NOTE

Children's difficulty in learning homonyms*

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ABSTRACT

Mazzocco (1997) claimed that children have persistent difficulty in learning pseudo-homonyms – words like *rope* used to refer to a novel object (e.g. spade). Because the novel objects were familiar, the pseudo-homonyms in her study were also synonyms (i.e. *rope* and *spade* both now mean spade). The results could therefore be due to children's well-known difficulties in learning synonyms. In Experiment 1, 55 six- to ten-year-olds used story context to select referents for pseudo-homonyms from picture sets containing the intended referents, with primary referents amongst the distractors. Children were equally poor when the intended referents were familiar (e.g. spade) as when they were unfamiliar (e.g. tapir) – 35 and 38% correct, respectively. This indicates that familiarity of referent does not account for children's difficulties. In Experiment 2, 64 five- to ten-year-olds received instruction about homonymy, then a story set without pictures of the primary referents, in order to make the experimenter's intentions clear. Children were then shown one of the story sets from Experiment 1. Performance was just as poor (38% correct), indicating that misunderstanding of task demands did not account for failure. The conclusion is that Mazzocco's findings represent a psychologically interesting developmental difficulty.

INTRODUCTION

Children have well-documented problems learning words when there is not a one-to-one mapping between the word and its meaning. Most interest has focused on words with overlapping extensions such as synonyms and words at

different levels of the same hierarchy, for example, spaniel, dog, and animal (see Woodward & Markman, 1998, for a review). However, children also clearly have remarkable difficulty correctly interpreting homonymous terms even when both meanings are in their lexicon. One of several striking examples given by Campbell & Bowe (1983) concerns a four-year-old child shown some pine cones:

Interviewer: What are these things?
Child: Cones
Interviewer: Where do you get cones?
Child: In the [ice cream] shop.

Even though the child herself provided the word *cones* referring to pine cones, when the interviewer repeats it the more familiar meaning of ice cream cones appears to override the meaning indicated by the context.

From the age of about 4;0 children have the metalinguistic ability to understand that one word may have two distinct meanings (Peters & Zaidel, 1980; Backscheider & Gelman, 1995; Doherty, 2000). One might therefore expect children's difficulty with homonyms to decline quite rapidly after this age. However, Beveridge & Marsh (1991) showed that six-year-olds still have difficulties, and a study by Mazzocco (1997) suggests that children's difficulty in overriding the familiar meaning of a homonym persists until children are at least 10;0. The aim of the present study is to examine the validity of this surprising finding.

In order to simulate children's first encounter with the secondary meaning of a homonym, Mazzocco devised pseudo-homonyms: familiar words used to refer to novel referents, such as using the word *rope* to refer to a spade. She told children short stories in which contextual information indicated a particular meaning (e.g. 'Becky pushed the sharp metal [key word] into the dirt' – intended meaning, spade) but the key word used had a different, familiar meaning, i.e. rope. Children had to pick the appropriate referent from a set of pictures containing the familiar and intended meanings of the pseudo-homonym. This task proved extremely hard: even children of mean age 10;8 could only do this on 62% of occasions, compared to 98% when the pseudo-homonym was replaced by a nonsense word (e.g. *gler*).

However, there is a potential counter-explanation for these results. All of the intended referents in Mazzocco's study were already familiar to children. The pseudo-homonyms were therefore also PSEUDO-SYNONYMS. For example, in the study the word *rope* has two distinct meanings, spade and rope, and is therefore a homonym. However, because children already know the word *spade*, the word *rope* has also become a synonym for *spade*. Children have well-documented difficulties in learning synonyms (e.g. Markman & Wachtel, 1988), often attributed to a bias to assume that word extensions are mutually

exclusive – the mutual exclusivity (ME) bias. Their difficulty with pseudo-homonyms could therefore be due to the fact that they are also synonyms.

The nonsense word trials do not adequately control for this. Although nonsense words are also apparent synonyms, there are no plausible distractors. The information provided gives good reason to choose the target, and there is no reason to choose any of the distractors. (Proponents of the ME bias theory allow that children will relax their bias given sufficient evidence that the bias does not apply in a particular case, e.g. Merriman & Bowman, 1989.) The pseudo-homonym trials, by contrast, have a very plausible distractor, the word's normal referent, which children might opt for in order to preserve mutual exclusivity. Even if this is not the case, the introduction of words which are both pseudo-homonyms and pseudo-synonyms complicates matters and may simply confuse children.

EXPERIMENT 1

The aim of Experiment 1 is to tease apart the factors of homonymy and synonymy by using unfamiliar objects as the intended referents of pseudo-homonyms. When the referent is an object children cannot readily name, an unfamiliar name cannot be an apparent synonym. This allows all four possible combinations of homonymy and synonymy: for familiar referents, pseudo-homonyms that are also synonyms, and nonsense words that are effectively pseudo-synonyms; for unfamiliar referents, pure pseudo-homonyms, and nonsense words that are effectively just ordinary unique names.

Unfamiliar referents were generated by intuition and several were used in a pilot study (Maxwell, 2001) on the basis of which the following four were selected: tapir (a rare animal), carburettor (an engine-part), silo (for grain) and portcullis (a grille used to block castle entrances). Familiar referents were selected from the original stories used by Mazzocco. Pseudo-homonym and nonsense word trials were interspersed with trials where familiar words were used correctly. This was done to make sure that children understood the task and to prevent possible discouragement during the experiment by providing questions which children could confidently answer. The nonsense words and the pseudo-homonym words chosen were adapted from those used by Mazzocco.

METHOD

Participants

The participants were 55 children (31 girls) from a suburban primary school in central Scotland. Children were in two groups: a six-year-old group (29 children from 6;3 to 7;1, mean age 6;8, S.D. = 3 months) and nine-year-old group (26 children from 9;2 to 10;1, mean age 9;7, S.D. = 3 months).

TABLE 1. *Pseudo-homonyms and nonsense words presented in Experiment 1, and their intended referents*

Pair	Version A	Version B	Unfamiliar referents	Familiar referents
1	Cake	Blas	Tapir	Spade
2	gler	Fork	Engine part	Clown
3	Cheese	slor	Silo	Cage
4	spef	Shoe	Portcullis	Ball

Materials

Story segments were arranged in pairs. The first segment had a key word that was familiar and used accurately, e.g. the word *fence* used to refer to a fence. The second segment's key word was either a pseudo-homonym or a nonsense word. Each segment consisted of two sentences, each containing the key word, and together providing information about the key word's intended meaning.

There were two sets of four pairs of story segments. The familiar referent set was adapted from stories used by Mazzocco (1997). The unfamiliar referent set was novel. Table 1 indicates the pseudo-homonyms, nonsense words and referents for each set. The story segments are listed in full in the Appendix. Sets were presented as a block in the order listed. There were two versions of each set: in version A, pairs 1 and 3 contained a pseudo-homonym (*cake* and *cheese*, respectively) and pairs 2 and 4 contained a nonsense word (*gler* and *spef*, respectively). In version B, pairs 1 and 3 contained a nonsense word (*blas* and *slor*) and pairs 2 and 4 contained a pseudo-homonym (*fork* and *shoe*). Children were presented with the familiar referent set in version A and the unfamiliar referent set in version B, or *vice versa.* Thus the pseudo-homonyms and nonsense words were the same in the two story sets, but individual children only encountered each word in one segment. Half the children had the familiar referent set first and half had it second. The four possible order-story version combinations were counterbalanced across children.

A book of illustrations was constructed to accompany the stories. Each segment corresponded to an A4 (29·6 cm × 21 cm) page with six illustrations arranged in three rows of two. On each page one picture was the intended target. Another picture was indirectly related to the context, e.g. a *bucket* when the target object was a spade. For pages corresponding to the second segment of each pair, one picture was the object usually referred to by the pseudo-homonym, e.g. a piece of cake for the pseudo-homonym *cake* (used to mean spade). The remaining pictures were taken from a set of illustrations used in previous research and generally depicted familiar or common objects. For example, on the page corresponding to Becky digging a hole in familiar referent story 1, the top row had pictures of a spade and a penguin, the middle

row a piece of cake and a chair, and the bottom row a bucket and an engine part. All pictures including the target pictures appeared twice in the two picture sets, with at least 5 pages separating the two appearances. Pictures were positioned randomly with the proviso that for the four pseudo-homonym and four nonsense word referents, target pictures were never placed in the same position more than once.

In sum, there were eight familiar words used correctly, two pseudo-homonyms used to refer to familiar referents, two pseudo-homonyms used to refer to unfamiliar referents, two nonsense words used to refer to familiar referents (pseudo-synonyms) and two nonsense words used to refer to unfamiliar referents.

Procedure

Children were shown the first page of illustrations. The experimenter read the corresponding story segment and asked 'Which one is the [key word] in the story?'. This procedure was repeated for each story segment.

At the end of the procedure children were shown pictures of the four familiar and four unfamiliar referents used in the pseudo-homonym and nonsense word segments and asked 'what's this?'. Children were judged to be familiar with the object if they provided a reasonable name for it. Two raters blind to the hypothesis of the study were asked to judge this. An answer was judged to be reasonable if it seemed likely that the child thought that they had provided an appropriate basic level term for the object. The other possibilities considered were that children were inappropriately overextending a known term, using a superordinate term because they did not know a basic level term, providing a phrase of description, or guessing.

Results

Children correctly identified all of the familiar words used accurately, indicating they understood and were attending to the task. Performance on the nonsense words was also close to ceiling: 92% correct for familiar referents and 95% correct for unfamiliar referents.

Performance on both types of pseudo-homonym however was much poorer, as shown in Table 2. Contrary to the experimental hypothesis there was no significant difference between performance on the familiar and unfamiliar referents. Children correctly answered 35% of familiar and 38% of unfamiliar referent questions, Wilcoxon signed ranks test, $Z = 0.49$, $p = 0.62$. Furthermore, performances on the two referent types were correlated, $r = 0.50$, $p < 0.001$. There was no significant difference between performances of the two age groups on either referent-type. Six-year-olds correctly answered 28% of familiar and 35% of unfamiliar referent questions, nine-year-olds

TABLE 2. *Number of children correctly identifying* 0, 1, *or* 2 *intended referents of pseudo-homonyms for the two story types of Experiment* 1

		Number of familiar referents identified			
		0	1	2	Total
(a) Six-year-olds					
Number of unfamiliar	0	10	4	1	15
referents identified	1	6	2	0	8
	2	1	2	3	6
	Total	17	8	4	29
(b) Nine-year-olds					
Number of unfamiliar	0	8	3	1	12
referents identified	1	2	4	1	7
	2	1	1	5	7
	Total	11	8	7	26

43% of familiar and 41% of unfamiliar referent questions, Mann–Whitney $U > 300$ in both cases, $p > 0.10$.[1]

The vocabulary test suggested that unfamiliar referents genuinely were unfamiliar: a reasonable name was provided for them 22% of the time, compared with 97% for the familiar referents. Raters disagreed on three of 25 names (kappa $= 0.76$, $p < 0.001$); disagreements were resolved by assuming the term to be reasonable.

DISCUSSION

The results are very clear: whether the child can name the referent makes no difference to their ability to identify it as the referent of a pseudo-homonym. The experimental hypothesis is disconfirmed: the fact that the pseudo-homonyms are also pseudo-synonyms does not account for children's difficulty identifying their referents.

Some children were clearly experiencing conflict between the two potential meanings (see Mazzocco, 1999, for discussion of conflict). This conflict may

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[1] The data are not appropriate for parametric analysis because they are not normally distributed, and the variances of the pseudo-homonym and nonsense word performances are not homogenous. Nevertheless, an ANOVA confirms the non-parametric analysis. Task (familiar and unfamiliar referent pseudo-homonyms, and familiar and unfamiliar referent nonsense words) was a within subjects variable and age group was a between subjects variable. There was a highly significant effect of task, $F(1, 53) = 133.4$, $p < 0.001$. T-tests show that this is entirely due to the differences between performances on the pseudo-homonyms and the nonsense words. The improvement with age was not significant, $F(1, 53) = 2.86$, $p = 0.097$. There was no age $\times$ task interaction.

be psychologically interesting, for example indicating difficulties suppressing the primary meaning of the pseudo-homonym. On the other hand, the conflict might simply be due to the unusual nature of the experimental situation. Children's first encounter with the secondary referent of a homonym will rarely be in the presence of the primary referent, and the demand to choose one in the presence of both is pragmatically strange. In addition, although the test question ends with 'in the story?', children may not pay sufficient attention to this and so impulsively choose the usual referent of the pseudo-homonym.

EXPERIMENT 2

The aim of Experiment 2 is to make the experimental demands absolutely clear to the children. Children were initially shown homonym pairs that were already in their vocabulary in order to introduce the distinction to be made in the experiment. Next, children were given one of the story sets used in Experiment 1 with the primary referents of the pseudo-homonyms removed from the picture sets. This allowed children to choose the correct referents of the key words and should alert them to the fact that the procedure involves using words in an unusual way. Finally the remaining story set was given with the original picture sets, with the primary referents of the pseudo-homonyms still present. The test question was reworded so that 'in the story' was said first to reduce impulsive responding.

METHOD

Participants

The participants were 64 children (40 girls) from an urban primary school in central Scotland. Children were in four groups as follows.
Five-year-olds: 16 children from 5;4 to 6;3, mean age 5;9, $S.D. = 4$ months.
Six-year-olds: 15 children from 6;4 to 7;2, mean age 6;11, $S.D. = 3$ months.
Seven-year-olds: 16 children from 7;4 to 8;3, mean age 7;11, $S.D. = 4$ months.
Nine-year-olds: 17 children from 9;2 to 10;5, mean age 9;9, $S.D. = 5$ months.

Materials

For the pretest four A4 sheets of paper were used. Each sheet had four pictures on it: two showed the different meanings of a homonym, and two were unrelated distractors. The homonyms were: *letter*, *nail*, *(k)night*, and *bat*.

The picture sets from Experiment 1 were used for the primary referent present trials. For the primary referent absent trials, an additional set of picture sets was made, identical to the first set with the exception that the pseudo-homonym's usual referent was not depicted, e.g. for the word *cake*

TABLE 3. *Percentage of children correctly identifying the intended referents of pseudo-homonyms for the two story types and two picture set types of Experiment 2*

Age group	Primary referent absent		Primary referent present	
	Familiar referents	Unfamiliar referents	Familiar referents	Unfamiliar referents
Five-year-olds	72	78	28	7
Six-year-olds	69	86	36	32
Seven-year-olds	84	86	54	34
Nine-year-olds	95	94	50	61
Total	81	86	39	37

used to mean 'tapir' or 'spade', there was no picture of a piece of cake. Instead, it was replaced by one of the other normal referents, in this case a shoe.

Procedure

The experimenter explained that sometimes two different things can have the same name. Children were then shown the first A4 sheet with a picture of a fish, a bicycle, a letter (the letter A), and a letter (a stamped addressed envelope). The envelope was concealed by a piece of card, and children were asked to 'point to letter'. The piece of card was then moved to conceal the letter A and children were again asked to point to letter. Once the child had responded, the card was removed altogether and the experimenter explained that both were letter – they were two different things with the same name. This process was repeated for the remaining three A4 sheets. Finally the experimenter told the child there would be some more of this kind of word in the following stories.

The remainder of the procedure was identical to Experiment 1, except the first set of stories (familiar or unfamiliar referent set, counterbalanced) was presented alongside the picture set with the pseudo-homonyms' primary referents absent. The second set of stories was presented with the original picture set. The test question was altered to 'In the story, which one is the [key word]?'.

Results

All children correctly identified both referents of the homonyms in the pretest. As shown in Table 3, children were very good at identifying the referents of pseudo-homonyms when the normal referent was not depicted: 81% of the time for the familiar referents and 86% of the time for the unfamiliar referents. There was a marginally significant age difference between the

five- and nine-year-olds, Mann–Whitney $U=84$, $p=0.063$. As before, children identified the referents of nonsense words 85% of the time or better.

Table 3 also shows that when the normal referents were present, performance on the pseudo-homonym trials remained poor; children identified the correct referent 39% of the time for the familiar referents and 37% of the time for the unfamiliar referents. Performance improves with age; combining both referent types, the nine-year-olds performed better than the five-year-olds, Mann–Whitney $U=65$, $p=0.01$. No other age comparisons were significant.

The six- and nine-year-old groups in Experiment 1 were compared with the six- and nine-year-old groups in Experiment 2 (using only the second set of stories from each experiment). There is clearly no difference between the two younger groups. Performance of the nine-year-olds in Experiment 2 is better than in Experiment 1, but the difference is not significant (Mann–Whitney $U=180$, $p=0.28$).

DISCUSSION

None of the manipulations aimed at clarifying experimental demands or giving children prior experience of a simplified version of the task made any difference to performance. This strongly suggests that children's difficulty is not with the unusual nature of the experiment or with pragmatic misunderstanding of the experimenter's intentions.

Apart from these specific concerns, the pseudohomonym task is arguably well suited to capturing the features of a common real-life homonym first encounter. The task measures children's tendency to interpret a novel homonym according to its primary meaning or the contextually consistent meaning. In real life children will of course not usually be asked to indicate their interpretation by choosing a picture, but the experiment requires some form of response from the child. Experiment 2 suggests that children are representing both the literal and the contextually consistent meanings of the pseudo-homonyms. When the normal referent is not depicted and the two interpretations are therefore not put in conflict, children usually choose the contextually consistent referent; otherwise they are likely to choose the primary meaning's referent.

In real life the homonym's primary referent will generally be absent when the secondary meaning is introduced. If the secondary referent is also absent, as is common in conversation and stories, children's difficulties should be similar to those in the present experiment: they will be representing both literal and intended meanings with no further information to guide them in their choice. As Campbell & Bowe (1983) showed, in these circumstances children up until the age of at least 6;0 often do make bizarre interpretations apparently quite happily.

If the referent of the secondary meaning is present, the situation is in some respects like the normal referent absent condition of Experiment 2. Unlike in the experiment, however, the choice of referents in reality is much less constrained (indeed, the primary function postulated for lexical principles is to constrain the number of meanings children must consider when learning words; see Markman, 1989). The difficulty of the task will therefore depend largely on the situation. When it is clear that the intended referent is present, the task should be relatively easy, especially when the intended referent is indicated by the speaker's gesture or attentional focus.

Explicit teaching of homonyms' secondary meanings should therefore be effective, although research suggests that parents may feel it necessary to give extra help. For example, if parents are aware that the word is a homonym, they may alter it to a distinct form. Kohn & Landau (1990) found that when describing objects to their infant and preschool children, parents might refer to *skate* as *ice-skate* or as *skate-fish* (an apparent neologism) in order to distinguish it from the other meaning which they had described earlier. Distinguishing the forms in this way plausibly helps children learn homonyms.

GENERAL DISCUSSION

Taken as a whole, this study suggests that children have genuine difficulties learning secondary meanings of homonyms, and these difficulties persist at least until the age of 10;0. However, Experiment 2 shows that when the primary referent of the homonym is absent, children are quite good at identifying the intended meaning. This is the more common situation in real life, so children's actual problems with homonymy are unlikely to be serious.

The present study does not address the cause of children's difficulties. There are two obvious possible explanations but as yet no clear evidence supporting either. Since children seem to have difficulty suppressing the primary meaning of the homonym, their difficulty may be a consequence of poor executive function.

Another possibility is that children are adhering to a lexical principle. Experiment 1 showed that the mutual exclusivity bias did not account for children's difficulties; when the pseudo-homonyms were no longer apparent synonyms, they were no easier to learn. However, a similar lexical principle might be at work. Slobin (1985) hypothesized that children assume each meaning is represented by a distinct form; homonyms, as well as synonyms, violate this assumption. Children might therefore fail to deduce a second meaning for a known word because they assume known words cannot have second meanings. The rarity of homonyms in English plausibly means that children do not have sufficient reason to override this assumption until relatively late. One value of such an assumption would be that once committed

to a word-referent association, children would no longer need to consider other hypotheses about the meaning of the word.

Which, if either, of these two accounts best explains children's enduring difficulties in learning homonyms is a matter for future research.

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APPENDIX

STORIES USED IN BOTH EXPERIMENTS

The version shown is version A. The words in parentheses are the corresponding words for version B.

Unfamiliar referent stories

1. Hamish and his mom went to the zoo on the *bus*. Hamish always sat at the front of the *bus*.

At the zoo they saw a strange *cake* (*blas*) from Brazil. Hamish thought the *cake's* (*blas's*) long nose looked funny.

2. Sarah's Dad bought a new *car*. After a few days, the *car* broke down.
When they took the car to the garage, the mechanic said the *gler* (*fork*) was broken. To make the engine work again, they had to replace the broken *gler* (*fork*) with a new one.

3. Max went to his uncle's farm on his uncle's *tractor*. The *tractor* was a big red one.
When they got there, Max saw a huge *cheese* (*slor*) for storing corn in. The *cheese* (*slor*) had a hole in the top where they put in the corn, and a door at the bottom for it to come out again.

4. Caitlin went to the *castle* with her dad. It was her first time to go to the *castle*. At the gateway there was a big metal *spef* (*shoe*). They used to lower the *spef* (*shoe*) to stop the enemy getting inside.

Familiar referent stories

1. Becky was helping her father build a *fence* all around their garden. They used tall pieces of wood so that the *fence* would keep the dog in the garden.
Becky used a *blas* (*cake*) to dig a hole in the ground. She pushed the sharp metal *blas* (*cake*) into the earth.

2. When James went to Joey's birthday party, he saw children playing on the metal *slide* in Joey's garden. James climbed up the ladder of the *slide* and went down very fast!
When James went inside, he saw that a *fork* (*gler*) was standing there making faces and doing tricks. James laughed because the *fork* (*gler*) looked so funny.

3. Linda wanted to go outside, so she took a *hat* out of the cupboard and put it on her head. Her *hat* helped to keep her head warm outside.
Before Linda went outside, she saw that her pet bird was not in the *slor* (*cheese*) where it lived. The door of the *slor* (*cheese*) had been left open.

4. In Cindy and Adam's garden, there were some pretty *flowers* that were growing. The *flowers* in the garden really smelled good.
Cindy and Adam were bouncing and rolling their new *shoe* (*spef*). They bought the round *shoe* (*spef*) at the toy shop.