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BRIEF RESEARCH REPORT

The role of within-language vocabulary size in children's semantic development: evidence from bilingual children*

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ABSTRACT

This study tested whether bilingual children show a lag in semantic development (the schematic–categorical shift) relative to monolingual children due to smaller vocabularies within a language. Twenty French–English bilingual and twenty English monolingual children (seven to ten years old) participated in a picture-naming task in English. Their errors were coded for schematic or categorical relations. The bilingual children made more schematic errors than monolinguals, a difference that was accounted for statistically by vocabulary score differences. This result suggests that within-language vocabulary size is one important factor in semantic development and may explain why bilingual children sometimes show a lag relative to monolingual children in one of their languages, perhaps the language in which they have received less formal instruction.

INTRODUCTION

In monolingual children, a shift from schematic to categorical relations between words has been observed between approximately five and ten years of age (Brown & Berko, 1960; Nelson, 1977; Perraudin & Mounoud, 2009; Sheng, McGregor & Marian, 2006). Schematic relations refer to relations between objects often found together in a physical context as well as relations between words often found together in discourse (Brown & Berko, 1960;

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Perraudin & Mounoud, 2009). For example, on a word-association task, young children often say *eat* in response to *apple*, an association of what one commonly does with an apple (Brown & Berko, 1960). Categorical relations refer to relations between words clustered according to semantic or taxonomic categories (Nelson, 1977; Norrby & Håkansson, 2007; Perraudin & Mounoud, 2009). Older children and adults might respond *banana* or *fruit* to *apple* in a word-association task, an association which could reflect a taxonomic structure of fruits in semantic memory (Brown & Berko, 1960; Nelson, 1977). Evidence for a schematic–categorical developmental shift in word and conceptual relations often comes from word-association tasks (Norrby & Håkansson, 2007; Sheng *et al.*, 2006; see review in Nelson, 1977), although other tasks have been used (see, for example, Muma & Zwycewicz-Emory, 1979).

The shift from primarily schematic relations to primarily categorical relations is related to what has been called a syntagmatic–paradigmatic shift (see discussion in Perraudin & Mounoud, 2009). Syntagmatic relations refer to relations between words that would be expected to appear in the same syntactic sequence, and are often from a different lexical class (e.g. *cold–outside*) while paradigmatic relations crucially come from the same grammatical form class. These include opposites, coordinates and synonyms, and are typically from the same lexical class (e.g. *cold–hot*). Earlier, psychologists argued that there was a developmental shift in the lexical class of words emerging from word associations (Brown & Berko, 1960; Nelson, 1977; see historical review in Jarman, 1980). There is now fair agreement that the syntagmatic–paradigmatic shift has to do with a broader shift in conceptual categorization, notably the schematic–categorical shift (Danovitch & Keil, 2004; Perraudin & Mounoud, 2009).

Researchers have generally attributed the schematic–categorical shift to a conceptual or semantic change in development. However, a number of variables seem to contribute to this shift, including age (Norlin, 1981; see also discussion in Namei, 2004), children's increasing understanding of what constitutes a definition (Norlin, 1981; Watson, 1985), the acquisition of reading (Cronin, 2002), and schooling (Sharp & Cole, 1972). For the present study, we highlight the predictive effect of vocabulary size. Vocabulary scores predict children's tendency to give paradigmatic responses (Cronin, 2002; see also Lovelace & Cooley, 1982). Children are more likely to show evidence of categorical relations with familiar words than with unfamiliar words (Brown & Berko, 1960; review in Nelson, 1977).

For monolingual children, vocabulary develops in concert with concepts, so it is difficult to disentangle the effects of vocabulary from the effects of conceptual development. In other words, it remains unclear whether the schematic–categorical shift might be linked to knowledge of words of a

particular language independently of conceptual development. In bilingual children, vocabulary development within a language and conceptual development can be somewhat independent. In some cases, particularly with school-aged children, bilingual children can perform on par with same-age monolinguals on vocabulary, in at least one language (Oller, Pearson & Cobo-Lewis, 2007; Sheng *et al.*, 2006) or both languages (Cromdal, 1999). However, young bilingual children often score below the monolingual norm or below same-age monolinguals on vocabulary tests in at least one of their languages (Bialystok, Majumder & Martin, 2003; Junker & Stockman, 2002; Nicoladis, 2006; Oller *et al.*, 2007; Uchikoshi, 2006; Umbel & Oller, 1994; Umbel, Pearson, Fernández & Oller, 1992; Verhalen & Schoonen, 1996). Also, bilinguals tend to have less-frequent exposure to and use of particular words than monolinguals (Gollan, Montoya, Cera & Sandoval, 2008). If the schematic–categorical shift is linked to vocabulary size within a language, bilinguals might therefore show a greater tendency to demonstrate schematic relations between words, particularly in their weaker language, relative to same-age monolinguals. In contrast, if the schematic–categorical shift is independent of vocabulary knowledge within a particular language, then same-age bilinguals and monolinguals should be at the same level of semantic development.

There is some evidence from adult bilinguals that the within-language vocabulary size plays an important role. Adult second language learners give more schematic responses in their second language than their first and relative to native speakers (Norrby & Håkansson, 2007; Zareva, 2007). Furthermore, as second language learners increase in their proficiency of their second language, their rate of demonstrating categorical relations increases (Zareva, 2007).

The results with child bilinguals between six and ten years of age are not so straightforward. Most studies comparing bilingual and same-age monolingual children show little to no differences between the two groups (Namei, 2004; Reustle, 2008; Sheng *et al.*, 2006). However, one study showed that Turkish–Dutch sequential bilingual children gave fewer paradigmatic responses in Dutch, their second language, than monolingual Dutch children (Verhalen & Schoonen, 1993). It is possible that the variability between studies could be related to the variability in vocabulary size of bilingual populations in the school years, as discussed above. While most of these studies did not measure vocabulary directly, Sheng *et al.* (2006) did. They found that there was no significant difference in English vocabulary scores between the Mandarin–English bilingual group and the English monolingual group. There were also few differences between monolinguals and bilinguals in the children's tendency to give paradigmatic responses on a word-association task. However, Sheng *et al.* (2006) did not report any analyses relating vocabulary scores to the

children's use of semantic relations. It is possible that Sheng *et al*. (2006) found little difference between monolinguals and bilinguals on paradigmatic responses because their samples showed little difference on vocabulary size.

In addition to responses demonstrating a lag in semantic development in terms of relations between words, bilinguals might differ from monolinguals in accessing words for production in at least three other ways. First, bilinguals might be more likely than monolinguals to paraphrase their intended target, including coining new lexical constructions or inserting a description of the intended target (Kachru, 1985). Second, bilinguals might show evidence of one language on their lexical choices in the other language, or cross-linguistic influence. Yan and Nicoladis (2009) reported the occasional use of cross-linguistic influence for French–English bilinguals on a picture-naming task, but did not quantify their observation. For example, one child called a 'fishing rod' *fishing can* (the French expression is *canne à pèche*; Yan & Nicoladis, 2009: 332). Third, bilinguals have the possibility of switching into their other language if they cannot access the word in the target language, or code-switching (Heredia & Altarriba, 2001). In the present study, the children were in a relatively monolingual (English) mode (Grosjean, 2001) so their rate of code-switching is likely to be low.

This study

The data for this study come from a picture-naming task originally carried out to compare French–English bilingual children's lexical access with that of English monolinguals (Yan & Nicoladis, 2009). The primary purpose of the present study was to test whether within-language vocabulary size is an important predictor of the schematic–categorical shift in bilinguals and monolinguals. Specifically, knowing that there was a near-significant difference in English vocabulary scores between the bilinguals and the monolinguals (Yan & Nicoladis, 2009), we predicted that the bilinguals would show evidence of a greater use of schematic relations in their errors on the picture-naming task than the same-age monolinguals. This difference should disappear once vocabulary scores are statistically controlled for.

Secondarily, this study also examined other ways in which bilinguals might differ from monolinguals in their non-target responses on this picture-naming task, specifically: (1) coining and paraphrasing, (2) cross-linguistic influence, and (3) code-switching.

METHOD

Participants

The twenty French–English bilingual children who participated in the Yan and Nicoladis (2009) study were between 7;0 (years; months) and

10;1, with a mean age of 8;5. Eight of the children were boys. All the children attended French language schools in Edmonton, Alberta, Canada. In the French language schools, the teachers speak only French except for an English language arts course, starting in Grade 3. Only four of the children were in Grade 2 and had not had formal exposure to English in a school setting; their pattern of responses was not remarkably different from the rest of the group. This area of Canada is primarily English-speaking, although there is a small and active French-speaking community. All the children were exposed to French from at least one parent and at school. All of the children learned English from the general community and many of the children had one English-speaking parent. As a group, the children are probably best characterized as simultaneous bilinguals, although five had heard primarily French until about the age of three years and could be characterized as early sequential bilinguals. These children's responses were not noticeably different from the rest of the group. As reported in Yan and Nicoladis (2009), these children had, on average, comparable standard scores on French and English vocabulary tests, suggesting that, as a group, they were relatively balanced in their proficiency in the two languages.

The present analyses also included the same twenty monolingual English-speaking children used in Yan and Nicoladis (2009) as a comparison group. The children did not speak more than a few words in any language other than English and were educated in English language schools. These children were aged between 7;6 and 10;1, averaging 8;8. There were twelve girls in the group. The age of the monolingual participants did not differ from that of the bilinguals ($t(38) = 1{\cdot}20$, $p = 0{\cdot}24$).

Materials

To measure vocabulary in English, the Peabody Picture Vocabulary Test III (PPVT; Dunn & Dunn, 1997) was administered to the children. This test has been normed by age. The raw scores were used in our analyses rather than the normed scores because we were interested in how the children's performance was related to their relative vocabulary size (following Sheng *et al.*, 2006).

The picture-naming task consisted of fifty pictures of objects that were thought to be challenging for children in this age range to name; see Figure 1 for an example. Most of the pictures were of objects from Faust and Dimitrovsky (1997), with some changes to avoid cognates in English and French because cognates show a facilitative effect in naming in adult bilinguals (Gollan & Acenas, 2004). See Yan and Nicoladis (2009) for the complete list.

Fig. 1. Sample picture (eagle) from picture-naming task.

Procedure

A native speaker of English tested the children. The vocabulary test was administered first followed by the picture-naming task. The bilingual children were tested in their homes or in a university library room while the monolinguals were tested in their after-school programs.

The vocabulary test was administered according to the instruction manual (Dunn & Dunn, 1997). Once the children reached ceiling on the vocabulary test, the children were introduced to the picture-naming task with the following instructions:

> ''I'm going to show you some pictures on the computer screen, and I want to know if you know the names of these pictures. Don't worry if you don't know all the words: some of them may be too hard for you. Just try your best.''

The children were given three practice trials (an apple, a sundial and an accordion) to demonstrate how to name the pictures. The children were given feedback on the answers on this trial. Then, the fifty test items were presented in a different random order for each child. The children were praised for responding but were not given any feedback as to the correctness of their answers on the test items.

Coding

The children's errors (i.e. the non-target responses) were coded according to the categories summarized in Table 1. In making these categorizations, we

TABLE 1. *Examples of coding categories*

Coding category	Target	Child's response
Categorical	Eagle	Hawk
Schematic	Electric outlet	Cord
Cross-linguistic influence	Pinecone	Pineapple
French	Pot	Casserole
Coinage	Gingerbread man	Cookie man
Description	Pinecone	Things that go on a pine tree

consulted frequently with native speakers of Canadian English to ensure the validity of these categorizations. These categories were not perfectly exclusive and there were three responses from two bilingual children that fell into two coding categories (e.g. one child called a weather vane *cock*, both a schematic response since it referred to part of the weather vane and cross-linguistic influence from French, *coq* being the French word for 'rooster'; note that *weathercock* was not a term recognized by the Canadian English-speaking adults we consulted). The rate of French, cross-linguistic influence responses, coinages and descriptions were calculated out of the total number of errors on the picture-naming task. There were very few descriptions so these were combined with the coinages in testing the hypothesis that bilinguals would use more creative linguistic constructions than monolinguals. To compare the two groups on schematic/categorical responses, the children's rate of schematic responses out of schematic + categorical responses was calculated. As the rate of categorical responses is the inverse of the rate of schematic responses, the groups were compared only on the rate of schematic responses.

There was a significant difference between the two language groups on the number of pictures that were correctly named (Yan & Nicoladis, 2009), with the monolingual children scoring higher ($M = 37{\cdot}4$, $SD = 6{\cdot}3$) than the bilingual children ($M = 26{\cdot}2$, $SD = 11{\cdot}8$). For this reason, all the dependent variables were calculated as percentages rather than raw numbers, to account for this difference between the groups.

RESULTS

On the PPVT, the monolinguals averaged 137·0 ($SD = 18{\cdot}8$) and the bilinguals 125·2 ($SD = 21{\cdot}0$), a difference that did not reach statistical significance ($F(1, 38) = 3{\cdot}48$, $p = 0{\cdot}07$, $\eta^2_p = 0{\cdot}053$).

Only the bilinguals could produce French or cross-linguistic influence. The average rate of French responses was 3·2% ($SD = 8{\cdot}6\%$) and the rate of cross-linguistic responses 3·0% ($SD = 4{\cdot}9\%$). These rates were compared on

TABLE 2. *Correlation coefficients between dependent measures and vocabulary scores/age*

	Bilinguals		Monolinguals	
	Age	Vocabulary	Vocabulary	Age
French responses	−0·280	−0·284	N/A	N/A
Cross-linguistic	0·018	−0·199	N/A	N/A
Creative responses	−0·086	0·219	−0·277	−0·316
Schematic	−0·321	−0·464*	−0·169	−0·090

*$p < 0{\cdot}05$.

a one-sample *t*-test to 0. The results showed a significant difference for cross-linguistic influence responses ($t(19) = 2{\cdot}74$, $p = 0{\cdot}013$), but not for French responses ($t(19) = 1{\cdot}68$, n.s.).

The rates of description were very low (less than 2% of children's responses) so these were combined with the coinages to in the category of creative linguistic responses. The average rate for the bilinguals was 13·5% ($SD = 16{\cdot}7\%$) and for the monolinguals 12·4% ($SD = 19{\cdot}1\%$). The difference between groups was not significant ($F < 1$).

The bilinguals gave a higher rate of schematic responses ($M = 36{\cdot}5\%$, $SD = 25{\cdot}0\%$) than the monolinguals ($M = 20{\cdot}8\%$, $SD = 20{\cdot}5\%$; $F(1, 37) = 4{\cdot}57$, $p = 0{\cdot}039$, $\eta^2_p = 0{\cdot}110$). When this analysis was re-run, with English vocabulary scores as a covariate, the difference between the two groups was no longer significant ($F(1, 36) = 2{\cdot}54$, $p = 0{\cdot}12$, $\eta^2_p = 0{\cdot}066$).

Table 2 summarizes the correlations between the dependent measures and the children's vocabulary scores/age. The only correlation to reach significance was the negative correlation between the rate of schematic responses and vocabulary scores for the bilingual children.

DISCUSSION

The results of this study showed that the bilinguals lagged behind same-age monolinguals in semantic development on this picture-naming task in English. That is, they produced significantly more schematic responses rather than categorical responses relative to same-age monolinguals. The bilinguals showed a trend to lag behind the monolinguals in English vocabulary scores as well. The bilinguals' rate of schematic responses was negatively correlated with their vocabulary scores. When the children's vocabulary scores were covaried, there was no longer a difference between the groups on the rate of schematic responses. These results are consistent with the interpretation that bilinguals lag behind same-age monolinguals

in semantic development, at least in part because of slightly lower vocabulary scores in that language.

The higher rate of schematic responses in bilinguals in the present study differs from those of Sheng *et al*. (2006), who showed little difference in syntagmatic or paradigmatic responses of bilinguals and monolinguals. It is possible to reconcile the results of the two studies when taking vocabulary into account. In the present study, there was a near-significant difference between bilinguals and monolinguals on English vocabulary scores while there was no difference between the bilinguals and the monolinguals in the Sheng *et al*. (2006) study. Previous studies of school-aged bilingual children show a great deal of variability in terms of whether the bilinguals lag behind same-age monolinguals in their vocabulary size. There has also been variability with regard to whether bilinguals lag behind monolinguals in semantic development. The variability in vocabulary scores may, in part at least, explain the variability in results with semantic development.

In this study, the bilingual children did not differ from the monolingual children in the rate of using novel lexical constructions, either in terms of coinages or descriptions of the concept. These results suggest that the children's bilingualism did not lead them to try to come up with periphrastic means to label the pictures, at least on this task (unlike in Kachru, 1985).

The bilingual children in this study produced very few answers in French, at a rate that did not differ significantly from zero. This result is suggestive that they were in a strongly monolingual mode (Grosjean, 2001) and aware of the experimenter's limitations in interpreting French (Paradis & Nicoladis, 2007).

The rate of responses reflecting cross-linguistic influence was significantly higher than zero, but still very low (i.e. 3·2% of the children's non-target responses). Such a low rate of cross-linguistic transfer is consistent with the argument that cross-linguistic influence is a kind of speech production error that results from competition between a bilingual's two languages (Nicoladis, 2006). Since the children were in a monolingual mode, there was little competition from French.

In this study, we tested only the English of the bilingual children, limited by the lack of availability of a French monolingual comparison group. By testing only the English, we may have an incomplete picture of the bilinguals' semantic development. Verhalen and Schoonen (1996) found that Turkish–Dutch sequential bilinguals had richer lexical knowledge in Dutch, their second language and the language of schooling, than in Turkish. The French–English bilinguals were learning both languages simultaneously and were being schooled in French. Unlike the Turkish–Dutch bilinguals, the French–English bilinguals in this study were being schooled in a minority

language for the community. By the ages of seven to ten years, they are undoubtedly aware of the majority language status of English and the importance of learning it well (see Paradis & Nicoladis, 2007, for evidence of sensitivity to the majority language in the preschool years). Nevertheless, it is possible that without results from the children's other language, we might reach the conclusion that the bilinguals lag in semantic development when this is only the case in one language (Oller *et al.*, 2007).

In spite of this weakness, the results of the present study suggest that when age and schooling are accounted for, vocabulary size within a language is an important variable contributing to the schematic–categorical shift. Furthermore, vocabulary size can help explain the variability across studies in semantic development of bilinguals relative to monolinguals. For example, in studies in which bilinguals seem to show few to no differences on semantic development (Namei, 2004; Reustle, 2008; Sheng *et al.*, 2006) may have included bilinguals who were on par in vocabulary with monolinguals. Other studies have shown that school-aged children can score on par with monolinguals on vocabulary tests (Cromdal, 1999; Oller *et al.*, 2007; Sheng *et al.*, 2006). Studies in which bilinguals are lagging in semantic development (e.g. Verhalen & Schoonen, 1993) may be those in which the bilinguals are lagging in vocabulary relative to monolingual children (e.g. Bialystok *et al.*, 2003; Verhalen & Schoonen, 1996). It is important to note that even when statistically significant, the differences between bilinguals and monolinguals are fairly small. These results have important ramifications for thinking about how the schematic–categorical shift might come about in all children: we have argued that knowledge of vocabulary within a language may be an important contributor to children's semantic development.

REFERENCES

Bialystok, E., Majumder, S. & Martin, M. M. (2003). Developing phonological awareness: Is there a bilingual advantage? *Applied Psycholinguistics* **24**, 27–44.

Brown, R. & Berko, J. (1960). Word association and the acquisition of grammar. *Child Development* **31**, 1–14.

Cromdal, J. (1999). Childhood bilingualism and metalinguistic skills: Analysis and control in young Swedish–English bilinguals. *Applied Psycholinguistics* **20**, 1–20.

Cronin, V. S. (2002). The syntagmatic–paradigmatic shift and reading development. *Journal of Child Language* **29**, 189–204.

Danovich, J. H. & Keil, F. C. (2004). Should you ask a fisherman or a biologist? Developmental shifts in ways of clustering knowledge. *Child Development* **75**, 918–31.

Dunn, L. M. & Dunn, L. M. (1997). *Peabody Picture Vocabulary Test*, 3rd edn. Circle Pines, MN: American Guidance Service.

Faust, M. & Dimitrovsky, L. (1997). Naming difficulties in language-disabled children: Preliminary findings with the application of the tip-of-the-tongue paradigm. *Journal of Speech, Language & Hearing Research* **40**, 1026–37.

Gollan, T. H. & Acenas, L.-A. R. (2004). What is a TOT? Cognate and translation effect on tip-of-the-tongue states in Spanish–English and Tagalog–English bilinguals. *Journal of Experimental Psychology: Learning Memory, and Cognition* **30**, 246–69.

Gollan, T. H., Montoya, R. I., Cera, C. & Sandoval, T. C. (2008). More use almost always means a smaller frequency effect: Aging, bilingualism and the weaker links hypothesis. *Journal of Memory and Language* **58**, 787–814.
Grosjean, F. (2001). The bilingual's language modes. In J. L. Nicol (ed.), *One mind, two languages: Bilingual language processing*, 1–22. Oxford: Blackwell.
Heredia, R. R. & Altarriba, J. (2001). Bilingual language mixing: Why do bilinguals code-switch? *Current Directions in Psychological Science* **10**, 164–68.
Jarman, R. F. (1980). Cognitive processes and syntactical structure: Analyses of paradigmatic and syntagmatic associations. *Psychological Research* **41**, 153–67.
Junker, D. A. & Stockman, I. J. (2002). Expressive vocabulary of German–English bilingual toddlers. *American Journal of Speech-Language Pathology* **11**, 381–94.
Kachru, B. B. (1985). The bilinguals' creativity. *Annual Review of Applied Linguistics* **6**, 20–33.
Lovelace, E. A. & Cooley, S. (1982). Free associations of older adults to single words and conceptually related word triads. *Journal of Gerontology* **37**, 432–37.
Muma, J. R. & Zwycewicz-Emory, C. L. (1979). Contextual priority: Verbal shift at seven? *Journal of Child Language* **6**, 301–311.
Namei, S. (2004). Bilingual lexical development: A Persian–Swedish word association study. *International Journal of Applied Linguistics* **14**, 363–88.
Nelson, K. (1977). The syntagmatic–paradigmatic shift revisited: A review of research and theory. *Psychological Bulletin* **84**, 93–116.
Nicoladis, E. (2006). Cross-linguistic transfer in adjective–noun strings by preschool bilingual children. *Bilingualism: Language and Cognition* **9**, 15–32.
Nicoladis, E. (2008). Why does bilingualism affect language and cognitive development? In J. Altarriba & R. Heredia (eds), *An introduction to bilingualism: Principles and practices*, 167–81. Mahwah, NJ: Lawrence Erlbaum.
Norlin, P. F. (1981). The development of relational arcs in the lexical semantic memory structures of young children. *Journal of Child Language* **8**, 385–402.
Norrby, C. & Håkansson, G. (2007). Girl—lass or curl? Word associations in second language learners. *Australian Review of Applied Linguistics* **30**, 22·1–22·17.
Oller, D. K., Pearson, B. Z. & Cobo-Lewis, A. B. (2007). Profile effects in early bilingual language and literacy. *Applied Psycholinguistics* **28**, 191–230.
Paradis, J. & Nicoladis, E. (2007). The influence of dominance and sociolinguistic context on bilingual preschoolers' language choice. *International Journal of Bilingual Education and Bilingualism* **10**, 277–97.
Perraudin, S. & Mounoud, P. (2009). Contribution of the priming paradigm to the understanding of the conceptual developmental shift from 5 to 9 years of age. *Developmental Science* **12**, 956–77.
Reustle, C. (2008). The effect of L1 on the syntagmatic–paradigmatic shift. Unpublished MSc thesis, William Patterson University of New Jersey.
Sharp, D. & Cole, M. (1972). Patterns of responding in the word associations of West African children. *Child Development* **43**, 55–65.
Sheng, L., McGregor, K. K. & Marian, V. (2006). Lexical–semantic organization in bilingual children: Evidence from a repeated word associate task. *Journal of Speech, Language, and Hearing Research* **49**, 572–87.
Uchikoshi, Y. (2006). English vocabulary development in bilingual kindergartners: What are the best predictors? *Bilingualism: Language and Cognition* **9**, 33–49.
Umbel, V. M. & Oller, D. K. (1994). Developmental changes in receptive vocabulary in Hispanic bilingual school children. *Language Learning* **44**, 221–42.
Umbel, V. M., Pearson, B. Z., Fernández, M. C. & Oller, D. K. (1992). Measuring bilingual children's receptive vocabularies. *Child Development* **63**, 1012–20.
Verhalen, M. & Schoonen, R. (1993). Word definitions of monolingual and bilingual children. *Applied Linguistics* **14**, 344–65.
Verhalen, M. & Schoonen, R. (1996). Lexical knowledge in L1 and L2 of third and fifth graders. *Applied Linguistics* **19**, 452–70.

Watson, R. (1985). Towards a theory of definition. *Journal of Child Language* **12**, 181–97.
Yan, S. & Nicoladis, E. (2009). Finding le mot juste: Differences between bilingual and monolinguals children's lexical access in comprehension and production. *Bilingualism: Language and Cognition* **12**, 323–35.
Zareva, A. (2007). Structure of the second language mental lexicon: How does it compare to native speakers' lexical organization? *Second Language Research* **23**, 123–53.