



# Bilingualism and conversational understanding in young children

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## ABSTRACT

The purpose of the two experiments reported here was to investigate whether bilingualism confers an advantage on children's conversational understanding. A total of 163 children aged 3–6 years were given a Conversational Violations Test to determine their ability to identify responses to questions as violations of Gricean maxims of conversation (to be informative and avoid redundancy, speak the truth, and be relevant and polite). Though comparatively delayed in their L2 vocabulary, children who were bilingual in Italian and Slovenian (with Slovenian as the dominant language) generally outperformed those who were either monolingual in Italian or Slovenian. We suggest that bilingualism can be accompanied by an enhanced ability to appreciate effective communicative responses.

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## 1. Introduction

One of the most central and enduring issues in cognitive science concerns the impact of access to language on cognitive development (Bloom & Keil, 2001; Carruthers, 2002; Siegal, 2008; Siegal & Surian, 2004, 2007). Children are exposed to a wide range of language environments. Some children such as deaf children with hearing parents may not be exposed to language until they enter into contact with users of a sign language. By contrast, bilingual children – the focus of the investigation reported here – are exposed early to more than one spoken language. Such children often may have one parent who is English- or Italian-speaking and the other who is a speaker of a different language, or they may be children of parents who have migrated to a country in which a language other than their own is spoken, or they simply may be exposed to a multilingual culture as is the case, for example, in Switzerland or Slovenia.

The importance of childhood bilingualism is underscored in the context of globalization. For example,

throughout the European Union, about 10% of the school age population have a language different than that of the majority of the country in which they live, and projections are that in the EU as a whole about one-third of the urban population under 35 will soon consist of ethnic minorities with a language background different than that of the majority (Extra & Yagmur, 2004; Romaine, 2004). Nevertheless, the effects of the timing and nature of very early bilingual language input on children's cognitive development are not well understood. Previous work (e.g., Bialystok, 2001; Bialystok & Martin, 2004; Bialystok & Senman, 2004; Cromdal, 1999) has shown that bilingualism has a positive effect on children's ability to judge grammar, to substitute symbols, and to 'inhibit' a prepotent response in executive functioning tasks requiring the ability to distinguish between reality and the phenomenal world of appearances. This capacity for flexibility in the representation of language and objects suggests that early bilingualism should be accompanied by advanced metapragmatic skills. However, little is known about the extent to which bilingualism influences performance on measures of conversational understanding – a process that is often key to cognitive development and learning (Siegal & Surian, 2004, 2007). In the present research, we aimed to address the question of whether bilingualism

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confers an advantage in terms of children's understanding and appreciation of messages as intended by speakers in conversation.

In depicting communication as a cooperative exchange, Grice (1975, 1989) proposed that appreciation of certain conversational rules or maxims provide the foundation for pragmatic competence. These maxims enjoin speakers to 'say no more or no less than is required for the purpose of the (talk) exchange' (maxims of *quantity*), 'tell the truth and avoid statements for which there is insufficient evidence (maxims of *quality*)', 'be relevant (maxim of *relation*)', and 'avoid ambiguity, confusion and obscurity (maxims of *manner*).' To characterize the nature of effective communication more fully, Grice also discussed the need to invoke other maxims such as 'be polite' (maxim of *politeness*).

An earlier study involved children aged 4–6 years who were either monolingual in English or Japanese or bilingual in the two languages (Siegal, Matsuo, & Pond, 2007). The aim was to examine whether bilingualism influences children's ability to draw "scalar implicatures" that arise when a speaker uses a weak member of a scale (e.g., *some*, *or*, *might*) to imply that the stronger term of the scale (*all*, *and*, *must*) does not hold (Guasti et al., 2005; Papafragou & Musolino, 2003). For example, the utterance: (1) *some* of the dwarfs loved Snow White implies and (2) *not every* dwarf loved Snow White. In keeping with the Grice's maxims of Quantity to say no more or no less than is required for effective communication, listeners' understanding of such implicatures is based on the pragmatic knowledge that *some* means *not all* despite the logical compatibility between *some* and *all*. Therefore it would not be communicatively effective for a speaker to state that "Some – and in fact all – of the dwarfs loved Snow White" since *all* cancels out *some*; if the speaker meant that the stronger term *all* applied, then he or she should have used it from the start instead of the weaker one *some*. As a test of this understanding using scalar implicatures common to both English and Japanese, children heard a puppet refer to actions such as that of a teddy bear who put all the hoops available on a pole as having put "Some of the hoops on the pole." They were asked to say whether the puppet could have described the action better. Although having lower vocabulary comprehension scores, the bilingual children significantly outperformed their monolingual counterparts in showing sensitivity to scalar implicatures by identifying pragmatically inappropriate uses of the term *some*.

In the present investigation, we sought to determine whether bilingual children excel more generally in their sensitivity to conversational maxims compared to their monolingual counterparts. Experiment 1 involved a comparison of children who were monolingual in Italian with children who were bilingual in Slovenian and Italian. The children were given a Conversational Violations Test (CVT) that aimed to determine the extent to which they can determine whether a maxim for conversation in the Gricean framework has been violated. Based on previous findings concerning scalar implicatures, our hypothesis was that the bilingual children would outperform the monolingual group.

## 2. Experiment 1

### 2.1. Method

#### 2.1.1. Participants

These were 41 children ranging in age from 4 years, 7 months to 6 years, 3 months who were divided into two language groups: 19 Italian monolinguals ( $M = 5$  years, 4 months,  $SD = 7.3$  months) and 22 Slovenian–Italian bilinguals ( $M = 5$  years, 6 months,  $SD = 7.8$  months). The Italian monolinguals lived in Trieste, northeastern Italy, whereas the Slovenian–Italian bilinguals were recruited from Koper, Izola, and other towns in the Istria region of Slovenia bordering northeastern Italy. The bilinguals attended preschools that provide instruction in Italian only. Most were children with Slovenian-speaking parents who enrolled their children in Italian language preschools in order to facilitate the children's participation to further education in Italian available in the greater Trieste area and in future employment in Slovenia that would involve interaction with Italian speakers. They had acquired their knowledge of Italian (L2) mainly from interactions at preschool and from exposure to television. All children tested in the three language groups attended preschools in working class areas, and were from working class backgrounds in which few parents had any education beyond high school.

#### 2.1.2. Procedure

All children were tested individually in Italian in a quiet area of their school on a Conversational Violations Test that was based on measures used earlier in research on children with autism and adults with right hemisphere lesions (Surian, Baron-Cohen, & van der Lely, 1996; Surian & Siegal, 2001; see also Siegal, 2008). The CVT involves the detection of utterances that violate Gricean conversational maxims. Using a laptop, children were shown a DVD in which 25 short conversational exchanges were staged by three doll speakers, one male and two female. For each episode, one of the two female speakers asked a question to the other two speakers who each gave a short answer. One answer violated a conversational maxim and the other did not. The children were asked to "point to the doll that said something silly or rude." The utterances violated the first or the second maxim of Quantity, the maxim of Quality, the maxim of Relation and the maxim of Politeness. There were five utterances for each of these five component maxims of the CVT.

For items that represented the First Maxim of Quantity (Quantity I), the target utterances were designed to fall short of providing an informative enough answer, as in the following:

Question: "What did you get for your birthday?"

Answer: "A present." (Alternative appropriate answer: "A bicycle.")

For items that represented the Second Maxim of Quantity (Quantity II), the utterances provided redundant information, thus demanding the expenditure of extra

**Table 1**

Mean scores (out of 5) and standard deviations of the Italian monolingual and Slovenian–Italian bilingual groups on the five components of the Conversational Violations Task in Experiment 1.

Group	N	Quantity I	Quantity II	Quality	Relation	Politeness
Monolinguals	19	3.37 (1.11)	3.26 (0.93)	3.84 (1.07)	3.84 (1.12)	4.26 (0.87)
Bilinguals	22	3.41 (1.05)	3.86 (0.77)	4.50 (0.98)	4.41 (0.66)	4.82 (0.50)

processing effort without producing any additional cognitive benefit. For example:

Question: “Who is your best friend?”

Answer: “My best friend is Pietro. He wears clothes.”  
(Alternative: “My best friend is Pietro. He goes to school with me.”)

Violations of the First Maxim of Quality consisted of targets that were obviously false:

Question: “Have you seen my dog?”

Answer: “Yes, he’s in the sky.” (Alternative: “Yes, he’s in the garden.”)

Violations of Maxim of Relation were presented by using targets that did not bear any obvious topical relation with the context question:

Question: “What game do you know?”

Answer: “I know your name.” (Alternative: “I like football.”)

Violations of the Maxim of Courtesy consisted of utterances that were rude:

Question: “Do you like my dress?”

Answer: “No, it’s disgusting.” (Alternative: “It’s pretty.”)

## 2.2. Results

Means and standard deviations of the children’s scores on each component of the CVT out of a maximum correct score of 5 are shown in Table 1. A 2 (language group: Italian vs. Slovenian–Italian bilingual)  $\times$  5 (type of CVT maxim) ANOVA yielded only a significant language effect,  $F(1, 39) = 12.76$ ,  $p < .001$ ,  $\eta^2 = .247$ , that pointed to a bilingual advantage. There were no main or interaction effects involving CVT maxims.

## 3. Experiment 2

As predicted, bilinguals outperformed monolinguals on the CVT in Experiment 1. However, this study was limited to the responses of Italian monolingual and Slovenian–Italian bilingual children aged 4–6 years. Experiment 2 was designed to examine the responses of a larger sample of children aged 3–6 years that also included a Slovenian monolingual group. In addition, bilingualism is liable to

be associated with verbal intelligence, as assessed by vocabulary tests, and may contribute to executive functioning abilities since shifting from one language to another requires shifts in attention (Colzato et al., 2008; Costa, Hernández, & Sebastián-Gallés, 2008). Therefore, we investigated whether the effects of bilingualism remain significant when vocabulary and executive functioning are considered.

### 3.1. Method

#### 3.1.1. Participants

These were 122 children in three groups: 43 Italian monolinguals, 41 Slovenian monolinguals, and 38 Slovenian–Italian bilinguals. The children in each language group were sub-divided into two age groups: 3 years, 6 months to 4 years, 6 months and 4 years, 9 months to 6 years, 0 months. These age groups correspond to those of children who were respectively in the first half and second half of their preschool program. The Italian monolingual children were recruited from various preschools in Trieste.<sup>1</sup> The Slovenian monolinguals were located in the town of Izola near the Italian border. The bilingual children were recruited from Izola and two other towns in the vicinity, Koper and Hrvatini. As in Experiment 1, most of the bilinguals were children who had both Slovenian-speaking parents, but attended schools that provided instruction in Italian only. As before, all children tested attended preschools located in working class areas and were from working class backgrounds in which few parents had any education beyond high school. No child had participated in Experiment 1.

#### 3.1.2. Procedure

Children were tested individually in a quiet area of their school. A native Italian speaker tested both the Italian monolingual group and the bilingual group in Italian whereas a native Slovenian speaker tested the Slovenian monolingual group in Slovenian and also tested the Slovenian vocabulary of the bilinguals. All children were given two executive functioning tasks as a measure of inhibition that requires shifting the focus of attention. These were the Day–Night (DN) and Card Sort (CS) tasks. Then the children

<sup>1</sup> In the Trieste area, both standard Italian with Tuscan origins and a Triestino dialect are spoken. However, this dialect differs from standard Italian mainly in some lexical terminology. Although some children have knowledge of certain aspects of Triestino dialect, the Italian-speaking monolingual children in our studies attended schools where only standard Italian was used in instruction and virtually all communication is in standard Italian.

were given vocabulary measures in Italian and Slovenian as appropriate and the CVT.

The Italian version of the Peabody Picture Vocabulary Test (Dunn & Dunn, 2000) was used to test the Italian vocabulary in Italian of the bilingual and Italian monolingual groups. Children were presented with a series of sets of four pictures, each accompanied by a label in the relevant language. They were asked to identify the picture in each set referenced by the accompanying label. Given that there are no measures presently available that are specifically dedicated to testing Slovenian vocabulary, the Italian version of the PPVT was adapted for the Slovenian-speaking children with Slovenian words substituted for Italian target items. Since word frequency and thus word familiarity for referents varies across languages, children's responses to the Slovenian-adapted PPVT should be considered with caution. The bilingual children were tested in Italian for the DN, CS, and the CVT. After having completed the CVT, their vocabulary proficiency on the PPVT was assessed in Italian. Approximately one month later, 17 of the bilingual children available for retesting and, on this occasion, they were assessed for vocabulary on the PPVT in Slovenian.

The DN Task required inhibition of the standard labeling of pictures depicting the sun as 'day', and pictures depicting the moon as *night*, to allow opposite labeling, i.e., a picture of the sun labeled as *night* (Gerstadt, Hong, & Diamond, 1994). A set of two training cards and 16 testing cards was used for this task. Half of these cards displayed a white crescent moon and stars on a black background, and half displayed a yellow sun and white clouds against a light blue background. The experimenter showed each child a card with the moon and said, "We're going to play a funny game. When you see this card I want you to say *day*. She then asked the child to repeat the word 'day.' She continued by showing a card with the sun and saying, "When you see this card I want you to say 'night.'" She then asked the child to repeat the word 'night.' Following this demonstration, the child was shown a card with the sun and asked, "What do you say when you see this card?" The correct response (moon) was praised and the child was given with a card with a moon. A second correct response was met with further praise and testing proper proceeded. If a child got either of the first two trials wrong or failed to respond, these two trials were counted as practice and the child was reminded of the rules and then again presented with a sun card followed by a moon card. If the child responded correctly, these were then counted as trials 1 and 2 of the test phase, and testing continued from there; otherwise these trials were counted as further practice trials and the child reminded of the rules again. The test phase involved presentation of cards in the following pseudorandom order: sun(s), moon (m), m, s, m, s, s, m, m, s, m, s, s, m, s, m. No feedback was given during the testing phase. The total number of correct 'day' or 'night' responses was scored on a 2–16 scale.

The CS task consisted of a child-adapted version of the Wisconsin Card-Sorting Task used by Woolfe, Want, and Siegal (2002) following Cole and Mitchell (2000). This task required inhibition of previous categorizations of stimuli by either shape or color to permit re-categorization on

the alternative dimension. There were 12 test cards to be sorted, 6 pink birds and 6 blue cars, and these were to be placed in one of two boxes: a box labeled with a picture of pink car and a box labeled with a picture of a blue bird. Each set was shuffled prior to testing. Preliminary questioning regarding shape and color labeling was used to establish that the children could distinguish the cards.

In the first test phase, for half of the children in each age and language group, the experimenter told the children that they were going to play a card game in which the object was to sort by shape. Using two sample cards, she asked them to help her put the cards in the correct box: the cars in the box with the (pink) car target card and the birds in the box with the (blue) bird target card. For other half of the children, color was the relevant dimension. Using two sample cards, she asked them to help her put the cards in the correct box: the pink birds in the box with the pink (car) target card and the blue cars in the box with the blue (bird) target card. Then she proceeded to shuffle the 6 test cards (3 blue cars and 3 pink birds) and asked the children to place each in the correct box. She responded to the children without corrective feedback in a neutral, non-evaluative fashion simply saying, "Let's do another one." After the phase was completed, the second phase began with the experimenter saying, "Now we're going to change how we sort them. Now we're going to sort by color (or shape depending on whether the children had sorted in the first phase by shape or color)." The children sorted the remaining 6 cards according to dimension that was not used in the first phase. Again, no corrective feedback was given. A child needed to sort all 6 cards correctly to pass in the first phase and 5 out of 6 to pass on the second phase for which it was necessary to pass the first. Thus children were credited with a score of 2 if both phases were passed, a score of 1 if they passed the first phase but failed the second, and 0 if the first phase was failed.

### 3.2. Results

The CVT, DN, CS, and PPVT scores are shown in Table 2. The level of performance on the CVT in Experiment 2 was very similar to that shown in Experiment 1. Scores on the CVT were analyzed in a 3 (language: Italian vs. Slovenian vs. bilingual)  $\times$  2 (age: 3- to 4-year-olds vs. 4- to 6-year-olds)  $\times$  5 (CVT scales) ANOVA with age group and language group as between-subjects factors and CVT scales as a within-subjects factor. This analysis yielded significant main effects for age group,  $F(1, 116) = 37.65$ ,  $p < .0001$ ,  $\eta^2 = .245$ , language group,  $F(2, 116) = 13.01$ ,  $p < .0001$ ,  $\eta^2 = .183$ , and CVT,  $F(4, 464) = 34.24$ ,  $p < .0001$ ,  $\eta^2 = .228$ . Both the age group  $\times$  language group interaction effect and the age group  $\times$  language group  $\times$  CVT interaction effects were not significant,  $F(2, 116) = 2.72$ ,  $p < .07$ ,  $\eta^2 = .045$ , and  $F < 1$ , respectively. However, there was a significant language  $\times$  CVT interaction effect,  $F(8, 464) = 3.46$ ,  $p < .001$ ,  $\eta^2 = .056$ .

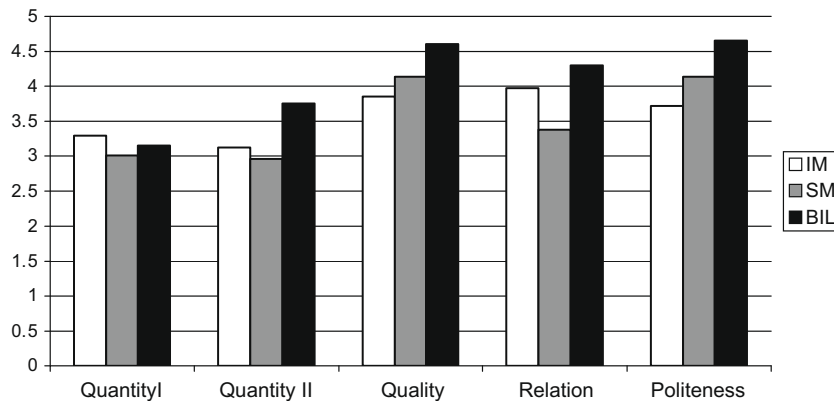
As shown in Fig. 1, this interaction indicated that, as predicted, the bilinguals outperformed Italian monolinguals on Quantity II,  $t(79) = 3.02$ ,  $p < .002$ ,  $\eta^2 = .103$ ; Quality,  $t(79) = 3.87$ ,  $p < .0001$ ,  $\eta^2 = .159$ ; and Politeness,  $t$

**Table 2**

Mean scores and standard deviations (in parentheses) of the Italian monolinguals (IM), Slovenian monolinguals (SM), and bilinguals (BIL) on components of the Conversation Violation Task (CVT), the Day–Night (DN) and Card Sort (CS) tasks in Experiment 2.

Lang.	N	Age group	Mean age	CVT					DN	CS	PPVT
				Quantity I	Quantity II	Quality	Relation	Politeness			
IM	23	3.6–4.6	47.9 (3.45)	2.83 (1.11)	3.09 (0.90)	3.61 (1.12)	3.74 (1.21)	3.43 (1.47)	11.87 (4.36)	1.39 (0.72)	90.87 (10.38)
	20	4.9–6.0	65.8 (4.11)	3.75 (0.91)	3.15 (1.14)	4.10 (0.97)	4.20 (1.01)	4.00 (0.86)	13.00 (3.32)	1.65 (0.59)	92.15 (11.51)
SM	21	3.6–4.5	48.4 (3.63)	2.62 (1.4)	2.62 (0.86)	3.71 (1.01)	2.86 (1.21)	3.52 (1.44)	13.10 (2.86)	1.81 (0.40)	89.76 (11.75)
	20	4.9–6.0	64.8 (4.25)	3.40 (1.31)	3.30 (0.80)	4.55 (0.76)	3.90 (1.01)	4.75 (0.55)	14.65 (2.16)	1.85 (0.37)	91.35 (11.63)
BIL	18	3.9–4.6	49.8 (3.46)	3.00 (0.91)	3.50 (0.98)	4.56 (0.71)	3.94 (0.80)	4.50 (0.79)	12.22 (3.67)	1.61 (0.50)	75.89 (8.31)
	20	4.9–6.0	65.0 (4.70)	3.30 (1.13)	4.00 (0.79)	4.65 (0.60)	4.65 (0.49)	4.80 (0.41)	13.35 (3.22)	2.00 (0.00)	71.40 (4.89)

Note: Maximum scores for the CVT were 5 and for the DN and CS tasks 16 and 2, respectively. PPVT scores are in Italian for the IM and BIL groups and in Slovenian for the SM group.



**Fig. 1.** Mean responses out of a maximum of five of the Italian monolinguals (IM), Slovenian monolinguals (SM), and bilinguals (BIL) on the five CVT components in Experiment 2.

(79) = 4.30,  $p < .0001$ ,  $\eta^2 = .189$  (all one-tailed tests). The difference between the scores of the bilinguals and the Italian monolinguals on Relation was only marginally significant at a one-tailed  $p < .045$  level,  $t(79) = 1.68$ ,  $\eta^2 = .034$ . However, combining scores of the bilingual and Italian monolingual children in Experiment 1 and 2 on Relation yielded a clearly significant difference,  $t(120) = 2.53$ ,  $p < .007$ ,  $\eta^2 = .051$ . Bilinguals also significantly outperformed Slovenian monolinguals on Quantity II,  $t(77) = 3.99$ ,  $p < .0001$ ,  $\eta^2 = .172$ ; Quality,  $t(77) = 2.58$ ,  $p < .006$ ,  $\eta^2 = .079$ ; Relation,  $t(77) = 4.43$ ,  $p < .001$ ,  $\eta^2 = .203$ ; and Politeness,  $t(77) = 2.41$ ,  $p < .009$ ,  $\eta^2 = .070$  (all one-tailed tests). The difference for Quantity I between the bilinguals and either of monolingual groups was not significant,  $t$ 's = 0.57,  $p$ 's  $> 0.30$ ,  $\eta^2 = .002$ .

Using Scheffé tests to examine differences in performance across maxims, we found that, for the bilingual group, scores on either Politeness or Quality were significantly higher than for either Quantity I or II scores,  $p$ 's  $< .0001$ . Relation scores were also significantly higher than either Quantity I scores,  $p < .0001$ , or Quantity II scores,  $p < .05$ . For the Italian monolingual group, Quality were higher than either those on Quantity II,  $p < .05$ , and scores on Relation were higher than for either Quantity I or II,  $p$ 's  $< .05$ . For the Slovenian monolinguals, scores on either Quality or Politeness were significantly higher than for either Quantity I or II,  $p$ 's  $< .0001$ , or Relation,  $p < .05$ .

Based on the total sample of children in two experiments ( $N = 163$ ), the coefficient for internal consistency of the CVT task demonstrated reasonably good reliability, Cronbach's alpha = .64. As the absence of significant differences for Quantity I could point to a comparatively weaker reliability of the items on this component of the CVT, we re-examined internal consistency when the five Quantity I were deleted. The alpha reliability at .63 was almost unchanged.

The DN scores were analyzed in a 2 (age group: 3- to 4- years vs. 4- to 6- years)  $\times$  3 (language group: Italian vs. Slovenian vs. bilingual) ANOVA and yielded a significant age main effect,  $F(1, 116) = 4.35$ ,  $p < .05$ ,  $\eta^2 = .036$ , indicating that the older group outperformed the younger one. There were no significant language group main effect,  $F(2, 116) = 2.06$ ,  $p < .13$ ,  $\eta^2 = .034$ , or age group  $\times$  language group interaction effect,  $F(2, 116) < 1$ .

In view of the absence of variation in the responses of the older children, the CS scores were analyzed non-parametrically. A Kruskal–Wallis Test indicated that there were significant differences among the three language groups,  $\chi^2(2) = 7.96$ ,  $p < .019$ . The bilingual and Slovenian monolingual children scored very similarly. Mann–Whitney Tests indicated that both groups significantly outperformed the Italian monolingual group,  $Z \geq 2.21$ ,  $p \leq .027$ . There were no age differences in the scores of the Italian monolinguals,  $Z = 1.25$ ,  $p = .21$ , or the Slovenian monolinguals,  $Z = 1.25$ ,  $p = .21$ .



uals,  $Z = 0.34$ ,  $p = .73$ . However, in the bilingual group, the older children outperformed the younger children,  $Z = 3.05$ ,  $p = .002$ .

Given the significant language group effect for the CS, we reanalyzed the CVT data using CS as a covariate. A 2 (age group: 3- to 4- years vs. 4- to 6- years)  $\times$  3 (language group: Italian vs. Slovenian vs. bilingual)  $\times$  5 (CVT maxim) ANCOVA with the CS covariate again revealed a significant main effects for age group,  $F(1, 115) = 31.31$ ,  $p < .0001$ ,  $\eta^2 = .214$ , language group,  $F(2, 115) = 12.44$ ,  $p < .0001$ ,  $\eta^2 = .178$ , and CVT,  $F(4, 460) = 3.42$ ,  $p < .01$ ,  $\eta^2 = .029$ . There were significant age group  $\times$  language,  $F(2, 115) = 3.40$ ,  $p < .04$ ,  $\eta^2 = .056$ , and a significant language group  $\times$  CVT interaction effect,  $F(8, 460) = 2.92$ ,  $p < .01$ ,  $\eta^2 = .048$ . This analysis did not change the nature of the significant differences and effect sizes between the bilingual and monolingual groups. Scheffé tests confirmed the differences in performance across maxims at the same level of significance.

As shown in a 2 (age: 3- to 4-year-olds vs. 4- to 6-year-olds)  $\times$  3 (language: Italian vs. Slovenian vs. bilingual) ANOVA on PPVT scores in the language in which they were given the CVT, there was a highly significant difference between language groups,  $F(2, 116) = 38.72$ ,  $p < .0001$ ,  $\eta^2 = .398$ . There were no main or interaction effects involving age,  $F's \leq 1.12$ . The Slovenian–Italian bilinguals were significantly less proficient in Italian than were either the Italian monolinguals in Italian or the Slovenian monolinguals in Slovenian,  $t(79) = 8.73$ ,  $\eta^2 = .491$ , and  $t(77) = 7.82$ ,  $\eta^2 = .443$ , respectively,  $p's < .0001$ . There was no significant difference between the two monolingual groups,  $t < 1$ .

Of the 17 bilingual children who were retested on vocabulary in Slovenian ( $M$  age = 4 years, 8 months,  $SD = 8.4$  months), their mean vocabulary standard score was 88.00 ( $SD = 17.45$ ) compared to 74.35 ( $SD = 7.35$ ) in Italian (L2). The children were significantly more proficient on the Slovenian version than in the Italian version,  $t(16) = 3.86$ ,  $p < .001$ , two-tailed,  $\eta^2 = .219$ . Their performance level in Slovenian was very similar to that on the Slovenian PPVT of the monolingual Slovenian children.

Correlations at the  $p < .01$  level, two-tailed, showed that CVT scores on any of the five scales were not significantly related to PPVT scores for either the bilinguals ( $-.187 \leq r \leq .193$ ,  $p's \geq .025$ ), the Italian monolinguals ( $-.027 \leq r \leq .251$ ,  $p's \geq .010$ ), or the Slovenian monolinguals ( $-.032 \leq r \leq .241$ ,  $p's \geq .13$ , except for scores on the Quality maxim,  $r = .38$ ,  $p > .01$ ).

#### 4. Discussion

The results of our two studies indicate that, despite an L2 vocabulary that is comparatively delayed, bilingual children show a striking advantage in detecting violations of conversational maxims as shown on the CVT measure used in our investigation. The high level of performance of both the monolinguals and bilinguals was above what would be expected by a chance level, but on only one of the five components of the CVT, Quantity I, was there an absence of a significant difference that favored the bilinguals. In this instance, we believe there were unforeseen cultural and con-

textual factors that influenced the children's answers. For example, some children, whether monolingual or bilingual, had difficulty accepting that a bicycle could be an appropriate answer to the question about what a child had received for a birthday present. It may be that neither alternative (present or bicycle) for items such as "What did you get for your birthday?" would necessarily be construed as redundant information if there has been no prior expectation on the part of speaker that a present would normally be received. On the item, "How do you prefer milk?" in which the silly, incorrect answer was "in a cup" rather than the appropriate answer "with biscuits," Slovenian children often assumed that this was a correct response, rather than a silly one, as milk in Slovenia is commonly given to children directly from a bottle. In fact, since it was possible to construe contents where either the target or the alternative makes sense, such items might not necessarily be seen to test recognition of violations of the Quantity maxim. This reservation about the validity of the Quantity I items requires that that more weight be given to the comparisons of performance of the language groups on the other four CVT components.

One explanation for the proficiency of bilingual children on the CVT, apart from performance on Quantity I, is that their EF abilities enable them to consider simultaneously the appropriateness of alternative responses to questions. However, there were no significant differences between the bilinguals and the Slovenian monolinguals on either of the EF measures. Perhaps this may be because many children scored near ceiling and so the particular measures used were not sensitive enough to pick up actual differences. A wider range of measures corresponding to various aspects of EF (Miyake, Friedman, Emerson, Witzki, & Howarter, 2000) might better display differences between monolinguals and bilinguals in detecting maxim violations. The finding that both the bilinguals and the Slovenian monolinguals outperformed the Italian monolinguals is consistent with results that have shown significant cultural differences in children's EF (Sabbagh, Xu, Carlson, Moses, & Lee, 2006).

Another explanation is that there was a bias in the selection of the language groups that favored the bilinguals' performance in detecting violations of maxims, regardless of their access to a second language. It might, for example, be proposed that the Slovenian parents of the bilingual children in view of their decision to send their children to Italian language preschools are more socially sensitive and open to dialogues with others than are the parents of the Slovenian monolingual children. On this basis, it might be predicted that their children would also display more sensitivity to interpersonal communication and thus be better able to detect violations of maxims irrespective of their preschool exposure to Italian. However, this explanation is implausible. As Genesee, Tucker, and Lambert (1975) pointed out many years ago in relation to the situation of English–French bilingualism in Quebec, parents who send their children to second language schools are mostly motivated, not by greater social sensitivity to need to engage in dialogues with speakers of another language, but by "instrumental and Machiavellian reasons, namely, to get better jobs and to have greater control over

monolingual members of the second language group.” This was also the case for the Slovenian parents of the children who enrolled their children in Italian language preschools. In Slovenia, the status of Italian as a minority language is recognized by law, and parents are encouraged to take advantage of Italian language educational facilities.

As a third explanation, it might be proposed that the differences between the bilingual and monolingual groups in our studies were due to SES or cultural differences that favor the performance of bilingual children rather than specifically to access to two languages. The role of SES in producing a bilingual advantage has been studied in relation to EF performance and is complicated by language status and the degree to which bilingual language proficiency is balanced (Carlson & Meltzoff, 2008; Pearson, 2007). Most relevant to the present research are data from Canadian 6- and 7-year-old bilinguals with a similar level of vocabulary in English and French that indicate the bilingual advantage on at least some EF tasks does not emerge when the SES of the bilingual and monolingual groups is controlled (Morton & Harper, 2007). In our investigation, there were no EF differences on either the DN or CS tasks between the monolingual Slovenian and bilingual children. This finding is inconsistent with the interpretation that an SES advantage could explain differences between children in the language groups whom we ensured were recruited from families living in comparable SES areas. Similarly, cultural differences apart from access to language appear unlikely to have influenced the pattern of our results. We note that there are many similarities between people in the areas in which the children in the different language groups were tested that include food and cuisine and work and holiday practices. Historically, from 1815 to 1945, Trieste and the Istrian region of what is now Slovenia were located in the same country: first in the Austrian–Hungarian Empire and then in Italy. This closeness has continued to the present day with use of the euro as the common currency and free Schengen agreement cross-border movement.

A fourth explanation for our findings is that the vocabulary delay in early bilingualism – especially in the weaker language – is accompanied by a specific compensatory mechanism much along the lines of that shown by persons who have become blind at early age in aspects of auditory perception such as pitch discrimination (Gougoux et al., 2004) or by persons born profoundly deaf who show enhanced peripheral visual attention (Dye, Baril, & Bavelier, 2007). Attention and response inhibition are central to bilingualism (Colzato et al., 2008; Costa et al., 2008). Facing difficulties in vocabulary comprehension and possibly also in certain other structural aspects of a weaker language, bilingual children may come to be more attentive than monolinguals to the specific pragmatics of communication and to use this ability to infer speakers' messages. We suggest that flexibility in attention may not be easily tapped by heterogeneous EF measures but may be investigated, for example, with specifically language-based measures of response inhibition similar to Hayling sentence completion items for which the task is to complete a sentence stem with a word that is unconnected to the content of the stem (e.g., Burgess & Shallice, 1996; German & Hehman, 2006). In this respect, attentional flexibility may be

shaped by a language environment in which children who are exposed to more than one language from parents and peers are required to have a wide range of pragmatic knowledge to extract intended meanings and inhibit inappropriate alternatives (Blum-Kulka, 1997). With practice at extracting meaning, bilingual children may gain a specific advantage in rapidly processing the conversational implications of speakers' messages. An issue for further research concerns the extent to which bilingual children's proficiency in the use of pragmatic knowledge is automatized and may free up resources that enable them to close the frequent gap with monolingual children in vocabulary knowledge.

In our studies, the bilinguals clearly had a better knowledge of one language (Slovenian) over the other (Italian). An area in need of further research is to examine how children who have a more balanced grasp of two languages are receptive to maxim violations. Moreover, Italian as a Romance language and Slovenian as a Slavic language have many differences in lexicon and grammar. There is a need to examine whether children who are bilingual in two similar languages such as Italian and Spanish also display an advantage in their conversational understanding over monolinguals. This research agenda promises to lead to a fuller characterization of how bilingualism influences aspects of children's conversational understanding.

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## References

- Bialystok, E. (2001). *Bilingualism in development: Language, literacy, and cognition*. New York: Cambridge University Press.
- Bialystok, E., & Martin, M. (2004). Attention and inhibition in bilingual children: Evidence from the dimensional change card sort task. *Developmental Science*, 7, 325–339.
- Bialystok, E., & Senman, L. (2004). Executive processes in appearance–reality tasks: The role of inhibition of attention and symbolic representation. *Child Development*, 75, 562–579.
- Bloom, P., & Keil, F. C. (2001). Thinking through language. *Mind and Language*, 16, 351–367.
- Blum-Kulka, S. (1997). *Dinner talk: Cultural patterns of sociability and socialization in family discourse*. Mahwah, NJ: Erlbaum.
- Burgess, P. W., & Shallice, T. (1996). Response suppression, initiation and strategy use following frontal lobe lesions. *Neuropsychologia*, 34, 263–273.
- Carlson, S. M., & Meltzoff, A. N. (2008). Bilingual experience and executive functioning in young children. *Developmental Science*, 11, 282–298.
- Carruthers, P. (2002). The cognitive functions of language. *Behavioral and Brain Sciences*, 25, 657–726.
- Cole, K., & Mitchell, P. (2000). Siblings in the development of executive control and a theory of mind. *British Journal of Developmental Psychology*, 18, 279–295.
- Colzato, L. S., Bajo, M. T., van den Wildenberg, W., Paolieri, D., Nieuwenhuis, S., La Heij, W., & Hommel, B. (2008). How does bilingualism improve executive control? A comparison of active and reactive inhibition mechanisms. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 34, 302–312.
- Costa, A., Hernández, M., & Sebastián-Gallés, N. (2008). Bilingualism aids conflict resolution: Evidence from the ANT task. *Cognition*, 106, 59–86.

- Cromdal, J. (1999). Childhood bilingualism and metalinguistic skills: Analysis and control in young Swedish–English bilinguals. *Applied Psycholinguistics*, 20, 1–20.
- Dunn, L. M., & Dunn, L. M. (2000). *Peabody Test di Vocabolario Recettivo*. Torino, Italy: Omega (Adapted by Stella, G., Pizzoli, C., & Tressoldi, P. E.).
- Dye, M. W. G., Baril, D. E., & Bavelier, D. (2007). Which aspects of visual attention are changed by deafness? The case of the Attentional Network Test. *Neuropsychologia*, 45, 1801–1811.
- Extra, G., & Yagmur, K. (2004). *Urban multilingualism in Europe*. Clevedon, UK: Multilingual Matters.
- Genesee, F., Tucker, G. R., & Lambert, W. E. (1975). Communication skills of bilingual children. *Child Development*, 46, 1010–1014.
- German, T. P., & Hehman, J. A. (2006). Representational and executive selection resources in ‘theory of mind’: Evidence from compromised belief-desire reasoning in old age. *Cognition*, 101, 129–152.
- Gerstadt, C., Hong, Y., & Diamond, A. (1994). The relationship between cognition and action: Performance of children 3–7 years old on a Stroop-like day–night task. *Cognition*, 53, 129–153.
- Gougoux, F., Lepore, F., Lassonde, M., Voss, P., Zatorre, R. J., & Belin, P. (2004). Pitch discrimination in the blind. *Nature*, 430, 309.
- Grice, H. P. (1975). Logic and conversation. In P. Cole & J. L. Morgan (Eds.), *Syntax and semantics. Speech acts* (Vol. 3, pp. 41–58). New York: Academic Press.
- Grice, H. P. (1989). *Studies in the way of words*. Cambridge, MA: Harvard University Press.
- Guasti, M. T., Chierchia, G., Crain, S., Foppolo, A., Gualmini, A., & Meroni, L. (2005). Why children and adults sometimes (but not always) compute implicatures. *Language and Cognitive Processes*, 20, 667–696.
- Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., & Howerter, A. (2000). The unity and diversity of executive functions and their contributions to complex “frontal lobe” tasks: A latent variable analysis. *Cognitive Psychology*, 41, 49–100.
- Morton, J. B., & Harper, S. N. (2007). What did Simon say? Revisiting the bilingual advantage. *Developmental Science*, 10, 719–726.
- Papafragou, A., & Musolino, J. (2003). Scalar implicatures: Experiments at the semantics–pragmatics interface. *Cognition*, 86, 253–282.
- Pearson, B. Z. (2007). Social factors in childhood bilingualism in the United States. *Applied Psycholinguistics*, 28, 399–410.
- Romaine, S. (2004). The bilingual and multilingual community. In T. K. Bhatia & W. C. Ritchie (Eds.), *The Handbook of Bilingualism*. Malden, MA: Blackwell.
- Sabbagh, M. A., Xu, F., Carlson, S. M., Moses, L. J., & Lee, K. (2006). The development of executive functioning and theory-of-mind: A comparison of Chinese and U.S. preschoolers. *Psychological Science*, 17, 74–81.
- Siegal, M. (2008). *Marvelous minds: The discovery of what children know*. Oxford: Oxford University Press.
- Siegal, M., Matsuo, A., & Pond, C. (2007). Bilingualism and cognitive development: Evidence from scalar implicatures. In Y. Otsu (Ed.), *Proceedings of the Eighth Tokyo Conference on Psycholinguistics* (pp. 265–280). Tokyo: Hituzi Syobo.
- Siegal, M., & Surian, L. (2004). Conceptual development and conversational understanding. *Trends in Cognitive Sciences*, 8, 534–538.
- Siegal, M., & Surian, L. (2007). Conversational understanding in young children. In E. Hoff & M. Shatz (Eds.), *Blackwell handbook of language development* (pp. 304–323). Oxford: Blackwell.
- Surian, L., Baron-Cohen, S., & van der Lely, H. (1996). Are children with autism deaf to Gricean maxims? *Cognitive Neuropsychiatry*, 1, 55–71.
- Surian, L., & Siegal, M. (2001). Sources of performance on theory of mind tasks in right hemisphere-damaged patients. *Brain and Language*, 78, 224–232.
- Woolfe, T., Want, S. C., & Siegal, M. (2002). Signposts to development: Theory of mind in deaf children. *Child Development*, 73, 768–778.