What's in a manner of speaking?
Children's sensitivity to partner-specific referential precedents.

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Abstract

This study investigated whether young children form 'referential pacts' (Brennan & Clark, 1996; Metzing & Brennan, 2003) such that they expect people to refer to objects with the same terms over time unless there is a good reason to switch to using a new expression. 128 children aged 3 and 5 years participated in a study where they cooperated with an experimenter (E1) to move toys around to new locations on a shelf. E1 established referential terms for all the toys in a warm up game. Then, either E1 (**original partner condition**) or a new experimenter, E2 (**new partner condition**), played a second game with the same toys. In the second game, two critical toys were referred to with their **original terms** and two with **new terms**. Children were significantly slower to pick up a toy if it was referred to with a new term than with an old term. Crucially, this difference in reaction times was significantly greater in the original partner condition. This suggests that children found it harder to process a new term when it was produced by someone who had previously referred to the same toy with a different expression. That is, children as young a 3 years of age show adult-like sensitivity to referential pacts.

1 Introduction

According to Grice's Maxim of Manner, speakers should not abandon a perspective without good reason. So, if we are engaged in moving some toys around on a set of shelves and I refer to a toy consistently as '*the bush'*, then you will come to expect me to continue to use that term to refer to the same object in the future. If I suddenly abandon our 'referential pact' and call the toy '*the tree'* you will be momentarily confused. However, if a new person (with no prior experience of our pact) enters the room and uses the alternative referring expression ('*the tree*'), you would not find it confusing, as long as it is an acceptable description of the toy in the absence of a prior pact (Brennan & Clark, 1996; Metzing & Brennan, 2003).

In an experimental investigation of adult sensitivity to referential pacts, Metzing and Brennan (2003) had participants play a cooperative game of the type described above with an experimenter who established shared terms for objects (e.g., ''the shiny cylinder'') during repeated references to them. After this warm up phase, either the original experimenter or a new experimenter (who had not observed the warm up) continued the game and used either the original expressions or a new ones (e.g., ''the silver pipe'') to refer to the previously discussed objects. In this test phase, adults were equally quick to comprehend original expressions regardless of which experimenter produced them. However, when objects were referred to with new expressions, there was partner specific interference: adults were 12 milliseconds slower to touch the target object when the new expression

was uttered by the original experimenter than when the new expression was uttered by the new experimenter. This difference in reaction times was also reflected in the adults' eye movements to target objects and was argued to reflect adult sensitivity to referential pacts – if someone suddenly switches from using one term to using another for no apparent reason, it slows you down.

Metzing and Brennan's (2003) finding that comprehension of referential terms is subject to partner-specific effects is now generally accepted. However, debate continues as to how early this effect of referential pacts is in adult processing (Brown-Schmidt, 2008; Kronmüller & Barr, 2007). There is also controversy concerning whether referential pacts rest on a principle of co-cooperativeness that is mutually assumed to hold between two conversational partners or whether pacts are a reflection of a more simple expectation that people will be consistent in their use of expressions across time (Shintel & Keysar, 2007).

Whatever the outcome of the above debates, it is unclear when we would expect children to show sensitivity to referential pacts. It is plausible that before the age of four, children would expect everyone to use the same term for an object regardless of whether they were present when a pact was established. Indeed, studies on the development of synonyms suggest that three-year-olds will not accept that a given toy can be called, for example, both 'a rabbit' and 'a bunny' (Doherty, 2000; Doherty & Perner, 1998; Perner, Stummer, Sprung, & Doherty, 2002). In these alternative naming studies, children aged between three and five years were instructed that if a puppet calls an item, e.g., 'a rabbit' the child has to call it something else, e.g., 'a bunny' or, in a judgment version of the task, the child has to name a toy and then, when the puppet refers to it with an alternative term, the child has to say whether the term is acceptable or not. The synonyms used in this task were: bunny–rabbit, lady–woman, television–TV, coat-jacket. In control games, the children were asked to name a colour of the item (e.g. Puppet: "bunny", Child: "white") or part of the item (Puppet: "bunny", Child: "tail"). Three-year-olds tended to fail the alternative name task (insist that a bunny cannot also be called a rabbit) despite passing the control task, whereas older children tended to pass the alternative naming task at around the same time they began to pass false belief tasks. The explanation of these results was thus that before four years of age children cannot reconcile conflicting perspectives in order to understand that what one person might call a bunny another might call a rabbit. Although not adult like, this kind of mutual exclusivity constraint has been argued to convey certain advantages in early language learning (c.f. Sabbagh & Henderson, 2007).

Given the above findings we were interested to investigate whether young children are sensitive to referential pacts and whether this sensitivity only emerges after 4 years. We thus adapted Metzing & Brennan's (2003) task for use with children. In a within-subjects design, children played with two sets of toys. With one set, experimenter 1 (E1) established names for the toys in a warm up phase and then continued to play in the test phase. With the other set of toys, E1 played the warm up phase and then a new person, E2, played the test phase. Each test phase had four critical toys: toys 1 and 3 were referred to with an original expression established in the warm up phase and toys 2 and 4 were referred to with an entirely new expression. We recorded how long it took children to pick up each toy. Thus for each test phase we were able to make two comparisons: whether children were quicker to pick up toy 1 than toy 2 (trial 1) and whether they were quicker to pick up toy 3 than toy 4 (trial 2). Of greatest interest is whether any differences in reaction times vary as a function of the identity of the experimenter.

2 Method

2.1 Participants

126 normally developing, monolingual, English-speaking children were included in the study (51 boys, 75 girls). There were 62 three-year-olds (range 3;0-3;11, mean age 3;5) and 64 five-year-olds (range 5;0-5;11, mean age 5;6). The children were tested in a university laboratory in the U.K.. Full parental consent was obtained for each child.

2.2 Materials and Design

Fourteen toys were selected on the basis that they could be described felicitously by two different, well-known nouns that occur frequently in the speech directed to 3-year-old children (as verified by a search of the CHILDES database, MacWhinney, 2000). Of these fourteen, eight were

selected as stimuli on the basis that a group of 16 3-year-olds (not tested in any of the subsequent procedures) used at least two different well-known words to spontaneously refer to the toys when asked '*What's this?*'. These preferred terms were then used as the referring expressions for the study. The pairs of terms used to describe the 8 critical toys are presented in table 1. One set of toys was used for the 'same partner' condition and another set for the 'new partner' condition (counterbalanced).

Table 1. Pairs of referring expressions used to refer to critical toys.

Set A	**Set B**
car / truck	girl / lady
book / story	pillow / cushion
horse / pony	turtle / tortoise
tree / bush	nose / apple

To be confident that most 3-year-olds would be able to identify each toy upon hearing either of the above terms, we first conducted a comprehension test with two groups each made up of seven 2-year-olds and 12 3-year-olds. Again, none of these children took part in the main study. Both groups saw all the toys at the same time and were asked to '*find the* [toy name]'. The first group heard the first of the alternative terms (*car, nose, book* etc.) and the second group heard the second of the terms (*bush, cushion, nose* etc.). In all cases at least five 2-year-olds and 11 3-year-olds were able to identify each toy on the basis of the terms they heard.

For each partner condition in the main study, we put one set of test toys along with 8 'filler' toys into a 5 x 3 block of Perspex pigeonholes (see figure 1). The arrangement of the toys was fixed such that an experimenter could instruct the child to rearrange them following a script. Photographs of each set of toys in differing arrangements were taken and used as props, as explained below. Figure 1 a and b present example arrangement for both of the set of toys. A video camera was set up at the edge of the Perspex boxes such that it was possible to code at precisely which frame the child's hand entered a box to retrieve a toy (see figure 2). Two other video cameras recorded the child and the experimenter as they interacted.

2.3 Procedure

Upon arrival, the child and their care-giver(s) entered the test room and the child was allowed to play freely with E1 while E2 obtained parental consent for the study. This ensured the child had seen both experimenters before the test began.

Figure 1. Toy sets A and B

After a period of free play, E2 left the room and the child sat with E1 at a table in front of the Perspex boxes that were covered over with a piece of cloth to prevent the child from spontaneously naming the objects. E1 explained that under the cover there were lots of toys and that she had a photo of where the toys should go. E1 showed the child the first photograph briefly at this point. She then suggested that she could look at the picture to see what needed moving round and the child could find the toys and put them in the right places. She asked the child if s/he would like to help and when the child agreed E1 said that they would manage to do it together. E1 then lifted the cover to reveal the toys for the first game.

Each child played four 'games', two per condition. Each game consisted of rearranging the toys so that they matched a photograph. The first game of each condition served as a warm-up in

which all the key referring expressions were introduced and entrained upon. This first game was always played with E1. It consisted of a sequence of 16 instructions of the basic form '*Get the X, put it next to/under/above the Y*'. Hesitations and hedges (e.g. '*Now get…I think it's Lego….can you see any? Yes, put it under the…er…man'*) were written into the script to reinforce the impression that the experimenter didn't have a fixed conceptualization of all of the toys from the outset. Each of the 4 critical test objects was referred to 4 times.

For accuracy of coding, it was important to ensure that children's hands were always in the same position on the table before they took an object out of a box. To achieve this, after 12 warm up instructions E1 showed the child a pair of red hands that had been drawn on the table and asked the child to put his/her hands on the red hands before they began each turn. From this point on, E1 ensured that the child returned their hands to the red hands on the table before each new instruction ' to show they were ready'.

Once all the warm-up instructions had been carried out, E1 announced that the toys looked the same as in the photo. She showed the child the photo to see if s/he agreed and remarked on what a great job they had done. E1 let the child chose a sticker as a reward and asked if s/he'd like to play another game. E1 then left the room on the pretext of needing to get another photo to make. She returned after a minute and suggested that they make the next photo. At this point E2 entered the room and explained that the secretary needed E1, asking if she could come and help her for a minute. E1 protested that she was just needed to play a game quickly and asked if she could come in a minute. What happened next varied according to the two experimental conditions.

In the **same speaker condition**, E2 acquiesced and said she would explain to the secretary that E1 would come in a minute. E1 then played the second game of that condition with the child. In the **new speaker condition**, E2 told E1 that the secretary really needed her help now. E1 agreed to go, asking E2 if she could quickly play the game with the child. E2 said she was not sure what to do but E1 reassured her it was easy and said '*You just need to make this look the same as my picture so you need to move the toys around. Like you might say "get the [filler item] and put it next to the [filler item]". . CHILD'S NAME will help you. We always put our hands on the red hands before we start to show we are ready. I'll be back in a minute.*'. E1 left the room and E2 played the second game with the child remarking that it didn't look too difficult and that she hadn't seen the toys before.

The second game consisted of 7 scripted instructions and was played in the same manner as the first, ensuring the child's hands were always on the red hand markers before beginning the next instruction. Instructions 1, 2 and 7 referred only to filler toys. Instructions 3 and 5 referred to two of the critical toys with the **same expressions** as had been previously used in the warm-up game. Instructions 4 and 6 referred to the other two toys with **different expression**s to the ones used in the warm up. Instructions 3,4,5, and 6 are henceforth referred to as critical trials with instructions 3 and 4 being referred to as trial 1 and instructions 5 and 6 being referred to as trial 2.

Half the children took part in the same speaker condition followed by the different speaker condition. The other half had the opposite order. Whichever condition came first always used toy set 1 and the second condition always used toy set 2. Scripts were fully counterbalanced so that, for each pair of referring expressions both terms were heard equally often as a) the same expression used twice (e.g. warm-up game: '*Tree'*, test game '*Tree'*), b) the first expression before a switch (e.g. warm-up game: '*Tree'*, test game '*Bush'*), c) the new expression after a switch (e.g. warm-up game: '*Bush'*, test game '*Tree'*). All the scripts were written so that the critical toys would be on the middle row before the test game began. This ensured the children would have the same distance to reach each toy. Furthermore, the scripts and accompanying photographs were counterbalanced so that the critical toys appeared on the shelf in two different orders from left to right. This ensured that if any of the boxes was in a privileged position on the shelf (i.e. that was quicker to reach) it would not affect the reaction times for a given condition. Finally, the identity of experimenter 1 and 2 was fully counterbalanced. The same full-time research assistant performed the role of experimenter 1 for half the children in each age group and experimenter 2 for the other half. The other experimenter role was performed by one of three other assistants.

2.4 Coding

The videos of the children's hand movements when retrieving toys were coded using Adobe Premier software. A research assistant coded the length of time it took from the onset of the critical referring expression (as located on the audio wave) for the child to reach into the relevant box (the first frame where the fingertips were inside the box). Very rarely, children retrieved and object that was not the target. These cases were excluded from analysis.

3 Results

Table 2 reports the reaction times for both ages and trials as a function of partner identity and referential term.

Table 2. Reaction times in seconds.

		Trial 1		Trial 2	
		Same Term	New Term	Same Term	New Term
3yrs	Same Partner	2.7	4.4	2.8	3.8
	New Partner	2.4	3.0	2.8	3.6
5yrs	Same Partner	1.8	2.9	2.3	3.1
	New Partner	1.8	2.3	2.1	2.7

To facilitate statistical analysis we converted these raw reaction times to difference scores (RT to New term – RT to Original term). These difference scores are presented in figure 2.

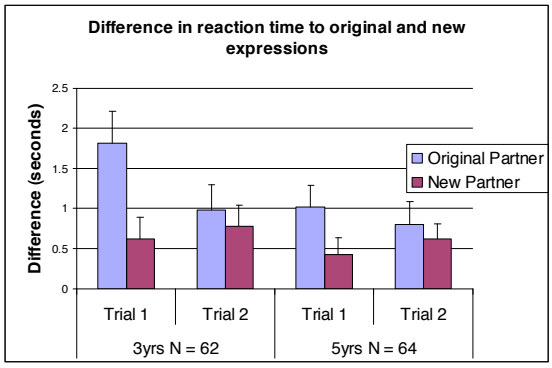

Figure 2. Difference in reaction time (new expressions minus original expressions)

Wilcoxon tests confirmed that on the first trial children were slowed down by the use of a new referring expression significantly more if the expression was produced by the original partner than if by a new partner ($Z = 2.561$, $p = .01$). This effect was more pronounced in the younger children and indeed when each age is considered separately only the effect of partner identity is only significant for the three-year-olds, ($Z = 2.068$, $p = .039$). There were no significant effects for trial 2, which would suggest that once a pact has been broken 'all bets are off': children are not surprised if subsequently other pacts are also not adhered to.

To investigate whether the effects observed in trial 1 were carried by particular items, we fitted a mixed effect regression model to the data with child, new term and original term (for each object) as random variables, age, partner identity and the interaction between these two factors as fixed effects and difference in reaction times on trial 1 as the outcome variable (Baayen, 2008). Partner identity was a significant predictor ($B = 1.9931$, $p = 0.0344$) such that difference scores were greater in the original partner condition. Age and the interaction between age and partner identity were not significant predictors.

4 Discussion

These results suggest that children show sensitivity to referential pacts from a young age. Like adults, children found it harder to process a new term for an object if it was produced by someone who had previously referred to the same object with a different expression. Interestingly this effect was only observed for the first trial of each test phase. This suggests that once someone has broken their 'referential history' children no longer expected them to adhere to it for subsequent reference to other objects.

From a developmental point of view, the current findings are surprising given that the three-year-olds we tested would not be expected to pass other tasks that require an understanding that whereas one person might call an object 'a tree' another might quite legitimately call it 'a bush'. Children were generally capable of processing two different terms for an object and were only slowed down in the comprehension of alternative terms by about 1 second - so long as their conversational partner was not breaking a referential pact. This would suggest that, at least in some circumstances, children are relatively flexible in understanding that an object may be referred to in different ways

by different people (Deák & Maratsos, 1998). Occasionally, some children were incapable of identifying an object given the new term of reference (and were accordingly given a maximum RT of 10 seconds, after which time the experimenter pointed to the target object). Thus on occasion, children were truly incapable of accepting two descriptions for one object. What the current results indicate, however, is that these cases are the exception rather than the rule.

Despite their ability to comprehend two different terms for one object, many children indicated that they were not happy with the use of the new term. They would often protest, saying, for example, 'It's not a tree, it's a bush!'. These protests were commonplace and indicate on the one hand that children detect a difference in perspectives about the same object, but on the other that they do not approve of it. Thus is would appear that children are 'hyper-conventional' at an early age. At the same time as understanding that the alternative terms where intended for the same object, they are very keen to pass normative judgment on their use. Children always preferred that the original term be maintained. Given the counterbalanced design, this suggests that children's protests were not based on their general preference for one term over another but rather based on a preference they created during the warm up trial.

With respect to the debates in the adult literature, the current results are informative to the extent that they demonstrate that referential pacts are not a highly controlled phenomenon that only adults would be capable of displaying. Whatever the preferred explanation of referential pacts - be they truly co-operative in nature or more expectation based – it is clear that they have an effect from early on in development and indeed are more pronounced for younger children. Apparently the older children were able to recover from a 'broken pact' faster than their younger counterparts. It would therefore not be surprising if such effects went undetected in adults at least some of the time, given how quickly they can be resolved in highly constrained contexts.

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