

How does childhood bilingualism and bi-dialectalism affect the interpretation and processing of implicature?

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Past research has revealed a negative effect of bilingualism on vocabulary proficiency and a positive effect on pragmatics, Theory of Mind, and executive control (see in [1]). Focusing on pragmatics, studies with pre-schoolers reported superior bilingual performance in detecting violations of Gricean maxims and in understanding scalar implicatures (SIs) (see in [1]). A recent study, however, found no differences between older multilingual, bi-dialectal, and monolingual children (6-9 years) in various implicatures (e.g. novel metaphors and SIs) [1].

In this study, we aimed to investigate whether a bilingual advantage might be found for implicatures that have not been previously tested (irony, contrastive implicatures) and whether such an advantage might be evident at the processing level. Based on [1], we hypothesised that there would be no group differences for most implicatures. However, we expected that a bilingual advantage might be found in irony for two reasons. First, irony is the most difficult and late-developing implicature for children [2]. It has been suggested that a bilingual cognitive advantage for older children and young adults might be found only when using very demanding and more sensitive tasks [3]. Second, a previous study reported that bilingual children (like adults) relied more than monolinguals on tone of voice to judge a speaker's emotion, but only when the paralinguistic cue was inconsistent with semantic content (possibly because bilinguals used their superior inhibition to focus on intonation) [4]. This situation resembles irony where intonation indicates a different interpretation than the utterance's literal meaning. Bi-dialectals were tested because (1) it has been suggested that they show smaller language delays than bilinguals due to the close similarity of their dialects (and language affects implicature) [1]; (2) bi-dialectals can be recruited from the same country and schools as monolinguals and, hence, cultural differences between the two groups are minimal (and cannot confound results).

Forty-four bilingual (in Dutch and French; 121-144 months old) and 46 bi-dialectal children from Belgium (in Dutch and West Flemish; 121-155 months old), and 48 Dutch-speaking monolinguals from the Netherlands (ages 121-145 months) were given: (1) a picture-selection task (in Dutch) on implicatures (testing irony, scalar, relevance, manner, contrastive implicatures, and novel metaphors). There were 12 critical and 32 filler items. Accuracy and reaction times (RTs) were recorded. For irony, for instance, children heard conversations ending with an ironic reply (e.g. *Yes, you know how much I like fruits* with an ironic intonation), and had to give the speaker one of three items (one compatible with an ironic, one with a literal interpretation, and one irrelevant). (2) The Word Definitions Test [5] and the Peabody Picture Vocabulary Test (PPVT) [6] for vocabulary. (3) The Family Affluence Scale (FAS) [7] and parental education levels for socioeconomic status (SES). We measured Vocabulary and SES because research suggests that they affect children's cognitive skills (see in [1]).

Percentage accuracy and mean RTs for accurate responses in critical items by implicature and group are presented in table 1. There was sufficient variation in all sub-tests (accuracies from 44% for irony and metaphors-82% for manner) besides relevance (93%). A Principal Component Analysis (PCA) on accuracies in each sub-test (excluding relevance because of ceiling performance) returned three components, with Scalars and Contrastive scores loading on the first factor, Manner and Metaphor scores loading on the second and Irony loading on a third. These results are largely in line with theory and developmental evidence on implicature

in that: (1) implicatures based on the maxim of quantity (scalar and contrastive implicatures) are related; (2) relevance implicatures are the easiest to understand (ceiling performance) with quantity implicatures following; (3) irony is one of the most difficult implicatures for children and is a distinct pragmatic phenomenon [2]. We also formed composite scores by averaging variables that were conceptually and statistically related to increase reliability: Vocabulary (from Word Definitions and PPVT), SES (from FAS, and parental education levels) and two Pragmatics composite scores (based on PCA results). Finally, analyses on background factors indicated differences in age ($F(2, 135)=3.625, p<.05$), SES ($F(2, 135)=80.56, p<.05$), and Vocabulary ($F(2, 135)=9.316, p<.05$), in that bi-dialectals tended to be older than bilinguals ($p=.08$) and monolinguals ($p=.06$); monolinguals had a higher Vocabulary than the other groups ($ps<.05$); and bilinguals had a higher SES than the others, while monolinguals had a higher SES than bi-dialectals ($ps<.05$). Age, SES, and Vocabulary were covaried in subsequent between-group analyses to control for these differences (see [1] that this is a valid use of ANCOVA).

A between-group analysis was conducted on Pragmatics (Pragmatics-1 vs Pragmatics-2, vs Irony) with age, Vocabulary, and SES covaried. Results indicated that neither the Group effect ($F(2, 124)=1.30, p>.05$) nor the Pragmatics x Group interaction ($F(4, 184.776)=.729, p>.05$) were significant. Similar results were obtained when Vocabulary was not covaried. Moreover, we obtained largely null results when performing similar analyses for each sub-test on RTs for correct responses in critical items and on difference scores calculated by subtracting RTs in fillers from RTs for correct responses in critical items (to control for baseline processing speed). Bi-dialectals, however, showed a trend for faster RTs ($ps=.07$) and smaller difference score ($ps=.08$) than bilinguals in Irony (with Vocabulary covaried or not) and significantly faster RTs than monolinguals in scalars (but only when Vocabulary was covaried) ($p<.05$).

Results show no consistent differences between bilingual, bi-dialectal, and monolingual children in implicature. This is true (1) despite bilinguals'/bi-dialectals' lower vocabulary, (2) for both implicature comprehension and processing, and (3) for late-developing implicatures, such as irony. These results suggest that (1) bilinguals'/bi-dialectals' lower language proficiency does not impede their implicature understanding and (2) that implicature comprehension possibly depends on other cognitive skills besides language proficiency. We discuss what these cognitive skills might be and, finally, suggest the possibility that a bilingual advantage is found only in the preschool years, when pragmatic skills are still at a very early stage of development.

	Relevance		Scalars		Contrastive		Manner		Metaphor		Irony	
	A	RTs	A	RTs	A	RTs	A	RTs	A	RTs	A	RTs
Monolinguals	90	2710	80	1949	72	2932	79	3138	50	5166	45	5006
Bilinguals	90	2439	75	1713	60	3483	82	3179	40	5291	42	8228
Bi-dialectals	95	2070	67	1651	57	2904	85	2228	40	4917	45	3457

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