

# Environmental Factors and Sentence Complexity in Child Second Language Acquisition

Susan Logue, Christina Sevdali, Raffaella Folli, and Juliana Gerard

## 1. Introduction

Variability in the linguistic proficiency of bilinguals is often associated with differences in exposure to the target language (Gathercole, 2014; Unsworth, 2016). The characteristic variation of environmental factors in child second language (L2) acquisition makes this population ideal for investigating how external components affect language learning (Paradis & Grüter, 2014). Research on input effects in child L2 acquisition often comprise quantitative, qualitative, and distal aspects of exposure. Previous studies investigating the effects of environmental factors in the morphosyntactic domain for child L2 learners have mostly focused on investigation of production of a number of complex structures (e.g. Armon-Lotem et al., 2011; Paradis & Kirova, 2014; Paradis et al., 2017; Unsworth, 2014; 2016). In the present study, we investigate the comprehension of L2 sentence structures ranging in complexity (active and passive voice, and subject and object relative clauses), and how their interpretation by child L2 learners is impacted by a number of environmental factors (length of L2 exposure; L2 language use at home; richness of the L2 environment; maternal education; and maternal L2 proficiency).

*Length of exposure* in L2 acquisition refers to the amount of time the individual has been exposed to the target language and is traditionally measured in years or months by taking age of first meaningful exposure to the L2 from the child's chronological age (Roesch & Chondrogianni, 2016; Unsworth, 2016). In child L2 acquisition, and where the child is of pre-school age, significant and consistent exposure (also referred to as meaningful exposure) typically occurs on commencing nursery or primary school (Paradis, 2011). Previous research focusing on the effect of length of L2 exposure and sentence structures has revealed both positive (e.g. Paradis et al., 2017) and negative (e.g. Unsworth, 2016) effects.

*L2 language use at home* comprises a fine grained measure of quantitative language input which involves the calculation of detailed L2 exposure time and use, to allow a more comprehensive representation of the individual's L2 exposure (Paradis, 2011). Fine grained measures are typically evaluated through

---

\* Susan Logue, Ulster University, logue-s17@ulster.ac.uk. Christina Sevdali, Ulster University. c.sevdali@ulster.ac.uk. Raffaella Folli, Ulster University, r.folli@ulster.ac.uk. Juliana Gerard, Ulster University, j.gerard@ulster.ac.uk.

the use of parent questionnaires asking parents to rate frequency of daily L2 exposure across settings (e.g. Chondrogianni & Marinis, 2011; Jia & Aaronson, 2003; Jia & Fuse, 2007; Paradis, 2011; Unsworth, 2014, 2016). More fine grained measures of input generally show no effects on proficiency of sentences including two clause structures (Paradis and Kirova, 2014; Paradis et al., 2017), passives (Armon-Lotem-Lotem et al., 2011; Chondrogianni & Marinis, 2011), and object scrambling (Unsworth, 2016), while other studies (Roesch & Chondrogianni, 2016; Chondrogianni & Marinis, 2011) have found correlations for accuracy of wh-questions.

*Richness of the L2 environment* is a qualitative input factor referring to the richness of the individual's L2 exposure time which can include engagement in L2 activities such as reading, watching TV, and play or social activities (Jia & Fuse, 2007; Paradis, 2011; Paradis & Kirova; 2014; Paradis et al., 2017). Qualitative factors, measured through the use of parent questionnaires, can include asking parents to indicate how often their child attends social or afterschool activities in the L2, or to rate the language spoken between the child and the friends they regularly play with. Studies including this factor have found it impacts accuracy of morphology (e.g. Jia & Fuse, 2007; Paradis, 2011) and sentence structures (Paradis & Kirova; 2014; Paradis et al., 2017).

*Distal input factors* impact the situational context in which input is provided and can include maternal educational attainment and level of L2 proficiency (Hoff, 2006; Sorenson Duncan & Paradis, 2018). Research investigating *maternal education* demonstrate mixed findings with some studies showing no impact on linguistic scores (Armon-Lotem et al., 2011; Paradis et al., 2017), whereas others do find an effect (Bohman et al., 2010; Sorenson Duncan & Paradis, 2018). However, it is noted that the impact of maternal education demonstrates a complex picture in which its effect can depend on whether the mother's education was completed in the L1 or L2, with findings indicating that L2 children's productive use of complex sentences is positively influenced by mothers educated in the L2 (e.g. Sorenson Duncan & Paradis, 2018). *Maternal L2 proficiency* may vary considerably as some mothers may be in the early stages of acquiring the L2, while others who emigrate for employment or study opportunities may have quite high levels of fluency. It seems intuitive that the better a mother's proficiency in the L2, the more successful they will be in expressing and demonstrating the L2 to their child (Sorenson Duncan & Paradis, 2018). Previous research has revealed a positive association between higher levels of maternal L2 proficiency and greater acquisition of sentence structures (e.g. Chondrogianni & Marinis, 2011; Hammer et al., 2012; Sorenson Duncan & Paradis, 2018).

For the present study, we investigate comprehension of sentence structures ranging in complexity to allow us to investigate how correlations between input and interpretation of sentence structures may be affected by the simplicity or complexity of the sentence construction. This range of complexity is reflected in the different number of components and relationships between components within each structure and its impact on acquisition. While children have few difficulties acquiring sentences with canonical word order (Guasti, 2016), e.g.:

- (1) Active voice: The dog chased the cat (canonical word order)
- (2) Subject relative clauses: The dog that chased the cat (canonical word order and embedding),

more difficulties are found with structures containing non-canonical word order and additional clauses or phrases (e.g. Corr ea, 1982, 1995; de Villiers et al, 1979; Sheldon, 1974; Slobin & Bever, 1982; Tavakolian, 1981), e.g.:

- (3) Passive voice: The cat was chased by the dog (non-canonical word order and by-phrase)
- (4) Object relative clauses: The cat that the dog chased (non-canonical word order and embedding)

Difficulties with more complex structures have been attributed to saliency of structures in the input (e.g. Bybee, 1985; Langacker 1988), and the occurrence of intervening properties (Grillo, 2009; Friedmann et al., 2009) or long distance dependencies (Riches et al., 2010) within the structure, all of which may put more burden on computational processing thus affecting comprehension accuracy (e.g. Chen et al., 2005; Just & Carpenter, 1992; King & Just, 1991; MacDonald & Christiansen, 2002).

The current study aims to further research in the domain of child L2 acquisition by focusing on identified influential environmental variables (length of L2 exposure, L2 language use and input at home, richness of the L2 environment, maternal education, and maternal L2 proficiency) and investigating their correlation with the comprehension of sentences ranging in complexity by Arabic-speaking children acquiring L2 English.

## **2. The study**

### **2.1. Research questions**

The current study looks to address the following questions:

1. Do environmental factors correlate with comprehension of sentence structures in child L2 acquisition?
2. Which type of sentence structures (simple to complex) are correlated with the target environmental factors?

To address these questions, we used two measures: a parent questionnaire measuring five environmental factors (length of L2 exposure, L2 language use at home, richness of the L2 environment, socio-economic status, and maternal L2 proficiency), and a colouring task to measure interpretation of four sentence structures ranging in complexity (active voice, passive voice, subject relative clauses, and object relative clauses).

## 2.2. Method

### 2.2.1. Participants

The child L2 participants were Arabic-speaking children attending primary school in Belfast, Northern Ireland, aged 5;0 – 12;4 (mean = 8;1, N = 43). Monolingual English-speaking participants aged 5;0 – 11;0 (mean = 8;1, N = 38) also took part in the study. Each primary school used English as the language of instruction and followed the Northern Ireland curriculum. Participants were all typically developing in relation to language acquisition, cognition, and hearing, as indicated by the schools. Most child L2 participants were born outside of Northern Ireland and had emigrated from Arabic-speaking countries. Each was reported to have begun meaningful (significant and consistent) exposure to English on commencing a nursery facility or primary school. All participants spoke Arabic as a first language, and this was the main language spoken at home. Participants, or their parents, originated from thirteen different Arabic-speaking countries, with the majority of subjects from Syria, Sudan, and Jordan.

### 2.2.2. Procedures

#### *Parent questionnaire.*

A parent questionnaire, adapted from the Alberta Language Environment Questionnaire (ALEQ; Paradis, 2011; Paradis, n.d.), was used to obtain a comprehensive representation of participant demographics and environmental language factors. The questionnaire was translated to Modern Standard Arabic (by a native Arabic speaker) and given to participants' mothers to complete. In the questionnaire we measured the environmental factors as follows:

- *length of exposure* was calculated by taking age of first meaningful (i.e. consistent and significant) exposure to the L2 from the child's chronological age (e.g. current age = 8, age of first L2 exposure = 3 years old, length of exposure = 5 years);
- *language use at home* was measured by asking parents to rate the use of the L2 at home by each household member (including both adults and siblings, if applicable) to the child, and from the child to each household member, by choosing a score from a 5-point rating scale (1 = Mother tongue always/English never, 2 = Mother tongue usually/English seldom, 3 = Mother tongue 50%/English 50%, 4 = Mother tongue seldom/English usually, 5 = Mother tongue almost never/English almost always);
- *richness of the L2 environment* was measured by asking the mother to indicate how often the child engages in social/extracurricular activities with the L2 as the language of instruction (0 = Almost never/Never, 1 = At least once a week, 2 = Everyday), and rate the language spoken between the child and the friends they regularly play with, using a 5-

point rating scale (1 = Mother tongue always/English never, 2 = Mother tongue usually/English seldom, 3 = Mother tongue 50%/English 50%, 4 = Mother tongue seldom/English usually, 5 = Mother tongue almost never/English almost always);

- *maternal education* was calculated in terms of the highest qualification obtained using a 6-point rating scale (1 = Primary education, 2 = Secondary education, 3 = Higher Educational Institution, 4 = Undergraduate degree, 5 = Masters, 6 = PhD); and finally,
- *maternal L2 proficiency* was measured by asking the mothers to rate their fluency in English using a 5-point rating scale (1 = No understanding/ speaking ability, 2 = Some understanding and can say short, simple sentences, 3 = Good understanding and can express myself on many topics, 4 = Can understand and use English adequately for work and most other situations, 5 = Can understand almost everything/very comfortable expressing myself in English in all situations).

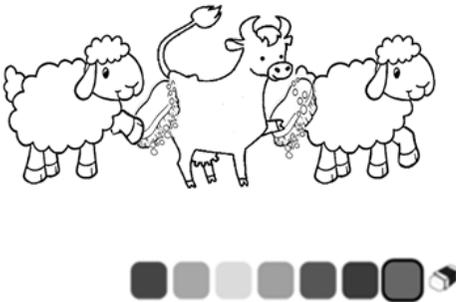
#### *The Coloring book task.*

To measure comprehension of target sentence structures, we used The Coloring Book Task (Pinto & Zuckerman, 2018). This task is a digital colouring paradigm completed on a touchscreen PC which assesses participants' comprehension of target structures by way of colouring in characters in the context according to the sentence they hear (Gerard, 2016; Zuckerman et al., 2015; Pinto & Zuckerman, 2018). The experimental design uses a simple and interactive format to reduce processing costs and encourage engagement throughout the task. The Coloring Book's computerised application can be formatted to include specific designs in which children indicate their grammatical interpretations by colouring in one of the characters in the context (Zuckerman et al., 2015). Participants were shown a black and white image on a touchscreen laptop consisting of three animal characters performing the same action on each other (Figure 1). In the sentence stimuli, one character is the agent (doing the action) and one is the patient (receiving the action). Children reveal their grammatical interpretations by colouring one character (choosing from an array of coloured squares below the characters) according to the sentence heard. A randomised 2 x 2 sentence design for each set of structures (active/passive, subject/object relative clauses) was used with 8 items for all conditions. Test items were alternated with fillers (16 per set), which comprised simple present tense sentences with an inanimate argument. Each sentence included a preamble describing the animal characters and requesting the participant to choose a colour, e.g.: "Ok, so in this picture there's a sheep, a cow, and another sheep. Let's choose a colour now". Examples of each sentence type are shown in Table 1. Figure 1 illustrates the picture that would accompany the sample target sentences in Table 1. The fillers also acted as control sentences. If participants did not respond at ceiling (75% correct) for controls, their data were

excluded from the analysis. Each participant's colouring task was video recorded so that screenshots of answers could be checked and scored. Data collection was administered over seven months by a native English-speaking member of the research team. Sessions took place at the participant's school during school hours and normally lasted between 25 to 30 minutes.

**Table 1. Sample sentences from the colouring task**

Condition	Example
1. Active voice	The cow washed the <colour> sheep.
2. Passive voice	The cow was washed by the <colour> sheep.
3. Subject relative clause	Something here is <colour>. Oh look, it's the sheep that washed the cow.
4. Object relative clause	Something here is <colour>. Oh look, it's the sheep that the cow washed.
5. Filler	Something here is <colour>. Oh look, it drives a bus.



**Figure 1. Sample item from colouring task**

### 3. Results

#### *Scoring.*

Children's accuracy in the colouring task (The coloring book task; Pinto & Zuckerman, 2018), was scored by calculating the mean for each condition over the 8 trials, which was then tallied and converted to a percentage score. The scores for the environmental input variables included different scoring methods: *length of exposure* was calculated in months; the score for *language use at home* was determined by first summing the scores for the relevant answers and taking this away from the number of scores x 4 to give a proportional score ranging

from 0.00-2.00; similarly, *richness of the L2 environment* was calculated by summing the scores for relevant answers and taking this away from the overall number of scores to give a proportional score between 0.00-1.00; both *maternal education* and *maternal L2 proficiency* were scored by way of rating scales between 1.00-5.00, and 1.00-6.00, respectively.

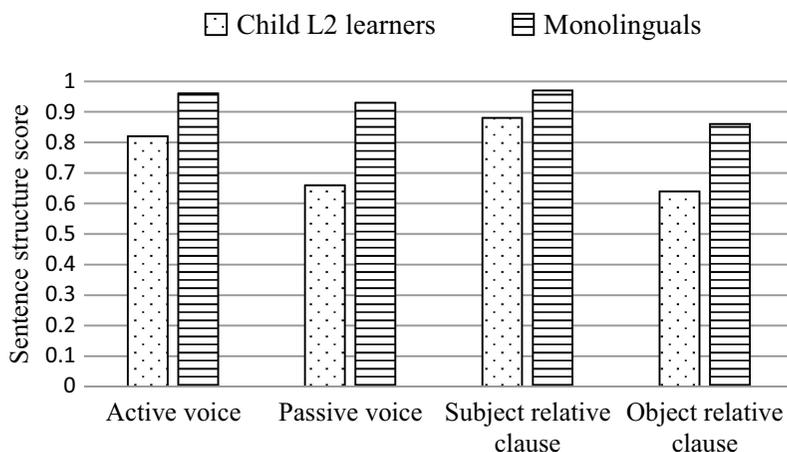
**Table 2. Summary of mean, SD, ranges, and descriptions of scores for environmental factors.**

Environmental factor	Mean	SD	Range/Description
Length of exposure	3;5 (42.93 months)	2;1 (25.83 months)	0;6 – 10;6 (0.6 – 128 months)
Language use at home	0.65	0.30	0.25 – 1.91 (scale= 0-2)
Richness of L2 environment	0.75	0.17	0.29 – 1.00 (scale= 0-1)
Maternal education	0.37	0.14	1.0 – 6.0 (scale = 1-6)
Maternal L2 proficiency	0.36	0.13	1.0 – 5.0 (scale = 1-5)

L2 = second language

*Descriptive statistics: target sentence structures.*

Participant averages from the colouring task on interpretation of target sentence structures showed that the child L2 learners demonstrated a high ability in interpreting the simpler sentence structures (active voice = 82%, subject relative clauses = 88%), and lower ability in interpretation of the more complex sentences structures (passive voice = 66%, object relative clauses = 64%). Contrasting these results with the age-matched monolingual controls demonstrates the difficulties child L2 learners had in interpretation of complex sentence structures as monolinguals showed a high ability across all structures (active voice = 96%, passive voice = 93%, subject relative clauses = 97%, object relative clauses = 86%). Figure 2 presents mean raw score results for the colouring task in relation to the child L2 learners and age-matched monolingual participants.



**Figure 2. Mean accuracy scores for target sentence structures (Colouring task) for child L2 and monolingual participants.**

*Correlation between target sentence structures and environmental factors.*

**Table 4. Correlation matrix of sentence structures and environmental factors.**

	r values								
	Active	Passive	Subject RC	Object RC	LoE	Lang use	L2 richness	Maternal educ	Maternal L2
Active	0.000	0.509	0.387	0.484	0.101	0.170	0.516	-0.028	-0.035
Passive	0.000	0.000	0.509	0.550	0.250	0.205	0.324	0.107	0.168
Subject RC	0.010	0.000	0.000	0.370	0.208	-0.006	0.165	-0.210	-0.110
Object RC	0.001	0.000	0.014	0.000	0.349	0.102	0.291	0.021	0.011
LOE	0.521	0.107	0.181	0.022	0.000	0.521	0.189	0.342	0.401
Lang use	0.275	0.187	0.968	0.514	0.000	0.000	0.438	0.380	0.499
L2 Richness	0.001	0.034	0.291	0.058	0.226	0.003	0.000	0.131	0.198
Maternal educ	0.860	0.495	0.176	0.894	0.025	0.012	0.401	0.000	0.753
Maternal L2	0.821	0.281	0.481	0.945	0.008	0.001	0.203	0.000	0.000
	p values								

L2 = second language; L2 richness = richness of second language environment; Lang use = second language use at home; LOE = length of exposure; Maternal educ = maternal level of education; Maternal L2 = maternal second language proficiency

In order to answer our research questions, we ran a correlation analysis to calculate the correlation coefficients ( $r$  value) and significance ( $p$  value) between participant averages for scores on accuracy of interpretation of target sentence structures and environmental factors. A correlation matrix of the coefficient and significance levels between variables is shown in Table 4. The analysis revealed a number of relationships between target factors.

Firstly, correlations between length of exposure and interpretation of sentence structures show positive trends across structures however, this is weak for active voice, slightly stronger for subject relative clauses and passive voice but much more robust for object relative clauses which indicated a significant correlation.

Language use at home revealed a slight positive correlation with interpretation of active voice, passive voice and object relative clauses however, none were significant. Moreover, a negative relationship was demonstrated between this factor and subject relative clauses.

The correlation coefficient for the richness of L2 environment revealed a positive trend for all structures with significance found for active and passive voice while a marginal correlation was found for object relative clauses.

Maternal education had a very weak association with passive voice and object relative clauses and a clear negative association with both active voice and subject relative clauses.

Results for maternal L2 proficiency showed a similar pattern with very weak associations revealed for passive voice and object relative clauses but negative associations with active voice and subject relative clauses. Thus, maternal education and maternal L2 proficiency were not significantly correlated to greater interpretation of any of the target sentence structures.

#### **4. Discussion and Conclusion**

The objective of this study was to investigate the correlation between environmental input factors and comprehension of sentence structures ranging in complexity in child L2 acquisition. We used two measures: a parent questionnaire to gather information on environmental input factors (length of exposure, L2 language use at home, richness of the L2 environment, maternal education, and maternal L2 proficiency); and a colouring task to measure interpretation of sentence structures ranging in complexity (active and passive voice, and subject and object relative clauses). A correlation analysis was used to calculate correlation coefficients and significance between the mean scores of environmental factors and sentence structures to address two research questions. One research question asked if the target environmental factors were correlated with understanding of sentence structures ranging in complexity in child L2 acquisition. Another research question asked which type of sentence structure (simple to complex) is correlated with the target environmental factors.

The results show a number of correlations across factors. Firstly, it should be noted that  $p$  values for correlations between environmental variables themselves demonstrate several significant relationships: length of exposure,

maternal education and maternal L2 proficiency correlate with all other input factors with the exception of richness of the L2 environment; while language use at home correlates with all input factors.

Correlations between environmental factors and target sentence structures reveal length of exposure to be significantly correlated with object relative clauses however, as this input factor is also correlated with most other input variables this result must be treated with caution. Richness of L2 environment was significantly correlated with active and passive voice, while a marginal effect was revealed for object relative clauses. Although there was not a significant correlation found for subject relative clauses, a positive trend was shown between this structure and factor. This result suggests that a child's L2 exposure from social activities and peers is associated with greater interpretation of some simpler sentences, and more complex structures involving non-canonical word order and additional phrases or clauses. This finding may indicate that these experiences which allow purposeful and naturalistic exposure to language in play-based settings, are providing children with rich opportunities to hear and use the target sentence structures. Moreover, as these activities are carried out in the L2, they may include engagement with native or highly proficient L2 speakers of the target language who may be providing valuable modelling of structures. Future research investigating the types of speakers L2 children engage with in these settings, the linguistic structures used between individuals, and the specific types of social activities engaged in, can provide greater understanding of how L2 richness impacts L2 children's understanding of sentence structures.

Furthermore, richness of L2 environment was significantly correlated with language use at home. This may indicate that being engaged in play and social activities in the L2 positively influences the individual's L2 use in the home environment. As measurement of language use at home included both the child's L2 output and input at home, future research measuring these factors separately may provide further insight on this association.

Language use at home was not associated with any language measure, a finding which supports most other research in this domain which has found that fine grained measures of input are not associated with acquisition of sentence structures including passives (e.g. Armon-Lotem et al., 2011; Chondrogianni & Marinis, 2011), embedded clauses (Paradis and Kirova, 2014; Paradis et al., 2017), and object scrambling (Unsworth, 2016). This result may indicate a negligible influence of L2 use at home on linguistic development which previous research has attributed to the diminished quality of the L2 language the individual receives from non-native speakers such as siblings and parents (e.g. Hammer et al., 2012; Hoff et al., 2014; Place & Hoff, 2011). However, again, as this factor includes two measures of language use at home (input and output) it is difficult to know which type is influencing this correlation with target structures.

Both maternal education and maternal L2 proficiency did not correlate significantly with any language measure. This finding for maternal education both supports (e.g. Armon et al., 2011) and contrasts (e.g. Bohman et al., 2010;

Paradis et al, 2017; Sorenson Duncan & Paradis, 2018) previous research. However, as indicated in Sorenson Duncan & Paradis (2018), the impact of maternal education may depend on whether the mother's education was completed in the L1 or L2, as a positive association has been found between the child's L2 language skills and the L2 proficiency of mothers who received their education in the L2. For the current study, it was noted that mothers of child participants were a mix of refugees and those completing either their Masters or PhDs at universities in Northern Ireland, which may mean that the mothers' English language abilities were mixed. However, as the language of the mother's education was not included as a measure in the current study, it is not known if this has impacted the findings for this factor. In relation to maternal L2 proficiency, it would appear intuitive that the mother's L2 fluency would have a positive impact on the child's language abilities (e.g. through modelling) however, this was not revealed in the current study. This finding contrasts with previous research which has suggested that higher maternal L2 proficiency is related to better morphosyntactic development (e.g. Chondrogianni & Marinis, 2011, Paradis, 2011, Sorenson Duncan & Paradis, 2018). However, it may be that more comprehensive measurements of maternal L2 proficiency (e.g. using a proficiency test score) could provide more accurate results for this factor and its impact on target structures.

Another point to consider is the collinearity present between most input factors in the present study. This may indicate that research which has included some but not all of the factors measured, and found effects for language phenomena, may be attributing findings to the wrong factor. In addition, a number of internal factors (e.g. age, memory) may also be impacting the target linguistic phenomena which needs to be accounted for in future research.

In conclusion, further research is needed to explore the role of qualitative L2 influences such as richness of the L2 environment (e.g. L2 play and social activities) and the quality of language use at home (e.g. from non-native speaking siblings and adults), which could include more nuanced evaluations of factors, to allow further insight on their impact on linguistic proficiency in child L2 acquisition. Furthermore, the inclusion of additional types of factors (a range of internal and external) may help to account for and disentangle the causal factors in this domain.

## References

- Armon-Lotem, Sharon, Walters, Joel, Gagarina, Natalia. (2011). The impact of internal and external factors on linguistic performance in the home language and in L2 among Russian-Hebrew and Russian-German preschool children. *Linguistic Approaches to Bilingualism*, 1 (3), 291–317.
- Bohman TM, Bedore LM, Peña ED, Mendez-Perez A, Gillam RB. (2010). What you hear and what you say: Language performance in Spanish-English bilinguals. *International Journal of Bilingual Education and Bilingualism*, 13, 325–344.
- Blom Elma. (2010). Effects of input on the early grammatical development of bilingual children. *International Journal of Bilingualism*, 14, 422–446.
- Bybee, Joan, L. (1985). *Morphology*, Amsterdam: John Benjamins.

- Chen, Evan, Gibson, Edward, & Wolf, Florian. (2005). Online syntactic storage costs in sentence comprehension. *Journal of Memory and Language*, 52, 144–69.
- Chondrogianni, Vasiliki, Maranis, Theodoros. (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* (3), 318–345.
- de Villiers, Jill, G., Helen, B. Tager-Flusberg, Kenji, Hakuta, & Michael, Cohen. (1979). Children's comprehension of relative clauses, *Journal of Psycholinguistic Research*, 8, 499–518.
- Friedmann, Naama, Belletti, Adriana, & Rizzi, Luigi. (2009). Relativized relatives: Types of intervention in the acquisition of A-bar dependencies, *Lingua*, 119, 67–88.
- Gathercole, Virginia, C. Mueller. (2014). Bilingualism matters: One size does not fit all. *International Journal of Behavioral Development*, 38, 359–366.
- Gerard, Juliana. (2016). *The acquisition of adjunct control: Grammar and processing*. Unpublished doctoral dissertation, University of Maryland, College Park.
- Golberg, Heather, Paradis, Johanne, Crago Martha. (2008). Lexical acquisition over time in minority first language children learning English as a second language. *Applied Psycholinguistics*, 29, 41–65.
- Grillo, Nino. (2009). Generalized Minimality: Feature impoverishment and comprehension deficits in agrammatism. *Lingua*, 119 (10), 1426–1443.
- Guasti, Maria Teresa. (2016). *Language Acquisition: The Growth of Grammar*. (Second edition). Cambridge, MA: The MIT Press.
- Hammer, Carol Scheffner Hammera, Eugene Komaroffa, Barbara L. Rodriguezb, Lisa M. Lopezc, Shelley E. Scarpinod, & Brian Goldstein. (2012). Predicting Spanish–English Bilingual Children's Language Abilities. *Speech Language & Hearing Research*. 55(5), 1251–1264.
- Hoff, Erika. (2006). How social contexts support and shape language development. *Developmental Review* 26, 55–88.
- Hoff, Erika, Welsh, Stephanie, Place, Silvia, & Ribot, Krystal. (2014). Properties of dual language input that shape bilingual development and properties of environments that shape dual language input. In Grüter, Theres & Paradis, Johanne (Eds.), *Trends in language acquisition research: Input and experience in bilingual development*, 119–140. Amsterdam: John Benjamins.
- Jia, Gisela & Aaronson, Doris. (2003). A longitudinal study of Chinese children and adolescents learning English in the United States. *Applied Psycholinguistics*, 24 (1), 131–161.
- Jia, Gisela, Fuse, Akiko. (2007). Acquisition of English Grammatical Morphology by native Mandarin speaking children and adolescents. *Journal of Speech, Language, and Hearing Research*, 50 (5), 1280–1299.
- Just, Marcel, A., & Carpenter, Patricia, A. (1992). A capacity theory of comprehension: Individual differences in working memory. *Psychological Review*, 98, 122–149.
- King, Jonathan, & Just, Marcel A. (1991). Individual differences in syntactic processing: The role of working memory. *Journal of Memory and Language*, 30, 580–602.
- Langacker, Ronald, W. (1987). *Foundations of Cognitive Grammar, Vol. I, Theoretical Prerequisites*, Stanford: Stanford University Press.
- MacDonald, Maryellen, C., Christiansen, Morten, H. (2002). Reassessing Working Memory: Comment on Just and Carpenter (1992) and Waters and Caplan (1996). *Psychological Review*, 109 (1), 35–54.
- Paradis, Johanne. (n.d.). CHESL Centre. Retrieved from [http://www.linguistics.ualberta.ca/CHESL\\_Centre.aspx](http://www.linguistics.ualberta.ca/CHESL_Centre.aspx) (accessed 22 February 2017).

- Paradis, Johanne. (2011). Individual differences in child English second language acquisition: comparing child-internal and child-external factors. *Linguistic Approaches to Bilingualism*, 1 (3), 213-237.
- Paradis, Johanne. & Grüter, Theres. (2014). Introduction to “Input and experience in bilingual development.” In Grüter, Theres & Paradis, Johanne (Eds.), *Trends in language acquisition research: Input and experience in bilingual development*, 1–14. Amsterdam, NL: John Benjamins.
- Paradis, Johanne, Kirova, Anna. (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(4), 342–349.
- Paradis, Johanne, Rusk, Brian, Sorenson Duncan, Tamara, & Govindarajan, Krithika. (2017). Children’s second language acquisition of English complex syntax: The role of age, input and cognitive factors. *Annual Review of Applied Linguistics*, 37, 1-20.
- Pinto, Manuela, Zuckerman, Shalom. (2018). Coloring Book: A new method for testing language comprehension. *Behavior Research Methods*, 51(6), 2609–2628.
- Place Silvia, Hoff, Erika. (2011). Properties of dual language exposure that influence 2-year-olds’ bilingual proficiency. *Child development*, 82, 1834–1849.
- Riches, Nick, G., Loucas, Tom, Baird, Gillian, Charman, Tony, & Simonoff, Emily. (2010) Sentence repetition in adolescents with specific language impairments and autism: an investigation of complex syntax. *International Journal of Language & Communication Disorders*, 45, 47-60.
- Roesch, Anne, Dorothee, Chondrogianni, Vasiliki. (2016). “Which mouse kissed the frog?” Effects of age of onset, length of exposure, and knowledge of case marking on the comprehension of wh-questions in German-speaking simultaneous and early sequential bilingual children. *Journal of Child Language*, 43, 635-661.
- Sheldon, Amy (1974). The role of parallel function in the acquisition of relative clauses in English. *Journal of Verbal Learning and Verbal Behavior*, 13, 272-281.
- Slobin, Dan, I., & Bever, Thomas, G. (1982). Children use canonical sentence schemas: A crosslinguistic study of word order and inflections. *Cognition*, 12 (3), 229-265.
- Sorenson Duncan, Tamara & Paradis, Johanne. (published online June 13, 2018). How does maternal education influence the linguistic environment supporting bilingual language development in child L2 learners of English? *International Journal of Bilingualism*.
- Tavakolian, Susan. (1981). *The conjoined clause analysis of relative clauses. acquisition and linguistic theory*. Cambridge, MIT Press.
- Unsworth, Sharon. (2013). Assessing the role of current and cumulative exposure in simultaneous bilingual acquisition: The case of Dutch gender. *Bilingualism: Language and Cognition*, 16(1), 86-110.
- Unsworth, Sharon. (2014). Comparing the role of input in bilingual acquisition across domains. In: Grüter, Theres & Paradis, Johanne (Eds.), *Trends in language acquisition research: Input and experience in bilingual development*, 181 – 201. Amsterdam: John Benjamins.
- Unsworth, Sharon. (2016). Early child L2 acquisition: Age or input effects? Neither, or both? *Journal of Child Language*, 43, 603-634.
- Unsworth, Sharon. (2016). Quantity and quality of language input in bilingual language development. In Nicoladis, Elena & Montanari, Simona (Eds.), *Lifespan perspectives on bilingualism*, 136-196. Mouton de Gruyter/APA.
- Zuckerman, Shalom, Pinto, Manuela, Koutamanis, Elly, van Spijk, Yoïm. (2015) A New Method for Testing Language Comprehension Reveals Better Performance on Passive and Principle B Constructions. *BUCLD 40*, 443-456.

# Proceedings of the 44th annual Boston University Conference on Language Development

edited by Megan M. Brown  
and Alexandra Kohut

Cascadilla Press    Somerville, MA    2020

## **Copyright information**

Proceedings of the 44th annual Boston University Conference on Language Development  
© 2020 Cascadilla Press. All rights reserved

Copyright notices are located at the bottom of the first page of each paper.  
Reprints for course packs can be authorized by Cascadilla Press.

ISSN 1080-692X  
ISBN 978-1-57473-057-9 (2 volume set, paperback)

## **Ordering information**

To order a copy of the proceedings or to place a standing order, contact:

Cascadilla Press, P.O. Box 440355, Somerville, MA 02144, USA  
phone: 1-617-776-2370, [sales@cascadilla.com](mailto:sales@cascadilla.com), [www.cascadilla.com](http://www.cascadilla.com)