

Running head: QUANTITY AND QUALITY OF LANGUAGE INPUT

To appear in Nicoladis, E. & Montanari, S. (Eds.) (in press). *Lifespan perspectives on bilingualism*. Mouton de Gruyter/APA.

Quantity and quality of language input in bilingual language development

Sharon Unsworth

Radboud University Nijmegen

Quantity and quality of language input in bilingual language development

One of the defining characteristics of bilingual language development is variability, both in terms of individual children's outcomes in their two (or more) languages and in terms of children's language learning experience. Whilst individual variation also exists in monolingual language development, and many of the factors contributing to experiential variation in bilingual contexts such as complexity of maternal speech are also at play in monolingual contexts, there also exist characteristics which are more typical of bilingual language experience. These include, for example, exposure to input from non-native speakers, the variety of speakers providing input in a given language and the existence of multilingual utterances in the input. An increasing body of research from the fields of psychology, linguistics and education has sought to address the extent to which such experiential factors relate to bilingual children's developing language skills. This research is reviewed in the present chapter.

The purpose of this chapter is to provide an overview of the burgeoning literature examining the role of input quantity and input quality on bilingual language development, with an emphasis on the most recent findings. In the present context, bilingual language development is understood in a broad sense and the studies under review here examine language acquisition in simultaneous and successive (or sequential) bilinguals. (For a recent review of the sparse literature on (input effects in) trilingual acquisition, see Unsworth (2013).) Almost all studies concern children between the ages of 2 and 10 years old. The chapter is organized as follows. The first part considers different sources of input in the bilingual child's language environment (following Gathercole, 2014). This section also considers the role of the child's own language output. The second part of the paper reviews studies focusing on and comparing specific linguistic domains, most usually vocabulary and

QUANTITY AND QUALITY OF LANGUAGE INPUT

morphosyntax. Finally, implications of some of these findings are considered for theories of language acquisition and for parenting and education.

Variability in bilingual children's language experience:

Sources of input

Children growing up with more than one language usually obtain their input for each language from different sources. They may have relatively balanced exposure or this may be skewed in favor of one language over the other. In comparison with monolinguals, bilinguals are generally assumed to hear comparatively less input *per language* than their monolingual peers (but cf. De Houwer, 2014). There may be multiple sources of input for a language, or this may be restricted to just one person or place. This section reviews the extant literature for a range of these sources, including home/parents, siblings and peers, native speakers, and (pre)school or daycare.

Home / Parents

Most studies examining the role of input on bilingual language development focus on children not yet at school and for whom home is the most important source of language input. Typically, researchers make use of relative measures, e.g., 70% Spanish / 30% English, based on parental report. These are either direct estimates made by the parents or indirect estimates calculated by the researcher on the basis of detailed parental questionnaires.

Bilingual children are by definition exposed to a language other than the societal (or majority) language at home. In many cases, parents and/or siblings or other family members may provide input in the societal language, too. The extent to which this is the case will of course depend on the family constellation: in the prototypical case of simultaneous bilingual children, each parent speaks his or her own language and one of these is usually – though not necessarily – the societal language, whereas in the case of successive bilingual children, both

QUANTITY AND QUALITY OF LANGUAGE INPUT

parents speak a minority language at home, with the main source(s) of the societal language outside the home, for example at daycare or school. In this latter case, one or both of the parents may choose to speak the societal language at home, too.

The impact of home language use on children's developing language skills has been examined in numerous studies. For example, work by Paradis and colleagues on English/French bilingual children has shown that variation in home language input/use affects children's rate of acquisition of vocabulary and morphosyntax (Paradis, Nicoladis, Crago, & Genesee, 2011). Similar findings have been observed for English/Welsh bilinguals growing up in Wales and Spanish/English bilinguals in the US, amongst others (Gathercole & Thomas, 2009; Oller & Eilers, 2002). There are however also studies where amount of language input at home in the societal language was not found to relate to children's language outcomes, most likely because the parents' proficiency level in that language was so low (Chondrogianni & Marinis, 2011; Goldberg, Paradis, & Crago, 2008).

Interestingly, the impact of amount of societal language use at home may be greater for children's development in the *minority* language. For example, Hoff, Rumiche, Burrige, Ribot, and Welsh (2014) found that in a group of bilingual English/Spanish toddlers growing up in the US, English use at home was a positive predictor of English expressive vocabulary skills for children growing up in 'one parent, one language' families, whereas it was a weak and non-significant predictor of Spanish vocabulary scores. In contrast, in families with two Spanish-speaking parents, English use at home was a weak and non-significant predictor for English vocabulary but a strong *negative* predictor for Spanish vocabulary, in line with earlier findings by Hammer, Davison, Lawrence, and Miccio (2009).

In a series of studies on bilingual English/Welsh children and adults, Gathercole and colleagues have repeatedly shown the impact of minority language use at home both on the rate and end state of acquisition (e.g., Gathercole & Thomas, 2009; Thomas, Williams, Jones,

QUANTITY AND QUALITY OF LANGUAGE INPUT

Davies, & Binks, 2014). In a large-scale survey of family language use in Flanders, Belgium, De Houwer (2007) found that children were most likely to speak both the minority and the societal language when both parents spoke the minority language and at most one parent spoke the societal language at home. In other words, in families where both parents spoke the societal language as well as (or instead of) the home language, children were significantly less likely to speak the minority language. The positive contribution of parental use of the minority language at home to children's development in that language has been observed elsewhere and this seems especially important once children start schooling in the majority language (Dixon, Zhao, Quiroz, & Shin, 2012; Duursma et al., 2007; Willard, Agache, Jäkel, Glück, & Leyendecker, in press). It may not however necessarily guarantee children's continuing minority language development (Sheng, Lu, & Kan, 2011); other social, linguistic and educational factors may be (more) relevant.

Siblings and peers

Parents are of course not the only source of children's language input at home. Anecdotally, older siblings in families where both parents speak the minority language are often reported as the source of increased societal language use within the home. There is to date, however, very little systematic research addressing the influence of siblings on bilingual children's language development (but see Barron-Hauwaert, 2011). In one of the few studies on the topic, Bridges and Hoff (2014) found that Spanish/English bilingual toddlers growing up in the US with older siblings attending English-language school did indeed hear more English input at home – both from their older siblings *and* from their mothers – than children without school-aged siblings. This, in turn, was related to children's reported vocabulary and grammatical complexity scores, with toddlers with school-aged siblings showing more advanced development in English than toddlers without school-aged siblings, and the reverse pattern holding for Spanish. These findings suggest that siblings should not only be seen as

QUANTITY AND QUALITY OF LANGUAGE INPUT

sources of language input themselves but also as potential agents of change in the language use of other family members.

Input from other children is also available from peers in the form of friends and classmates. The limited research available on this topic suggests that peers may be a useful and important source of input in both the home and societal language (e.g., Jia & Fuse, 2007). In the school context, Palermo, Mikulski, Fabes, Hanish, Martin and Stargel (in press) found frequency of peer interaction to be a better predictor of Spanish-speaking preschoolers' receptive and expressive vocabulary in their L2 English than the frequency of teacher interaction.

Native speakers

The discussion thus far has illustrated the clear relationship between the amount of input to which bilingual children are exposed and their rate of acquisition (at least in certain linguistic domains – see below for further discussion). Unlike most monolinguals, bilingual children may hear input from both native and non-native speakers, who in turn may vary in their level of proficiency (Fernald, 2006). Where in the aforementioned studies no relation was found between input quantity and language outcomes (e.g., Paradis, 2011), it was suggested that the low proficiency of the input-providers may be responsible. Similarly, exposure to non-native input has also been put forward as an explanation for bilingual children's apparent fossilization in the acquisition of grammatical gender in Dutch (Cornips & Hulk, 2008). That non-native speakers may be a less effective source of language input than native speakers finds support in a recent study by Place and Hoff (2011; see also Driessen, van der Slik, & De Bot, 2002), who observed proportion of native input to be a significant predictor of bilingual Spanish/English toddlers' vocabulary, even after controlling for input quantity. As the authors note, their data indicate that non-native speech may not support language acquisition as effectively as native speech, but why this should be the case

QUANTITY AND QUALITY OF LANGUAGE INPUT

remains unclear. Furthermore, the more general questions of whether native input should always be preferred over non-native input, and at what level of proficiency non-native speakers should for example be encouraged to provided input in a minority language, remain unanswered. This is clearly an area for future research.

Variety / Richness

The study by Place and Hoff (2011) found that the number of different speakers providing input in English was also a significant predictor of children's vocabulary scores in that language. More specifically, following work on early phonological and lexical learning by Fisher, Church, and Chambers (2004), Richtsmeier, Gerken, Goffman, and Hogan (2009) and Singh (2008; as cited in Place & Hoff, 2011), the authors suggest that exposure to a variety of sources may be necessary "to extract the categories that will support later recognition and production" (p. 1847). It is also possible that an increase in the number of different people providing input in a given language may simply increase the variation in lexical items to which the child is exposed, especially if associated with different contexts, and this may be (part of) what contributes to higher vocabulary scores.

Work by Jia and colleagues (e.g., Jia & Fuse, 2007) on the L2 English of Chinese and Korean children in the US incorporated what is essentially a measure of variety, i.e., number of predominantly L2-speaking friends, in their "richness" variable. Other elements included hours of TV viewing in the L2, number of books read in the L2, and the extent to which the L2 was spoken at home. In a study on the L2 English development of five year olds from a range of L1 backgrounds, Paradis (2011) found that a composite measure using all but the last of these elements was a significant predictor of children's scores on verbal morphology and vocabulary.

School / Preschool / Daycare

QUANTITY AND QUALITY OF LANGUAGE INPUT

The discussion thus far has almost exclusively focused on language input within the home. School, and for younger children, daycare or preschool, are of course other important sources of language input. In fact, for children from homes where only the minority language is spoken, attendance at some kind of childcare or at school may be the main or perhaps even the only contact with the societal language. In the context of bilingual education, school may also be an important source of a different, more academic type of input in the minority language, as well as giving the child the opportunity to meet (more) same-language peers (see Lindholm-Leary, this volume for a review of the literature). The focus here lies on the role of language input provided by teachers to children learning the (pre)school language as a second language.

A limited number of studies have examined the extent to which specific linguistic properties of teacher's speech relate to monolingual children's developing school language skills (e.g., Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002), but there is hardly any research on this question for bilingual children. One exception is a study on the vocabulary growth in preschool children learning English as L2 in a monolingual classroom by Bowers and Vasilyeva (2011). They found that the overall amount of speech produced by teachers was a significant predictor of growth in children's PPVT scores within one school year. The lexical diversity of teacher talk was not related to the children's scores, whereas their MLU showed a negative relation whereby an increase in teachers' number of words per utterance corresponded to a decrease in children's vocabulary growth. Bowers and Vasilyeva explain these results as follows. The positive relation between children's scores and total amount of speech is line with previous research (e.g., Huttenlocher et al., 2002); the negative relation with MLU may reflect the fact that even though these 4-5-year-old children were likely able to hold in memory the longer and complex sentences produced by teachers, these utterances were at this stage of their L2 development still too difficult to deconstruct and this may have

QUANTITY AND QUALITY OF LANGUAGE INPUT

complicated the word learning process. Finally, the failure to find any relation with lexical diversity may also relate to the relatively low proficiency of these L2 children: the teacher's use of more sophisticated vocabulary was likely too advanced and hence unlikely to facilitate lexical growth.

In a similar study, Gámez and Levine (2013) examined impact of the quality of language input provided by teachers in transitional bilingual Spanish/English kindergarten classes on children's L1 Spanish. The results showed that children's gains in expressive language were related to the rate of complexity, i.e., the proportion of Spanish language utterances with more than one clause divided by total number of Spanish language utterances, and number of unique word types in teachers' input. Importantly, this observation held after controlling for total amount of teacher talk and other inter-class differences; in addition, there was no relation between child's level at start of year and measure's of teacher input, providing evidence for the independent effect of teacher input throughout the year. The authors speculate that the difference between their and Bowers and Vasilyeva's (2011) results with respect to the effect of structural complexity may be due to the different way in which each study operationalised this variable, i.e., the use of multi-clause utterances vs. MLU.

Output and other factors

One final factor relating to variability in bilingual children's language experience and the amount of exposure they may hear is their own language output. Whilst input and output are often combined into one language use score (e.g., Bedore et al., 2012), a number of recent studies have suggested that output may be a significant predictor of children's outcomes in its own right. For example, in a study on the early semantic and morphosyntactic development of Spanish/English bilinguals, Bohman, Bedore, Peña, Mendez-Perez, and Gillam (2010) found that output is a significant predictor of both domains in both languages, whereas input was only relevant for both domains in English. The authors suggested that "using a language

QUANTITY AND QUALITY OF LANGUAGE INPUT

(i.e., output) forces the learner to process the language in a way that only hearing it (i.e., input) does not” (p. 339 – see also Sheng et al., 2011 for differential effects of output across languages and age groups). In a study on the acquisition of verbal morphology and vocabulary in English/Dutch bilinguals in the Netherlands between the ages of 3 and 17 years, Unsworth (in prep) also observed that output was a better predictor of children’s scores on the minority language, English in this case, which is in line with earlier findings for heritage language development (Montrul, 2008).

Output/use may also be important simply because it invites more input (as in the input-proficiency-use cycle proposed by Pearson, 2007). A relevant recent study in this context is Ribot and Hoff (2014) who showed that amount of input at home was related to children’s code-switching behavior. More specifically, English/Spanish toddlers (aged 2 ½) who switched to English when speaking Spanish heard more English input at home than children who switched in the other direction or children who evidence limited switching behavior. The reverse was also found to hold. Additionally, children with no asymmetry in code-switching behavior had more balanced input. In short, then, emerging evidence suggests that how much bilingual children use a language may contribute to their overall development in that language in a different way than how much exposure they get, although why exactly this should be the case is not yet completely understood.

There are various other factors which may affect both the quantity and the quality of the input to which bilingual children are exposed and which have been claimed to predict children’s language outcomes. These include factors which are also relevant to monolingual acquisition, such as socio-economic status, usually indexed by maternal education (Hoff, 2006), as well as factors which are characteristic of the bilingual language experience, including the number of input-providers with whom the child exclusively speaks the

QUANTITY AND QUALITY OF LANGUAGE INPUT

language in question (Place & Hoff, 2011) and the amount of mixing in the input (Byers-Heinlein, 2013).

Summary

Most studies investigating the role of input in bilingual language development have focused the effect of varying amounts of exposure within the home and have shown that more input generally leads to quicker rates of acquisition. These effects may however be moderated by the proficiency level of the input-providers and they may differ for the bilingual's two languages. A number of other factors have also been shown to affect bilingual children's language experience and consequently impact upon their development. These include the extent to which children use the language in question themselves, the variety of input sources available to them – either in terms of number of different people or the regularity and extent of language- and literacy-related activities within the home – and the existence of older, school-aged siblings.

Variability in bilingual children's language outcomes:

Input effects across linguistic domains

Children growing up with more than one language vary considerably in their language outcomes (see Quay and Montanari, this volume). The literature reviewed in the first part of this chapter suggests that at least in part, this is likely due to certain characteristics of their language experience which, in turn, lead to variation in both quantity and the quality of the input to which they are exposed. In the second part of this chapter, we examine the relationship between input quantity and quality and language outcomes relate more closely, considering the extent to which input effects holds across different linguistic domains.

Vocabulary

QUANTITY AND QUALITY OF LANGUAGE INPUT

One of the most robust findings concerning differential rates of acquisition as a consequence of variability in bilingual children's language experience is for vocabulary development. The general observation is as follows: when both languages are taken into account, young bilingual children's total vocabularies are comparable to those of their monolingual peers, but when only one language is considered, bilingual children typically show a slower rate of development than children acquiring the same language as their only language (e.g., Marchman, Fernald, & Hurtado, 2010; Patterson, 2004; Pearson, Fernández, & Oller, 1993).

This slower single language growth has been related to the *distributed characteristic* of bilingual knowledge, that is, the fact that bilinguals often acquire and use their languages in different contexts means that their vocabulary is distributed across two languages (Oller, Pearson, & Cobo-Lewis, 2007). Evidence for this claim comes from a recent large-scale study by Bialystok, Luk, Peets, and Yang (2010) employing the widely used Peabody Picture Vocabulary Test (Dunn & Dunn, 2007). Whilst persistent bilingual-monolingual differences were observed across a wide age range (3 to 10 years), separating the words into those which were related to home and those which were related to school revealed a striking difference: the significant bilingual-monolingual difference persisted for the home words, whereas on the school words, the two groups were much more comparable.

Recent studies have however challenged the claim that monolinguals consistently outperform bilinguals in their single language vocabulary development (De Houwer, Bornstein, & Putnick, in press). Smithson, Paradis, and Nicoladis (in press). suggest that the more positive wider sociocultural context and higher status of the home language may account for the differences in their findings for French-English bilinguals in (a French minority context in) Canada when compared with earlier findings other bilingual populations. One further factor which may also contribute to higher vocabulary scores for certain language

QUANTITY AND QUALITY OF LANGUAGE INPUT

combination is the existence of cognates (Stadthagen-González, Gathercole, Pérez-Tattam, & Yavas, 2013).

Bilingual children's rate of vocabulary acquisition is also strongly influenced by variation in amount of exposure (e.g., Scheele et al., 2010). This relationship does not appear to be direct, however. Rather, it has been suggested that once a certain threshold has been reached, more input is not required (Gathercole, 2007). For example, in a study on the vocabulary development of bilingual French-English preschoolers in Montréal, Canada, Thordardottir (2011) observed that on the group level, 40%-60% exposure was enough for the bilingual children to attain comparable scores to their monolingual peers on receptive vocabulary. Interestingly, for productive vocabulary, the threshold was higher, at more than 60%. These findings have since been replicated for younger children growing up bilingually in the UK (Cattani et al., in press, 2014; see also Hoff et al., 2012 for comparable findings)

The studies reviewed thus far investigated how differences in input quantity and quality relate to offline measures of bilingual children's vocabulary development. In a series of recent studies, researchers at Stanford University have explored whether differential input also affects bilingual children's language processing skills. First, in a study on 30-month-old simultaneous bilingual Spanish/English bilinguals, Marchman, Fernald, and Hurtado (2010) found that processing efficiency, as measured by reaction times in a looking-while-listening procedure, was related to vocabulary size, thereby replicating an earlier finding for monolinguals. Subsequently, Hurtado, Grüter, Marchman, and Fernald (2014) examined the relation between relative amount of exposure to both relative vocabulary size and relative processing efficiency in both 30- and 36-month-year olds bilinguals from the same population. The results showed a significant relation between amount of exposure and vocabulary size, on the one hand, and between amount of exposure and processing speed, on the other. Furthermore, processing speed and amount of exposure at 30 months each

QUANTITY AND QUALITY OF LANGUAGE INPUT

predicted unique variance in children's vocabulary scores at 36 months, suggesting that "increased processing efficiency enables children to more effectively take advantage of whatever amount of Spanish they hear to gain expressive vocabulary knowledge in Spanish" (p. 199).

Grammar / Morphosyntax

Properties of bilingual children's bilingual experience, and in particular differential input, have been related to their (rate of) acquisition of a range of morphosyntactic phenomena, including verbal morphology (Blom, 2010; Blom, Paradis, & Sorenson Duncan, 2012; Nicoladis, Palmer, & Marentette, 2007; Paradis et al., 2011), nominal morphology (Thomas et al., 2014), and grammatical gender (Gathercole & Thomas, 2009; Montrul & Potowski, 2007; Unsworth, 2013), as well as more comprehensive assessments of children's grammatical abilities (Chondrogianni & Marinis, 2011; Hoff et al., 2012).

Similar to the findings for vocabulary reported above, Thordardottir (in press) finds evidence for a non-linear relationship between amount of exposure and the acquisition of morphosyntax, that is, children with approximately 50% exposure were indistinguishable from their monolingual peers. Not all measures included in the study were equally sensitive to input effects, however; the diversity of morphemes which children used correctly was particularly sensitive to differences in amount of exposure. Furthermore, input effects differed between languages: whereas MLU was significantly associated with amount of input for English, this was not the case for French. Similar non-linear patterns of association between input quantity and morphosyntactic outcomes have been found for Spanish/English bilingual children (e.g., Bedore et al., 2012) and for English/Dutch bilingual children (Unsworth, in press). In this latter study, on patterns of language dominance, it was observed that children classified as being Dutch-dominant, where dominance was operationalised in

QUANTITY AND QUALITY OF LANGUAGE INPUT

terms of MLUw and number of different verbs, all had at least 65% exposure to that language, whereas exposure levels for balanced children were significantly lower.

Whilst some studies show that – given sufficient input – bilingual children perform comparably with their monolingual peers, others suggest that for certain linguistic properties, and/or in circumstances of limited input, bilingual children may fail to catch up. For example, Thomas (2014) found that in their acquisition of plural morphology in Welsh, children from English-only homes were still struggling with most plural forms at age 11, whereas children from Welsh-only homes were approaching adult norms on some of these at the same age. In fact, even adults who had grown up with Welsh and English from birth were not as accurate in their production of plural morphology as adults who had grown up with Welsh only at home and who had acquired English at a later age. As Thomas notes, these findings suggest that for complex phenomena, such as Welsh plural morphology, exposure from birth seems to be insufficient for complete acquisition to take place as the effects of reduced input appear to be long-lasting (see also Gathercole & Thomas, 2009).

The finding that variation in amount of exposure may affect the acquisition of linguistic properties differently as result of the level of opacity or complexity of that property is in line with other work (Blom et al., 2012; Gathercole, 2002; Paradis, 2010). The claim here is that, as in monolingual acquisition, bilingual acquisition is affected by factors relating such as type/token frequency and the transparency of form-to-function mappings, but as a result of having to split their time across two languages, the impact of (some of) these factors may be greater for bilinguals than monolinguals, at least in the early stages of development.

It is also possible that differences in input quantity may affect aspects of the same target language property differently. In a study on the acquisition of grammatical gender by simultaneous bilingual English/Dutch children, Unsworth (2013) observed input effects for gender-marking on definite determiners, but for gender-marking on adjectives such effects

QUANTITY AND QUALITY OF LANGUAGE INPUT

were absent. This was expected for the following reasons. In Dutch, which has a two-way gender system, distinguishing between common and neuter, the form of the definite determiner is the main source/markings of gender information for any given noun; furthermore, properties of the Dutch grammatical gender system conspire to make the gender of neuter nouns difficult to detect. Therefore, input effects are to be expected. Gender-marking on adjectives, on the other hand, involves the application of a rule. Whilst a certain amount of input will of course be necessary to acquire this rule of gender agreement, once it is acquired, it should be applied consistently, as long as the child knows the gender of the noun in question that is. This means that once children's knowledge of gender attribution is taken into account, input effects on gender agreement should be minimal, and this turned out to be the case.

Unsworth (2013) argued that for phenomena such as gender-marking on definite determiners in Dutch, i.e., properties where considerable input effects are to be expected, bilingual children can better be matched to monolinguals not on chronological age, as is usually the case, but rather on their *cumulative* length of exposure, i.e., the approximate number of years of exposure taking into account variation in amount of exposure from year to year (see Bohman et al., 2010; Gutiérrez-Clellen & Kreiter, 2003; Thordardottir et al., 2006 for similar calculations, albeit used for different purposes). The logic of the argument is as follows: if one wants to address the question of whether reduced input or bilingualism is the relevant predictor of bilingual children's lower accuracy on a given phenomenon, simultaneous bilingual children who are for example 8 years old at time of testing and who have for example heard the target language for on average 75% of their exposure time since birth can better be compared with 6 year old monolinguals than with 8 year old monolinguals. Whilst such a comparison no doubt requires a certain degree of oversimplification, and it inevitably introduces another confound, namely that the

QUANTITY AND QUALITY OF LANGUAGE INPUT

comparison monolingual group will always be younger (Long & Rothman, 2014), it arguably offers a potentially informative dimension to monolingual-bilingual comparisons and the exploration of input effects therein.

Other domains

There are relatively few studies (directly) assessing the role of input in bilingual acquisition from domains other than vocabulary and morphosyntax, and the results are mixed. For example, Bohman et al. (2010) included a measure semantic fluency and they found that both children's input and their output were significant predictors of scores in the home language, Spanish (but not in the societal language, English). Unsworth (2014), on the other hand, investigated the acquisition of direct object scrambling in Dutch in English/Dutch bilinguals and found no effects of input. This was predicted given that the input provides insufficient information concerning the nature of this phenomenon. Similarly, in a study on the narrative abilities of L2 English children in Canada, Paradis and Kirova (2014) found that children who were born in Canada and who were therefore exposed to more English at home and for a longer period of time did not score any differently than children who were born outside of Canada. Possible explanations the authors suggest for this finding is that English exposure for all children came from native speakers, and the two groups did not differ in terms of the richness of their English language environment outside of school. In other words, the comparable *quality* of input for these two groups of children may have compensated for the differences in *quantity* of input.

Finally, a few recent studies have investigated input effects on children's phonological memory, as measured by non-word repetition (NWR) tasks. Thordardottir (2014) found that children's scores on NWR were either not associated or only weakly associated with amount of exposure. She suggests that this is because NWR relies less on knowledge of the language in question in comparison to the ability to understand or produce

QUANTITY AND QUALITY OF LANGUAGE INPUT

real words, for example. These results contrast with findings from Parra, Hoff, and Core (2011), who found that phonological memory (as measured by NWR) not only correlated with amount of exposure in each of their bilingual toddlers two languages, it also mediated the effect of amount of exposure on children's reported vocabulary and grammar scores..

Cross-domain comparisons

We have seen that there is an increasing body of research showing that variation in bilingual children's language experience, in the form of quantitative and qualitative differences between bilingual children and in some cases between bilingual children and their monolingual peers, impacts upon their development in a range of linguistic domains. To date, however, there are relatively few studies examining the effect of differential input across various linguistic domains *within the same* children, yet such cross-domain comparisons are essential if we are to fully understand the nature of these effects and their implications.

As mentioned above, bilingual children's vocabulary knowledge is assumed to take on a *distributed characteristic* and it has been suggested that this may lead to *profile effects* whereby bilingual children's scores on tests of vocabulary will be systematically lower than those testing knowledge which is not tied to a particular context, such as phonics (Oller et al., 2007; Verhoeven, 1994). Some support for the notion of profile effects was found in a study of L1 Turkish children acquiring English by Chondrogianni and Marinis (2011): participants were less accurate on receptive vocabulary and (complex) morphosyntax (articles, passives, *wh*-questions) than on tests of general grammar comprehension and the production of tense-marking morphology. In addition to the distributed characteristic of bilingual vocabulary, Chondrogianni and Marinis suggested that L1 transfer may also play a role in explaining these findings; indeed, L1 transfer (or crosslinguistic influence) is also a factor which needs to be taken into account in considering how bilingual language acquisition interacts with input factors.

QUANTITY AND QUALITY OF LANGUAGE INPUT

In their study on the narrative abilities of L2 English children, Paradis and Kirova (2014) found that children's scores were lower for sub-skills which depended more on specific knowledge of English grammar and vocabulary, e.g., MLU and lexical diversity, than those relating to story grammar, a skill which they argue "could be considered a *shared* as opposed to a *distributed* skill" (p. 343). This study is thus in line with Oller and colleagues' proposal concerning profile effects.

Another set of studies comparing children's performance across a range of linguistic domains focuses not on their scores ('Are children more advanced in one domain vs. another?') but on the existence of input effects ('Are there input effects in one domain vs. another?'). For example, in Thordardottir's (2011; 2014; in press) series of studies on bilingual English/French preschoolers in Montreal, a similar non-linear relationship between amount of exposure and language development was established for both vocabulary and morphosyntax. In their study on Spanish/English toddlers in Florida, Hoff and colleagues (2012) also observed similar patterns in the relationship between rate of acquisition and both vocabulary and grammar scores. Likewise, Paradis (2011) observed that the same input factors, namely length of L2 English exposure and richness of the English environment, emerged as significant predictors of children's scores on vocabulary and verbal morphology.

These findings contrast with those of Unsworth (2014), who compared the acquisition of linguistic properties taken from two different domains, namely gender-marking on definite determiners, a morphosyntactic property of Dutch with a considerable lexical component, (see above) and the acquisition of meaning restrictions on different word orders ('scrambling'), a property involving both compositional semantic and syntactic processes. In short, Unsworth argued that because the information needed to acquire these meaning restrictions is simply unavailable in the input (a 'poverty of the stimulus' problem), differences between bilingual children in terms of amount of exposure should be largely

QUANTITY AND QUALITY OF LANGUAGE INPUT

irrelevant, and hence no input effects are expected. The results were consistent with this prediction: bilingual children with varying degrees of weekly exposure to Dutch acquired the relevant interpretive constraints within the same timeframe as their monolingual peers, unlike gender-marking on definite determiners..

Summary

Faster rates of development in bilingual children have been shown to correlate with relative amount of input, and this has been observed for the acquisition of vocabulary and certain aspects of morphosyntax, most typically verbal morphology. This relationship is however non-linear in nature. Research into input effects in other domains is sparse and the results are mixed. Limited number of studies examining input effects across domains suggest that there are profile effects, that is, children may be comparatively more advanced in one area than another. More research is however needed to establish whether input effects emerge in a similar fashion across domains.

Some implications

This section draws together the findings discussed in this chapter to highlight some of the implication for theories of language acquisition, and for parenting and education.

Theories of language acquisition

Hoff et al. (2012), Paradis (2011) and Thordardottir (in press) all argue that finding similar input effects across different domains is consistent with usage-based or emergentist approaches (e.g., Lieven & Tomasello, 2008). As Paradis (2011, p. 218) notes, what is relevant about these theories in the context of input effects in bilingual acquisition, is the emphasis on input properties as determinants of rate of acquisition, and the assumption that the same learning mechanisms dictate both lexical and morphosyntactic acquisition (see also Gathercole, 2007). The aforementioned findings do indeed align well with the spirit of such

QUANTITY AND QUALITY OF LANGUAGE INPUT

an empiricist approach. To further corroborate such claims, however, more specific predictions are needed about exactly where and when input effects are expected (see Blom et al., 2012 for a recent attempt). Furthermore, as illustrated by Unsworth's (2014) findings, to gain a complete understanding of the interaction between input and bilingual acquisition, studies also need to include properties of language which are either arguably absent from the input or at least highly infrequent, and to compare these to properties such as vocabulary and verbal morphology, for which input effects are easier to account for on any approach.

Indeed, it is worth pointing out that nativist approaches to language acquisition do not claim that there is *no* role for input, nor are they incompatible with the observation that variation in bilingual – or, for that matter, monolingual – children's language experience impacts upon rates of acquisition. Nativist theories such as Universal Grammar are, however, theories about the nature of the linguistic knowledge acquired ('property' theories) rather than how the learner moves from state of knowledge to another ('transition' theories) (Gregg, 1996). In order to capture the largely input-dependent differences in rate of acquisition observed in much of the literature reviewed here, a theory of UG must be combined with some kind of transitional component (e.g., Yang, 2002). Only then can specific predictions be made concerning the precise effect of variation in input quantity and quality on bilingual children's developing linguistic systems.

Parenting and education

Given the large and growing number of children in the world growing up with more than one language, a better understanding of bilingual language acquisition in general, and the effect of certain input properties on this process more in particular, is crucial for educators to successfully support their students' development in both of languages. Given that early language experience, and in particular, school-entry levels of language development, have been shown to predict later academic achievement (see Lindholm-Leary, this volume),

QUANTITY AND QUALITY OF LANGUAGE INPUT

knowing how best to promote language learning in the early years is of critical importance. For example, the results of Place and Hoff's (2011) study suggest that encouraging non-native parents of bilingual toddlers to access (more) native-speaker input and to increase the number of interlocutors providing (native-speaker) input is likely to promote children's societal language development. In addition, encouraging parents, especially those with low proficiency, to speak the societal rather than the minority language to their children is not to be advised (Hammer et al., 2009; Paradis, 2011). Not only is this unlikely to lead to better L2 performance, removing vital input in the home language will decrease the likelihood of children becoming fully-fledged bilinguals, with the consequence that they may miss out on many of the advantages which this entails. Finally, there is some evidence to suggest that teachers should be encouraged to use syntactically complex utterances, i.e., using multiple clauses, and a range of different words (Gámez & Levine, 2013).

Conclusion and future research

Bilingual children's language experience is characterized by variability, as are their language outcomes. The extant literature reviewed in this chapter suggests that the two are clearly related in some meaningful way. This relationship is however complex and its intricacies are far from well understood. Variation in input quantity has been found to impact upon children's rate of acquisition in vocabulary and syntax, although not for all age groups and not in all contexts. In addition, it appears that input beyond a certain level (around 50% to 60%) does not facilitate further development, suggesting that bilingual children are able to achieve as much as monolinguals but with less (Thordardottir, 2011; Thordardottir, in press). This interpretation of the findings provides a positive twist to a debate all too often couched in terms of delay and deviance from the monolingual norm prevalent in most of the countries in which this research takes place.

QUANTITY AND QUALITY OF LANGUAGE INPUT

All input is not equal, however. Recent research has demonstrated the importance of input quality as well as quantity. More specifically, factors such as (more) exposure from native speakers and from a range of different sources have been shown to have a positive impact on children's developing language skills, at least in the early years.

Despite the ongoing thriving research enterprise on the topic, most studies examining the role of input quantity and/or quality in bilingual acquisition are still rather limited in scope. To fully understand this relationship, more comparisons are needed across multiple linguistic domains and across multiple age groups, and these should preferably (at least in part) be longitudinal in nature. Furthermore, the child's complete social network, including siblings and peers, as well as the wider social context needs to be considered. Finally, more sophisticated statistical techniques (e.g., the polynomial fitting procedures used in Thordardottir, 2011 and 2014; the cluster analysis in Cattani et al., in press) as well as more careful consideration of how we quantify input properties (Blom et al., 2012; Grüter et al., 2014) will surely also further out understanding of the array of outstanding issues on this topic.

References

- Bedore, L. M., Pena, E. D., Summers, C. L., Boerger, K. M., Resendiz, M. D., Greene, K., & Gillam, R. B. (2012). The measure matters: Language dominance profiles across measures in Spanish-English bilingual children. *Bilingualism: Language and Cognition*, 616-629.
- Bialystok, E., Luk, G., Peets, K. F., & Yang, S. (2010). Receptive vocabulary differences in monolingual and bilingual children. *Bilingualism: Language and Cognition*, 13, 525-531.

QUANTITY AND QUALITY OF LANGUAGE INPUT

- Blom, E. (2010). Effects of input on the early grammatical development of bilingual children. *International Journal of Bilingualism*, 14, 422-446.
- Blom, E., Paradis, J., & Sorenson Duncan, T. (2012). Effects of input properties, vocabulary size, and L1 on the development of third person singular –s in child L2 English. *Language Learning*, 62, 965-994. doi:10.1111/j.1467-9922.2012.00715.x
- Bohman, T. M., Bedore, L. M., Pena, E. D., Mendez-Perez, A., & Gillam, R. B. (2010). What you hear and what you say: Language performance in Spanish-English bilinguals. *International Journal of Bilingual Education and Bilingualism*, 13, 325-344.
- Bowers, E. P., & Vasilyeva, M. (2011). The relation between teacher input and lexical growth of preschoolers. *Applied Psycholinguistics*, 32, 221-241.
- Bridges, K., & Hoff, E. (2014). Older sibling influences on the language environment and language development of toddlers in bilingual homes. *Applied Psycholinguistics*, 35, 225-241. doi:10.1017/S0142716412000379
- 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, 32-48.
- Cattani, A., Abbot-Smith, K., Farag, R., Krott, A., Arreckx, F., Dennis, I., & Floccia, C. (in press). How much exposure to English is necessary for a bilingual toddler to perform like a monolingual peer in language tests? *International Journal of Language & Communication Disorders*, doi:10.1111/1460-6984.12082
- Chondrogianni, V., & Marinis, T. (2011). Differential effects of internal and external factors on the development of vocabulary, tense morphology and morpho-syntax in successive bilingual children. *Linguistic Approaches to Bilingualism*, 1, 318-342.
- Cornips, L., & Hulk, A. (2008). Factors of success and failure in the acquisition of grammatical gender in Dutch. *Second Language Research*, 28, 267-296.

QUANTITY AND QUALITY OF LANGUAGE INPUT

- De Houwer, A. (2007). Parental language input patterns and children's bilingual use. *Applied Psycholinguistics*, 28, 411-424.
- De Houwer, A. (2014). The absolute frequency of maternal input to bilingual and monolingual children: A first comparison. In T. Grüter, & J. Paradis (Eds.), *Input and experience in bilingual development*. Amsterdam: John Benjamins.
- De Houwer, A., Bornstein, M., & Putnick, D. L. (in press). A bilingual-monolingual comparison of young children's vocabulary size: Evidence from comprehension and production. *Applied Psycholinguistics*, doi:10.1017/S0142716412000744
- Dixon, L. Q., Zhao, J., Quiroz, B. G., & Shin, J. (2012). Home and community factors influencing bilingual children's ethnic language vocabulary development. *International Journal of Bilingualism*, 16, 541-565. doi:10.1177/1367006911429527
- Driessen, G., van der Slik, F., & De Bot, K. (2002). Home language and language proficiency: A large-scale longitudinal study in Dutch primary schools. *Journal of Multilingual and Multicultural Development*, 3, 175-194.
- Dunn, L. M., & Dunn, D. M. (2007). *Peabody picture vocabulary test (PPVT-4)* (Fourth Edition ed.). Minneapolis, USA: Pearson.
- Duursma, E., Romero-Contreras, S., Szuber, A., Proctor, P., Snow, C. E., August, D., & Caldéron, M. (2007). The role of home literacy and language environment on bilinguals' English and Spanish vocabulary development. *Applied Psycholinguistics*, 28, 171-190.
- Fernald, A. (2006). When infants hear two languages: Interpreting research on early speech perception by bilingual children. In E. Hoff, & P. McCardle (Eds.), *Childhood bilingualism. Research on infancy through school age*. (pp. 19-29). Clevedon, UK: Multilingual Matters.

QUANTITY AND QUALITY OF LANGUAGE INPUT

- Gámez, P. B., & Levine, S. C. (2013). Oral language skills of Spanish-speaking English language learners: The impact of high-quality native language exposure. *Applied Psycholinguistics, 34*, 673-696. doi:10.1017/S0142716411000919
- Gathercole, V. C. M. (2002). Command of the mass/count distinction in bilingual and monolingual children: An English morphosyntactic distinction. In D. K. Oller, & R. E. Eilers (Eds.), *Language and literacy in bilingual children* (pp. 175-206). Clevedon: Multilingual Matters.
- Gathercole, V. C. M. (2007). Miami and North Wales, so far and yet so near: Constructivist account of morpho-syntactic development in bilingual children. *International Journal of Bilingual Education and Bilingualism, 10*, 224-246.
- Gathercole, V. C. M. (2014). Bilingualism matters: One size does not fit all. *International Journal of Behavioral Development, 38*, 359-366. doi:10.1177/0165025414531676
- Gathercole, V. C. M., & Thomas, E. M. (2009). Bilingual first-language development: Dominant language takeover, threatened minority language take-up. *Bilingualism: Language and Cognition, 12*, 213-237.
- Goldberg, H., Paradis, J., & Crago, M. (2008). Lexical acquisition over time in minority L1 children learning English as L2. *Applied Psycholinguistics, 29*, 41-65.
- Gregg, K. R. (1996). The logical and developmental problems of second language acquisition. In W. C. Ritchie, & T. K. Bhatia (Eds.), *Handbook of second language acquisition* (pp. 49-81). San Diego: Academic Press.
- Grüter, T., Hurtado, N., Marchman, V., & Fernald, A. (2014). Language exposure and online processing efficiency: Relative versus absolute measures. In T. Grüter, & J. Paradis (Eds.), *Input and experience in bilingual development*. Amsterdam: John Benjamins.
- Gutiérrez-Clellen, V. F., & Kreiter, J. (2003). Understanding child bilingual acquisition using parent and teacher reports. *Applied Psycholinguistics, 24*, 267-288.

QUANTITY AND QUALITY OF LANGUAGE INPUT

- Hammer, C. S., Davison, M. D., Lawrence, F. R., & Miccio, A. W. (2009). The effect of maternal language on bilingual children's vocabulary and emergent literacy development during head start and kindergarten. *Scientific Studies of Reading, 13*, 99-121.
- Hoff, E. (2006). How social contexts support and shape language development. *Developmental Review, 26*, 55-88.
- Hoff, E., Core, C., Place, S., Rumiche, R., Senior, M., & Parra, M. (2012). Dual language exposure and early bilingual development. *Journal of Child Language, 39*, 1-27.
- Hoff, E., Rumiche, R., Burrige, A., Ribot, K., M., & Welsh, S. (2014). Expressive vocabulary development in children from bilingual and monolingual homes: A longitudinal study from two to four years. *Early Childhood Research Quarterly, 29*, 433-444. doi:10.1016/j.ecresq.2014.04.012
- Hurtado, N., Grüter, T., Marchman, V., & Fernald, A. (2014). Relative language exposure, processing efficiency and vocabulary in Spanish–English bilingual toddlers. *Bilingualism: Language and Cognition, 17*, 189-202.
- Huttenlocher, J., Vasilyeva, M., Cymerman, E., & Levine, S. (2002). Language input and child syntax. *Cognitive Psychology, 45*, 337-374.
- Jia, G., & Fuse, A. (2007). Acquisition of English grammatical morphology by native mandarin speaking children and adolescents: Age-related differences. *Journal of Speech, Language and Hearing Research, 50*, 1280-1299.
- Lieven, E. V. M., & Tomasello, M. (2008). Children's first language acquisition from a usage-based perspective. In P. Robinson, & N. Ellis (Eds.), *Handbook of cognitive linguistics and second language acquisition* (pp. 168-196). London: Routledge.
- Long, D., & Rothman, J. (2014). Some caveats to the role of input in the timing of child bilingualism. *Linguistic Approaches to Bilingualism, 4*, 351-356.

QUANTITY AND QUALITY OF LANGUAGE INPUT

- Marchman, V., Fernald, A., & Hurtado, N. (2010). How vocabulary size in two languages relates to efficiency in spoken word recognition by young Spanish-English bilinguals. *Journal of Child Language, 37*, 817-840.
- Montrul, S. A. (2008). *Incomplete acquisition in bilingualism*. Amsterdam: John Benjamins.
- Montrul, S. A., & Potowski, K. (2007). Command of gender agreement in school-age Spanish-English bilingual children. *International Journal of Bilingualism, 11*, 301-328.
- Nicoladis, E., Palmer, A., & Marentette, P. (2007). The role of type and token frequency in using past tense morphemes correctly. *Developmental Science, 10*, 237-254.
- Oller, D. K., & Eilers, R. E. (Eds.). (2002). *Language and literacy in bilingual children*. Clevedon, UK: Multilingual Matters.
- Oller, D. K., Pearson, B. Z., & Cobo-Lewis, A. B. (2007). Profile effects in early bilingual language and literacy. *Applied Psycholinguistics, 28*, 191-230.
- Palermo, F., Mikulski, A. M., Fabes, R. A., Hanish, L. D., Martin, C. L., & Starget, L. E. (in press). English exposure in the home and classroom: Predictions to Spanish-speaking preschoolers' English vocabulary skills. *Applied Psycholinguistics*, doi:10.1017/S0142716412000732
- Paradis, J. (2010). Bilingual children's acquisition of English verb morphology: Effects of language exposure, structure complexity, and task type. *Language Learning, 60*, 651-680.
- Paradis, J. (2011). Individual differences in child English second language acquisition: Comparing child-internal and child-external factors. *Linguistic Approaches to Bilingualism, 1*, 213-237.
- Paradis, J., Nicoladis, E., Crago, M., & Genesee, F. (2011). Bilingual children's acquisition of the past tense: A usage-based approach. *Journal of Child Language, 38*, 544-578.

QUANTITY AND QUALITY OF LANGUAGE INPUT

- Paradis, J., & Kirova, A. (2014). English second-language learners in preschool: Profile effects in their English abilities and the role of home language environment. *International Journal of Behavioral Development, 38*, 342-349.
doi:10.1177/0165025414530630
- Parra, M., Hoff, E., & Core, C. (2011). Relations among language exposure, phonological memory and language development in Spanish-English bilingually developing 2 year olds. *Journal of Experimental Child Psychology, 108*, 113-125.
doi:10.1016/j.jecp.2010.07.011
- Patterson, J. (2004). Comparing bilingual and monolingual toddlers' expressive vocabulary size: Revisiting Rescorla and Archenbach (2002). *Journal of Speech, Language and Hearing Research, 47*, 1213-1217.
- Pearson, B. Z. (2007). Social factors in childhood bilingualism in the united states. *Applied Psycholinguistics, 28*, 399-410.
- Pearson, B. Z., Fernández, S. C., Lewedeg, V., & Oller, D. K. (1997). The relation of input factors to lexical learning by bilingual infants. *Applied Psycholinguistics, 18*, 41-58.
- Pearson, B. Z., Fernández, S. C., & Oller, D. K. (1993). Lexical development in bilingual infants and toddlers: Comparison to monolingual norms. *Language Learning, 43*, 93-120.
- Place, S., & Hoff, E. (2011). Properties of dual language exposure that influence two-year-olds' bilingual proficiency. *Child Development, 82*, 1834-1849.
- Ribot, K., M., & Hoff, E. (2014). "¿Cómo estas?" "I'm good." conversational code-switching is related to profiles of expressive and receptive proficiency in Spanish-English bilingual toddlers. *International Journal of Behavioral Development, 38*, 333-341.
doi:10.1177/0165025414533225

QUANTITY AND QUALITY OF LANGUAGE INPUT

- Scheele, A. F., Leseman, P. P. M., & Mayo, A. Y. (2010). The home language environment of monolingual and bilingual children and their language proficiency. *Applied Psycholinguistics*, *31*, 117-140.
- Sheng, L., Lu, Y., & Kan, P. F. (2011). Lexical development in mandarin-English bilingual children. *Bilingualism: Language and Cognition*, *14*, 579-587.
- Smithson, L., Paradis, J., & Nicoladis, E. (in press). Bilingualism and receptive vocabulary achievement: Could sociocultural context make a difference? *Bilingualism: Language and Cognition*, doi:10.1017/S1366728913000813
- Stadthagen-González, H., Gathercole, V. C. M., Pérez-Tattam, R., & Yavas, F. (2013). Vocabulary assessment of bilingual adults: To cognate or not to cognate. In V. C. M. Gathercole (Ed.), *Solutions for the assessment of bilinguals* (pp. 125-145). Bristol, UK: Multilingual Matters.
- Thomas, E. M., Williams, N., Jones, L. A., Davies, S., & Binks, H. (2014). Acquiring complex structures under minority language conditions: Bilingual acquisition of plural morphology in welsh. *Bilingualism: Language and Cognition*, *17*, 478-494.
doi:10.1017/S1366728913000497
- Thordardottir, E. (2011). The relationship between bilingual exposure and vocabulary development. *International Journal of Bilingualism*, *15*, 426-445.
- Thordardottir, E. (2014). The typical development of simultaneous bilinguals: Vocabulary, morphosyntax and language processing in two age groups of Montreal preschoolers. In T. Grüter, & J. Paradis (Eds.), *Input and experience in bilingual development*. Amsterdam: John Benjamins.
- Thordardottir, E. (in press). The relationship between bilingual exposure and morphosyntactic development. *International Journal of Speech-Language Pathology*, doi:10.3109/17549507.2014.923509

QUANTITY AND QUALITY OF LANGUAGE INPUT

- Thordardottir, E., Rothernberg, A., Rivard, M. E., & Naves, R. (2006). Bilingual assessment: Can overall proficiency be estimated from separate measurement of two languages? *Journal of Multilingual Communication Disorders*, 4, 1-21.
doi:10.1177/1367006911403202
- Unsworth, S. (2013). Assessing the role of current and *cumulative* exposure in simultaneous bilingual acquisition: The case of Dutch gender. *Bilingualism: Language and Cognition*, 16, 86-110.
- Unsworth, S. (2013). Current issues in multiple first language acquisition. *Annual Review of Applied Linguistics*, 33, 21-50.
- Unsworth, S. (2014). Comparing the role of input in bilingual acquisition across domains. In T. Grüter, & J. Paradis (Eds.), *Input and experience in bilingual development*. Amsterdam: John Benjamins.
- Unsworth, S. (in press). Amount of exposure as a proxy for dominance in bilingual language acquisition. In C. Silva-Corvalan, & J. Treffers-Daller (Eds.), *Language dominance in bilinguals: Issues of measurement and operationalization*. Cambridge: Cambridge University Press.
- Verhoeven, L. (1994). Transfer in bilingual development: The linguistic interdependence hypothesis revisited. *Language Learning*, 44, 381-415.
- Willard, J. A., Agache, A., Jäkel, J., Glück, C. W., & Leyendecker, B. (in press). Family factors predicting vocabulary in Turkish as a heritage language. *Applied Psycholinguistics*, doi:10.1017/S0142716413000544
- Yang, C. (2002). *Knowledge and learning in natural language*. Oxford: Oxford University Press.