Are Children Willing to Accept Two Labels for a Single Object? A Comparative Study of Mutual Exclusivity in Monolingual and Bilingual Children

Emma Healey and Barbora Skarabela

University of Edinburgh

Abstract
This study compares two word-learning strategies in monolingual and bilingual children. Specifically, we examined children's behaviour when mutual exclusivity (ME), a lexical bias believed to be a default strategy in early word-learning, and a social cue from the experimenter conflict. We predicted that bilinguals will violate ME in response to the social cue more than monolinguals. We tested this prediction in six monolinguals (mean age 3;6, range 2;9-4;4) and six bilinguals (mean age 3;4, range 2;6-4;4). The children participated in two experiments: (1) a picture-matching task which introduced novel labels for three familiar objects (the thimbles game) and (2) a representational task which tested children's willingness to accept these objects as the intended referents of the novel labels (the treasure hunt game). The results showed that while there was no difference between the groups in the thimbles game, in the treasure hunt game the bilinguals were significantly more willing to follow a socio-cognitive cue (thus violating ME) than the monolinguals ($t(10) = -3.35, p < 0.01$). This suggests that monolinguals follow different word-learning strategies from bilinguals. We review the results in light of two dominant accounts of lexical acquisition and discuss potential sources of bilinguals' preference for socio-cognitive cues.

1 How do Children Learn Words?

To learn the meaning of a new label successfully requires the learner to identify the correct mapping between a series of sounds and a referent in the real word. Given that the relationship between form and meaning is arbitrary and potential referents are infinite (Quine, 1960), how is it that children are able to succeed in this task? Various word-learning strategies have been proposed: some researchers suggest that word-learning is facilitated by a series of lexical biases, which limit the potential referents of a novel label (e.g. Markman, 1992). Others suggest that word-learners rely on socio-cognitive abilities, such as perspective-taking and intention-reading ( Tomasello, 1999, 2003; Clark, 2003), or sensitivity to statistical regularities (Houston-Price, Plunkett and Duffy, 2006; Montague and Akhtar, 1999). There is evidence to suggest that children use all these sources of information to assign reference, but remarkably little attention has been paid to the relationships between them. Specifically, it is not clear whether one source of information may be systematically preferred. To address this question, we explore children's learning of
new words in contexts where two cues conflict. In particular, we investigate the relationship between lexical biases and socio-cognitive cues in two groups of young word learners, comparing the willingness of monolingual and bilingual children to apply the Mutual Exclusivity (ME hereafter) constraint in response to a socio-cognitive cue. The results show that bilingual children follow a socio-cognitive cue rather than applying ME, but this is not the case for monolingual children. We will first outline the two relevant accounts of lexical learning. This is followed by the description of the experiments and the results. The paper concludes with some speculations about what can account for the differential behaviour of bilingual and monolingual children in this study.

1.1 Contrasting the Lexical Bias and Socio-Cognitive Accounts

Advocates of the role of lexical biases in word-learning tend to emphasise the learnability problem posed by the arbitrary relationship between words and their referents. This is commonly illustrated using Quine’s (1960) ‘Gavagai’ paradox, in which a linguist in a foreign country sees a native speaker point to a white rabbit running past, and hears them shout ‘gavagai!’ The linguist is then faced with the task of ascertaining precisely what the speaker is referring to. ‘Rabbit!’, ‘Running!’ and ‘Look, dinner!’ are just three of the infinite possibilities. This is known as the problem of referential indeterminacy. As much of children’s early linguistic input is comprised of ostensive definition, it is claimed that this is precisely the problem that word-learners face as they acquire their native lexicon (Markman, 1987). In light of this, researchers have proposed a number of lexical biases which constrain the hypothesis space and reduce the potential referents of a novel label. For example, it is suggested that Mutual Exclusivity (ME hereafter) ‘leads children to prefer that each object have only one category label’ (Markman, Wasow and Hansen, 2003:242). This bias is believed to underlie the so-called disambiguation effect (Merriman and Bowman, 1989), whereby children initially apply novel labels to novel objects (see Davidson, Jergovic, Imami and Theodos, 1997; Merriman and Stevenson, 1997; Au and Glusman, 1990; Markman and Wachtel, 1988). ME therefore reduces the number of hypotheses a child is required to entertain by biasing them against assigning a novel label to an already labelled object.

Lexical biases are understood as representing ‘violable default assumptions’ (Jaswal and Hansen, 2006:163), which give children ‘good first guesses about the meaning of a novel term’ (Markman, 1992:69-70). As such, this account predicts that word-learners should initially behave in accordance with lexical biases, and, in principle, should thus subordinate socio-cognitive cues to lexical cues. Specifically, if early lexical acquisition is constrained by lexical biases, then children should honour ME and assume that novel labels should be assigned to novel objects, even when a socio-cognitive cue indicates that the intended referent of a novel label is, in fact, a familiar object. The lexical bias account therefore predicts that children will be ‘unwilling’ to violate ME in this context.

The socio-cognitive account approaches the problem of word-learning somewhat differently. Advocates of this account claim that children’s early linguistic interactions with others allow the intended referent of a novel label to be identified without recourse to lexical biases. Children are argued to make use of socio-cognitive information, such as the communicative intention and knowledge state of their interlocutor, to ascertain the likely referent of a novel label in context (e.g. Tomasello, Strosberg and Akhtar, 1996). There is a growing body of evidence to support children’s ability to use this type of information to assign reference (see Tomasello, 2003:43-93 for a summary). Given that on this account lexical acquisition is not guided by lexical biases, it predicts that a learner will map a novel label onto a
1.2 Predictions and Monolingual and Bilingual

In order to test these predictions we compared word-learning strategies in monolingual and bilingual children. We chose to compare these two populations because it is likely that they will use different strategies to assign reference when ME conflicts with a socio-cognitive cue. Children acquiring multiple languages will, by definition, assign more than one label to a single object. For example, a child acquiring Spanish and English may label their dwelling place as both ‘a house’ and ‘a casa’. As such, bilingual children routinely violate ME across languages and may therefore be more willing to violate ME within a language (see Merriman and Kutlesic, 1993, and Davidson et al, 1997) than monolingual children. Furthermore, there is considerable evidence to suggest that early bilingualism confers a socio-cognitive advantage. Specifically, young bilinguals are more aware of the intrinsically social nature of words (Rosenblum and Pinker, 1983) and are better able to understand a situation from another person’s perspective than their monolingual peers (Genesee, Tucker and Lambert, 1975; Goetz, 2003). They are also highly adept at monitoring the knowledge state of their interlocutors (Lanza, 1992; Genesee, Boivin and Nicoladis, 1996). We therefore predict that these enhanced perspective-taking skills, together with the children’s routine use of two labels per object across languages, will allow bilinguals, but not monolinguals, to assign novel labels to familiar referents. As such, the bilingual children are predicted to be more willing to follow a socio-cognitive cue (and thus appear to violate ME) than their monolingual peers.

2 Method

2.1 Description and Aims

The aim of this study is to investigate word learning in situations where a lexical cue competes with a socio-cognitive cue. Specifically, it compares the willingness of monolingual and bilingual children to violate ME (a lexical cue) and accept the experimenter’s use of a novel label to refer to a familiar object (a socio-cognitive cue). If children honour ME and ignore the socio-cognitive cue, then they should select a novel object as the intended referent of the novel label (the disambiguation effect). If, however, the socio-cognitive cue is resistant to pressure from ME, then children should select a familiar object. We predict that monolingual and bilingual children will use different strategies to assign reference, and that bilingual children will subordinate lexical information to socio-cognitive information more than monolingual children. The experimental hypothesis is therefore that bilingual children will violate ME significantly more than their monolingual peers. The null hypothesis is that there will be no difference between the groups on this measure.

2.2 Participants

Six Danish/English-speaking bilinguals and six English-speaking monolinguals participated in this study. The bilingual participants were recruited from a Danish-speaking family-group and the monolingual participants from an English-speaking nursery, both of which met in central Edinburgh. Three of the bilingual children were tested in their homes and all other children were tested in a quiet area of their respective meeting places. Appropriate parental consent was obtained in all cases.
The groups were closely matched for age and gender: the bilingual group comprised three boys and three girls (with a mean age of 3;4 and a range of 2;6 - 4;4) and the monolingual group comprised four girls and two boys (with a mean age of 3;6 and a range of 2;9 - 4;4).

2.3 Linguistic Proficiency

Before beginning the experiments it was necessary to ensure that the bilingual participants were demonstrably bilingual, the monolinguals monolingual, and that the labels for the ostensibly familiar objects used during the experiment were known by all participants in all languages. This information was obtained by means of a parental questionnaire and an experimental pre-test. The results of the questionnaire showed that all the monolingual participants spoke only English and that no other language was used in the home. Conversely, all the bilingual participants spoke and were spoken to in both English and Danish and were believed to know the names of the relevant familiar objects in both languages. The pre-test targeted the participants’ comprehension and production of the familiar objects and confirmed the results of the parental questionnaire. During the course of the experiment three objects (a hat, a sock and an apple) were given novel labels (manna, buba and pommo). Native speakers of English and Danish confirmed that these are non-words for both languages. We assume that accepting a novel label only constitutes an ME violation if it is assigned to an already labelled object in that language. It was therefore vitally important to ensure that all participants demonstrated knowledge (i.e. either comprehension or production) of the labels for these ‘target objects’ (TOs) in English (for the monolinguals) and English and Danish (for the bilinguals). This was true for all the children and very few mistakes were made regarding the names of the other familiar objects. As such, these children were judged to have the requisite linguistic proficiency to take part in this study.

2.4 Materials

A 30x45cm picture board depicting twelve brightly coloured everyday objects and twelve picture cards, each illustrating one of the twelve objects on the board, were used in the training phase and the first experiment. A decorated wicker box containing real-life exemplars of the TOs (i.e. a hat, a sock and an apple), three novel objects (an egg-slicer, a honey-spoon and a ring-pull opener) and ten familiar objects acting as distractors was used in the second experiment. Audio-visual recordings were made of all experiments using a Canon XM2 digital camcorder mounted on a tripod. Stickers were used as rewards at various points throughout the experiment and each participant was given a packet of stickers at the end as a thank-you for their participation.

2.5 Training Phase and Experiment 1 – Thimbles Game

The aim of Thimbles Game was to introduce three novel labels and to provide a socio-cognitive cue revealing the experimenter’s belief that these labels refer to familiar objects. During the training phase, the experimenter took a card, showed it to the child, and labelled it with either a novel label (for the TOs) or the conventional label (for all other objects). The child was then asked to place the card on top of the

---

1 Even though ‘manna’ is a word in English referring to ‘bread from heaven’, its frequency is very limited. In fact, several adult native speakers of English did not recognize it as such and none of the children responded to it as a known label.
corresponding picture, and the object was labelled a further two times. A typical request was as follows: ‘This is a *buba* [holds up the sock card], can you put the *buba* on the *buba* on the board?’ The socio-cognitive cue was therefore explicit: the experimenter clearly demonstrated her belief that a sock was called a ‘*buba*’. The order of the cards was arranged before the start of the experiment in order to allow the child to practice the game using non-novel labels first and to ensure the TOs did not occur directly before or after each other.

The first experiment directly followed the training phase and required participants to select a picture in response to a request from the experimenter. This was done only for the three TOs which, crucially, were referred to by the novel labels assigned to them during the training phase, e.g. ‘can you point to the *buba*?’. The aim of this experiment was to ensure that all children understood that the experimenter was using a novel label to refer to a familiar object and were able to respond appropriately to this social cue. Importantly, children did not have an option for mapping the unfamiliar label to a novel object. This was therefore not a test of ME in its strict sense because the search-space for an intended referent was limited to familiar referents only (though see Markman, Wasow and Hansen, 2003, for a discussion of ME use in a similar context). In fact, to succeed in this task all children were required to violate ME. This was therefore not a situation of direct cue-conflict and we do not predict a difference between the groups in this task.

### 2.6 Experiment 2- Treasure Hunt Game

The Treasure Hunt Game was a representational task designed to ascertain whether participants were willing to extend the denotation of the novel labels to stand for the entire category that the TO represents, rather than referring only to the particular token on the card/picture board. Crucially, it also examined whether children were willing to accept the experimenter’s use of the novel label to refer to a familiar object in a situation where there were both familiar and novel potential referents. As such, this was a direct situation of cue-conflict, with ME predicting the selection of a novel object and the social cue predicting the selection of a familiar object. In this task the experimenter produced a decorated wicker box and asked the child to help her find some objects hidden inside. The contents of the box were then tipped out onto the floor/table top, and separated so that all objects can be seen and were within reach of the child. The experimenter then asked the child to find each of the items in turn. The order in which the children were asked to find the objects was organised beforehand and kept constant throughout. This was to allow children to practise the game with familiar labels and to ensure that requests using the novel labels did not occur one after another.

### 2.7 Coding

For the Thimbles Game the participants’ responses were coded as either correct or incorrect. For the initial training phase, a child’s response was considered correct if they correctly placed the TO picture card on the TO on the board (1 point) and incorrect in all other cases (0 points). For the first experimental phase, a response was considered correct if a child selected any of the three TOs when asked to point to the *manna/buba/pommo* (1 point). For the Treasure Hunt Game, responses were coded as either violating ME, honouring ME or neither. A child was said to violate ME
if they selected a TO (1 point)² and to honour ME if they selected a novel object (1 point). Selection of a familiar non-TO (i.e. one of the distractors) was coded as 'neither' (1 point) and excluded from the main analyses.

One objection to the coding procedure may be raised. According to ME children assume that an object has only one name. As such, it could be argued that if a child selected any familiar object (regardless of whether that object was a TO), then they have violated ME. The problem with this construal for our present purposes is that in the Thimbles Game all the potential referents for the novel labels were familiar objects and to describe the selection of a familiar object as an ME violation in a situation where this is the only positive response possible seems unreasonable (though see Markman, Wasow and Hansen, 2003). We therefore chose to ignore the selection of non-target familiar objects in the main analysis. Note that children were not required to select the TO that the novel label had originally been applied to, and selection of any TO was considered an ME violation. The coding scheme was, however, overall conservative in what it considered to be a violation of ME. This was done to compensate for the emphasis placed on the socio-cognitive cue in the training phase and the first experiment.

3 Results

All participants scored the maximum 3 points in the training phase. This means that both monolingual and bilingual children readily accepted novel labels for familiar objects in the context of simple picture-matching. Furthermore, the results of the first experiment revealed that these two groups were equally willing to select a TO as the intended referent of the novel label (ML mean = 2.17, BL mean = 1.50, t(10) = 1.265, p = .235). This indicates that both populations were equally able to recall and use the novel labels appropriately. Most importantly, it suggests that all participants were able to respond appropriately to the socio-cognitive cue in a non-conflicting situation. In the Treasure Hunt Game, however, the bilinguals violated ME and selected a TO as the intended referent significantly more than their monolingual peers (ML mean = 0.33, BL mean = 1.50, t(10) = -3.796, p < .01). The reverse was not true, and monolinguals did not honour ME by selecting a novel object as the intended referent of a novel label more than the bilinguals (ML mean = 1.83, BL mean = 1.17, t(10) = 1.174, p = .267). There was also no difference between groups in terms of the selection of familiar distractor objects in response to the novel label (ML mean = 0.83, BL mean = 0.33, t(10) = 1.342, p = .209).

No age or gender effects were found in either game or on any measure. Specifically, male and female children behaved comparably in their ability to respond appropriately to the novel label in the first experiment (male mean = 2.00, female mean = 1.71, t(10) = .503, p = .626), and performance in this task did not vary with age (f(7,4) = 1.437, p = .382). Likewise, in the Treasure Hunt Game, children's willingness to violate ME was not affected by gender (male mean = 1.00, female mean = 0.85, t(10) = .295, p = .774), nor was the tendency to honour ME (male mean = 1.60, female mean = 1.42, t(10) = .280, p = .785) and nor was the tendency to select a distractor (male mean = 0.40, female mean = 0.71, t(10) = -.789, p = .448). As before, performance in this task did not vary with age. Specifically, there was no relationship between age and violating ME (f(7,4) = 1.010, p = .529), accepting ME (f(7,4) = 3.619, p = .116), and doing neither (f(7,4) = .365, p = .884). As such, the

² Two children selected the water pistol in response to a novel label and a novel object in response to 'water-pistol'. These responses suggested that the children were not familiar with the water-pistol. As such these children were said to honour ME by selecting this object in response to a novel label.
differences between monolinguals and bilinguals cannot be attributed to the age and gender differences between those groups.

The results show that whilst both populations were equally able to respond appropriately to the socio-cognitive cue in non-conflicting situations (and hence performed comparably in the Thimbles Game), the bilingual children were more willing to violate ME in response to a socio-cognitive cue than their monolingual peers when these cues conflicted (i.e. in Treasure Hunt Game). This finding is in line with the experimental hypothesis. However, it was not the case that monolingual children accepted ME more than bilinguals.

4 Discussion

The analyses of the bilingual and monolingual data showed that the bilingual participants were significantly more likely to violate ME and accept a familiar object as the intended referent of a novel label than their monolingual peers. As such, the results of this investigation provide evidence for the differential application of ME in monolingual and bilingual populations. This indicates that in situations where lexical and socio-cognitive cues make different predictions regarding the intended referent of a novel label, bilingual children will attend to socio-cognitive cues to a greater extent than monolingual children.

It was somewhat surprising to find that although the bilinguals violated ME more often than the monolinguals, it was not the case that the monolinguals accepted ME more often than the bilinguals. This is due to the fact that whilst the bilinguals tended to either violate ME or honour ME, the monolinguals made more use of the third response category. Specifically, they frequently selected a familiar distractor object as the intended referent of a novel label (i.e. 27% of monolingual responses as opposed to 11% of bilingual responses). It is not clear at present what motivates the monolinguals to assume that the novel label refers to a distractor. One possibility is that they are simply less able to learn and remember new words in comparison to bilinguals. This needs to be addressed in future studies. Another possibility is that the socio-cognitive cue is too subtle for the monolingual population. It is important to note, however, that monolinguals did predominantly honour ME (61%). Monolinguals thus tend to rely on this lexical bias more so than bilinguals, who, in contrast, follow a socio-cognitive cue.

The results of this investigation suggest that ME is used differently by monolingual and bilingual children. Previous studies in this area have yielded controversial results. Merriman and Kutlesic (1993) investigated monolingual and bilingual children’s willingness to violate ME both within and across languages. Their central finding was that whilst both populations maintained ME within a language, the bilingual children were more likely to suspend the bias between languages. Davidson et al (1997) found, however, that bilingual children did suspend the bias within a language. Crucially, however, this behaviour was found only in a group of bilinguals who were significantly older than the ones in our study (age range between 5;10: 10-6;4, mean: 6;2). In fact, their younger bilinguals did not behave differently from monolinguals. In this sense, our study is only partially in line with Davidson et al. and provides new results in this area.

How can we account for the difference between the bilinguals and monolinguals with respect to ME? Davidson et al (1997; see also Davidson and Tell, 2005) claim that repeatedly suspending ME between languages causes bilingual children to assume it less readily as a default across a language (Davidson et al 1997). This is closely related to Bialystok’s (1988) claim that bilingual children’s experience of two linguistic systems makes them more aware of the arbitrary relationship between a label and its referent. It is therefore possible that bilingual children’s enhanced meta-
linguistic awareness enables them to perform better than monolingual children in tasks where the conventional relationship between a word and its referent is changed (see also Cromdal, 1999). As such, it is possible that the bilingual children in our study would have violated ME more than monolingual children even in the absence of a socio-cognitive cue, and that their behaviour could be attributed solely to their meta-linguistic awareness. There is, however, an alternative explanation. It is also possible that bilingual children respond to a social cue more than monolinguals because of their enhanced socio-cognitive skills. As stated before, there is some evidence that childhood bilingualism confers a socio-cognitive advantage. Most importantly for our present purposes, it has been shown that young bilinguals are better able to take the perspective of others than their monolingual peers (Goetz, 2003; Genesse, Tucker and Lambert, 1975). It is therefore possible that only the bilingual participants were able to respond to the experimenter’s requests (‘can you point to the buba for me?’) based on what they thought the experimenter thought the novel label referred to. In the context of our experiment this would lead assume that the novel label should be applied to a familiar object. The current study does not, however, tease apart which of these provides the more accurate explanation of this behaviour.

Previous studies of word-learning in situations where cues conflict have focussed on monolingual children only, and have produced inconsistent results. Specifically, Jaswal and Hansen (2006) compared children’s use of ME in response to a socio-cognitive cue. They found that children overwhelmingly selected a novel object as the intended referent of a novel label even when the experimenter looked at or pointed to a familiar object. They consequently claim that ME is ‘robust even in the face of some forms of usually robust pragmatic information’ (Jaswal and Hansen, 2006:163). However, Grassmann, Kittel and Tomasello (2007) identified a methodological flaw with this investigation and claimed that the pragmatic cues employed were neither natural nor communicative. Once this was rectified, the reverse pattern emerged, and children tended to subordinate the lexical information to the socio-cognitive information. The results of the present study therefore add another dimension to a neglected (and yet seemingly controversial) area by suggesting that different learning strategies are employed by monolingual and bilingual word-learners in situations of cue-conflict.

The results of this experiment suggest that both socio-cognitive awareness and lexical biases are relevant to the task of word-learning. Specifically, whilst the behaviour of the bilinguals suggests that lexical cues are subordinated to socio-cognitive cues (as predicted by the socio-cognitive account), the behaviour of the monolinguals indicates, albeit somewhat less clearly, that lexical cues are resistant to socio-cognitive information (as predicted by the lexical bias account). The finding that monolingual and bilingual children use different strategies to assign reference is not straightforwardly predicted by either of these accounts. The results of this study suggest that comparison of the word-learning strategies used by monolingual and bilingual children in situations where cues conflict is likely to be a fruitful area for further research.

5 Conclusion

This study compared word-learning strategies used by monolingual and bilingual children in situations where cues conflict. We targeted socio-cognitive cues and lexical cues by comparing children’s willingness to violate ME and instead accept the experimenter’s use of a novel object to refer to a familiar label. We found that in this situation bilingual children were more willing to violate ME than their monolingual peers. This indicates that in situations of cue-conflict bilingual children will
subordinate lexical information to socio-cognitive information, whereas monolinguals will rely predominantly on lexical cues. As such, we have shown that these populations use different strategies to assign reference.

Acknowledgements

This study was partially funded by a Small Project Grant from the University of Edinburgh Development Trust, for which we are most grateful. We thank the children and their families as well as the staff at Unitots for their participation and help. We also thank Mits Ota, Monica Tamariz, and Elspeth Edelstein for helpful comments on previous versions of this paper and Luke Worthington for help collecting the data.

References

Davidson, D, and Tell, D. Monolingual and bilingual children’s use of mutual exclusivity in the naming of whole objects. Journal of Experimental Child Psychology 92: 25-42


