

Acceptance of lexical overlap by monolingual and bilingual toddlers

Marina Kalashnikova^{1,2}, Aimee Oliveri³, Karen Mattock^{2,3}

¹BCBL. Basque Center on Cognition, Brain and Language, San Sebastian, Spain.

²The MARCS Institute for Brain, Behaviour and Development, Western Sydney University, Sydney, Australia.

³School of Social Sciences and Psychology, Western Sydney University, Sydney, Australia.

Corresponding author:

Marina Kalashnikova

The Basque Center on Cognition, Brain and Language, Mikeletegi Pasealekua, 69, 20009 San Sebastian, Gipuzkoa, Spain

m.kalashnikova@bcbl.eu

Acknowledgements

This research was funded by the Western Sydney University Researcher Development Funding (Women's Research Fellowship) to the first author. We would like to thank all the children and their parents for their valuable time and interest in this research.

Cite as:

Kalashnikova, M., Oliveri, A., & Mattock, K. (in press). Acceptance of lexical overlap by monolingual and bilingual toddlers. *International Journal of Bilingualism*.

Abstract

Aims and Objectives: Mutual exclusivity refers to children's assumption that there are one-to-one correspondences between words and their referents. It is proposed to guide the process of fast-mapping when children encounter novel words in referentially ambiguous situations. However, children are often required to suspend this default assumption and accept lexically overlapping labels, which is particularly common for bilingual children who learn multiple labels for most referents in their environment. Previous research has shown that school-aged bilinguals are more successful at learning overlapping labels than monolinguals, but the mechanisms underlying the development of this word-learning ability remain unknown.

Methodology: This study investigated the ability to accept lexical overlap in monolingual and bilingual two-and-a-half-year-old children and its relation to children's lexical competence. Children's ability to retain two novel labels assigned to a novel referent was assessed in an interactive lexical overlap paradigm. In addition, parental inventories were used to measure children's receptive vocabulary size and patterns of language exposure and use.

Data and analysis: Data were collected from sixty-eight (34 monolingual and 34 bilingual) children between 26 and 34 months of age. Binomial logistic regressions were used to assess the effects of children's language background and their individual lexical competence (receptive vocabulary for monolinguals and bilinguals, and conceptual vocabulary size and degree of bilingualism for bilinguals).

Findings: Results showed that vocabulary size was a significant predictor of lexical overlap performance for monolingual children, but this was not the case for bilinguals.

ACCEPTANCE OF LEXICAL OVERLAP

Originality: These findings are the first to indicate that the individual linguistic experience of growing up monolingual or bilingual shapes the mechanisms that underlie the development and usage patterns of early word-learning strategies.

Limitations: This study leaves open the question of what aspect of growing up bilingual leads children to develop word-learning strategies that are shaped by their linguistic experience.

Keywords: Mutual exclusivity, lexical overlap, bilingualism, word learning, lexicon

ACCEPTANCE OF LEXICAL OVERLAP

One of the most intriguing aspects of early language acquisition is children's ability to successfully identify and learn the meanings of novel words, which are often encountered in ambiguous or non-ostensive naming situations (Bloom, 2000). Children are able to recognise the meanings of their first words before their first birthday (Bergelson & Swingley, 2012), and their vocabulary continues growing at a rapid pace throughout their first years of life (Fenson et al., 1994). The development of the ability to rapidly and successfully learn the meanings of new words has been attributed to children's growing lexical knowledge (Graham, Poulin-Dubois, & Baker, 1998; Mervis & Bertrand, 1994), general learning or attentional processes (Samuelson & Smith, 2000), and social-pragmatic information (Baldwin, 2000). The process of lexical development is also shaped by children's linguistic environment and individual experiences with language use, such as in the case of children acquiring more than one language from birth (Byers-Heinlein, 2013). The present study investigates the development of children's ability to acquire multiple labels for a single referent in relation to their lexical competence and individual differences in early linguistic environment, that is, whether they are being raised in monolingual or bilingual families.

It has been proposed that children rely on a number of default assumptions or strategies that facilitate the process of lexical acquisition by minimising the number of potential meanings for novel labels encountered in their linguistic input (e.g., Clark, 1995; Golinkoff, Mervis, & Hirsh-Pasek, 1994; Markman, 1990). One of these is mutual exclusivity (ME), which refers to the assumption that there are one-to-one correspondences between every linguistic form and its referent (Markman, 1990). This powerful strategy is useful for resolving situations of referential ambiguity. For instance, if a child encounters a familiar referent, e.g., an apple, and a novel referent, e.g., an artichoke, and hears a novel label, e.g., "mummy cooked the artichoke", by relying on ME, they can successfully infer that the novel label refers to the novel instead of the familiar referent. Extensive research investigating the

ACCEPTANCE OF LEXICAL OVERLAP

ability to disambiguate meanings of novel words in this type of situation has shown a robust reliance on the ME assumption among infants (Bion, Borovsky, & Fernald, 2013; Halberda, 2003; Kalashnikova, Mattock, & Monaghan, 2016b; Mather & Plunkett, 2010; Markman, Wasow & Hansen, 2003), children (Diesendruck & Markson, 2001; Markman & Watchel, 1988), and adults (Halberda, 2006; Kalashnikova, Mattock, & Monaghan, 2014; Malone, Kalashnikova, & Davis, 2015).

Even though the assumption that label-referent correspondences are mutually exclusive can be useful, it does not always lead to correct mappings, even for children acquiring language in a monolingual context. Natural languages include numerous instances of lexical overlap or multiple to one word-referent mappings, as does young infants' early linguistic input (e.g., the family's pet can be called Snowball, cat, pet, animal; Clark, 1995). However, even pre-school aged children are often unsuccessful at learning referentially overlapping labels (Merriman, Bowman, & MacWhinney, 1989; Merriman & Stevenson, 1997; Savage & Au, 1996), which is attributed to the cognitive demands of storing two linguistic forms in memory and also the requirement of suspending the default ME assumption (Liittschwager & Markman, 1994). Supporting this claim, it has been shown that monolingual children can successfully accept overlapping labels in less demanding mapping situations such as when richer pragmatic information is available. For instance, in a laboratory task with auditory only and audio-visual presentation of a speaker introducing word-object pairings, three- to five-year-old monolingual children were successful in acquiring new labels by relying on ME when the new labels were presented in either modality (audio-only and audio-visual). In contrast, they could only successfully map overlapping labels when they were presented in an audio-visual manner (Kalashnikova, Mattock, & Monaghan, 2016a). This finding suggests that in a more challenging learning situation where they are required to learn two labels for one object, children require both the

ACCEPTANCE OF LEXICAL OVERLAP

audio and visual cues of the speaker (i.e., gaze, pointing, etc.) to hold their attention to the naming situation and the mapping. When no such information is available, children revert to the default ME assumption by mapping one of the labels to the target referent and assigning an alternative meaning to the second label such as the label for another referent, an object property, or an object part (Dickinson, 1988; Hall, Waxman, & Hurwitx, 1993; Imai & Haryu, 2001; Soja, Carey, & Spelke, 1991; Taylor & Gelman, 1988).

While lexical overlap is not uncommon in the monolingual language environment, it is even more frequently encountered by multilingual children. Bilingual children start acquiring multiple labels for referents in their environment from their first year of life (Pearson, Fernandez, & Oller, 1995). This extensive exposure to lexical overlap has been proposed to impact the development of the ME assumption in young bilingual children. For instance, at 17- to 20-months of age, bilingual infants rely on ME to a lesser extent than same-aged monolinguals (Byers-Heinlein & Werker, 2009; Houston-Price, Caloghiris, & Raviglione, 2010). Moreover, Byers-Heinlein and Werker (2013) showed that as a group, 17-month-old bilingual infants did not employ ME to disambiguate the meaning of a novel word. However, their individual performance was related to the composition of their lexicon, whereby children who knew more translational equivalents (i.e., words from the two languages that have the same meaning) were less likely to rely on ME than those with fewer translational equivalents. At the age of two years, bilingual toddlers have been shown to exhibit the disambiguation effect to a similar extent as their monolingual peers (Byers-Heinlein, Chen, & Xu, 2014). Nevertheless, their use of ME at this age remains qualitatively different. That is, while monolingual toddlers retain the new labels learned via disambiguation, bilingual toddlers do not (Kalashnikova, Escudero, & Kidd, 2018).

Even though it has been demonstrated that bilingual infants and toddlers use ME to a different extent than monolinguals (Byers-Heinlein & Werker, 2009, 2013), it remains

ACCEPTANCE OF LEXICAL OVERLAP

unknown whether bilingual experience leads children to accept lexical overlap within a language more readily than monolinguals. That is, the findings described above indicate that bilingual children do not assume that a novel label refers to a novel referent to the same extent as monolingual children, but this does not necessarily imply greater flexibility in the process of learning a second label for an already named referent. For instance, even monolingual pre-school-aged children, who reliably use ME as a default assumption to disambiguate the meanings of unfamiliar words, do not apply ME and succeed in learning overlapping labels when the labels belong to different languages. However, their performance in accepting lexical overlap *within a language* is poorer (Au & Glusman, 1990; Diesendruck, 2005). Research with pre-school and school-aged children has suggested that bilinguals indeed are more likely to accept lexical overlap within a language than their monolingual peers. Davidson and colleagues (Davidson, Jergovic, Imami, & Theodos, 1997) presented three- and six-year-old monolingual and bilingual children with a test of ME and found that the three-year-olds in the two groups performed similarly, but six-year-old bilinguals relied on ME to a lesser extent than monolinguals. In a more recent study, Kalashnikova, Mattock, and Monaghan (2015) assessed acceptance of lexical overlap in three- to five-year old monolingual and bilingual children. In their task, children were presented with two puppets who each assigned a different novel label for a novel referent. In the test phase, children were presented with four response options, two familiar objects, the named target, and a nameless distracter, and were asked to find the referent of the two labels taught by the puppets. Children in the sample were divided into two age groups for analyses, a younger group with a mean age of four years, and an older group with a mean age of five years. Results showed that monolingual and bilingual performance did not differ in the younger group, but in the older group, bilinguals were significantly more likely to accept the overlapping labels than monolinguals. Hence, children's increasing individual linguistic experience appeared to

ACCEPTANCE OF LEXICAL OVERLAP

continue shaping their word-learning assumptions even later in childhood, whereby bilinguals became more accepting of lexical overlap, but monolinguals became more reliant on the ME assumption.

Research on lexical overlap with younger monolingual and bilingual children, however, has yielded mixed results. Frank and Poulin-Dubois (2002) assessed two-and-a-half year olds' performance in ME and lexical overlap tasks and found that monolingual and bilingual children performed similarly. In their study, children saw two speakers who each named the same object either with two labels belonging to the same language, or two labels belonging to different languages, and their reliance on ME also did not differ across these two conditions. However, more recently Kandhadai, Hall, and Werker (2017) showed that bilinguals may be more flexible ME users from a young age. In their study, 18-month-old monolinguals and bilinguals were presented with a second label for a familiar referent. In this task, infants were shown images of highly familiar objects presented in an unusual colour (e.g., a purple dog). Infants were then given the opportunity to choose whether a novel label referred to the object category (by generalising it to other dogs) or to the name of the colour (by generalising it to other objects of the same colour, e.g., a purple cat). Bilinguals were more likely to map this new label as an acceptable second label for the referent, but monolinguals were more likely to map the novel label to one of the properties of the familiar object (in this case the unusual colour).

Previous research indicates that early linguistic experience can impact the extent to which children employ ME as a default word-learning strategy in their second year of life (Byers-Heinlein & Werker, 2009; 2013; Davidson et al., 1997; Kalashnikova et al., 2016b, 2018; Kandhadai et al., 2017). However, the aspects of early language experience that lead to successful acceptance of lexical overlap by both monolingual and bilingual children remain unclear. For example, Frank and Poulin-Dubois (2002) suggested that at the age of two years,

ACCEPTANCE OF LEXICAL OVERLAP

monolingual and bilingual children did not differ in their ability to accept two overlapping labels for the same object, whereas more recent evidence suggests that bilingual children show greater flexibility in their reliance on ME as early as at 18 months of age (Kandhadai et al., 2017). The aim of the present study was to investigate monolingual and bilingual children's ability to learn two labels for the same object, and to investigate the relation between the development of this ability and children's increasing lexical competence and patterns of language exposure (monolingual vs. bilingual). For monolingual children, we explored the relationship between lexical overlap performance and vocabulary size in the target language, and for bilingual children, we investigated the relationship between their conceptual vocabulary size, knowledge of translational equivalents, and patterns of language exposure (Byers-Heinlein & Werker, 2013). We predicted that if the ability to accept lexical overlap develops as a consequence of exposure to lexical overlap, then bilinguals would perform more successfully than monolinguals; and within the bilingual group, bilinguals who know more translational equivalents and who receive more balanced exposure to the two languages would obtain higher lexical overlap scores. Alternatively, if the ability to accept lexical overlap develops as a consequence of increased lexical competence and understanding of the arbitrary relations between words and their referents rather than specifically to how many translational equivalents a child knows, then it was predicted that monolingual and bilingual children with larger vocabulary sizes would be more successful in the lexical overlap task.

Method

Participants

Sixty-eight children between 26 and 34 months of age ($M = 30.78$, $SD = 2.14$) participated. Thirty-four children (17 female) were growing up acquiring Australian English and another language in a bilingual environment, and 34 (12 female) were growing up

ACCEPTANCE OF LEXICAL OVERLAP

monolingual acquiring Australian English. Children's languages other than English included Mandarin (6), Cantonese (4), Arabic (3), Greek (3), Spanish (3), French (2), Assyrian, Burmese, German, Korean, Kote, Kurdish, Romanian, Serbian, Shona, Sinhala, Swedish, Tagalog, and Urdu. Children in the monolingual and bilingual groups were matched for age, $t(66) = .154, p = .87, d = .04$, came from predominantly middle-class families in Australia, and were not reported to be at risk for developing any language or cognitive deficits. Additional 10 children (8 bilingual and 2 monolingual) participated but were excluded due to failure to complete the test trials in the lexical overlap task.

Language Proficiency

Monolingual measures. Parents of children in the monolingual group completed a receptive vocabulary version of the OZI (Kalashnikova, Schwarz, & Burnham, 2016), which is an Australian English adaptation of the McArthur-Bates Communicative Development Inventory (Fenson et al., 1994). The OZI is a checklist that contains 558 items, and in this version, parents are asked to select the words that their child is able to understand (receptive vocabulary).

Bilingual measures. A bilingual adaptation of the OZI was developed for the purposes of this study. In this adaptation, parents saw two checkboxes next to each item on the OZI inventory and were required to indicate whether the child was able to understand the word in English and in their additional language. This non-normed version of the OZI was used in this study given that the bilingual children came from a variety of language backgrounds, thus making it impossible to employ a standardised language assessment or CDI adaptations for languages other than English. The bilingual OZI was used to obtain measures of receptive vocabulary size in children's English and other language vocabularies, their total conceptual vocabulary size (number of concepts for which children understood a word regardless of the language to which this word belonged; Core, Hoff, Rumiche, & Señor,

ACCEPTANCE OF LEXICAL OVERLAP

2013), and the percentage of translational equivalents in their lexicon (percentage of concepts for which children understood a label from each of their languages out of their total conceptual vocabulary size; Byers-Heinlein & Werker, 2013).

In addition, caregivers of the bilingual children were asked to complete a language background questionnaire (Sabourin, Leclerc, Lapierre, Burkholder, & Brien, 2016) and indicate the number of hours that their child was exposed to English and their additional language in an average week. Children were placed in the bilingual group if they were exposed to a language other than English for at least 10% of time in an average week. Children's exposure to English ranged from 16 to 88% ($M = 61.24$, $SD = 17.18$) and from 12 to 84% for the other language ($M = 38.87$, $SD = 17.39$). Where possible, the bilingual language proficiency measures were completed by the caregiver who was most familiar with the child's knowledge of each language.

Lexical Overlap Task

Materials. Twelve objects matched for size (approx. 10cm in length) and for visual salience were used in this task. Six were familiar: boat, bottle, toothbrush, duck, cup, and spoon. Six objects that young children were unlikely to know the names for were used as the novel objects: funnel, toy grenade, lemon squeezer, whisk, honey dipper, and a hose piece. Novel labels adapted from the NOUN database (Horst & Hout, 2015) were used to refer to the novel objects: *mido*, *tarry*, *toma*, *gavi*, *manu*, and *koba*. During the experimental session, objects were presented on a wooden tray, divided into four parallel compartments to ensure they were equally spaced. In addition, two hand puppets named Monkey and Tiger, a puppet house, and a toy truck were used to help introduce the task and to make the task more engaging for young children. All interactions between the experimenter, children, and their parents were conducted in English during all experimental sessions.

ACCEPTANCE OF LEXICAL OVERLAP

Procedure. The task procedures were adapted from Kalashnikova et al. (2015). All children first completed a practice trial to familiarise them to the experimenter and the test settings. In this trial, they were presented with four familiar objects on the display tray (objects not used in the experimental trials). The experimenter then asked the child to select one object (e.g., can you show me the ball?). All children in the final sample completed the familiarisation trial successfully. The experimenter then proceeded to introduce the experimental trials. The experimenter used the two hand puppets, Monkey and Tiger, to introduce the experiment to the child. The experimenter explained to the child that Monkey and Tiger sometimes use different names for the same thing and that the child had to listen carefully to learn the names of these things. Each experimental trial consisted of two phases: the teaching phase and the test phase.

Teaching phase. The first four experimental objects were then positioned on the tray (two familiar, two unfamiliar). The position on the tray chosen for each object was randomised across trials. The experimenter was careful not to name any of the objects during this phase, but most children spontaneously named the familiar objects, in which case the experimenter nodded her head in agreement. If a child labelled an unfamiliar object incorrectly (e.g., using the word scissors to refer to the hose piece) or enquired about its name, the experimenter said “I don't know what that's called”. This was to ensure that the unfamiliar objects remained nameless until given a novel label by the puppets. Next, the experimenter announced that the puppets were going to take a look at the objects and instructed the child to listen carefully. Each puppet in turn picked up an object from the tray and made a series of comments about that object, before returning it to its position on the tray. One of the unfamiliar objects (target) was named during this phase, and each puppet labelled it using a different novel name:

Tiger: Look, this is a *mido*. It's a *mido*. See? It's a *mido*.

Monkey: Look, this is a *tarry*. It's a *tarry*. See? It's a *tarry*.

ACCEPTANCE OF LEXICAL OVERLAP

Tiger: I call this a *mido*.

Monkey: I call this a *tarry*.

Thus, children heard each novel label four times in the teaching phase. All other objects received generic, non-labelling comments and were handled identically to reduce the salience of the target object:

Tiger: Look at this. This is pretty. This is nice.

Monkey: Look at this. This is nice. This is pretty.

Tiger: It is pretty.

Monkey: It is nice.

After all four objects had been introduced, the experimenter announced that the puppets were going to take a nap and placed them inside the puppet house. The experimenter introduced the “driving game” to the child, where the child and experimenter took turns in driving the objects using the toy truck. This game served to prepare children for the testing phase where a similar procedure was used, and also to give the child the opportunity to handle all the objects before the test phase. After all four objects had been taken for a drive, they were returned to their original positions on the tray in preparation for the test phase.

Test phase. In the test phase, the puppets appeared from the puppet house one at a time to join the “driving game”. The experimenter asked each puppet what object they wanted to drive, and each puppet in turn made two requests. The first request was for a familiar object (familiar-label request). Familiar-label requests (e.g., I want to drive the cup) were included to assess the child’s understanding of the task and to ensure that the child’s object selections would alternate between the familiar and the novel objects. For this reason, each puppet requested a different familiar object on each trial. The second request was for the target object (target-label request) using the same label that was introduced by that puppet during the training phase. Target-label requests addressed children’s comprehension of the word introduced during training (e.g., Tiger: I want to drive the *mido*; Monkey: I want to drive the *tarry*).

ACCEPTANCE OF LEXICAL OVERLAP

Most children immediately chose an object and handed it to the puppet upon their request. However, if the child failed to select an object, the experimenter repeated the request (e.g., Monkey wants the cup, can you get the cup?). In these cases, the experimenter would repeat the request up to three times, and if the child failed to respond, the trial was scored as an incomplete trial. Ten children were excluded from the final sample (see Participants) due to failure to complete both test trials (there were no cases where the child has provided a response to only one test trial). Importantly, the experimenter provided minimal cues during the test phase, taking special care not to look at any of the objects when requests were made.

Each child completed two experimental trials (each trial comprising one teaching and one test phase). The order of the trials, the order in which each puppet introduced the labels in the teaching phase (i.e., labels for the target objects and generic comments for the remaining objects) and made requests in the test phase, and object-label pairings were counterbalanced across participants. In the test phase of each experimental trial, children produced four responses: two to target-label requests and two to familiar-label requests. Only the responses to target-label requests were used to calculate children's lexical overlap scores. Therefore, children received a lexical overlap score for their performance on the test phase of each experimental trial. They received a score of 1 if they selected the same object in response to the two puppets' request (i.e., accepted lexical overlap), and they received a score of 0 if they showed any other response pattern. Thus, each child could obtain a maximum overlap score of 2 (i.e., lexical overlap successfully accepted on both experimental trials) and a minimum overlap score of 0 (i.e., failure to accept lexical overlap on both experimental trials).

Results

Language Proficiency

ACCEPTANCE OF LEXICAL OVERLAP

Monolingual children ($M = 472.57$, $SD = 74.82$) were reported to have significantly larger English receptive vocabularies than their bilingual peers ($M = 424.17$, $SD = 113.84$), $t(67) = 2.09$, $p = .04$, $d = .51$. In the bilingual group, children's receptive vocabulary size in English was significantly larger than the vocabulary in their additional language ($M = 238.29$, $SD = 175.97$), $t(33) = 6.52$, $p < .001$, $d = 2.27$. Additionally, the mean conceptual vocabulary size of the bilinguals was 428.12 ($SD = 111.81$), and translational equivalents were reported to range between 2.36 to 99.6% of their vocabularies ($M = 53.34\%$, $SD = 34.25$).

Lexical Overlap

The distribution of children's lexical overlap scores is presented in Table 1.

[insert Table 1 about here]

To investigate the effect of language experience and lexical competence on children's ability to accept lexical overlap, a binomial logistic regression was conducted using the lme4 package (Bates, 2015) in R (R Core Team, 2015). The model included overlap scores for each trial as the dependent variable, children's language group and English receptive vocabulary scores (transformed to log scores) as predictor variables, and random intercepts for participant. This analysis yielded no main effect of group, $\chi^2(1) = .024$, $p = .87$, no main effect of vocabulary score, $\chi^2(1) = .93$, $p = .33$, but a significant group by vocabulary score interaction, $\chi^2(1) = 3.56$, $p = .05$. To understand the source of this interaction, identical models were constructed separately for the monolingual and bilingual groups. For the monolingual group, the effect of vocabulary size was significant, $\chi^2(1) = 4.20$, $p = .04$. For the bilingual group, no effects of English receptive vocabulary size were found, $\chi^2(1) = .0001$, $p = .97$. As seen in Figure 1, monolingual infants who obtained a score of 1 in the lexical overlap task had larger vocabulary scores, but this relationship is not observed in the bilingual group.

[Insert Figure 1 about here]

ACCEPTANCE OF LEXICAL OVERLAP

While English competence was relevant for performance in this task for both monolingual and bilingual children as this was the language used for the interactions, the English receptive vocabulary measure may not be informative for understanding bilingual performance in this task. That is, while for monolinguals, English receptive vocabulary size denotes these children's overall vocabulary size, for bilinguals, it is solely a measure of their English language proficiency. For this reason, three additional models were constructed for the bilingual group to assess the effects of their overall vocabulary size (conceptual vocabulary across the two languages), their knowledge of translational equivalents, and their degree of bilingualism. To obtain a measure of children's degree of bilingualism, the percentage of exposure to their dominant language was divided by the percentage of exposure to their non-dominant language. A score of 1 denotes that the child is a balanced bilingual who receives 50% of exposure to each language ($50\% / 50\% = 1$). The magnitude of scores above 1 denotes the degree to which the child is more dominant in one of their languages. Results showed that the percentage of translational equivalents in bilingual children's receptive vocabulary sizes, $\chi^2(1) = .86, p = .35$, their conceptual vocabulary size, $\chi^2(1) = .003, p = .95$, and their degree of bilingualism, $\chi^2(1) = 2.31, p = .12$, did not significantly explain their lexical overlap scores.

In order to further understand children's performance, an error analysis was conducted for trials where children obtained a score of 0 (i.e., failed to learn overlapping labels). In these trials, three patterns were observed: (a) ME selections where children selected the target object as the referent for one of the labels and the unfamiliar distracter as the referent for the other label; (b) lexical overlap incorrect item selections where children selected the unfamiliar distracter as the referent for the two labels; (c) familiar object selections where children selected one of the familiar distracters as the referent for one or both labels. The error analysis focused on how many trials children showed the pattern from

ACCEPTANCE OF LEXICAL OVERLAP

category (a), which shows that they preserved the ME assumption despite the ostensive naming provided in the teaching phase. These analyses involved performance across individual trials and not across individual children. In the monolingual group, 31 out of 68 trials (45.59%) had a score of 0. Of those, children showed an ME selection on 16 trials (38.39%), and a lexical overlap incorrect or familiar selection on 14 trials (51.61%). Thus, children's tendency to rely on ME in cases where they did not learn overlapping labels was not different from chance, $\chi^2(1, N = 31) = .032, p = .857$. In the bilingual group, 31 out of 63 trials (49.21%) had a score of 0, with children showing an ME selection on 22 trials (70.97%) and a lexical overlap incorrect or familiar selection on 9 trials (29.03). That is, contrary to monolinguals, bilinguals relied on ME in trials where they did not learn overlapping labels more often than predicted by chance, $\chi^2(1, N = 31) = 5.452, p = .020$.

Discussion

The present study investigated the ability to accept lexical overlap by monolingual and bilingual toddlers in an interactive word-learning paradigm. It was predicted that if the ability to accept lexical overlap develops in relation to children's exposure to overlapping labels, then bilinguals would outperform monolinguals, and within the bilingual group, children with a greater number of translational equivalents in their lexicon and who receive more balanced exposure to their two languages would accept lexical overlap more readily. On the other hand, if lexical overlap performance relates to general lexical knowledge, children with greater vocabulary sizes were predicted to be more successful in the lexical overlap task, regardless of whether they were acquiring one or two languages. The second prediction was partially supported by our results. Monolingual and bilingual children accepted lexical overlap to a similar extent in our task. However, the underlying mechanisms for monolingual and bilingual performance were different for children in the two groups. That is, monolingual performance was dependent on children's receptive vocabulary size, but

ACCEPTANCE OF LEXICAL OVERLAP

bilingual performance was independent of any measures of vocabulary size and vocabulary composition (i.e., number of translational equivalents).

Previous research investigating the acceptance of within-language lexical overlap by monolingual and bilingual preschool-aged children has yielded mixed results. On the one hand, Kandhadai et al. (2017) demonstrated that when presented with a novel label for a familiar object, bilingual 18-month-olds were more likely to accept it as a second label for that object than monolinguals. Similarly, previous research has suggested that bilingual infants at this age show an overall lower degree of reliance on the ME assumption in word-learning tasks (Byers-Heinlein & Werker, 2009; 2013; Houston-Price et al., 2010). On the other hand, Frank and Poulin-Dubois (2002) who used an interactive lexical overlap task, similar to the one used in our study, also found no performance difference in acceptance of lexical overlap in two-and-a-half-year-old monolingual and bilingual children. The dissociation between our, Frank and Poulin-Dubois', and Kandhadai et al.'s results may point to an interesting methodological effect on children's performance in word-learning tasks. That is, when presented with a non-ambiguous naming situation, monolingual and bilingual children are likely to learn two overlapping labels to a similar extent. However, monolinguals may be more likely to rely on ME as a default assumption than bilinguals when presented with an ambiguous naming situation, such as in the case of the task used by Kandhadai and colleagues and the disambiguation paradigm usually employed in infant studies on ME (e.g., Bion et al., 2013; Byers-Heinlein & Werker, 2009; 2013; Houston-Price et al., 2010; Kalashnikova et al., 2018). This suggests that a child's ability to suspend ME in a word-learning task that introduces two labels for the same referent does not necessarily infer that this child will fail to rely on ME in a word-learning task that introduces referentially-ambiguous novel labels.

ACCEPTANCE OF LEXICAL OVERLAP

Our findings show that not all monolingual children performed to the same extent in the lexical overlap task. Instead, children with larger vocabulary sizes were significantly more successful at learning overlapping labels. The relationship between young children's reliance on ME as a word-learning strategy and their lexical knowledge has been demonstrated previously (Graham et al., 1998; Kalashnikova et al., 2016a), whereby children with larger vocabulary sizes have been shown to rely on ME to a greater extent. At first glance, the present finding appears to contradict these previous studies by showing that children with larger vocabulary sizes showed less reliance on ME. However, in the present task, children did not fail to employ ME to successfully learn a novel label as is the case of disambiguation tasks. Rather, the behavior that children showed here (i.e., learning two referentially overlapping labels) also allowed them to learn labels successfully. Therefore, the findings of the present study speak to the account of ME that views it as a reliable default strategy on which children may rely in ambiguous or cognitively demanding naming situations, and not as a constraint that must be suspended or violated for the acquisition of lexical overlap (McMurray, Horst, & Samuelson, 2012; Samuelson, Kucker, & Spencer, 2017). In accordance with this account, monolingual children with greater lexical experience were more successful in identifying that ME was not an appropriate strategy for this learning situation and therefore successfully accepted overlapping labels (Kalashnikova et al., 2015).

Interestingly, this relation between lexical competence and word learning performance did not hold for the bilinguals in our sample. This could be because the measure of English vocabulary size used in the present study was not appropriate for capturing bilinguals' lexical knowledge. This is plausible, given that measures of vocabulary size in only one language spoken by a bilingual, tend to underestimate overall lexical knowledge (Pearson et al., 1995). However, it must be noted that bilingual performance was also unrelated to children's overall conceptual vocabulary size or the number of translational

ACCEPTANCE OF LEXICAL OVERLAP

equivalents in their lexicon. The lack of relation between bilinguals' lexical overlap scores and measures of vocabulary size and composition may be related to the vocabulary measure employed in this study. Given that it was not possible to directly assess children's performance in language tests for each of their languages, a parental report was used. The OZI is typically employed with infants up to 30 months of age (Kalashnikova et al., 2016). However, it is noteworthy that even though several children in this study were older than 30 months of age, no children (monolingual or bilingual) obtained a ceiling score on the OZI. However, it is still possible that the accuracy of parental judgements in these cases was low given that as children become older and become involved in more varied activities and social interactions, parents' awareness of their child's linguistic knowledge decreases.

Another possible and not mutually exclusive explanation is that a different attentional or social-pragmatic mechanism that was not assessed in this study underlined bilinguals' performance in the lexical overlap task. This possibility has been suggested by previous studies showing that monolingual and bilingual children rely on different communication cues when establishing novel label-referent mappings. In comparison to their monolingual peers, pre-school bilinguals show greater reliance on referential cues such as gaze or pointing than on word learning assumptions in fast-mapping tasks (Brojde, Ahmed, & Colunga, 2012; Verhaggen, Grassmann, & Kuntay, 2017; Yow et al., 2017). In addition, bilingual children may rely to a greater extent than monolinguals on general attentional and learning processes in tasks of ME and lexical overlap. Bilingual experience, specifically the early continuous exposure to two languages, has been demonstrated to enhance the early development of attentional control (e.g., Crivello, Kuzyk, Rodrigues, Friend, Zesiger, & Poulin-Dubois, 2016; Kovács & Mehler, 2009; Poulin-Dubois, Blaye, Coutya, & Bialystok, 2011). This general cognitive ability in turn relates to word-learning processes allowing children to manipulate multiple word forms during a lexical task and to resolve lexical conflict during

ACCEPTANCE OF LEXICAL OVERLAP

the process of lexical retrieval. This account may also relate to the finding that, bilinguals in this study were more systematic in employing ME on trials where they failed to demonstrate lexical overlap. It is possible that monolinguals who were unable to map and maintain two labels in this task may have been overall less attentive, which led to the selection of incorrect or even familiar objects (which could be interpreted as random responses as children had no reason to assume that *mido* could refer to the toothbrush, for example). Bilinguals on the other hand, mapped the novel labels to referents presented in the task even when they were unable to succeed in the demanding lexical overlap task. Thus, while monolinguals may rely on their lexical competence in solving a lexical overlap task, bilinguals may instead rely on their social-pragmatic understanding and attentional control when solving an identical task.

The present findings suggest that the relation between ME usage and vocabulary size in monolingual toddlers may not be underpinned by children's emerging understanding that there are one-to-one mappings between words and their meanings. Instead, the acquisition of more abstract linguistic knowledge may lead children to be more successful word learners via their development of the ability to employ ME in referentially ambiguous situations, yet still successfully learn referentially overlapping labels. Our results showed that bilingual children's ability to learn overlapping labels did not relate to their lexical knowledge. This leaves open the question of what aspect of growing up bilingual leads children to develop word-learning strategies that are shaped by their linguistic experience.

ACCEPTANCE OF LEXICAL OVERLAP

References

- Au, T. K., & Glusman, M. (1990). The principle of mutual exclusivity in word learning: To honor or not to honor? *Child Development*, *61*(5), 1474-1490.
- Baldwin, D. A. (2000). Interpersonal understanding fuels knowledge acquisition. *Current Directions in Psychological Science*, *9*(2), 40-45.
- Bates, D. (2005). Fitting linear mixed models in R. *R News*, *5*(1), 27–30.
- Bergelson, E., & Swingle, D. (2012). At 6–9 months, human infants know the meanings of many common nouns. *Proceedings of the National Academy of Sciences*, *109*(9), 3253-3258.
- Bion, R. A., Borovsky, A., & Fernald, A. (2013). Fast mapping, slow learning: Disambiguation of novel word–object mappings in relation to vocabulary learning at 18, 24, and 30 months. *Cognition*, *126*(1), 39-53.
- Bloom, P. (2000). *How children learn the meanings of words*. The MIT Press.
- Brojde, C. L., Ahmed, S., & Colunga, E. (2012). Bilingual and monolingual children attend to different cues when learning new words. *Frontiers in Psychology*, *3*(155). doi: 1-.3389/fpsyg.2012.00155
- Byers-Heinlein, K., Chen, K. H., & Xu, F. (2014). Surmounting the Tower of Babel: Monolingual and bilingual 2-year-olds' understanding of the nature of foreign language words. *Journal of Experimental Child Psychology*, *119*, 87-100.
- Byers-Heinlein, K., & Werker, J. F. (2009). Monolingual, bilingual, trilingual: Infants' language experience influences the development of a word-learning heuristic. *Developmental Science*, *12*(5), 815-823.
- Byers-Heinlein, K., & Werker, J. F. (2013). Lexicon structure and the disambiguation of novel words: Evidence from bilingual infants. *Cognition*, *128*(3), 407-416.

ACCEPTANCE OF LEXICAL OVERLAP

- Byers-Heinlein, K. (2013). Parental language mixing: Its measurement and the relation of mixed input to young bilingual children's vocabulary size. *Bilingualism: Language and Cognition*, 16(1), 32-48.
- Clark, E. V. (1995). *The lexicon in Acquisition* (Vol. 65). Cambridge University Press.
- Core, C., Hoff, E., Rumiche, R., & Señor, M. (2013). Total and conceptual vocabulary in Spanish–English bilinguals from 22 to 30 months: Implications for assessment. *Journal of Speech, Language, and Hearing Research*, 56(5), 1637-1649.
- Crivello, C., Kuzyk, O., Rodrigues, M., Friend, M., Zesiger, P., & Poulin-Dubois, D. (2016). The effects of bilingual growth on toddlers' executive function. *Journal of Experimental Child Psychology*, 141, 121-132.
- Davidson, D., Jergovic, D., Imami, Z., & Theodos, V. (1997). Monolingual and bilingual children's use of the mutual exclusivity constraint. *Journal of Child Language*, 24(1), 3-24.
- Dickinson, D. K. (1988). Learning names for materials: Factors constraining and limiting hypotheses about word meaning. *Cognitive Development*, 3(1), 15-35.
- Diesendruck, G., & Markson, L. (2001). Children's avoidance of lexical overlap: A pragmatic account. *Developmental Psychology*, 37(5), 630-641.
- Diesendruck, G. (2005). The principles of conventionality and contrast in word learning: An empirical examination. *Developmental Psychology*, 41(3), 451.
- Fenson, L., Dale, P. S., Reznick, J. S., Bates, E., Thal, D. J., Pethick, S. J., ... & Stiles, J. (1994). Variability in early communicative development. *Monographs of the Society for Research in Child Development*, i-185.
- Frank, I., & Poulin-Dubois, D. (2002). Young monolingual and bilingual children's responses to violation of the mutual exclusivity principle. *International Journal of Bilingualism*, 6(2), 125-146.

ACCEPTANCE OF LEXICAL OVERLAP

- Golinkoff, R. M., Mervis, C. B., & Hirsh-Pasek, K. (1994). Early object labels: The case for a developmental lexical principles framework. *Journal of Child Language*, *21*(1), 125-155.
- Graham, S. A., Poulin-Dubois, D., & Baker, R. K. (1998). Infants' disambiguation of novel object words. *First Language*, *18*, 149–164.
- Halberda, J. (2003). The development of a word-learning strategy. *Cognition*, *87*, B23–B34.
- Halberda, J. (2006). Is this a dax which I see before me? Use of the logical argument disjunctive syllogism supports word-learning in children and adults. *Cognitive Psychology*, *53*, 310–344.
- Hall, D. G., Waxman, S. R., & Hurwitz, W. M. (1993). How two- and four-year-old children interpret adjectives and count nouns. *Child Development*, *64*(6), 1651-1664.
- Horst, J. S., & Hout, M. C. (2015). The novel object and unusual name (NOUN) database: A collection of novel images for use in experimental research. *Behavior Research Methods*, *48*(4), 1393-1409.
- Houston-Price, C., Caloghiris, Z., & Raviglione, E. (2010). Language experience shapes the development of the mutual exclusivity bias. *Infancy*, *15*(2), 125-150.
- Imai, M., & Haryu, E. (2001). Learning proper nouns and common nouns without clues from syntax. *Child Development*, *72*(3), 787-802.
- Kalashnikova, M., Escudero, P., & Kidd, E. (2018). The development of fast-mapping and novel word retention strategies in monolingual and bilingual infants. *Developmental Science*, e12674.
- Kalashnikova, M., Mattock, K., & Monaghan, P. (2014). Disambiguation of novel labels and referential facts: A developmental perspective. *First Language*, *34*(2), 125-135.

ACCEPTANCE OF LEXICAL OVERLAP

- Kalashnikova, M., Mattock, K., & Monaghan, P. (2015). The effects of linguistic experience on the flexible use of mutual exclusivity in word learning. *Bilingualism: Language and Cognition*, *18*(4), 626-638.
- Kalashnikova, M., Mattock, K., & Monaghan, P. (2016a). Flexible use of mutual exclusivity in word learning. *Language Learning and Development*, *12*(1), 79-91.
- Kalashnikova, M., Mattock, K., & Monaghan, P. (2016b). Mutual exclusivity develops as a consequence of abstract rather than particular vocabulary knowledge. *First Language*, *36*(5), 451-464.
- Kalashnikova, M., Schwarz, I., & Burnham, D. (2016). OZI: Australian English Communicative Development Inventory. *First Language*, *36*(4), 407-427.
- Kandhadai, P., Hall, D. G., & Werker, J. F. (2017). Second label learning in bilingual and monolingual infants. *Developmental Science*. doi:10.1111/desc.12429
- Kovács, Á. M., & Mehler, J. (2009). Cognitive gains in 7-month-old bilingual infants. *Proceedings of the National Academy of Sciences*, *106*(16), 6556-6560.
- Liittschwager, J. C., & Markman, E. M. (1994). Sixteen-and 24-month-olds' use of mutual exclusivity as a default assumption in second-label learning. *Developmental Psychology*, *30*(6), 955.
- Malone, S. A., Kalashnikova, M., & Davis, E. M. (2016). Is it a name or a fact? Disambiguation of reference via exclusivity and pragmatic reasoning. *Cognitive Science*, *40*(8), 2095-2107.
- Markman, E. M. (1990). Constraints children place on word meanings. *Cognitive Science*, *14*(1), 57-77.
- Markman, E. M., & Wachtel, G. F. (1988). Children's use of mutual exclusivity to constrain the meanings of words. *Cognitive Psychology*, *20*(2), 121-157.

ACCEPTANCE OF LEXICAL OVERLAP

- Markman, E. M., Wasow, J. L., & Hansen, M. B. (2003). Use of the mutual exclusivity assumption by young word learners. *Cognitive Psychology*, *47*(3), 241-275.
- Mather, E., & Plunkett, K. (2010). Novel labels support 10-month-olds' attention to novel objects. *Journal of Experimental Child Psychology*, *105*(3), 232-242.
- McMurray, B., Horst, J. S., & Samuelson, L. K. (2012). Word learning emerges from the interaction of online referent selection and slow associative learning. *Psychological Review*, *119*(4), 831-877.
- Merriman, W. E., Bowman, L. L., & MacWhinney, B. (1989). The mutual exclusivity bias in children's word learning. *Monographs of the Society for Research in Child Development*, *i*-129.
- Merriman, W. E., & Stevenson, C. M. (1997). Restricting a familiar name in response to learning a new one: Evidence for the mutual exclusivity bias in young two-year-olds. *Child Development*, *68*(2), 211-228.
- Mervis, C. B., & Bertrand, J. (1994). Acquisition of the novel name-nameless category (N3C) principle. *Child Development*, *65*(6), 1646-1662.
- Mervis, C. B., Golinkoff, R. M., & Bertrand, J. (1994). Two-year-olds readily learn multiple labels for the same basic-level category. *Child Development*, *65*, 1163-1177.
- Pearson, B. Z., Fernández, S., & Oller, D. K. (1995). Cross-language synonyms in the lexicons of bilingual infants: one language or two? *Journal of Child Language*, *22*(2), 345-368.
- Poulin-Dubois, D., Blaye, A., Coutya, J., & Bialystok, E. (2011). The effects of bilingualism on toddlers' executive functioning. *Journal of Experimental Child Psychology*, *108*(3), 567-579.
- R Core Team. (2015). *R: A language and environment for statistical computing* [Computer software manual]. Vienna, Austria. Retrieved from <http://www.R-project.org/>.

ACCEPTANCE OF LEXICAL OVERLAP

- Sabourin, L., Leclerc, J-C., Lapierre, M., Burkholder, M., & Brien, C. (2016). The language background questionnaires in L2 research: Teasing apart the variables. *Proceedings of the Canadian Linguistics Association*. Available online.
- Samuelson, L., & Smith, L. B. (2000). Grounding development in cognitive processes. *Child Development, 71*(1), 98-106.
- Samuelson, L. K., Kucker, S. C., & Spencer, J. P. (2017). Moving word learning to a novel space: A dynamic systems view of referent selection and retention. *Cognitive Science, 41*(S1), 52-72.
- Savage, S. L., & Au, T. K. F. (1996). What word learners do when input contradicts the mutual exclusivity assumption. *Child Development, 3120*-3134.
- Soja, N. N., Carey, S., & Spelke, E. S. (1991). Ontological categories guide young children's inductions of word meaning: Object terms and substance terms. *Cognition, 38*(2), 179-211.
- Taylor, M., & Gelman, S. A. (1988). Adjectives and nouns: Children's strategies for learning new words. *Child Development, 411*-419.
- Verhagen, J., Grassmann, S., & Küntay, A. C. (2017). Monolingual and bilingual children's resolution of referential conflicts: Effects of bilingualism and relative language proficiency. *Cognitive Development, 41*, 10-18.
- Yow, W. Q., Li, X., Lam, S., Gliga, T., Chong, Y. S., Kwek, K., & Broekman, B. F. (2017). A bilingual advantage in 54-month-olds' use of referential cues in fast mapping. *Developmental Science, 20*(1).

ACCEPTANCE OF LEXICAL OVERLAP

Table 1.

Number of children in the monolingual and bilingual groups who obtained scores of 0, 1, and 2 in the lexical overlap task.

Language group	Lexical overlap score		
	0	1	2
Monolingual	9	13	12
Bilingual	12	12	10

ACCEPTANCE OF LEXICAL OVERLAP

List of Figures

Figure 1. Distribution of monolingual and bilingual children's English receptive vocabulary scores as a function of their lexical overlap performance.

ACCEPTANCE OF LEXICAL OVERLAP

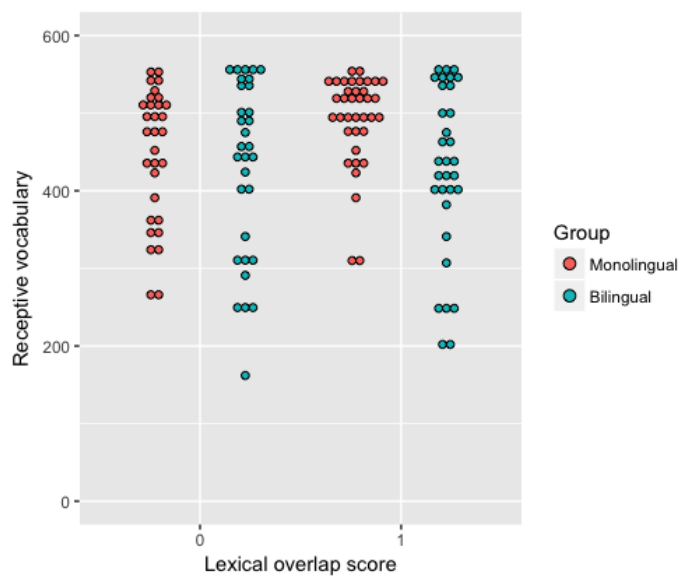


Figure 1. Distribution of monolingual and bilingual children's English receptive vocabulary scores as a function of their lexical overlap performance.