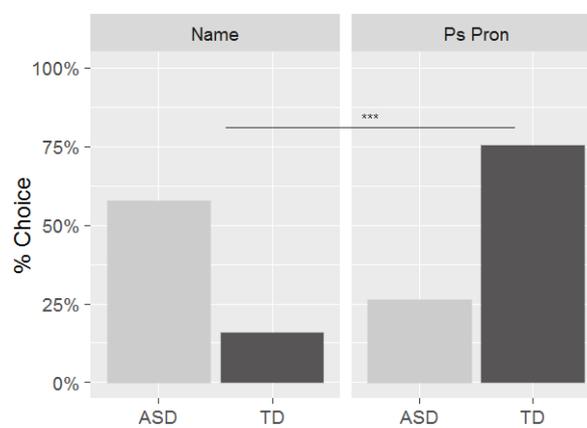


Figure 3: Choices of terms the children used to refer to themselves

5.2. Production

The most common personal reference terms that the children in both groups used to refer to themselves are personal names and personal pronouns. However, they were found in a reversed preferred pattern (Figure 3). In the ASD group, personal names were used 57.4% of the time versus 25.9% for personal pronouns, compared to 15.7% versus 75.2%, respectively, for the TD group. The proportion of counts for the two most commonly-chosen categories for self-reference showed a very significant difference across participant groups (Fisher's Exact, $p<0.001$).

As for the reference to the experimenter, children with ASD used the occupational title k^hru : 'teacher' to refer to the experimenter the most (51.95%), followed by the use of kin term $p^h\hat{i}$: 'older sibling' (42.3%). TD children, on the other hand, preferred the kin term (55%), over the occupational title (44.15%). However, the proportion of the choices for referring to the experimenter was not significantly different across groups (Fisher's Exact, $p=0.23$). As for the reference to the cardboard figures, both of the groups mainly used common nouns (boy, girl, monkey) to refer to them (92.1% for ASD; 97.1% for TD). Thus, the two participant groups are not significantly different from each other (Fisher's Exact, $p=0.19$).

5.3. Comprehension

Overall, third person yields the poorest performance for the ASD group (See Figure 4). As for the TD group, only the male third person yields poorer performance among the third persons. The only form where ASD children outperformed TD children is the formal second-person pronoun *k^hun* with a non-ambiguous referent. A fixed effect logistic regression model (Accuracy \sim Group + Gender + zAge + zNVIQ) was run on the comprehension task. It reveals that the accuracy is significantly different across participant groups ($z=10.736$, $p<0.001$), age ($z=12.294$, $p<0.001$), and NVIQ ($z=10.167$, $p<0.001$). The gender of the participants is not a significant factor for their performance ($z=-0.015$, $p=0.99$).

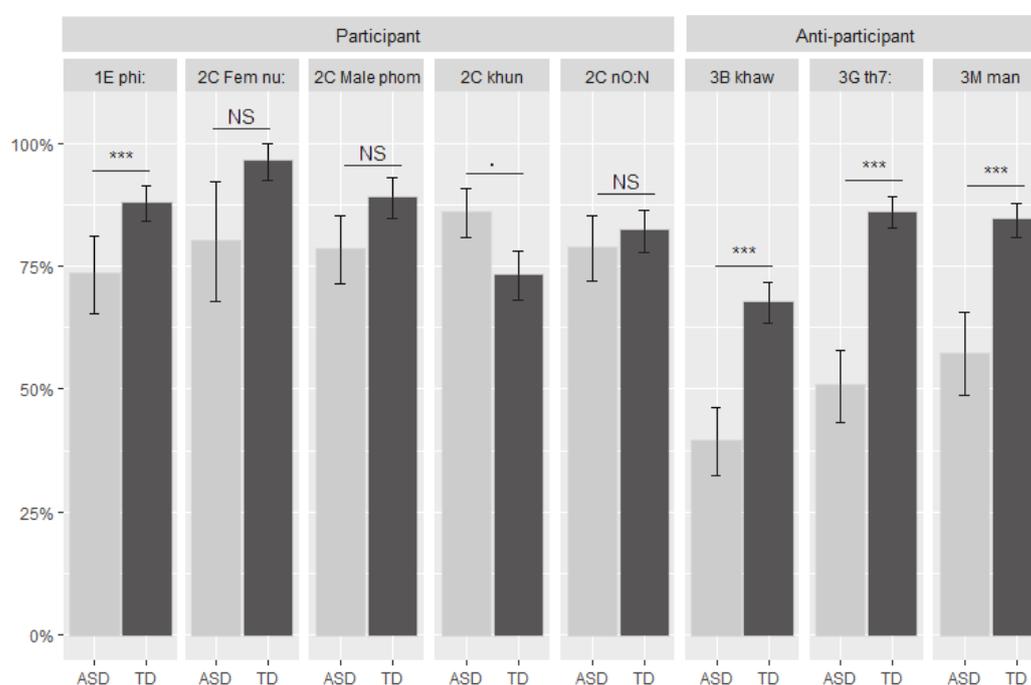


Figure 4: Accuracy in comprehension task by item

5.3.1. Error analysis

This section explores the pattern of errors in the comprehension task. Figure 5 shows the percentages of errors among all trials. This is to examine the choices the children opted for, instead of the expected referents.

Experimenter-Targeted: Instead of choosing the experimenter as the target for the pronoun *p^hi*: ‘older sibling’, a subgroup of both ASD and TD children mistook the term for referring to the cardboard figures (Figure 5a). The ASD children made more mistakes answering that they themselves were the referent to the term ‘older sibling’, while in fact, they were not older (ASD 8%; TD 1.5%).

Child-Targeted: A similar pattern was observed in the comprehension of the term *nó:n*: ‘younger

sibling’ where the children chose the cardboard figures as the referent, instead of choosing themselves (Figure 5e). Some ASD children also chose the experimenter as the referent for the terms *nũ*: (1st/2nd younger female) (10%; Figure 5b), *p^hõm* (1st male deictic-center shifted) (8.7%; Figure 5c), *k^hun* (2nd formal) (1.8%; Figure 5d), and *nó:ŋ* ‘younger sibling’ (1.8%; Figure 5e). As for the TD children, regardless of the number of errors they made in the comprehension of the formal second person pronoun *k^hun*, the experimenter was never one of the wrong targets for any of the tested second person pronouns.

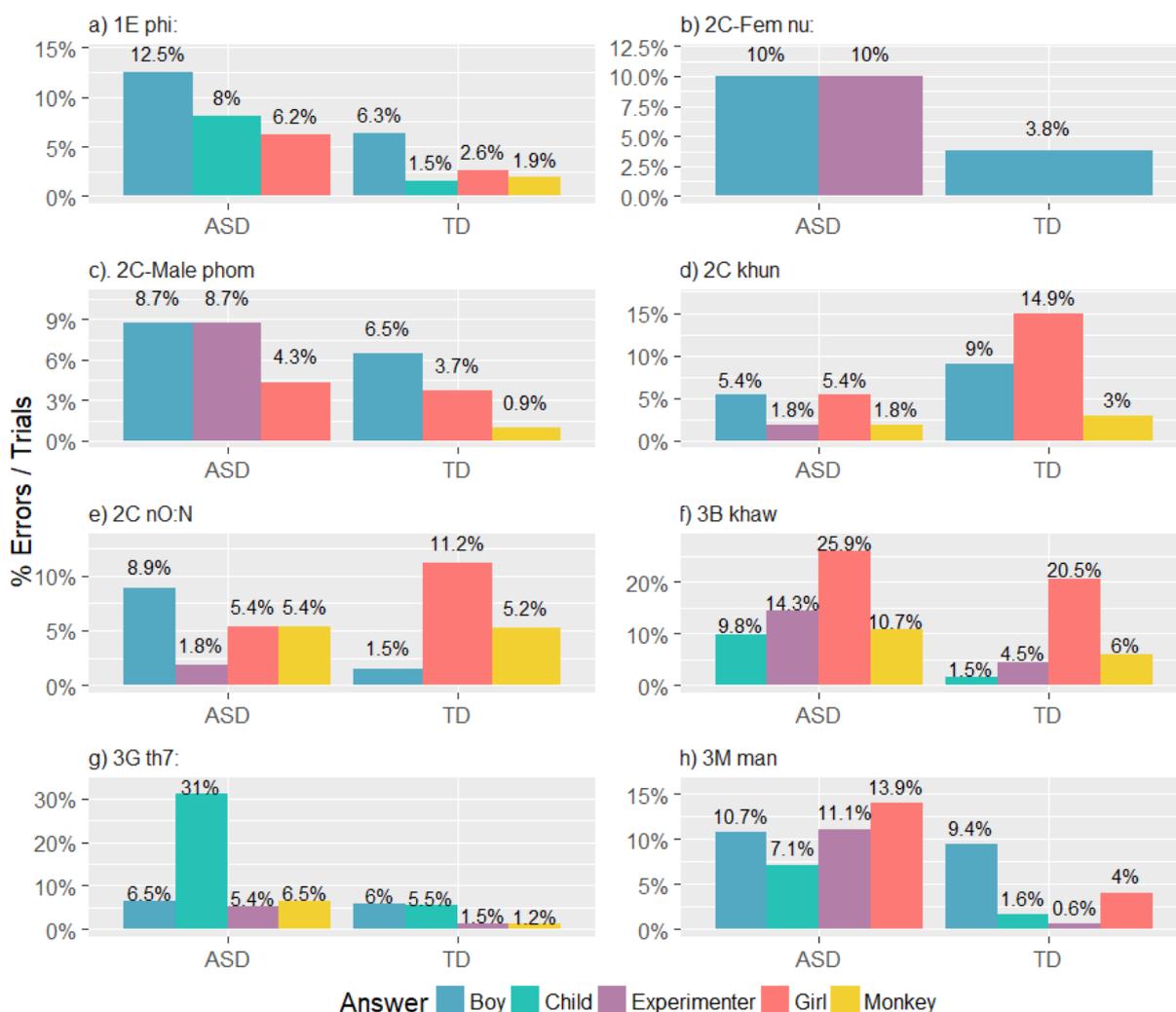


Figure 5: Errors in comprehension task by item

Boy-Targeted: The majority of mistakes made by both ASD and TD was related to gender, where they chose the cardboard girl figure instead (ASD 25.9%; TD 20.5%). With regards to the person feature, the ASD children chose more non-third-person targets than the TD group (24.1% versus 6%; see Figure 5f).

Girl-Targeted: The pronoun used for targeting the girl is *t^hɣ*. As noted earlier, this pronoun is generally used to refer to a second person, with underspecified gender. Although the usage as a second person is very common, it is only used among people of the same age or status.

It is highly likely that the participants were referred to by their peers using this pronoun. If the speaker of the pronoun is an older person, the addressee and the speaker must be close to each other (stylistic use), otherwise, the term would sound very unfriendly and pragmatically inappropriate. The results seem to show that the sensitivity to this social dimension of the pronoun was largely ignored by the ASD children, choosing themselves as the target 31% of the time (Figure 5g).

Monkey-Targeted: The errors for *man* covered all four other choices (Figure 5h). The ASD children made mistakes with regards to person features, choosing the experimenter or themselves (11.1% and 7.1%, respectively) at a much higher rate than the TD children (0.6% and 1.6%).

6. Discussion

Not only do the results present many interesting aspects of the data, but they also show a coherent picture of the acquisition pattern of personal reference terms in TD and ASD children. The performance on production and comprehension was asymmetrical in both participant groups, with the ASD children performing significantly poorer than the TD children in the comprehension tasks, regardless of their significantly more accurate production. Lexical presuppositions seemed to be easier to comprehend than implicated presuppositions for both groups of children as well. Even though their overall accuracy is lower than TD children, ASD children are, to a large extent, able to comprehend the second person lexical presupposition suggested by the person ϕ -feature, when the person feature is not underspecified. This was suggested by the fact that *k^hun* (2nd formal) is the only pronoun which the ASD group outperformed the TD group. The TD group's performance, on the other hand, seems to be suppressed by the social awkwardness of using the formal pronoun to refer to a child, while the ASD children solely paid attention to the person ϕ -feature as they largely ignored the social deictic dimension of the formal second-person pronouns.

A similar result was found in the errors in the comprehension of the pronoun *t^hɔː*, targeting the cardboard girl figure. The ASD children made significantly more mistakes than the TD children even though the [female] feature is marked, suggesting that person ϕ -features are the most prominent cue for them, not gender or social descriptive features. This is in accordance with the overall results that the ASD children could correctly detect the marked person feature of a pronoun, instead of the unmarked 3rd person, but failed to take into account the social descriptive features (that the term is mostly used among peers) or to recognize the social relationship in a particular context (that the experimenter is not his/her peer).

However, given the freedom of production, ASD children avoid person deixis by choosing fixed referential terms (names) rather than terms with a higher level of person deixis (i.e., pronouns) to refer to themselves. To refer to the experimenter, both of the groups mainly chose to use either kin terms or occupational titles. Recall that Thai is among the seven languages that omit 2nd person pronouns for politeness. If a relationship between the speaker and the addressee is known, the term denoting that relationship, rather than a 2nd person pronoun, should be used. As for the terms used for cardboard figures, children in both groups chose to use common

nouns, rather than any personal reference terms. This can be explained by the fact that the use of pronouns also presupposes salience (Roberts 2004). The children preferred the full form over the pronouns because the referent was not salient or not as salient as other possible referents in the context. If the experiment had been conducted in English, the same results should still be expected, as can be seen in the examples below where a weakly familiar referent does not guarantee salience (13). It is, therefore, not possible to conclude that the choice of less deictic terms for the 2nd and 3rd person referents in the experiment is the case of person deixis avoidance or not.

- (13) a. * In Amsterdam, if a bicyclist isn't very careful, it'll be stolen.
b. In Amsterdam, if a bicyclist isn't very careful, her bicycle will be stolen.
(Roberts 2004, pp. 517)

Regardless of the fact, the choice for the 2nd person across the participant groups still yielded interesting results. Although the proportion of the choice between kin terms and occupational titles by the ASD group and the TD group is not statistically significant, the ASD group preferred to use more occupational titles than kin terms. It is worth noting that kin terms and occupational titles contain different levels of social deixis. The use of occupational titles is more fixed. It is possible to refer to someone using occupational titles even though the terms are not applicable to one's relationship with that person. For instance, the owner of a restaurant near a school may refer to his/her customer using the term 'teacher' without having to be the student of that person if he/she knows the customer's occupation. This is in contrast with kin terms which could vary by age and relationship between the speaker and the addressee.

In terms of implicated presuppositions across populations, challenges arise in the resolution of implicated presuppositions when certain ϕ -features are unspecified. For the ASD group, person unmarkedness alone could decrease their performance, as can be seen in the lower performance in all the third-person forms. The further pragmatic inference that has to be made for gender unmarkedness of male pronouns had an additive decreasing effect for the ASD group. The implicated presupposition from the unmarked non-human feature seemed to be easier than that from the unmarked masculine feature across participant groups. The TD group's performance was only affected in male third-person pronouns, but not any other third-person forms. This suggests either that the TD group may only be affected when two implicated presuppositions (from person and gender unmarkedness) appear simultaneously or that the gender unmarkedness is particularly difficult for them. Such performance on different kinds of implicated presuppositions and deixis might correspond to the order of acquisition.

As for the case where adult native speakers of Thai seem to, *prima facie*, reverse 'I' and 'you' while talking to young children, pronouns with deictic-center shifting seemed to yield results similar to those with unmarked person features as kin terms and other 1st and 2nd person pronouns. This supports our hypothesis that person syncretism as a result of deictic-center shifting is not the same as the one which involves person underspecification.

7. Concluding remarks

In terms of types of presuppositions as proposed by Heim (1991), our results support Yatsushiro (2008) and Legendre et al. (2011) that lexical presuppositions are acquired earlier than implicated presuppositions. We add to the literature that the types or the amount of implicated presuppositions matter in the acquisition. The implicated presuppositions of non-human seemed to be relatively easier than those of masculine gender for children in both groups. The evidence lies in the lowest performance by both groups on the 3rd person male pronouns, which lack both their person ϕ -feature and their masculine gender feature. With regards to the difference between the two groups of participants, the ASD children avoided terms with higher person deictic level when they had free choice in production. In general, the TD children made fewer and different types of errors than the ASD children. The ASD children were shown to generally be able to detect the person features, but they seemed to struggle the most with the pragmatic aspects of personal reference terms that involve implicated presuppositions and person and social deixis. A smaller group of the ASD children had difficulties with marked ϕ -features, resulting in the pronoun-reversal type of errors. These grammatical mistakes with regards to ϕ -features may hint on more fundamental language deficits. ASD children who made such mistakes after a certain age may belong to the ALI subgroup.

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