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Assessing language development in Arabic-learning monolingual and bilingual toddlers

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Assessing language development in Arabic-learning monolingual and bilingual toddlers

By

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Copyright Statement

Dedication

This thesis is dedicated with appreciation to my first two teachers in life, my ‘parents’ who have always believed in me.

DECLARATION

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Doctoral Colleg Quality Sub-Committee. Work submitted for this research degree at the University of Plymouth has not formed part of any other degree at the University of Plymouth or at another establishment.

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The work reported in this thesis complies with the British Psychological Society's (2009) ethical guidelines. Ethical approval was granted for all of the methodological procedures used throughout this thesis by the Faculty of Science and Technology at the University of Plymouth. The author completed and passed Criminal Records Bureau checks in order to undertake this work with participants under the age of 18.

Relevant scientific seminars and conferences were regularly attended at which work was presented. Courses were attended to develop specific skills and papers are in the process of preparing for publication.

Papers submitted:

1- Abdelwahab, A., Forbes, S., Cattani, A., & Floccia, C. (submitted). An Arabic adaptation of the MacArthur-Bates CDI in 17 dialects

Papers in progress:

1- Evaluating existing language exposure questionnaires for the study of language development in bilingual children.

2- Comparing between language development in bilingual English/ Arabic children living in the UK and Arabic/ English children living in Emirates.

Conference presentations

Oral Presentation

Abdelwahab, A. Cattani, A., & Floccia, C. (2017). Validation of the Arabic Communicative Development (Arabic CDI). *The International Conference on Language Learning Ability and Aptitude Measurement (ICLLAAM)*. Dubai, March 11-12.

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Abstract

Assessing language development in Arabic-learning monolingual and bilingual toddlers

Alshaimaa Gaber Salah Abdelwahab

Assessing children's language is fundamental for changing their developmental outcome as it gives a chance for a quick and early intervention with a suitable planning and monitoring program. Since there is no universal Arabic language screening tool that can be used for the assessment of Arabic-speaking toddler due, in part, to the particular case of the Arabic language, this thesis aims to validate and standardize a new Arabic assessment tool, usable by parents and professionals to screen the development of language in children between 8 months and 30 months across 17 countries. The second aim of the Arabic CDI is to be usable with Arabic-English bilingual children living in the UK from different dialect backgrounds, and in countries like Lebanon and UAE where multilingualism is common. Because previous research has shown that the relative exposure to each language is a central predictor of bilingual children's vocabulary development, we evaluated whether different ways of measuring exposure to each language would lead to different outcomes, through comparing a selection of language exposure tools to assess their relative reliability and ultimately, their user-friendliness. The role of factors that could modulate vocabulary knowledge in monolingual and bilingual children such as SES, gender, siblings, etc. has been examined as these might be important to consider by parents, practitioners and researchers when using the CDI. In addition to the standardization of the dialect-adapted Arabic CDI, this thesis showed that there is no significant impact of dialect variations on language development in Arabic-speaking children.

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General Introduction

Like any other children, children learning Arabic, whether it is as their unique language or together with another language like English, have a 7-15% chance of experiencing delayed language acquisition, which could be due to autism (2.6%) (Kim et al., 2011), hearing impairment (1%) (Fortnum et al., 2001), or Developmental Language Disorder (7%) (Tomblin et al., 1996). An essential initial step to detect a language delay in a young child is to use a standardised screening tool; the outcome of the test will allow parents and professionals to provision for further action such as planning an intervention. The sooner the intervention starts, the more positively it affects the child's language outcomes (Lee et al., 2016). However, to date, there is no "universal" Arabic language screening tool allowing for the assessment of any Arabic-speaking toddler, and this is due, in part, to the particular case of the Arabic language.

Latest official data show that there are around 366,000 Arabic speakers in the UK (National Association of British Arabs and Office for National Statistics, Census 2011), and about 274 million in the world (Ethnologue: Languages of the World, 2018). Arabic is a unique case of a language whose most common variety, Modern Standard Arabic, is not a native language. MSA is the language of writing and formal speech, learned at school but not acquired in infancy as a maternal language. In contrast, regional dialects such as Levantine Arabic or Egyptian Arabic are spoken in day-to-day life, and acquired in infancy. When developing assessment tools for Arabic-speakers, focussing on MSA only is not appropriate to encompass the variety of Arabic dialects. Conversely, focusing on a regional dialect prevents, a priori, the use of the tool in other countries, as the impact of dialect variation on learners' developmental path is unknown.

The primary aim of this thesis is to provide two essential tools for assessing language development in bilingual Arabic-English speaking children living in the UK and in other

Arabic-speaking countries where multilingualism is prevalent. Since it is vital to have the right assessment tool to assess the child's language development to get an accurate estimate of her vocabulary, this will be carried out first in part 1 by validating and standardising a new Arabic assessment tool, usable by parents and professionals to screen the development of language in children between 8 months and 30 months. Given that it is not enough to have an estimate of the child's language development and that screening for the amount of exposure she receives in each language is also important for detecting language delay, we will compare different exposure questionnaires to identify the most reliable and user-friendly screening tool that can be used for assessing language exposure in this age range (Part 2). This age range (8-30 months) has been selected for this study due to the necessity of assessing language development at an early age to provide early planning and intervention that would positively affect the child's future life (Lee et al., 2017). Since our aim is not only to assess language development but also to screen for language exposure the child receives to examine the relationship between them to detect a language delay, we decided to use the same age range in part 2 (the exposure study).

The Arabic CDI tool, an adaptation of the parental questionnaire MacArthur Communicative Developmental Inventories (Fenson et al., 2007), will be developed in MSA and 17 regional dialects; for the first time we will evaluate how norms in one dialect (Egyptian Arabic) can account for the variability found across the remaining 16 dialects. The long-term goal is to provide Arabic populations across 17 countries with an easy-to-use and reliable tool that can help make a difference in the support provided to young children and their families. In Study 1 we present the research behind the standardisation of the Arabic CDI.

The additional aim is for the Arabic CDI to be usable with the increasing number of Arabic-English bilingual children living in the UK. Here again, the diversity of the Arabic dialects spoken by families currently complicates the task of early years professionals: available tools

are always dialect specific, with no indications of their use with other Arabic varieties. The Arabic CDI should remedy that difficulty by providing a one-size-fits-all approach to the problem of dialect variation.

Assessing language in bilingual children is a universal problem, faced for example in multilingual communities like the UAE or Lebanon. Most studies show that bilingual children usually know and produce fewer words in each language as compared to monolinguals (Hoff et al., 2012; Oller & Eilers, 2002; Smithson, Paradis, & Nicoladis, 2014). Yet most standardised tools have been normed for monolingual populations, making them improper for the assessment of bilinguals: a delay detected with a monolingual assessment tool could be due to a "normal" bilingual delay, or to a delay signalling an underlying developmental issue. Recently Floccia et al. (2018) designed and normed a test for UK-raised bilingual toddlers, based on the measurement of vocabulary in the two languages using CDIs, and estimates of contextual parameters. Out of these contextual estimates, by far the most powerful predictor of vocabulary knowledge at age 2 was the amount of exposure to each language (see also Cattani et al., 2014; Gathercole & Thomas, 2009; Hoff et al., 2012; Pearson et al., 1997; & Thordardottir, 2011). For clinical purposes, evaluating accurately the relative amount of exposure to each language is critical as it is a robust predictor of the level of language development in bilingual children. The rate of development of vocabulary is strongly related to the child's relative amount of exposure, favouring a frequency-based explanation for the mechanisms underlying lexical growth. A study by Hoff et al. (2012) on Spanish- English bilingual children between 22 to 30 months has shown that children from homes where only one language was dominant, whether English or Spanish, had stronger skills in this dominant language; those who received a balanced exposure to the two languages at home had developed balanced language skills. According to Gathercole and Thomas (2009), children in Wales (a part of the UK where English and Welsh co-exist) between the ages of 7 and 11 who came

from Welsh-only home environments outperformed their peers who had either Welsh and English at home, or English-only home environments, when their Welsh vocabulary was tested. This is consistent with the conclusions reached in another study by Oller and Eilers (2002) for Spanish- English children at Kindergarten, 2nd and 5th grade in the US. Bilingual children who came from environments where English and Spanish languages were spoken at home outperformed their peers from English-only homes environments, when their English and Spanish languages were tested in an oral test at schools with a bilingual education program. Finally, Cattani et al. (2014) showed a clear correlation between 30-month-old bilingual toddlers' relative amount of exposure to British English and their vocabulary knowledge in comprehension and production.

Similarlily, Head and Mahoney (2016) have investigated the impact of early language exposure in relation to parent-child interactions and reading on the children's language development at the age of 5 years. They found that back and forth communications between the parent and the child affects the child's vocabulary comprehension and production skills positively. Additionally, reading to the child at an early age was found to decrease odds of a language delay and it affected the child's language comprehension and complexity positively.

Therefore, evaluating accurately the relative amount of exposure to each language is just as critical to the assessment of early language, than estimating vocabulary size. Many labs have developed their own tool to estimate the amount of exposure, and these tools vary greatly in terms of duration, administration, complexity and level of detail. Since our primary aim in this thesis was to provide Arabic speaking populations with the simplest, most affordable solution in terms of screening tools, we decided to evaluate whether different ways of measuring exposure to each language would lead to different outcomes. This will be the aim of the second

study, where we will compare language exposure tools to one another, assess their relative reliability and ultimately, their user-friendliness.

In what follows, in Part 1 we will expose the linguistic variability found in Arabic dialects, and review the factors that need to be controlled for when predicting language development in children such as presence of siblings, the child's exposure to additional languages in addition to some demographic factors such as gender and SES. A series of 5 studies will be run: Study 1 examines the validity of the Arabic CDI in a selection of countries spanning the Middle East for children within the age range of 8 to 30 months; Study 2 aims at validating the Arabic CDI in Egypt through a comparison with another Egyptian 'Arabic Language Test' (Rifaie, 1994). Based on results of Study 2 and preliminary data collected through a web-based platform, in study 3 the long Arabic CDI (404 words-list) will be shortened into a 100 words-list. Validity of the short version (100 words-list) will be assessed together with its mode of completion (online vs. paper) in Study 4. Finally, we will report the main data collection for the standardisation of the Arabic CDI in Study 5 together with the norms for the Arabic CDI.

Then in Part 2, we will compare the estimates of relative exposure to each language obtained through a selection of tools, and examine if they would reliably predict vocabulary knowledge in bilingual toddlers and we will also examine the effect of a range of factors which are known to be robust indicators of language growth alongside exposure such as presence of siblings and childcare attendance, in addition to some demographic factors. A series of 3 studies will be conducted: in Study 1, we will compare between the interchangeability of different exposure questionnaires in relation to their assessment of exposure and whether they would lead to the same prediction of language knowledge in bilingual children. Study 2 will be run with two aims: to examine whether parents' own estimation of their children's language exposure would predict their vocabulary development as efficiently as exposure questionnaires, and to

investigate if there is an impact of caregiver's language mixing on the vocabulary knowledge of the children.

Part 1

1.1 Introduction

It is important to point out that measuring vocabulary in young children is an appropriate proxy for assessing language development as a whole. Bates, Bretherton, and Snyder (1988) have collected lexical and syntactic measures from 27 children aged between 20 and 28 months. They found a positive significant correlation between lexical knowledge in children at 20 months and syntactic development at 28 months. In addition, two longitudinal studies have found out that the syntactic development at 3 years of age can be predicted by the lexical knowledge at 2 years of age (Bates & Goodman, 1997; Dionne, Dale, Bolvin, & Plomin, 2003). Following a child's language development over time is critical to find out if she is following a typical developmental rate or suffering from language delay (Kelley et al., 2004), that might require an intervention from a speech and language therapists or a psychologist. The main aim of this study is to validate and provide the norms for an early assessment tool (Arabic Communicative Development Inventory, or Arabic CDI) that would enable parents and professionals in most areas of the Arab world to assess the development of children's vocabulary and to identify those at risk of a language delay. By doing so, we are also examining the factors that may predict language development in Arabic children such as age, gender, and Socio-Economic Status (SES), in addition to some less documented factors such as the number of siblings or the method of recruitment. The Arabic language poses a unique challenge as it comprises a large range of dialectal variations, to the extent that some are mutually non-understandable. Our pragmatic approach is to develop a tool usable across all these dialects, and one aim of this study will be to evaluate the feasibility of this approach.

Language disorder is the most common developmental problem in pre-schoolers in the US (Rossetti, 2001) and in China (Lam, 2006). Language disorder, impairment, and disability are all synonyms referring to language problems, which are nowadays referred to as Developmental language Disorders. However, Wallace et al. (2015) has differentiated between language disorder and language delay as ‘‘A speech or language delay implies that the child is developing speech or language in the correct sequence but at a slower rate than expected, whereas a speech or language disorder suggests that the child’s speech or language ability is qualitatively different from what is typical’’ (p. 449). The prevalence of language delays and disorders is estimated between 5% and 12% (median 6%) in children between 2 and 5 years of age (Law et al., 2000).

There are three kinds of language disorders: language comprehension disorder in which the child has a problem to understand others; language production disorder in which the problem is with the child expressing her own ideas; and mixed language comprehension-production disorder in which the problems include both understanding and producing language. Therefore, it is important to have a thorough assessment tool in both modalities prior to the start of any early intervention. The earlier the enrolment in intervention, the more positive are the outcomes concerning the development of the child’s language (Burchinal et al., 1997; C. T. Ramey & S. L. Ramey, 1998; Wasik et al., 1990). Besides, early detection gives access to early diagnosis and treatment (Illingworth, 2013). According to Feldman (2005), early intervention can improve language and speech skills to a great extent and reduce the functional impact of persistent disorders.

Very few assessment tools exist for evaluating the development of Arabic-learning children, due to the diversity of dialects in Arabic; in addition, they are primarily based on a face-to-face interaction with the child, which is an issue when resources are scarce and considering

the common shyness of young children with strangers. Therefore parent reports are the most useful methods of assessements especially when assessing children at an early age. They do not require any cooperation from the child, and they depend on the parents themselves to fill in given that parents are the ones who have the most extensive knowledge of their child. Additionally, parent reports are cost-effective and save time. However, some parents may exaggerate in their evaluation of their children and may have different abilities to report their children's knowledge accurately (Stiles, 1994) which might affect the children's evaluation process.

Currently, there are some dialect-specific tools that are used to assess the development of children's language in each Arab country but in addition to being dialect specific, they rely on a face to face interaction with the child and they cover a broad age range. For example, The Arabic Language Test (Rifaie, 1994) is used in Egypt for assessing children's comprehension and production for children between 2 to 8 years; the Arabic Token Test for children (McGhee et al., 2007) is used for assessing comprehension vocabulary in Jordanian children between 3,0 to 12;11 (years; months); the Language Comprehension Test (Al-Akeel, 1998) is used to assess comprehension development only in Saudi children within the age range of 3;0 to 6;0 years old. So far there are no practical applications of these tools, beyond their original intended target population and age range, but they have been selected as examples here because they are published as standardised tools for assessment of language development

Therefore we aim at developing a user-friendly assessment tool, suitable for all Arabic dialects, freely available for research and clinical purposes, appropriate for cross-linguistic studies, and based on a parental questionnaire rather than a child-centered approach. In this study, we will translate, culturally adapt and test the validity of an assessment tool, the Arabic

CDI, from English (Alcock et al., 2017; Fenson et al., 2007; Hamilton, Plunkett, & Schafer, 2000) to standard Arabic and then to 17 Arabic dialects of 17 Arabic countries, to be used widely with Arabic-speaking children.

The first part of what follows will provide an overview of the variety of the Arabic language, and the difference between the standard Arabic language and the everyday dialects used in each country. We will then review characteristics of the Arabic and English assessment tools currently available for evaluating comprehension and production vocabulary in Arabic-speaking children, and the potential predictors of language development in monolingual Arabic-speaking children.

1.1.1 Modern Standard Arabic vs. Arabic Dialects

The Arabic language is commonly used in all Arabic countries, but the MSA which is widely known by all educated Arabs due to formal schooling is different from each country's own dialect. The complexity of assessing language development in Arabic children stems from the fact that children in the Arab world are exposed to two kinds of languages: the MSA is the official language in school books (though the dialect of each country is used for teaching), newspapers, media, and official communications. It is also the language used in official documents such as birth certificates, driving licences, national identity cards, etc. (Schaub, 2000). It is only understood by educated people, while each country's dialect is the informal (colloquial) everyday language. Though it originates from standard Arabic, it differs from one country to the other. Unlike MSA which is usually used for writing, the dialects are rarely used for literacy as there is no established rules for writing them.

Not only are these dialects different from MSA, but they also differ from one another, sometimes inside the same country. For example, Egyptians living in Upper Egypt use a dialect (which is the one used for the Arabic CDI, being the most common in Egypt) that is

not familiar to these in the south and vice versa. Due to historical and political factors, some of these dialects have words derived from other languages like English, French, Turkish, etc. These borrowed words were of course phonologically altered to fit the country's dialect, like, for example, the Algerian dialect which is derived from the French language (Harrat et al., 2015; 2017). According to Ferguson (1959), the major difference between MSA and the dialects lies in the grammatical area, but the phonological difference between them is moderate. As for the lexical variations, the differences lie in the form, use, and meaning of words.

1.1.2 Arabic Dialects Differences

Arabic dialects are only spoken, and differ from each other to the degree that can make them incomprehensible to one another. Differences between these dialects are closely related to the geographical distance between countries: the larger the distances between the countries, the larger the difference between their dialects (Holes, 2004).

Dialects across the Arab world can be divided geographically and linguistically into dialect groups, with some disagreements between authors. Gulf Arabic (GA), Yemeni Arabic (YA), and Iraqi Arabic (IA) are in the same dialect group. Another group is made of Levantine Arabic (LA: Jordan, Lebanon, Syria (SA), Palestine), followed by Egyptian Arabic (EA), and Moroccan Arabic (MA: Morocco, AA: Algeria, LA: Libya, and TA: Tunisia (Habash, 2010; Holes, 2004; Versteegh, 2001). On the other hand, Hetzron (1997) divided them into Middle-East dialects and Maghreb dialects. Middle-East dialects include Gulf countries and Yemen dialect, Levantine dialects (such as Syria, Lebanon, Palestine, and Jordan), Iraqi dialect, Egyptian and Sudan dialect, while Maghreb dialects include Algeria, Tunisia, Morocco, and Libya (Harrat et al., 2017). There are, at least, phonological variations within each dialect group and within each country as well.

The Egyptian dialect is considered the most familiar language to other Arabs because of the strategic role of Egypt in the whole region, in addition to the heavy presence of the Egyptian media, especially movies (Haeri, 2003). Egyptian dialect was brought to Sudan, so the Sudanese dialect is highly similar to the Egyptian one (Coghill, 2017). Levantine dialect is practiced in Syria, Lebanon, Palestine, and Jordan, though they differ somewhat in pronunciation and intonation. The Gulf Arabic dialect can be regarded as the closest one to the MSA especially in terms of verb conjugation and prepositions. The Iraqi dialect differs from the Gulf one in having its own prepositions, verb conjugations, and pronunciation. The Maghrebi dialect, on the other hand, is the most different from other dialects and MSA, being affected by the French and Berber languages (Zaidan & Callison-Burch, 2014), and the most difficult to be understood by Arabs speaking other Arabic dialects.

There are some phonological, morphological, and lexical differences between Arabic dialects themselves as below.

Phonological differences

There are 28 consonant phonemes in the Arabic language which are the same for all dialects, but they only vary from one dialect to the other in their length contrast, depending on whether they occur initially, medially, or finally. The phonological differences between dialects appear in the use of the three fricatives /θ/, /ð/, and /đ/. Like MSA, Gulf, Iraqi, and Yemeni Arabic in addition to Jordanian and Tunisian Arabic follow the same patterns (Khamis-Dakwar et al., 2012). On the other hand, Egyptian, Levantine, and Moroccan Arabic use the dental stops /t/, /d/, and /ḍ/ respectively instead. For example:

English	**MSA**	**GA/IA/JA/TA**	**EA/LA/MA**
More	ʔkθar	ʔkθar	ʔktar

Arm	ðiræʕ	ðiræʕ	deræʕ
Clean	Nađiif	Nađiif	Neḍiif

For some words that are borrowed from MSA with the sounds /θ/, /ð/, and /đ/, unlike all dialects, the Egyptian Arabic and the Levantine Arabic change them into /s/, /z/, and /ẓ/ respectively. For example:

English	**MSA**	**Other dialects**	**EA/ LA**
Example	Miθæl	Miθæl	Misæl
Intelligence	ðakæʔ	ðakæʔ	Zakæʔ
Luck	ḥʌđđ	ḥʌđđ	ḥʌẓẓ

Another sound that differs between Arabic dialects is /dž/. While GA (apart from Oman that uses it as /g/), IA, and YA and some areas in Morocco and Algeria pronounce it as /j/, /ž/ is used instead in Moroccan Arabic and Levantine Arabic, and /g/ in Egyptian Arabic (see an example below).

English	**MSA**	**GA/YA/IA**	**MA/LA**	**EA**
Star	Nadžim	Najim	Nažim	Nigmah

The sound /q/ is another important example of variation between Arabic dialects. In Egyptian Arabic, it is generally pronounced as /ʔ/ or as /g/ in Upper Egypt. It is used as /g/ in GA (apart

from Oman where /q/ is used) and YA. It is pronounced as /q/ or /ʔ/ in LA especially in urban areas, but used as /g/ or /q/ in rural ones. The new generation in Jordan tends to use /ʔ/ instead of the /g/ used by the old one (Al-Wer, 2007; Mustafawi & Shaaban, 2018). In MA, there is a mix between /q/, /ʔ/, and /g/ depending on the area, and there is also a mix between /g/ and /q/ in Iraqi dialect, where /g/ is used in urban cities like Baghdad and Basra (Al-Ani, 1978; Mustafawi, 2018). For example:

English	**SA**	**EA**	**GA**	**LA**	**MA**	**IA**
Monkey	*q*írd	ʔírd	gird	ʔírd	*q*írd	*q*írd

Dialects also differ in the pronunciation of /*k*/. Similar to SA, Egyptian and Syrian Arabic maintain it as /*k*/ while GA, and IA would turn the /k/ into /č/ (Holes, 2004). For example:

English	**SA**	**EA**	**GA**	**LA**	**IA**
Fish	sama*k*	sama*k*	sima*č*	sama*k*	sima*č*

Regarding vowels, Arabic language has 3 short vowels (a, I, u) and 3 long vowels /a:/, /I:/, and /u: / with a length contrast on each and that explains why there is little variation across dialects in terms of vowels. In LA, unlike other dialects, words with the two sounds /I/ and /u/ in other dialects are pronounced with /ə/ instead in LA. For example, a word like 'I slept' which is pronounced in most of the dialects like /nimt/ would be pronounced in LA as /nəmt/. In MA, /a/ and /I/ would be merged into /ə/ and it would be deleted when unstressed. It is the same for

Tunisian dialect except that there these vowels would be deleted in non-final open syllables. In EA, like LA, unstressed long vowels are shortened (Coghill, 2017). In Arabic dialects, most of the verbs in present indicative are preceded by prefix. The word 'I smell' would be pronounced in MSA as /yaʃum/ while it would be pronounced as /b-yiʃim/ in EA, /am-b- yiʃəm/ in LA, and /tayʃəm/ in MA. To express these verbs in future tense, the prefix /raḥ/ would be added in LA, and the prefix /ha/ would be added in EA.

Lexical differences

Examples of lexical differences between dialects are shown in the example below (adapted from Coghill, 2017:15):

Word	Baghdad	Gulf	Damascus	Cairo	Morocco
man	*rijjāl*	*rayyāl*	*rəžžāl*	*rāgil*	*ṛažl*
woman	*mara*	*mara*	*mara*	*sitt*	*mṛa*
house	*bēt*	*bayt*	*bēt*	*bēt*	*ḍaṛ*
good	*zēn, xōš*	*zayn, xōš*	*mnīḥ*	*kwayyis*	*mzyan*
very	*kulliš*	*killiš*	*ktīr*	*ʾawi*	*ʿad*
how?	*šlōn, kēf*	*čayf*	*kīf, šlōn*	*ʾizzāy*	*kif*
he went	*rāḥ*	*rāḥ*	*rāḥ*	*rāḥ*	*mša*

To sum up, MSA is only understood by educated people in the Arab world and is only used in official events and ceremonies while, on the other hand, there is a specific dialect for each Arab country that is used as an everyday language. There are some phonological, morphological and lexical differences between Arabic dialects that could make it challenging for a citizen from an Arab country to understand the dialect of another. Children's programs in television use the country's own dialect and not MSA, yet the children are still exposed to MSA when using

tablets and IPads. The impact of this passive exposure to MSA in unknown, but past research on children's learning of native speech sounds through television suggests that it might be minimal. Kuhl et al. (2003) ran an experiment to examine the impact of social interaction on phonetic learning of a foreign language. Children were divided into two groups and both of them were exposed to Mandarin Chinese during 12 sessions, each 25 min in duration, over a 4-weeks period, but the first group received language exposure through auditory visual DVD movies, while the other group received exposure through a face to face interaction. Only the group exposed to face to face interactions showed some perceptual learning. This suggests that auditory visual language materials do not affect children's acquisition of phonetics. Therefore it appears critical to assess the development of the children's language based upon the dialect of their original country or the dialect they are mostly familiar with.

1.1.3 Assessment of Language Comprehension and Production in Arabic- Speaking Children

Assessing children's language is fundamental to determine if there is a problem that needs further assessment and to evaluate its degree, to set up goals for intervention, to suggest the procedures of intervention, and to determine what kind of progress is expected in an intervention program, in contrast to progress with or without this program (Rifaie, 1994; Lahey, 1988, 1990; Moustafa & Kotby, 1984; Rossetti, 1990).

The appropriateness of any given test for use in evaluation depends upon a proper match between the degree to which the test possesses characteristics of objectivity, sensitivity, reliability and validity, and the extent of the need for these characteristics by the evaluation process (Bishop, 2014; McCauley, 2013; McCauley & Swisher, 1984; Pena et al., 2006; Plante & Vance, 1994; Thomas et al., 2009).

Here we review some examples of language tests that have been developed with the aim of assessing and identifying language impairment in Arabic-speaking children.

The Arabic Language Test (Rifaie, 1994)

It was developed to provide a broad picture of the child's language comprehension and production . The test is suitable for the age range of 2 to 8 years and takes between 45 to 60 minutes to administer. It was validated on a cohort of 120 typically developing Egyptian children. This test is translated from English, based on previous studies in language testing by other Western authors, into the Egyptian dialect. It is constructed to assess attention and presence of a good eye-contact, the ability to imitate simple actions, non-speech sounds, and speech sounds. It assesses the child's comprehension through testing her ability to understand a simple short sentence, a sentence containing a preposition or a place indicator, a longer sentence, a complex sentence, time indicators, different verb-tenses, orders increasing in length, singular and plurals, pronouns, adjectives, adverbs, conjunctions, number concepts, negation forms, comparatives and superlatives, passive voice sentences, and action-agent use (the use of objects). It also assesses the child's production through testing her ability to utter her name and 'mammy', to respond to a question whose answer is one word, various verb-tenses, prepositions or place indicators, a sentence composed of 3 words, singular and plurals, pronouns, adjectives, adverbs, conjunction (and), counting (1 to 100), negation forms, comparatives and superlatives, passive voice sentences, action agent use, time indicators, repetition words, and articulation. The test assesses semantics through the child's ability to recognize and name different semantic groups such as body parts, clothes, fruits, etc. It assesses pragmatics through testing the ability of the child to understand and respond to sentences carrying pragmatic intentions. It also assesses prosody through testing three parameters: tone units, tonicity, and tone. The materials used in the administration of the 'Arabic Language Test'

are cards of coloured pictures that represent the related items. In addition to the cards, a small ball is used for the imitation item, small sticks were used for counting, and a toy telephone was used for eliciting conversation in pragmatics. Validity of the test was established by 6 methods which all proved that the test is valid as a measure of language development, particularly factorial validity which was the most powerful proof of the test's validity. Reliability was assessed through test-retest and the normative scores were expressed in language ages, quotients, means, and standard deviations.

Comprehensive Arabic Language Test (CALT)

It was designed by Abo Ras et al. (2009) for children between 2 to 6 years of age, with a four months age interval chosen to detect the minor changes in the development of each language component tested. The test aimed at developing a detailed comprehensive assessment battery for the Egyptian dialect. It was administered and standardised on 540 Egyptian children divided into 2 groups: The first one included 320 typically developing children and the second included 220 language impaired children. The test uses materials such as cards with coloured pictures, and 12 cubes coloured in specific colours. It is divided into subtests and an individual score is calculated for each subtest according to a recording form. The level of difficulty of each subtest is adapted to the age of the child. In the phonology test which includes 71 words, the child is shown a picture for each word and she is asked to say what each picture refers to. This subtest has two aims: assessing the accuracy of each phoneme in different position (beginning, middle, and end of the word) and assessing the correct articulation of the corresponding word. In the second subtest, which is a test of semantics, 214 items testing recognition and naming (body parts, clothes, etc) are presented. The third subtest (which includes 56 words) assesses production morphological structures such as personal pronouns, plurals, verb tense, negation, etc. The fourth sub-test assesses syntax, both

comprehension (through repeating 10 sentences, following 8 directives, and answering 7 questions) and production (describing 10 actions, and sequencing 10 events) syntactic ability. The last subtest is about pragmatics where the child has to answer 42 questions assessing different speech acts such as requesting, informing, and organising devices. The test takes 60 minutes to administer and can be completed in two sessions according to the age and the responses of the child. The final total test score is the sum of all subtests scores. For the validity of the test, a correlation was found between the total language score and each subtest score, in addition to a correlation between demographic data and overall responses. It also prove to be highly sensitive and specific, based on the comparison between typically and atypically developing children.

Arabic Token Test for Children (A-TTFC)

This is an Arabic translated version of the English Token Test for Children (2nd edition) (E-TTFC; McGhee et al., 2007), adapted and validated by Alkhamra and Al-Jazi (2016). It aims at evaluating the language comprehension in Arabic-speaking Jordanian children between the age of 3;0 to 12;11 (years; months). After translating the test into standard Arabic, it was administered to 397 Jordanian typically developing children for validation. The test consists of 46 items, divided into 4 parts and is based on manipulating 20 tokens that are differentiated by shape, colour, and size to test the child's syntax, semantics, and morphology. The child's syntax is assessed through understanding of the sentence structure that is specific to individual items, while the child's semantics is assessed though testing her ability to understand vocabulary or concepts related to individual items; morphology is assessed through the understanding of root words and word endings that are specific to individual items. The test takes between 10-15 minutes to administer. The test proved to be

reliable and valid for use with Arabic-speaking children with comprehension vocbulary problems in Jordan and in other Arab countries.

Language Comprehension Test

This test was designed by Al-Akeel (1998) and administered to Saudi children within the age range of 3;0 to 6;0 years old. It aimed at assessing their comprehension skills through their understanding of 24 morphosyntactic structures. These structures were selected by recording conversations between fathers and children during play time, or by the author himself through his own linguistic knowledge of the Saudi dialect, or extracted from some English language tests. Some structures were tested by using objects (23 items to test 3 structures) such as possessives, prepositions, and complex commands, while other structures (63 items to test 21 structures) were tested by using four pictures, each of them representing a sentence to test every item. Each was made of four pictures, a target and three distracters, which varied according to the structure. For example, when the structure was a singular noun, the target was the picture of one boy, while distracters were a picture of one girl, two boys and three girls; it assesses the child's lexical and morphosyntactic abilities through testing the understanding of the meaning of 'boy' and the plural inflection of the noun. Time for administering the whole test ranged between 40 to 75 minutes. Item analysis was used for assessing the validity of the test as it was examining comprehension of certain morphosyntactic structures.

In summary, we have reviewed 4 dialect-specific tests spanning the ages of 2 to 12; 11 years; months, all based on face to face interaction and assessing varied aspects of language development.

Because of the scarcity of available dialect-specific tests, some speech therapists in Arabic countries use direct (non-official) translations of standardised English tests to assess language development, which is a usually highly unreliable practice. In what follows we review the most popular examples of these translated tests.

Peabody Picture Vocabulary Test 4th Edition (PPVT- 4 Scale)

Revised by L. Dunn and D. Dunn in 2007, this highly popular test is applicable for children between 2 years 6 months through adults aged 90 years and older. It was designed to evaluate the knowledge of the meaning of single words using a picture selection format. In addition, the test helps detecting language impairment across the life span and screens for comprehension vocabulary knowledge in individuals whose primary language is not English. Administering the test takes between 10 to 15 minutes.

The PPVT is available in two forms, each of which contains training items and 228 test items. Each item consists of a single word stimulus associated with four pictorial choices. The vocabulary items are presented in increasing order of difficulty. The examiner says each word and the child is required to point to the one picture among the four possible choices that best represents the meaning of the word.

The fourth PPVT edition was standardized through an age norm sample which consisted of 3,540 cases, and a grade norm subsample which included 2,003 cases. For the reliability of the test, the test-retest score ranged from .91 to .94, and the internal consistency ranged from .91 to .97. Concurrent validity was set with the Expressive Vocabulary Test, Second Edition (William, 2007) and ranged from .81 to .84. The records for the sensitivity and the specificity of the test are unknown.

The cultural sensitivity of this American-English test is such that a specific version was developed for British English children (British Picture Vocabulary Test III, GL Assessment), with different (yet overlapping) words and pictures. Therefore, a direct translation from American English to Arabic is likely to provide an inadequate measurement of the child's language skills.

Pre-school Language Scale - fifth Edition (PLS-5 UK)

With its fifth version developed in 2011 (Zimmerman et al., 2011), it offers a comprehensive developmental language assessment to identify language delayed or disordered children between birth to 7 years 11 months. Administration time differs according to the age range, for example, birth through 11 months takes between 25 to 35 minutes, while it takes between 45 and 55 min for children aged 12 to 35 months.

The PLS-5 tests different language skills across the developmental language spectrum, and addresses the needs of children through age 7 who have severe, persistent deficits such as autism or severe developmental delays. The test targets interaction, attention, vocal/gestural behaviours, and different levels of play for children from birth to 2:11.

It was normed with data from 1,400 children collected from about 45 states in the US. Split half reliability was set and it ranged from .80 to .97; the sensitivity for the Total Language score is .83 and specificity is .80. Again, a British version was developed (PLS-5 UK) to adapt to cultural and linguistic specificities, questioning the reliability of using a directly translated version with Arabic children.

Summary and discussion

A variety of language tests have been developed with the aim of measuring vocabulary comprehension and production or some combination in Arabic-speaking children, but none of

them have been designed for children younger than 24 months. In addition all Arabic assessment tools that have been developed are dialect specific, which makes them difficult to administer with children learning a different Arab dialect. Besides, all of these tests are time- and resource-consuming, which is problematic for their use in societies with scarce resources where large-scale screening is needed. Finally, the majority of these assessment tools depend on the child's cooperation in the assessment procedure, which is not always easy to do when children are under 24 months and even beyond.

In comparison, parental report assessments are cost-effective, quick to use, do not require a professional for administration (but the interpretation of results needs to be taken with caution), and can be used with children with difficulties whose assessment would be problematic in a face to face interaction. In addition, such reports can reflect skills across a wide range of contexts (Crais, 2011; Fenson et al., 2007). According to Crais (2011), one of the most useful parent report tools for comprehension of early words is the Infant/Toddler Checklist and the CDI (Communicative Developmental Inventory) - Words and Gestures, originally designed by Fenson et al. (1994). It is a parent report test, designed to evaluate the communicative skills of young children from their "early signs of comprehension, to their first nonverbal gestural signals to the expansion of early vocabulary and the beginnings of grammar" (Fenson et al., p.7). It comprises three versions: the "CDI: Words and Gestures" is used to measure the comprehension and production vocabulary and the use of communicative gestures from 8 to 16 months; the "CDI: Words and Sentences" is designed to assess the production vocabulary and early grammar development from 16 to 30 month; the "CDI III" (Dale & Fenson, 1996) assesses the language skills in children between 30 to 37 months including vocabulary development, grammatical complexity, semantics, pragmatics, and comprehension. These inventories are being used increasingly in various research studies as well as for clinical

purposes. Following the development and adaptation of the MacArthur CDI in up to 60 languages, we undertook the development of the Arabic CDI (this will be discussed in details in the method section).

In the process of standardising the Arabic CDI, we examined the role of factors that could modulate children's vocabulary knowledge, as these might be important to consider by parents, practitioners and researchers when using the CDI. In what follows, we will briefly the range of factors that we investigated, and showed how they have been found to modulate language development in other monolingual populations.

1.1.4 Factors Affecting Vocabulary Development in Monolingual Children

We can distinguish between primary factors that have been well established as predictors of language development (SES and gender) and other, secondary factors whose effect is less established.

1.1.4.1 Primary factors

Socio-Economic Status (SES)

It is well established that children from low SES background score lower in all measures of language skills as compared to children from higher SES background (Campbell et al., 2003; Hart & Risley, 1995; Hoff et al., 2002). Most of the studies have found that maternal education is the main reason for children from low SES having poorer language skills than their high SES counterparts (Rack, Snowling, & Olson, 1992) as it affects the maternal language input (Hoff, 2003). The current explanation is that unlike mothers from low SES whose speech with their children aims mainly at monitoring behaviours, highly educated mothers tend to talk to their children with the aim of eliciting conversations (Hoff, Laursen, & Tardif, 2002); in addition they use more diverse vocabulary, in terms of nouns, tenses, and verbs than parents from low

SES (Feldman et al., 2000; Hart & Risley, 1995). Here we predict a similar effect of SES on the vocabulary knowledge of Arabic-speaking children.

Gender

Bornstein and Cote (2005) have conducted a comparative study between 20-month-old children in three countries: USA, Italy, and Argentina. A maternal recognition checklist aiming at assessing the children's expressive vocabulary was used and they found that girls acquire more production vocabulary than boys in all word categories at the same age. This supported findings by Eriksson et al. (2012) who, using adapted versions of the MacArthur-Bates CDI, examined data from children from 10 non-English language countries (i.e., Austrian German, Basque, Croatian, Danish, Estonian, French, Galician, Slovene, Spanish, Swedish), with an age spanning from 8 to 30 months. They observed that while boys and girls scored nearly the same in relation to their comprehension performance, girls outperformed boys in relation to gesture acquisition, word production, and word combination. The conclusion was that this gender effect on language production is biologically determined rather than cultural, however all these countries are quite similar in terms of cultural profiles (i.e., Western Christian). It is an open question as to whether we will also find an impact of gender on the development of vocabulary knowledge in Arabic-speaking children. The only study we are aware of is by Al-Akeel (1998) who assessed the comprehension of morpho-syntactic structures in Saudi children within the age range of 3;0 to 6;0 years old through using language comprehension test (see above for details of the test). Dividing the children into six groups according to their age with 10 boys and 10 girls in each group, no impact of gender was found. This might be due to the small sample size, and to the fact that comprehension was assessed rather than production, so it will be of interest to re-evaluate the claim that girls outperform boys in production in a much larger sample, in Arabic-speaking countries.

1.1.4.2 Secondary factors

Number of siblings and first borns

Typically for monolinguals who are our sample in this study, first borns tend to have more vocabulary than later-borns (Fenson et al., 1994; Jones & Adamson, 1987) possibly because the former get more attention from their parents than the latter, and because they generally get direct speech from their parents which is of better quality than speech produced by older siblings. Further, Bates (1975) reported single children have more vocabulary and are more advanced on standardized measures of language development than later borns with other siblings. Indeed, Bornstein (2002) found that mothers differ in their amount of language engagement with first-borns and other children, providing more language input to the former. In the current study, we also expect to observe an impact of the number of siblings, with first-born children scoring higher than the others.

Identity of the parent who filled in the CDI (mother vs. father)

Previous research found out that fathers' interactions with children tend to be physical and based on playing activities (Gottman, 1998; Parke & Clarke-Stewart, 2002), whereas mothers' interactions are more verbal (Gottman, 1998) and related to the children's later language development (Olsen et al., 2002). This suggests that fathers may know less about their children's language development than mothers. Furthermore, Arab fathers are generally more likely to spend time outside of the home than mothers or salaried work or other economic reasons (Barakat, 2005), which suggests that mothers would have more time to evaluate the development of their child's language. Therefore, we anticipated a possible impact of the identity of the parent who filled in the CDI: mothers may provide more accurate scores than fathers given that mothers typically spend more time with their children and should have more opportunities to evaluate their language.

Method of recruitment (nursery or social media)

Whether parents were recruited through social media or nurseries, all of them filled in the Arabic-CDI online. Therefore we expected no impact of the method of recruitment on the Arabic CDI scores once controlled for other factors such as SES.

Identity of the primary caregiver (mother versus other)

Huttenlocher et al. (1991) found that the amount of speech directed from mothers to children had a positive impact on their language development in the period between 14 to 26 months, together with a relationship between mothers' input and the amount of variation in the children's vocabulary growth. In contrast, Pancsofar and Vernon- Feagans (2006) found that fathers of 2-year-olds produced less input to their children than mothers. However, they found that at the age of 36 months, the quality of childcare, rather than mother's input, predicted the child's language. We expected a potential impact of the identity of the primary caregiver, with children whose mothers are the primary caregivers expected to outperform their counterparts.

Child's exposure to additional languages inside/ outside home

Bilingualism is well established as a cause of language delay, when comparing the bilingual child's each language to that of a monolingual (Bialystok et al., 2009; Perani et al., 2003; Portocarrero, Burright, & Donovick, 2007). However, Cattani et al. (2014) showed that 30-month-olds who have 60% percentage or more of English exposure typically perform like English monolinguals at the same age. For that reason, all children in our sample were selected so that they did not have more than 10 hours of total exposure per week to a non-Arabic language, inside and outside their home. We will further verify that exposure to additional languages does not have any impact on Arabic learning.

Some other factors such as the richness of vocabulary in relation to the number of word tokens, the number of word types in addition to the length of the utterances used, and the variety of questions asked to the child at an early age, have also been found to be positive predictors of language development around the age of 24 months (Hoff & Naigles, 2002; Weizman & Snow, 2001). However the study of the impact of these factors was beyond the scope of this thesis.

1.1.5 Aims of the Study

The present study aims at developing and testing an easy to use online assessment tool for language development in Arabic-speaking children in most areas of the Arab world. This tool will be available in 17 dialects which would make it easier for parents and professionals in these areas of the world to assess the development of children's vocabulary knowledge at an early age. A first version of the Arabic CDI, made of 404 words, will be developed (Study 1) and its validity assessed through a comparison with another Arabic language tool (Study 2). Following, a 100-word version will be developed (Study 3), and the effect of its mode of completion will be examined, together with its test-retest reliability (Study 4). Finally, data will be collected all across the Middle East (Study 5), resulting in 435 children from Egypt and 172 from the 16 remaining countries. The norms for the Arabic CDI will be provided based on the Egyptian data collected. Impact of core predictors (age, gender and SES) will be tested in addition to that of some additional secondary variables (e.g. number of siblings, method of recruitment, etc.). Most importantly, we will attempt to determine if the rate of vocabulary development is equivalent across the 17 dialects, by comparing the large data set from the Egyptian dialect to the smaller dataset obtained in the 16 other countries.

Methods

In the following section, a first study (Study 1) was conducted to examine whether the Arabic CDI provides comparable estimates of vocabulary knowledge in a selection of countries spanning the Middle East, and whether it would be valid for use for children within the age range of 8 to 30 months. Then, Study 2 was run with 23 Egyptian parents with the aim of validating the Arabic CDI through a comparison with another Arabic test, the 'Arabic Language Test' (Rifaie, 1994). Following results of Study 2 and an initial data collection using a web-based platform, the Arabic CDI was shortened from the long 404 words list to a 100-words list (Study 3), and the validity of this short version was assessed together with its mode of completion (online vs. paper) in Study 4.

In Study 5 we report the main data collection for the standardisation of the Arabic CDI, and we examined how factors that are known to predict language development account for vocabulary scores of Arabic-speaking children, looking at Egyptian and non-Egyptian data individually and then at the data as a whole. Variables were divided into core variables such as age, gender, and SES, complemented by secondary variables such as the number of siblings and primary caregiver. Finally, fitted quantile scores for comprehension and production vocabulary are reported.

Initial steps

Prior to the translation and cultural adaption of the Arabic CDI, a request for authorization was sent to the MacArthur CDI advisory board to adapt the CDI for the dialects of 19 Arabic dialects. Previous authorisations had been granted by the consortium to other researchers for the Saudi, Kuwaiti, and Tunisian dialects. Following an exchange with these three teams, who expressed a desire to collaborate, the Saudi team asked us to buy the norms that they had already generated, which we believe contradicted the spirit of new CDI developments. The

Kuwaiti team did not express an interest to collaborate, while the Tunisian one was happy for us to include the Tunisian dialect in the Arabic CDI, but with reference that it has been previously adapted by them. So our Arabic CDI ended up with being available for 17 countries, with the exclusion of Saudi and Kuwaiti dialects. Then, after being granted the authorization from the MacArthur consortium the standardisation study was approved by the University of Plymouth ethics committee (Faculty of Health and Human Sciences).

1.2 Study 1: Design and Initial Validation of the Arabic CDI

In this section we report how the Arabic CDI was originally designed and validated. As suggested by the MCDI recommendations, only the major parts of the CDI were adopted, that is, the vocabulary checklist (comprehension and production) in our case. Also, as suggested, we developed a first version on a small scale (23 children, Study 2) concentrating on obtaining the information necessary to revise the inventory before proceeding to a larger-scale norming study.

Word selection

Our starting point was a list of words overlapping the MacArthur CDI (Fenson et al., 2007), the Oxford CDI (Hamilton, Plunkett & Schafer, 2000), and the UK CDI (Alcock et al., 2017). Words in common between the 3 of them were included to form the initial Arabic CDI version. These words were translated into standard Arabic by the author of this thesis, which was checked with a well-qualified Arabic teacher to ensure that the right standard Arabic words were used. Due to cultural differences, some words were opted out (about 15 words) from the 3 English CDIs such as pig, penguin, owl, pony, puppy, and kitty. Other words in the English CDIs correspond to only one word in Arabic such as jacket, jumper, pullover, and sweater which correspond with one word (jacket) in Arabic. In addition, cultural-specific words such as ‘mosque’ were added. Therefore, items were selected to suit the Arabic speaking child,

socially and culturally. This standard Arabic list was then translated into the dialects of 17 Arabic countries by sending the standard Arabic list to a citizen of this Arabic country to translate it to the dialect of his country. It was then given to a second speaker of the same country to translate again, independently from the first, to ensure consistency of word use.

By the end of this process, we obtained a word list translated into 17 dialects: Algerian, Bahraini, Egyptian, Emirati, Iraqi, Jordanian, Lebanese, Libyan, Moroccan, Omani, Palestinian, Qatari, Saudi, Sudanese, Syrian, Tunisian, and Yemeni. This word list composed of 404 words divided into 19 categories: 12 sounds of animals, 33 animals' names, 11 vehicles' names, 8 names of toys, 34 names of foods and drinks, 19 names of clothes, 22 names of body parts, 26 names of furniture and rooms, 34 names of small household items, 24 names of outside things and places, 22 names of people, 20 names of games and routines, 65 verbs, 8 words related to time, 35 adjectives, 10 pronouns, 6 question words, 8 prepositions, and 7 quantifiers.

To examine whether the Arabic CDI provides comparable estimates of vocabulary knowledge (comprehension and production) across countries, and whether it would be valid for use in children within the age range of 8 to 30 months, we used the Arabic CDI to assess the vocabulary of a group of 24 months from a selection of geographically spread countries. The age of 24 months was chosen as a reasonable middle point (in terms of vocabulary size) of the 8-30 months target range.

1.2.1 Method

Participants

Data were collected from a total of 33 Arabic children living in their original countries of birth (from 33 families), which included between 3 and 4 children from each Arab country (10

randomly selected countries, based on an opportunity sample). The children's age was 24 months +/- 2 weeks, and it included 19 female and 14 male. The countries from which the data were collected were: Egypt (4), Saudi Arabia (4), Palestine (4), Iraq (3), Algeria (3), Morocco (3), Syria (3), Libya (3), Emirates (3), and Jordan (3).

Procedures

The 404 words list version (as a word document) was sent to parents living in these selected countries via Facebook, friends and relatives living in these countries and through mailings and phone contacts. Their task was to tick the words their children understand only, and the words they understand and say. On completion they returned it back to the researcher through the same way of contact used in the beginning.

1.2.2 Results

Descriptive statistics for vocabulary knowledge for each group from each selected country are found in Table 1.

Table 1. *Mean and range for comprehension and production scores for each group*

Country	N	M (Comp.)	SD(Comp.)	Skewness (Comp.)	Shapiro-Wilk (Comp.) Sig.	M (Prod.)	SD (Prod.)	Skewness (Prod.)	Shapiro-Wilk (Prod.) Sig.
Egypt	4	197.25	34.44	1.557	.257	111.50	37.22	1.928	.025
Palestine	4	220.50	77.47	-.309	.216	127.25	36.40	.390	.283
Saudi	4	237.50	25.36	-1.560	.225	103.50	22.22	1.348	.406
Iraq	3	216.33	37.81	1.390	.407	116.67	58.62	1.651	.196
Algeria	3	212.67	55.81	-1.319	.449	101.67	17.04	-.350	.870
Morocco	3	250.33	48.69	-1.233	.496	153.33	43.15	1.681	.155
Syria	3	227.33	59.88	1.626	.224	119.67	36.12	-.412	.847
Libya	3	164.67	84.04	1.167	.529	97.33	70.22	1.286	.467
Emirates	3	196.67	25.42	1.720	.075	116.33	62.61	.310	.885
Jordan	3	217	34.18	.519	.806	124.67	62.17	1.634	.215

Given the small number of data points per dialect, statistical tests were not appropriate. However, the inspection of data shows that the Arabic CDI provided comparable comprehension and production scores across all the selected countries at the age of 24 months. In the next study, we examined the validity of the Arabic CDI.

1.3 Study 2: Assessing the Validity of the Arabic CDI

Validity of the Arabic CDI was checked through concurrent validity. According to this kind of validity, a comparison is set up between the results of a new measurement and a previously established one for the same construct. Therefore we used the Arabic Language Test (Rifaie, 1994) as a gold standard to evaluate against the Arabic CDI. This was not, strictly speaking, necessary, because the CDIs have been confirmed over the years as being reliable tools of

language outcome, but given the unique multiple-dialects approach we opted for, we estimated that it was a safe step to take.

This second study aims at testing the validity of the new Arabic CDI, that is, to examine if the two tests (the Arabic CDI and the Arabic Language Test) equally assess the development of language in toddlers and identify language disordered children.

1.3.1 Participants

Twenty-three typically developing Egyptian healthy children with a mean age of 2 years (M = 24 months and 10 days, SD = 30.2) took part in this study. The sample included 13 male (56.5%) and 10 female (43.5%). The children were recruited from different Northern Egypt districts using word of mouth from the author's personal contacts. They were raised in comparable middle- to higher-class backgrounds.

Materials

The Arabic Language Test (Rifaie, 1994)

This test was selected because of its specificity for the Arabic language (Egyptian dialect), with an appropriate overlapping target age range, and having the same purpose as the Arabic CDI. See the introduction for full details about the test construction.

The Arabic CDI

A paper version of the CDI was used, similar to that used in Study 1. Additional questions were asked about where the child had any hearing problems, any developmental delay, or whether the child was born more than 6 weeks premature.

Procedure

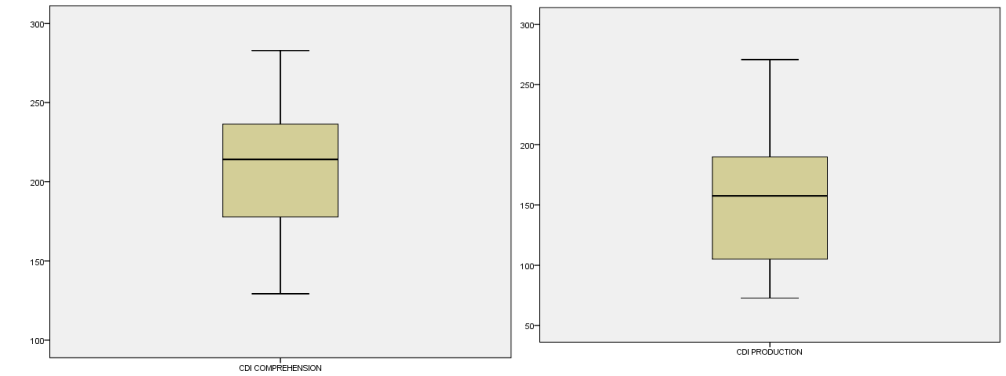
An interview was first prepared with the child's mother to give her information about the study and sign the consent form. Following this, some mothers started doing the new Arabic CDI first, and after completing it they contacted the researcher to prepare an interview with the child for the Arabic language test; others preferred to fill it in at the same time as the researcher was carrying out the Arabic Language Test with the child, especially in cases when the child was happy to engage with the experimenter. Each of the two measures took between 30 to 45 minutes to be administered.

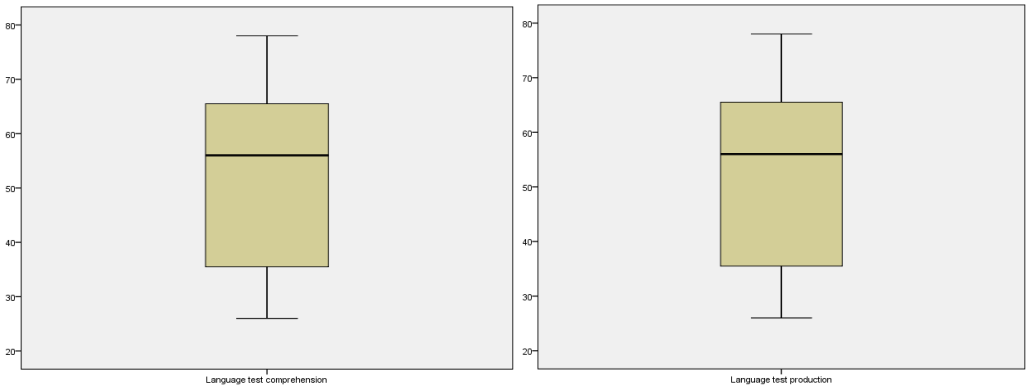
1.3.2 Results

Descriptive statistics of the children's scores in the two tests at the age of 24 months are provided in Table 2.

Table 2. *Mean and standard deviation for vocabulary knowledge scores in the two tests (N = 23)*

	M	**SD**	Skewness
Gender (1 = female; 2 = male)	10 females; 13 males		
CDI comp.	210.96	38.75	-.070
CDI prod.	154.09	58.96	.185
Language test comp.	59.61	12.24	.030
Language test prod.	51.17	15.97	-.297





According to the normative scores of the Arabic Language Test, the mean score of the comprehension vocabulary for children between 2 and 3 years is 56.75 which is very close to the scores obtained by children in our sample. In contrast, for production vocabulary, the normative scores as measured by the Arabic Language Test suggest that children aged between 2 and 3 years should score at 40.95, which is much below what we observe here (mean = 51.17). The simplest explanation if that our sample came from a higher socio-economic background than those tested in the Arabic Language Test.

Importantly, we examined through Pearson's correlations whether the children's comprehension and production scores in the Arabic CDI were related to those measured by the Arabic Language Test. As can be seen in Table 3, both comprehension and production scores as measured by the Arabic CDI strongly and positively correlated with the comprehension and production scores measured by the Arabic Language Test.

Table 3. *Pearson correlations between Arabic CDI: Comprehension, Arabic CDI: Production, Language Test: Comprehension, and Language Test: Production (N= 23).*

	Arabic CDI comp	**Arabic CDI prod.**	**Lang test comp.**	**Lang test prod.**
Arabic CDI comp.	1			
Arabic CDI prod.	.574**	1		
Lang test comp.	.653**	.783**	1	
Lang test prod.	.511*	.795**	.894**	1

*p<.05, **p<.01

The strong positive correlation between the two tests suggests that they measure similar abilities. Given that we established the Arabic CDI validity in the Egyptian dialect at age 2, we can reasonably assume that it will also be valid in the other dialects (i.e., it will assess language development) and usable for assessing the development of both comprehension and production of Arabic children in 17 Arabic countries. The next step to prepare for the main data collection, was to design a website allowing parents to input their data. The aim of the next study was to assess the reliability of data collection with this online method. As we will see, this lead us to produce a shorter version of the original list for words, to accommodate for the poor rate of questionnaire completion.

1.4 Study 3: Comparing Modalities of Data Collection and Shortening the CDI

Following the recent standardisation of the UK-CDI (Alcock et al., 2016) with an online platform, as well as the CDI-based UKBT bilingual norms at age 2 (Floccia et al., 2018), we opted for an online data collection to establish norms for the Arabic CDI. This was further justified by the geographical spread of the target countries. A sample of data was collected through a bespoke website, and data were compared to those collected on a paper version. Following, a shorter version of the CDI was developed using collected data, to increase the data completion rate for the next steps.

1.4.1 Participants

A total of 343 participants signed up on the initial Arabic CDI platform, of whom 205 participants completed the long CDI (404 words). Out of these, only 50 participants provided useful data: monolingual children within the age range (8-30 months), living in one of the Arab countries included and speaking an Arabic dialect consistent with their country of origin. We excluded 155 participants either because they were less than 8 months old (21 children), more than 30 months old (47 children), had more than 10 hours per week exposure to English or another additional language (87 children). The 50 participants included 27 Egyptians, 14 Syrians, 3 Jordanians, 2 Sudanese, 2 Algerians, 1 Libyan, and 1 Bahraini. See descriptive statistics of the group in Table 4. The recruitment for this study was done through social media, especially Facebook groups.

Materials

A bespoke website was designed by the psychology technicians at the University of Plymouth, so parents could sign up and provide information about their children's vocabulary

knowledge. The website was made available in English and standard Arabic. For signing up, only one parent, at least, was required to provide personal information about himself/herself (surname, email, parent's nationality and dialect, country of current residence, education, occupation, and optional annual income). Some demographic information about the child was also collected (date of birth, gender, nationality, dialect of use, country of birth, country of current residence) together with background information. This included questions related to the primary caregiver, number and age of siblings, whether the child has any hearing problems, developmental delay, or was born more than 6 weeks premature. We also asked whether the child was exposed to an additional language inside and outside home (in each case, which one, spoken by whom, and number of hours per week). After providing this information and selecting the child's dialect, a 404-word list translated into the child's dialect appeared and parents were asked to tick the words their children understood only and the words they understood and said. As a thank you, after completing the word list, an email was sent to the parent with a word cloud to provide them with a memory of the words the child understood and/or said at that age.

1.4.2 Results

Summary of data from the final sample of 50 participants is provided in Table 4.

Table 4. *Descriptive statistics for the group (N = 50)*

	M	**SD**	**Skewness**
Age	19.83	7.01	
Gender	33 females, 17 males		
Comprehension	151.32	132.75	.722
Production	73.08	104.62	.909

First, an expected positive correlation between age and CDI scores was found for comprehension ($r = 0.63$, $p < .000$) and for production ($r = 0.52$, $p < .000$). Children's recognition and production of words increased by age as shown in Figure 1.

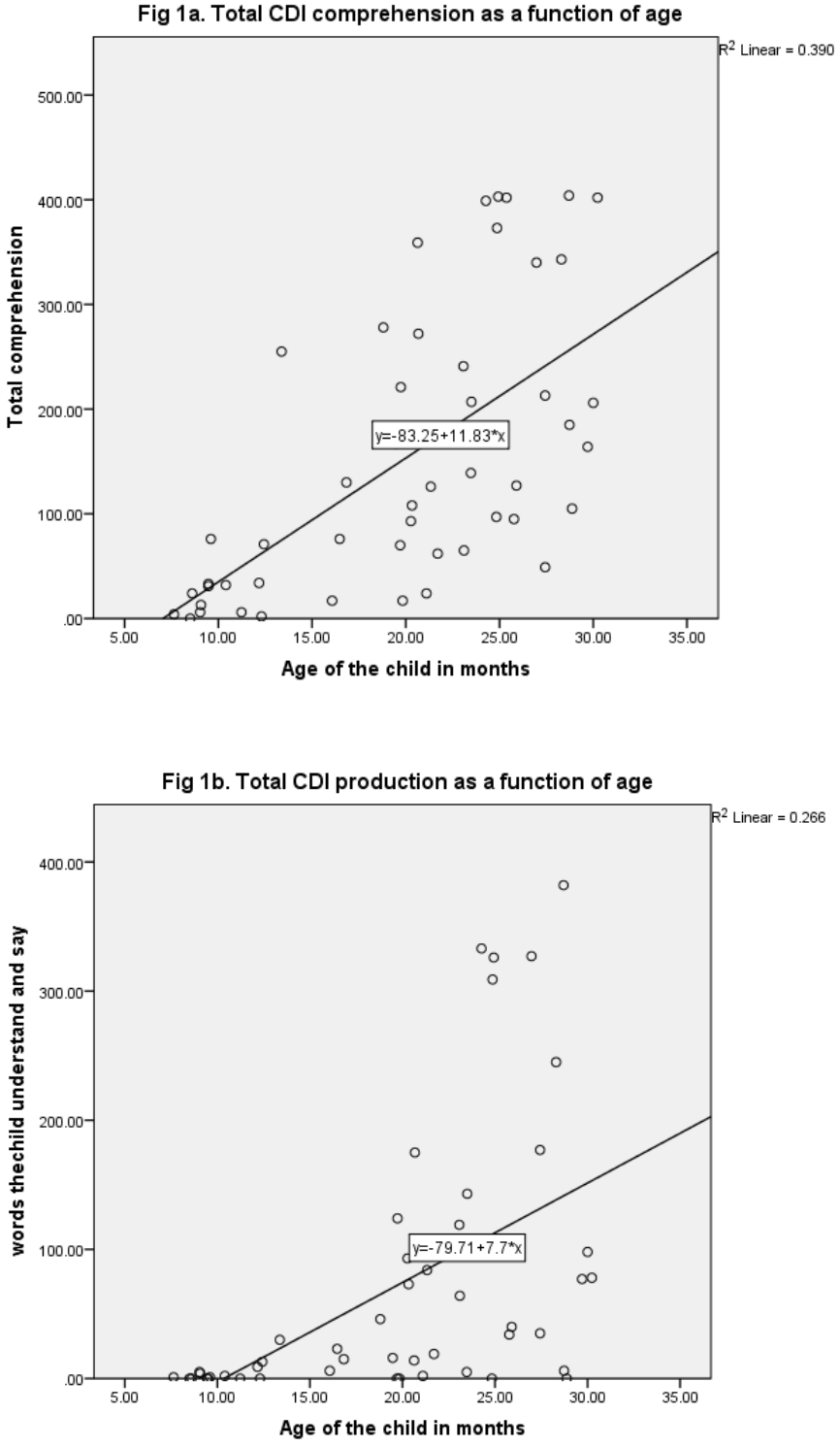


Figure 1*: Comprehension (a) and production (b) as a function of age*

Also, expectedly, a strong positive correlation was found between children's comprehension and production (r= 0.78, p< .000) as children with higher performance in comprehension had also high scores in their production and vice versa, as illustrated in Figure 2.

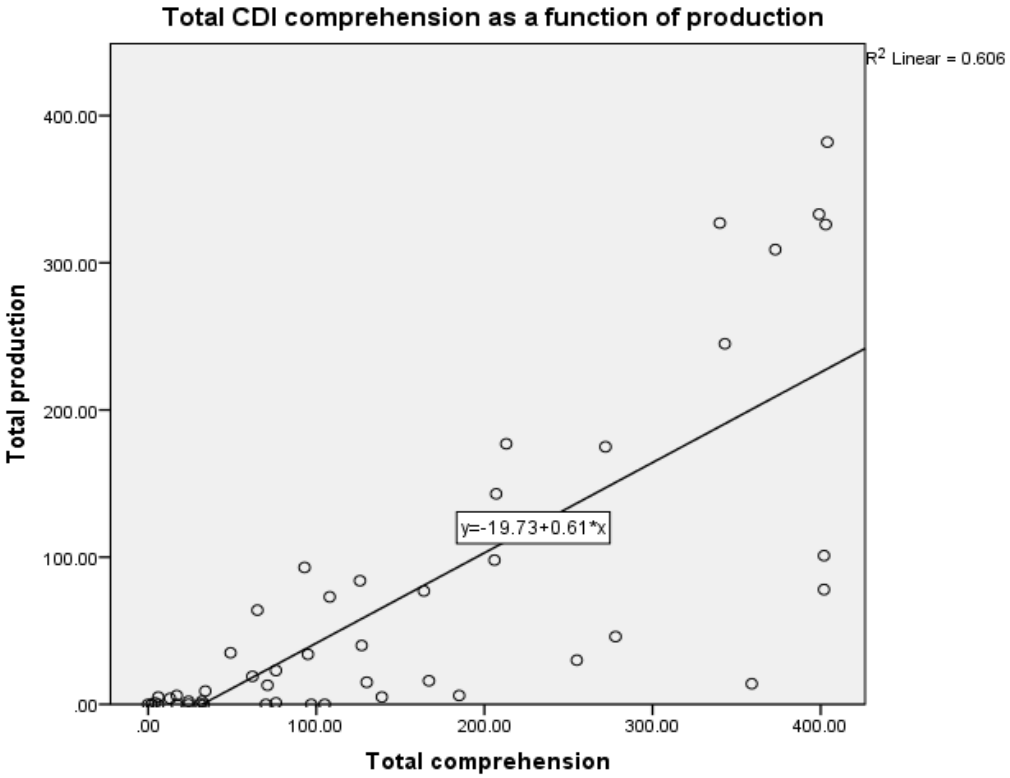


Figure 2: *Vocabulary comprehension as a function of production*

Data collection for the long CDI proved to be disappointing in terms of completion rate. Therefore, and following recent trends in CDI development (Fenson et al., 2000; short Oxford CDI: Floccia et al., 2018), we decided the use the data collected with the long CDI to generate a 100-word version.

On the model of the development of the short Oxford CDI version (Floccia et al., 2018), we selected 100 words based on their frequency ranges. Initially, the children were binned in 3 age groups: min to 500 days (16 children: 1 Sudanese, 1 Libyan, 7 Syrians, 7 Egyptians), 501 to 700 days (17 children: 9 Egyptians, 1 Bahraini, 3 Jordanians, 1 Algerian, 3 Syrians) and 701

to max (17 children: 4 Syrians, 11 Egyptians, 1 Sudanese, 1 Algerian). Then in each age group, we selected 100 words that span all categories of frequency (15 bins of frequency).

To do this, we started from the middle age bin (17 children) where vocabulary scores are the most stable. The words both understood and produced were arranged in order of decreasing frequency and 100 words were picked according to the most frequent to the less frequent using bins of 10 words, and keeping an equal distribution of types of words across the whole lists (same proportion of nouns, adjectives, verbs, function words). Then we checked whether the selected words were suitable choices for the other two age bins (see figure3)

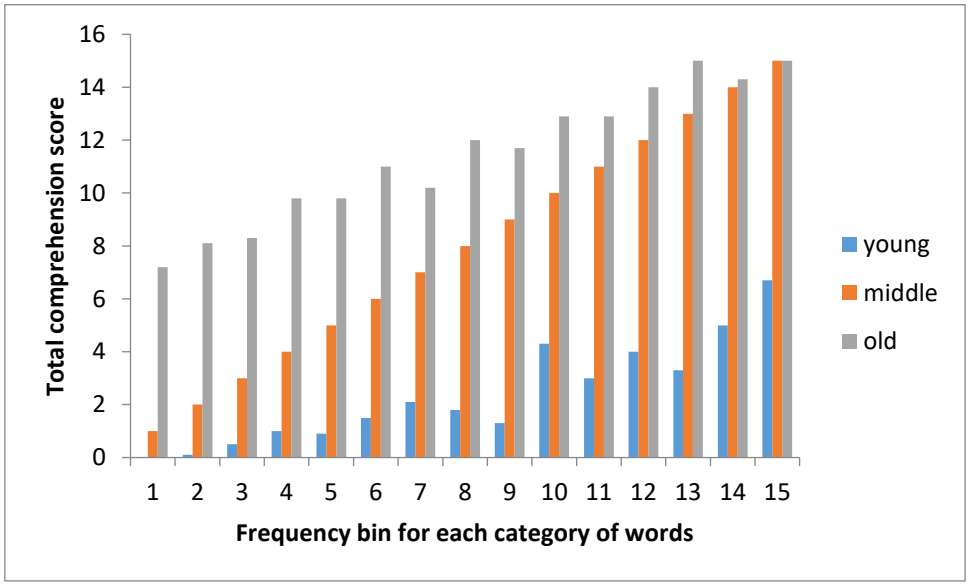


Figure 3: *Mean number of children for the 3 age groups who know each category of words: the less frequent (category 1) to the most frequent (category 15). For example, for the youngest group, the words from the most frequent category (category 15) are known on average by about 7 children, while the less frequent words (category 1) are known by no children 6) (See Appendix B).*

After shortening the Arabic CDI into 100 words list, it was important to check the reliability of this new list. This was done in Study 4, with an additional aim: comparing the modes of completion (online vs. paper).

1.5 Study 4: Effect of Mode of CDI Completion

The aim of this fourth study was first to verify that our 100-word CDI was suitable for measuring vocabulary development in a new group of children, and second to establish whether the mode of CDI completion (online versus on paper) resulted in significant differences in vocabulary scores. To do this, we asked participants to fill in the 100-word CDI on paper, and then online (or vice versa), which allowed us as well to assess the test-retest validity of this new tool.

1.5.1 Participants

Twenty-one parents of typically developing Egyptian healthy children (M = 23.71 months, SD = 5.77) took part. The child sample included 10 male (47.6%) and 11 female (52.4%). The children were recruited from different Northern Egypt districts through relatives and friends, from the same type of socio-economic background as in Study 2. Nine participants filled in the Arabic CDI online first and 12 completed it on paper first.

Procedure

An interview was first prepared with the child's mother to give her information about the study and sign the consent form. Following this, about half of the mothers did the online Arabic CDI first and after completion they contacted the researcher to prepare an interview to do the paper one; the other half filled in the paper version first and then the online one. There was a time period between 2 to 3 weeks separating the completion of the 2 versions of the CDI.

1.5.2 Results

The analysis sought to examine the relation between the comprehension and production scores as measured by the online CDI as compared to those measured by its paper version. Descriptive statistics of the participant sample are found in Table 5.

Table 5. *Descriptive statistics of the participants who filled in the Arabic CDI online and on paper*

	Mean	**SD**	**Skewness**
Age	23.71	5.77	
Gender	11 females; 10 males		
Online Comp.	76.38	24.95	-1.508
Online Prod.	49.24	26.75	-.555
Paper Comp.	77.48	24.88	-1.702
Paper Prod.	50.10	26.81	-.577

Pearson correlations were first computed across all variables. Significant strong correlations were found between vocabulary comprehension scores as measured by the online CDI and those measured by the CDI paper version ($r = .99$, $p < .000$), vocabulary production as measured by the online CDI and the paper one ($r = .99$, $p < .000$). Additionally, a strong positive correlation was found between the child's age and vocabulary comprehension and production as measured by the CDI paper version($r = .67$, $p = .001$; $r = .71$, $p < .000$) respectively. Another strong positive correlation was found between the child's age and vocabulary comprehension and production as measured by the CDI online version ($r = .62$, $p = .003$; $r = .72$, $p <.000$) respectively.

A repeated measure ANOVA was run on comprehension scores with two factors: order of completion as a between subject variable (online version first or second) and mode of completion (online vs. on paper) as a within participant variable. Analysis revealed no main effect of the mode of completion, $F(1,19) = 2.18$, $p = .156$, $\eta_p^2 = .10$, and no main effect of the order of presentation of the CDI, $F(1,20) = 1.28$, $p = .27$, $\eta_p^2 = .063$. No interaction between

modality and order was found, $F(1, 19) < 1$. This test-retest result suggests that the Arabic CDI is reliable, and that the format of presentation does not have any impact.

1.5.3 Discussion of studies 1 to 4

To sum up, an initial validation of the Arabic CDI was undertaken to examine whether the Arabic CDI provides comparable estimates of vocabulary knowledge in an initial range of countries for children within the age range of 8 to 30 months.

Results showed that the Arabic CDI provides comparable comprehension and production scores across the few selected countries at the age of 24 months (Study 1). Concurrent validity was assessed through the comparison of the Arabic CDI and another language assessment test, the Arabic Language Test (Refaie, 1994) which showed that the two tests measure similar abilities (Study 2). Based on the poor return of data in preliminary data collection, we decided to use the data collected from the long Arabic CDI to select 100 words based on their frequency ranges, which would make it easier and quicker to complete (Study 3). The 100 words for the new version of the Arabic CDI replaced the long CDI on the online platform and data collection resumed. Finally, Study 4 was conducted to confirm the validity of the Arabic CDI through test-retest, and to ensure that the mode of CDI completion (online or on paper) was equivalent.

The final data collection resumed using the short list of the Arabic CDI through the online platform, with the aim of standardising the Arabic CDI and examining the factors that would predict language development in Arabic-speaking children aged from 8 to 30 months.

1.6 Study 5 Standardisation of the 100-Word Arabic CDI

Here we report the main data collection for the standardisation of the Arabic CDI, based on a 100-word list selected and validated in the previous studies. Data were collected on a remote

web-based platform, published in country-specific social media and distributed to local nurseries across the 17 countries.

1.6.1 Participants

Data were collected from 924 participants in total, out of which 607 participants were usable data, of whom 435 were Egyptians and the 172 were from other dialects (10 Algerian, 8 Bahraini, 23 Emirati, 15 Iraqi, 8 Jordanian, 8Lebanese, 8 Libyans, 8 Moroccans, 9 Omanis, 10 Palestinians, 10 Qataris, 18 Saudis, 8 Sudanese, 8 Syrians, 12 Tunisians, 9 Yemeni). Some children were excluded either because the parent did not complete the CDI (N = 243) or because they violated any of the inclusion criteria (N = 74) as described below.

Inclusion/ Exclusion criteria

All children included in this study had no hearing problems, no developmental delays, were no more than 6 weeks premature, and they were aged no less than 8 months and no more than 30 months at the time of conducting the study. In relation to exposure to additional languages, the children included were not exposed to a non-Arabic language more than 10 hours in total per week, both inside and outside their home. Finally, children living in non-Arabic-speaking countries were excluded.

Procedure

Most data were collected through nurseries in Egypt and other countries by sending the link to nurseries, who forwarded it to the parents of children within the age range (8 to 30 months). Participants who filled in the CDI through nurseries were paid, but only in Egyptian nurseries (5 Egyptian private nurseries); payment was not possible for other nurseries in other Arabic countries (15 non-Egyptian private nurseries) due to the difficulty of transferring money. Out

of 435 Egyptian participants, 390 participants were recruited through nurseries; out of 172 non-Egyptians, 56 were recruited through nurseries. The remaining data were collected through social media by publishing the link on social groups.

1.6.2 Results

1.6.2.1 Predictors of language development for Egyptian and non-Egyptian children

The first step was to examine which factors would reliably predict vocabulary scores in Arabic-learning children, separately for the Egyptian dialect and the other 16 dialects, before collating data across all dialects. Participants were divided into two groups according to the CDI dialect. The first group was for the Egyptian children and the second group for all other children with other dialects.

Two sets of analyses were run for each group: primary analyses with impact of core factors (age, gender, SES) on comprehension and production scores; these variables are well established predictors of vocabulary development, starting with age (e.g. Fenson et al., 2007), SES (Hart & Risley, 2003), and gender, at least for production (Eriksson et al., 2012); secondary analysis examined the impact of less established factors such as the identity of the parent who filled in the CDI, whether the child was recruited through a nursery or social media, the number of siblings, whether the child was first born or other, the primary caregiver, and the exposure to additional languages inside home and outside home. The same two-step approach was taken in Floccia et al. (2018) when analysing the effects of contextual variables in bilingual toddlers.

Egyptian group

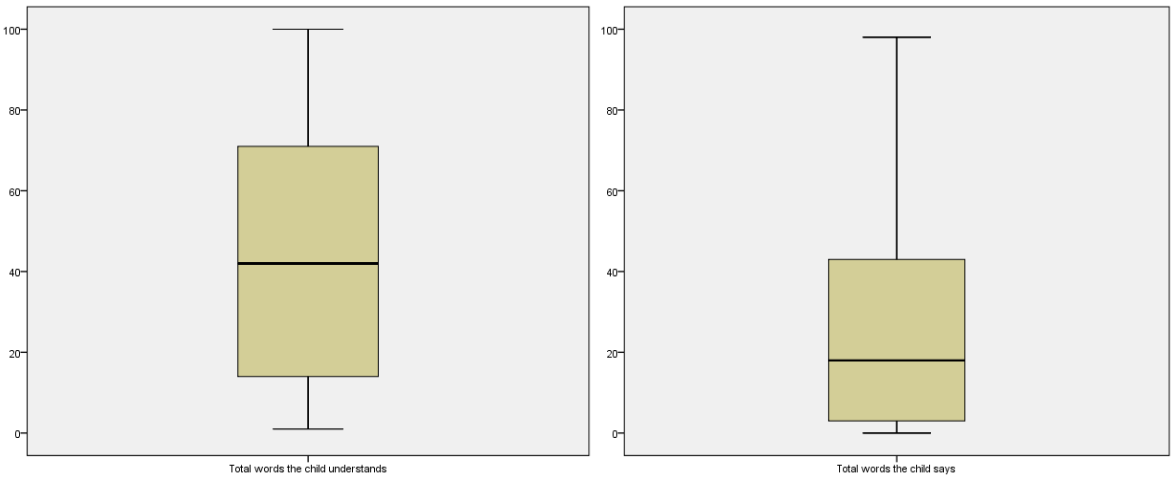
Primary analysis for the Egyptian group

In the first set of analysis, we asked whether the Egyptian children's vocabulary scores (comprehension and production individually) could be predicted by the core variables of age, gender, and SES (see Table 6). SES was assessed through the level of education of the parent who filled in the Arabic CDI (very often information about the second parent was missing). The reason for not using a compound variable combining the education and occupation of the parent who filled the CDI, is because very often it was a stay-at-home mother. It is very common in the Arab world that mothers prefer not to work and to stay at home to take care of the children, while at the same time the second parent may have a highly rated occupation.

Table 6. *Means and SD for the core variables tested for prediction of vocabulary development in Egyptian children (N = 435).*

Factor	Mean	SD	Skewness
Age	19.84	7.17	
Gender	232 females; 203 males		
SES	2.83	.57	
Comprehension	44.21	31.03	.250
Production	26.77	27.23	.917

Note. Age = age in days of the child at testing (between 8 to 30 months); Gender = 1 for female and 2 for male; SES = Socio-Economic Status of the family: 0= not educated to 4 = highest education (postgraduate degree). Comprehension = number of words the child understands out of 100; Production = number of words the child says out of 100.



First, correlations between all independent variables (age, gender, and SES) were computed to identify potential multicollinearity issues. There was no significant correlation between any of them. So all of them were included in the same model as predictors of vocabulary knowledge.

For the first regression analysis predicting the child's comprehension from age, gender, and SES (all forced into the equation), the model was fitting the data, $F(3,431) = 171.20$, $p < .000$, with a high R^2 (.54). Thus 54% of the variability in comprehension scores was predicted by the model (see Table 7 for the full model). It must be noted however that only age provided a significant contribution to the prediction.

Table 7. *Full model of prediction for vocabulary comprehension as a function of age, gender, and SES (N= 435)*

Predictors	***B***	***SE***	***β***	***t***	***p***
(Constant)	-18.651	4.671		-3.993	.000
Age	3.189	.141	.737	22.652	.000
Gender	-.203	2.024	-.003	-.100	.920
SES	-.051	.860	-.002	-.059	.953

This was confirmed when using a stepwise regression procedure to find the best fitting model, whose results are in Table 8. This model, where only age was included, did not account for any additional variance in comprehension score as R^2 was the same ($F(1,433) = 515.96$, $p < .000$, $R^2 = .54$).

Table 8. *Stepwise regression model results for comprehension scores*

Predictors	***B***	***SE***	***β***	***t***	***p***
(Constant)	-19.063	2.962		-6.437	.000
Age	3.189	.140	.737	22.715	.000

For children's word production, the same initial full model with age, gender and SES was also fitting the data, $F(3,431) = 169.32$, $p < .000$, with a high R^2 (.54). Thus 54% of the variability in production scores was predicted by the model (see Table 9 for the full model). Here similarly, only age contributed significantly to predict vocabulary scores.

Table 9. *Full model of prediction for vocabulary production as a function of age, gender, and SES (N= 435)*

Predictors	***B***	***SE***	***β***	***t***	***p***
(Constant)	-29.697	4.112		-7.221	.000
Age	2.790	.124	.735	22.508	.000
Gender	.657	1.782	.012	.369	.712
SES	.059	.757	.003	.078	.938

When a stepwise regression procedure was used to find the best fitting model (Table 10), age only was included in the model, which accounted for the same variance in production score, ($F(1,433) = 510.01$, $p < .000$, $R^2 = .54$).

Table 10. *Stepwise regression model results for production scores*

Predictors	***B***	***SE***	***β***	***t***	***p***
(Constant)	-28.622	2.608		-10.975	.000
Age	2.792	.124	.735	22.583	.000

In summary, age was the only significant predictor of vocabulary comprehension and production for children aged 8 to 30 months, above and beyond gender and SES. In the general discussion, we will get back to the unexpected finding that gender did not contribute to explain production scores in this population as previous literature (Eriksson et al., 2012; Floccia et al., 2018) found an impact of gender on vocabulary knowledge with girls outperforming boys, especially in relation to the production vocabulary.

Secondary analysis for the Egyptian group

After having established the role (or absence of role) of core predictors of vocabulary knowledge, in the second set of analysis we asked whether the Egyptian children's rate of vocabulary knowledge (comprehension and production individually) could be further predicted by other secondary variables. These were the identity of the parent who filled in the CDI (mother versus father), the method of recruitment (nursery or social media), the identity of the primary caregiver (mother versus other), the number of siblings, whether the child was first

born or other, the child's exposure to additional languages inside home, and the child's exposure to additional languages outside home (see descriptive statistics in Table 11). We anticipated an impact of the identity of the parent who filled in the CDI: mothers might be expected to give more accurate scores than fathers given that mothers typically spend more time with their children and should have more opportunities to evaluate their language (Barakat, 2005). We expected no impact of the method of recruitment, but we expected a potential impact of the identity of the primary caregiver (Huttenlocher et al., 1991), with children whose mothers are the primary caregivers expected to outperform their counterparts. An impact of the number of siblings was also expected with first-born children scoring higher than the others (Fenson et al., 1994; Jones & Adamson, 1987). Finally no impact of exposure to additional languages neither inside nor outside home was expected given that all children in our sample were selected so that they did not have more than 10 hours of total exposure per week to a non-Arabic language inside and outside their home.

Table 11 provides descriptive statistics for the range of factors that will be examined here.

Table 11. *Means and SD for the secondary variables tested for prediction of the vocabulary development (N = 435).*

Factor	Mean	SD
The parent who filled in the CDI	270 by mothers; 165 by fathers	
Method of recruitment	63 social media; 372 nurseries	
The primary caregiver	407 with mothers; 28 with other	
Number of siblings	1.07	1.17
First borns vs. others	219 first borns; 216 others	
Exposure to additional language inside home	396 no; 39 yes	
Exposure to additional language outside home	426 no; 9 yes	
Comprehension	44.21	31.03
Production	26.77	27.24

Note. The parent who filled in the CDI = 1 for mother, 2 for father. Method of recruitment = 1 through social media, 2 through nursery. The primary caregiver = the person the child spends most of the time with: 1 with mother, 2 with other. Siblings (number of siblings) = 0 (no siblings) to 4 (4 siblings). First borns vs. others: 0 = first borns, 1 = others. Exposure to additional languages inside/outside home (no more than 10 hours for both inside and outside home per week): 0 = no additional languages, 1 = exposed to additional language. Comprehension = number of words the child understands out of 100. Production = number of words the child says out of 100.

The effect of secondary variables on comprehension and production scores was tested one by one in addition to age as the only surviving variable from the first set of analyses.

A series of stepwise regressions were run with each of the secondary variables (identity of the parent who filled in the CDI, recruitment method, siblings, exposure to additional language inside home), but in all cases there was no effect of any of them with age only contributing significantly to predict vocabulary scores (comprehension and production individually). The exceptions were the primary caregiver and exposure to additional languages outside home, which predicted comprehension scores but not production scores (see Table 12 & Table 13).

Table 12. *Stepwise regression model for vocabulary comprehension as a function of age and primary caregiver.*

Predictors	***B***	***SE***	***β***	***t***	***p***
(Constant)	-7.18	5.21		-1.38	.17
Age	.11	.005	.74	22.91	.000
Primary caregiver	-11	4.07	-.09	-2.70	.007

Children who spent most of the time with their mother had higher comprehension scores (n = 407, M = 44.87, SD =131) than their counterparts who spent most of the time with others (n = 28. M = 34.61, SD = 30.34); (F(2,432) = 265.59, p = < .000, R2 = .55).

Table 13. *Stepwise regression model for vocabulary comprehension as a function of age and exposure to additional languages outside home.*

Predictors	***B***	***SE***	***β***	***t***	***p***
(Constant)	-18.55	2.94		-6.31	.000
Age	.11	.005	.73	22.50	.000
Additional language	15.92	7.07	.07	2.25	.025

In comprehension, children exposed to additional languages outside home outperformed (N = 9, M = 75, SD = 31.03) children who were not (N = 426, M = 43.56, SD = 30.90); ($F(2,432) = 263.14$, $p = < .000$, $R2 = .55$)., but the sample is very low so this result must be taken with caution.

To sum up, amongst the primary predictors of language development, only age predicted comprehension and production performance in Egyptian children. When secondary variables such as the identity of the parent who filled in the CDI, recruitment method, and number of siblings were examined, neither of them did predict comprehension nor production performance apart from the identity primary caregiver (see Pancsofar and Vernon-Feagans, 2006 for a similar result). Exposure to additional languages outside home (no more than 10 hours) predicted comprehension scores, however the small sample of data in one condition (n = 9 children hearing an additional language) prevents us to drawing any conclusion.

Other dialects group

Similar analysis were run for the second group which included all children from non-Egyptian backgrounds (16 other possible dialects). Again, two analyses were run: a primary analysis with impact of core factors (age, gender, SES) on comprehension and production scores, and a secondary analysis testing the impact of less established measures (e.g. the identity of the parent who filled in the CDI).

Primary analyses for the other dialects group

In the first set of analyses, we asked whether the children's rate of vocabulary knowledge (comprehension and production individually) could be predicted by the core variables of age, gender, and SES (see Table 14).

Table 14. *Means and SD for the core variables tested for prediction of the vocabulary development in other dialects children (N = 172).*

Factor	Mean	SD	Skewness
AGE	19.18	6.56	
Gender	84 females; 88 males	.50	
SES	2.72	.87	
Comprehension	45.36	30.50	.332
Production	23.84	25.04	1.207

Note. Age = age of the child at testing (between 8 to 30 months); Gender = 1 for female and 2 for male; SES = Socio-Economic Status of the family: 0= not educated to 4 = highest education (postgraduate degree); Comprehension = number of words the child understands out of 100; Production = number of words the child says out of 100.

First, correlations between all independent variables (age, gender, and SES) were computed to identify potential multicollinearity issues. There was no significant correlation between any of them. So all of them were included at the same model as predictors of vocabulary knowledge.

For the first regression analysis predicting the child's comprehension from age, gender, and SES, the model was fitting the data, $F(3,168) = 56.24$, $p < .000$ with a high R^2 (.50). Thus 50% of the variability in comprehension scores was predicted by the model (see Table 15 for the full model). It must be noted however that only age provided a significant contribution to the prediction.

Table 15. *Full model of prediction for vocabulary comprehension as a function of age, gender, and SES (N=172)*

Predictors	***B***	***SE***	***β***	***t***	***p***
(Constant)	-15.602	8.900		-1.753	.081
Age	.110	.008	.709	12.955	.000
Gender	-.359	3.348	-.006	-.107	.915
SES	-.756	1.917	-.022	-.395	.694

This was confirmed when using a stepwise regression procedure to find the best fitting model, whose results are in Table 16. This model, where only age was included, did not account for additional variance in comprehension score, $F(1,170) = 170.41$, $p < .000$, $R^2 = .50$.

Table 16. *Stepwise regression model results for comprehension scores*

Predictors	***B***	***SE***	***β***	***t***	***p***
(Constant)	-18.08	5.13		-3.52	.001
Age	.11	.01	.71	13.05	.000

For children's word production, the same full model was also fitting the data, $F(3,168) = 37.61$, $p < .000$, with $R^2 = .39$. Thus 39% of the variability in production scores was predicted by the model (see Table 17 for the full model). Here similarly, only age contributed significantly to predict vocabulary scores.

Table 17. *Full model of prediction for vocabulary production as a function of age, gender, and SES (N=172)*

Predictors	***B***	***SE***	***β***	***t***	***p***
(Constant)	-18.944	7.998		-2.369	.019
Age	.080	.008	.633	10.557	.000
Gender	.547	3.009	.011	.182	.856
SES	-1.689	1.723	-.059	-.980	.328

When a stepwise regression procedure was used to find the best fitting model (Table 18), age only was included in the model, which accounted for the same variance in production score, $F(1,170) = 112.40$, $p < .000$, $R^2 = .39$.

Table 18. *Stepwise Regression model Results for Production scores*

Predictors	***B***	***SE***	***β***	***t***	***p***
(Constant)	-22.59	4.62		-4.89	.000
Age	.08	.01	.63	10.60	.000

In summary, age was the only significant predictor of vocabulary comprehension and production for children aged 8 to 30 months in other dialects, above and beyond gender and SES.

Secondary analyses for the other dialects group

In the second set of analysis, we asked whether the rate of vocabulary knowledge (comprehension and production individually) for the children from non-Egyptian dialects could be predicted by other secondary variables: the identity of the parent who filled in the CDI, the method of recruitment (nursery or social media), the primary caregiver, the number of siblings

if any, first borns vs. others, and the child's exposure to additional languages inside and outside home. Table 19 provides descriptive statistics for the sample.

Table 19. *Means and SD for the secondary variables tested for prediction of the vocabulary development for children from other dialects (N = 172).*

Factor	Mean	SD
The parent who filled in the CDI	112 by mothers; 60 by fathers	
Method of recruitment	74 social media; 98 nurseries	
Primary caregiver	149 with mother; 23 with others	
Siblings	.91	1.32
First borns vs. others	112 first borns; 60 others	
Exposure to additional language inside home	145 no; 27 yes	
Exposure to additional language outside home	151 no; 21 yes	
Comprehension	45.36	30.50
Production	23.84	25.04

Note. The parent who filled in the CDI = 1 for mother, 2 for father; Method of recruitment = 1 through social media, 2 through nursery; Primary caregiver (the person the child spends most of the time with): 1 with mother, 2 with others; Siblings= 0 (no siblings) to 4 (4 siblings); First borns vs. others: 0 = first borns, 1= others; Exposure to additional languages inside/outside home (no more than 10 hours for both inside and outside home per week) = 0 no additional languages, 1 exposed to additional language; Comprehension = number of words the child understands out of 100; Production = number of words the child says out of 100.

For the regression analyses predicting the child's comprehension and production from secondary variables, the secondary variables were tested one by one in addition to age, the only surviving variable from the first analysis.

A series of stepwise regressions were conducted with each of the secondary variables (method of recruitment, primary caregiver, siblings, exposure to additional language inside home, and exposure to additional languages outside home), but in all cases there was no effect of any of them, with only age contributing significantly to predict vocabulary scores (comprehension and production individually). The exception was the identity of the parent who filled in the CDI, which predicted the comprehension and production scores (see Table 20 & Table 21).

Table 20. *Stepwise regression model for vocabulary comprehension as a function of age and the parent who filled in the CDI.*

Predictors	***B***	***SE***	***β***	***t***	***p***
(Constant)	-4.99	7.17		-.70	.487
Age	.11	.01	.69	12.95	.000
Parent who filled in the CDI	-8.80	3.42	-.14	-2.57	.011

Children whose mothers filled in their CDIs scored higher in their comprehension scores (N = 112, M = 49.96, SD = 31.96) than other children whose CDIs were filled in by their fathers (N = 60, M = 36.78, SD = 25.69); ($F(2,169) = 91.34$, $p < .000$, $R^2 = .51$). Similarly for the production scores (see Table 31), production scores for children whose CDIs were filled in by mothers were higher (N =112, M = 28.14, SD = 27.45) than those for their counterparts whose CDIs were filled in by their fathers (N = 60, M = 15.80, SD = 17.27); ($F(2,169) = 63.33$, $p < .000$, $R^2 = .42$) .

Table 21. *Stepwise regression model for vocabulary production as a function of age and the parent who filled in the CDI.*

Predictors	***B***	***SE***	***β***	***t***	***p***
(Constant)	-8.95	6.42		-1.39	.165
Age	.08	.01	.61	10.50	.000
Parent who filled in the CDI	-9.17	3.06	-.18	-2.99	.003

1.6.2.2 Interim summary

When considering the primary factors of language development, for the two groups of children (Egyptian and other dialects), only age predicted comprehension and production performance significantly. Gender and SES did not predict vocabulary skills in the two groups, when controlled for age. When the impact of secondary variables such as recruitment method were examined, Egyptian children's scores were partially predicted by the identity of their primary caregiver, with children whose mothers are the primary caregivers outperforming the others. This factor did not affect the children learning another dialect than Egyptian Arabic, but here the identity of the parent who filled in the CDI had a significant impact on both comprehension and production scores separately. Children whose mothers filled in the Arabic CDI had higher scores in their comprehension and production vocabulary than their counterparts whose fathers filled in the Arabic CDI. This will be addressed further in the general discussion. In what follows we examined whether the data collected in Egypt were different from those collected in the other 16 Arabic countries.

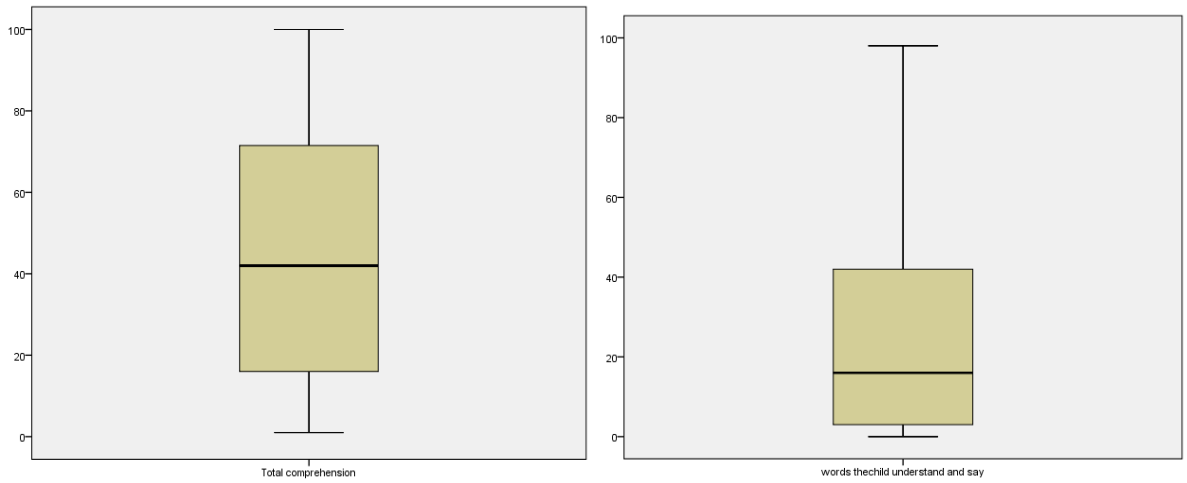
1.6.2.3 Total Arabic data analysis

To compare data from the two samples, we asked whether CDI dialect could explain the rate of vocabulary knowledge (comprehension and production) together with the core variables of age, gender and SES (See Table 22).

Table 22. *Means and SD for the core variables tested for prediction of the vocabulary development for all Arabic children (N = 607).*

Factor	Mean	SD	Skewness
AGE	19.67	7.02	
Gender	315 females; 292 males		
SES	2.53	1.10	
CDI Dialect	1.28	.45	
Comprehension	44.54	30.86	.270
Production	25.94	26.64	.991

Note. Age = age of the child at testing (between 8 to 30 months); Gender = 1 for female and 2 for male; SES = Socio-Economic Status of the family according to the level of education of the parent who filled in the CDI: 0 = not educated to 4 = highest education (postgraduate degree); CDI Dialect = 1 for Egyptians, 2 for non-Egyptians; Comprehension = number of words the child understands out of 100; Production = number of words the child says out of 100.



In summary, age was the only significant predictor of vocabulary comprehension and production for children from all dialects aged 8 to 30 months, above and beyond gender, SES, and CDI Dialect. The norms for the Arabic CDI were thereby calculated on the Egyptian sample of data using age as the only modifying variable (see Tables 23 & 24). Although our analyses did not reveal any impact of dialect, the small number of participants per dialect could hide some differences that could be uncovered with further research. The norms are taken from quantile regression curve which were calculated by Samuel Forbes, a Senior Research Assistant at East Anglia University, UK. The normative scores were expressed in age in months and quantiles. Raw percentile scores were used for both sexes, starting with the 8th percentile and ranging till the 30th percentile. Percentiles from 10 to 90 express the CDI scores for word comprehension and production separately. For example, a child who is 18 months and understands 50 words would fall in the 50 percentiles for comprehension; while a child who is 18 months and says 50 words would be between 80 to 90 percentiles for production. The table contains some anomalies (e.g. comprehension and production scores appear to decrease after 29 months), which are due to the uneven number of children per age bracket, particularly on the edges.

Table 23.*Fitted percentiles from 10 to 90 for the comprehension score as measured by the Arabic CDI expressed in age in months from 8 to 30*

Ages	N	10	20	30	40	50	60	70	80	90
8	7	0.010	0.014	0.026	0.030	0.030	0.036	0.042	0.048	0.058
9	29	0.020	0.030	0.044	0.054	0.080	0.080	0.090	0.094	0.100
10	29	0.038	0.040	0.050	0.080	0.080	0.098	0.126	0.140	0.180
11	17	0.040	0.086	0.110	0.114	0.120	0.156	0.192	0.200	0.230
12	19	0.038	0.060	0.064	0.070	0.090	0.106	0.164	0.206	0.350
13	24	0.070	0.092	0.119	0.152	0.215	0.246	0.278	0.376	0.450
14	13	0.032	0.044	0.050	0.138	0.210	0.242	0.290	0.374	0.614
15	18	0.074	0.112	0.171	0.180	0.200	0.232	0.370	0.564	0.686
16	19	0.090	0.142	0.170	0.330	0.330	0.376	0.398	0.532	0.620
17	13	0.136	0.196	0.268	0.384	0.420	0.454	0.482	0.512	0.672
18	9	0.316	0.378	0.430	0.468	0.500	0.532	0.552	0.732	0.990
19	17	0.320	0.400	0.416	0.450	0.490	0.534	0.570	0.698	0.820
20	17	0.250	0.334	0.374	0.418	0.430	0.512	0.564	0.588	0.898
21	14	0.331	0.398	0.419	0.444	0.515	0.610	0.742	0.776	0.814
22	13	0.182	0.258	0.366	0.386	0.420	0.462	0.478	0.562	0.658
23	11	0.190	0.310	0.410	0.480	0.490	0.600	0.740	0.770	0.910
24	21	0.260	0.290	0.410	0.460	0.540	0.570	0.660	0.720	0.950
25	28	0.371	0.400	0.511	0.550	0.640	0.712	0.844	0.882	0.970
26	23	0.144	0.376	0.540	0.616	0.670	0.710	0.758	0.874	0.906
27	16	0.330	0.510	0.600	0.720	0.755	0.850	0.860	0.890	0.940
28	24	0.583	0.642	0.736	0.754	0.800	0.820	0.861	0.924	0.947
29	28	0.511	0.574	0.664	0.742	0.780	0.842	0.896	0.940	0.973
30	27	0.384	0.600	0.648	0.660	0.720	0.780	0.800	0.826	0.934

Table 24 *Fitted percentiles from 10 to 90 for the production score as measured by the Arabic CDI expressed in age in months from 8 to 30*

Ages	N	10	20	30	40	50	60	70	80	90
8	7	0.000	0.002	0.008	0.010	0.010	0.010	0.010	0.010	0.010
9	29	0.000	0.000	0.004	0.010	0.010	0.010	0.010	0.020	0.022
10	29	0.000	0.000	0.000	0.000	0.010	0.010	0.010	0.020	0.030
11	17	0.000	0.002	0.010	0.010	0.010	0.016	0.040	0.040	0.048
12	19	0.000	0.006	0.010	0.012	0.020	0.030	0.036	0.100	0.138
13	24	0.013	0.026	0.040	0.040	0.055	0.068	0.080	0.096	0.130
14	13	0.012	0.024	0.030	0.030	0.050	0.060	0.076	0.148	0.188
15	18	0.017	0.020	0.032	0.050	0.065	0.092	0.221	0.266	0.350
16	19	0.040	0.050	0.054	0.072	0.080	0.098	0.128	0.174	0.406
17	13	0.000	0.032	0.086	0.098	0.110	0.122	0.174	0.186	0.358
18	9	0.100	0.120	0.140	0.184	0.240	0.240	0.318	0.382	0.514
19	17	0.086	0.142	0.158	0.184	0.200	0.238	0.274	0.306	0.324
20	17	0.066	0.078	0.134	0.208	0.270	0.310	0.340	0.348	0.400
21	14	0.130	0.130	0.184	0.212	0.270	0.296	0.358	0.442	0.495
22	13	0.044	0.064	0.082	0.122	0.130	0.198	0.234	0.276	0.332
23	11	0.020	0.110	0.220	0.220	0.250	0.260	0.310	0.490	0.660
24	21	0.140	0.200	0.230	0.240	0.280	0.300	0.390	0.510	0.560
25	28	0.058	0.288	0.331	0.348	0.415	0.432	0.459	0.726	0.766
26	23	0.078	0.206	0.416	0.430	0.530	0.562	0.614	0.666	0.738
27	16	0.250	0.350	0.395	0.410	0.610	0.720	0.745	0.830	0.865
28	24	0.323	0.354	0.526	0.564	0.650	0.688	0.747	0.826	0.898
29	28	0.224	0.296	0.401	0.440	0.550	0.636	0.718	0.760	0.920
30	27	0.214	0.354	0.404	0.436	0.500	0.586	0.666	0.748	0.858

1.7 Discussion

Following the development and adaptation of the MacArthur CDI in up to 60 languages, we undertook the development of the Arabic CDI for its use in 17 Arabic countries (and dialects). In the first study, we verified that the initial Arabic CDI (404 words list) provides comparable scores of vocabulary knowledge in an initial subset of Arab countries, establishing that the Arabic CDI is valid for use in the chosen age range (8 to 30 months). This goes in line with findings from Bleses et al. (2008) who found a more or less similar early developmental trends in the age range of 0;8 to 3;0 across 18 different language backgrounds assessed through an adapted CDI specific for each language. This suggests that children's vocabulary development generally follows comparable path in different languages at the same age, regardless of the cultural and linguistic background. A second study was conducted to assess the validity of the Arabic CDI through its comparison to an Egyptian dialect specific language test, the 'Arabic Language Test' (Rifaie, 1994). As expected, a strong correlation was found between the children's language skills (comprehension and production individually) in the two tests. Since the Arabic CDI proved to be valid for use in Egyptian children, we reasonably assumed that it would be valid for assessing comprehension and production in children in the other 16 dialects. In Study 3, after starting data collection in the 17 countries, a high attrition rate alerted us to the fact that we needed a more condensed version the CDI. The data collected were used to shorten the Arabic CDI into a 100 words list (Study 3) according to word frequency (as in the Oxford CDI: see Floccia et al., 2018). Test-retest validity and effect of completion mode were concurrently assessed in Study 4, with a strong correlation between the two modes of completing the CDI (online vs on paper). Finally, in the final study, the main data collection was undertaken in Egypt (N = 435) and 16 other countries (N = 172), and norms for the

Egyptian dialect calculated. In what follows, we will discuss the main findings of this whole study: the effects of demographic and contextual predictors on vocabulary scores, and the generalisation of findings to other dialects. We will end up with recommendations and limitations for the use of the CDI norms in the future.

In the process of standardising the Arabic CDI, we examined the impact of core factors known to affect language development in various populations, namely SES and gender. Contrary to our expectations, we found no impact of SES, assessed based upon parent's education, on word comprehension or production for Egyptians and non-Egyptians groups. Hoff (2003) reported that maternal education affects children's vocabulary knowledge at the age of 2 years old. Similarly, Dollaghan et al. (1999) found a positive impact of maternal education on the development of vocabulary in 3 years old. The explanation for these findings is that mothers from low educational backgrounds tend to talk less to their children than mothers with more education (Hoff, 2003), and that mothers from high education background provide their children with higher quality language (Paradis, 2009). In relation to the impact of quantity of speech, Hoff-Ginsberg (1998), using recorded interactions between children in the age range of 18 to 29 months and their mothers, found that the language of college-educated mothers addressing their children is richer in vocabulary, includes many more questions, and contains fewer directives compared to that of high-school educated mothers. Similarly, Feldman et al. (2000) and Hart and Risley (1995) found that families from high SES spend more time interacting with their children and use more diverse vocabulary, in terms of nouns, tenses, and verbs than those used by parents from low SES. In relation to the quality of speech, Hoff, Laursen, and Tardif (2002) found that mothers with higher educational background talk to their 5-year-old children with the aim of eliciting conversations, unlike less-educated mothers whose speech with their children aims mainly at monitoring behaviours. However, apart from Feldman et al. (2000) who used the Mac-Arthur CDI, all these previously mentioned studies

depended on recording interactions between the caregiver (particularly mothers) and the child during play time to assess language development. On the other hand assessing vocabulary development through parent report measures in the literature proved no impact of SES on language development. For example in line with our findings, Fenson et al. (1994) who conducted the first standardisation of the MacArthur CDI in the US (N = 1,130) found no impact of SES on vocabulary skills before 3 years of age, but they observed a small effect after that age.Additionally, Fenson and colleagues (1994), using the original MacArthur CDI, found a very small impact of SES limited to production vocabulary in children between 16 to 30 months. Similarly, Hamilton et al. (2000) found no impact of SES neither on comprehension nor on production of children when collecting CDI data in the UK with children (N = 200) aged 1;0 to 2;1. The use of parent report as a measure cannot be a reason for these null findings since parent reports have widely proven to be valid when compared to other observation measures and standardised tests (Lee, Chiu, van Hasselt, & Tong, 2009; Marchman, Martınez-Sussman, & Dale, 2004). It is therefore possible that our sample, which is a self-selected sample, is made primarily of parents who are actively engaged in their child's language development, across education levels, as is probably the case for the other CDI norming studies. This is clearly a limitation to this research, and future development of the CDI should involve targeting a wider profile of families across all SES strata.

Our second finding is that we did not observe any impact of gender on the development of vocabulary knowledge in Arabic-speaking children, neither for the whole sample, nor on each group separately (Egyptian versus non-Egyptian dialects). It was an open question as to whether there would be such an effect. On one hand, the only other study in Arabic (Al-Akeel, 1998) did not find any effect of gender on the development of comprehension of morpho-syntactic structures in Saudi children, using a child-based language comprehension test. On the other hand, large scale studies in other cultures or countries have reported, rather

consistently, an advantage of girls over boys in production. For example, Eriksson et al. (2012), using adapted versions of the MacArthur CDI, found that girls outperformed boys between the age of 8 to 30 months, in relation to word production, word combination, and gestures acquisition, though not in comprehension performance, across 10 European countries. Bornstein and Cote (2005), using a parent report checklist, also found that girls produce more words than boys at the same age (20 months) in a comparative study between three countries: USA, Italy, and Argentina. Similarly, Huttenlocher and colleagues (1991), using audio-recorded and videotaped conversations between children and mothers in playtime, found an impact of gender only on production skills of children assessed at several points in time between 14 to 26 months of age.

Before concluding that we uncovered a cultural difference in the way Arab-speaking girls and boys acquire language, we need to consider the possibility that the absence of gender effect is due to (1) the use of the CDI and/or (2) the socio-economic profile of our sample.Regarding the first point, most studies using the MacArthur CDI: Words and sentences checklist found that differences between boys and girls in relation to their vocabulary development start to appear after the age of 24 month. It must be noted that for CDI norming studies using a parental report, Fenson and colleagues (1994; 2007) reported that gender accounted only for 1%-2% of the variance in vocabulary scores, with females scoring slightly higher than males in all measures. Similarly, using the Danish version of the MacArthur CDI, Bleses et al., (2008) found no gender impact on vocabulary development until the age of 1;2 in a sample of 6,112 children in the age of 0;8 to 3;0. On the other hand, Floccia et al. (2018), using adapted versions of the MacArthur CDI with a group of 372 bilingual children, found an impact of gender on production skills of 24-years-old children, with girls outperforming boys in their production skills only (see also Eriksson et al., 2012). So it is unlikely that the use of the CDI is solely responsible for the absence of a gender effect. Regarding the second point,

Zambrana et al. (2012), using data from the Norwegian Mother and Child Cohort Study conducted by the Norwegian Institute of Public Health in children from 18 to 36 months, found that differences between male and female children in relation to language development increase with the decrease of the maternal education. Boys with mothers from high educational background had lower language comprehension than girls with mothers from lower educational background at 18 and 36 months, though between the two ages, first born boys with highly educated mothers had the highest scores in their language comprehension. It is possible then that the gender difference in our Arabic sample would have been minimised due to the predominance of highly educated mothers in our dataset. It is also possible that gender differences increase with age, so that the effect would be still latent at the age of 30 months. Marjanovic-Umek and Fekonja-Peklaj (2017) performed nine cross-sectional studies and one longitudinal study to analyse the effect size of gender on the language development of Slovenian-speaking children in different stages of their life (i.e., infants, toddlers, children, and adolescents). They found that the effect size of gender increases with age and depending on the language measure tested. It was found to be largest in studies that included children between 4 to 6 years where language expression was assessed. So the children in our simple could be too young to reveal any substantial vocabulary differences between boys and girls (but see Floccia et al., 2018).

A range of secondary predictors of language development were also examined (number of siblings, identity of the parent who filled in the CDI, method of recruitment, identity of the primary caregiver, and exposure to additional languages), out of whom only two had an impact on the vocabulary scores. First, the identity of the parent who filled in the CDI modulated vocabulary knowledge in the non-Egyptian group, with mothers reporting more accurate (higher scores) than fathers.One reason for this may be that most Egyptian mothers taking part in the study work outside of home, and as a consequence, they spend less time

with their children than if they stayed at home; therefore their knowledge about their children's vocabulary may not be as accurate as that of our sample of non-Egyptian mothers who were mostly not working outside of home. Second the identity of the primary caregiver predicted vocabulary knowledge in the Egyptian group, with children whose mothers filled in the CDI reporting a larger vocabulary.

The fact that mothers reported more words than fathers is compatible first with findings from Gottman (1998) who showed that fathers' interactions with children are based on physical playing activities, while mothers' interactions are more verbal, which suggests that mothers know more about their children's vocabulary skills. It is also supported by findings from Barakat (2005) that Arab fathers are traditionally the primary providers, spending less time with their children, which justifies their limited knowledge of the children's vocabulary skills as compared to mothers (especially stay-at-home mothers).

The second finding that children whose mothers are the primary caregiver performed better than their counterparts with other primary caregivers such as fathers, grandparents, crèche, or babysitter, is consistent with findings from Huttenlocher et al. (1991) that there is a positive impact of the amount of speech directed from mothers to children on their language development in the period between 14 to 26 months. They are also consistent with a study by Pancsofar and Vernon-Feagans (2006) who found that mothers provided more language input than fathers, particularly more verbal output altogether, longer conversational turns through using more utterances and words in free play sessions with their children at 24 months, more varied word roots, and more wh-questions.

As expected, though the majority of Egyptian participants were recruited through nurseries and the majority of the other dialects' group children were recruited through social media, no

impact of the method of recruitment was found on the whole sample, potentially because in both methods parents who signed up were interested to fill in the CDI accurately.

This study is the first study to compare vocabulary development between Arabic-speaking children from different Arabic-speaking countries. Due to the small number of participants collected in each non-Egyptian dialect, we grouped all children from these 16 dialects, and compared them with the larger, Egyptian group. Results at this stage show that the two groups do not differ significantly, which could hide a different picture once the number of participants is increased in all non-Egyptian dialects. However, at this stage, the learning curves of the two groups are strikingly similar.

Most of previous studies have examined the impact of language variations on the development of children's word comprehension and production, more than the impact of dialect variations. Bleses et al. (2008) compared the lexical development of Danish children to that of children in the age range of 0;8 to 3;0 learning other languages (17 languages), using CDI data. Danish children were found to command a smaller vocabulary than children from other languages, even less than Swedish children who speak a very close language; the effect was found from the start of the first year of life, both in comprehension and production. The main interpretation of this effect was that the children are slowed down by the highly complex sound structure of Danish, with a very rich vowel space, and for example the endings of the words being unclearly pronounced, with the final syllables of words usually consisting of monotonous vocalic stretches

Maital et al. (2000), comparing the development of vocabulary skills in US English-speaking children and Israeli Hebrew-speaking ones aged 1; 6 to 2; 0 , found a similarity in patterns of vocabulary growth between both of them in spite of the different word ordering between Hebrew language, in which Subject Verb Object (SVO) word order is relatively free, and the

American English which has a fixed SVO order. This similarity was justified by the fact that there are similar sociocultural factors between the two countries, where mothers follow the same type of mother-child interactions. Additionally, Caselli et al. (1995) ran cross-linguistic study between English children living in US and Italian children, using the adapted version of the Macarthur CDI for each language, for children between 8 to 16 months. Italian children's vocabulary skills were found to lag behind those of the English children especially at older ages. Though these studies are comparing between development of vocabulary in two different languages and not dialects, we can assume that, in line with their findings, cultural similarities between Arab countries could be a reason behind this lack of difference in vocabulary development given that Arab-speaking children appear to be familiar with specific words within this age range.

Looking at dialect comparisons in the literature, the most well-known example is the study run by Hamilton et al. (2000) in which British children aged between 1;0 and 2;1 were found to lag behind the Americans in relation to their comprehension and production vocabularies at the same age. The authors suggested that this difference could be due to cultural differences between the two populations, or to linguistic difference. Indeed, one other interpretation was that, unlike American English, in British English there are some words that end with the unpronounced /r/ which makes it more vowel-like end; this could potentially result in a difficulty in segmenting the speech stream into words. Another reason might be that unlike American English where some words have secondary stress, British English has unstressed syllables with vowel reduction, leading to a poorer acoustic transparency (Bleses et al., 2008). This can be one of the possible reasons for the little variation between Arabic dialects in relation to vocabulary development, as one common characteristics across dialects is that there is a length contrast on each vowel. Having said that, and as previously mentioned in the introduction, in both LA and EA, unstressed long vowels are shortened which may

make them less complicated to learn than other dialects. Additionally, the use of /ə/ instead of the two sounds /I/ and /u/ would make the LA easier for children to acquire. We lack the granularity necessary to examine if these vowel-related variations would translate in different developmental outcomes, and further data from each individual country could show variation in acquiring words related to this aspect.

Second, comparing the vocabulary scores of Cantonese and Mandarin children aged between 0 ; 8 to 2 ; 6, Tardif et al. (2009) found a difference in the vocabulary knowledge between the two groups, favouring the Mandarin children. This was thought to be due to Mandarin dialect having fewer syllables to master and a smaller number of contrastive tones than Cantonese, making it easier for Mandarin children to outperform their Cantonese counterparts in the lexical acquisition of the Chinese language. Given that most of the Arabic dialects have the same syllable types (CV, CVC, CV:, CV:C, CVCC; Abdoh, 2011) with different degrees of syllable lightness and heaviness, the dialectal difference from Tardif et al. (2009) could not be applied to our case. Based on those previous findings, especially in relation to dialect variations, we can attribute the lack of differences in relation to vocabulary development between to the Egyptian and non-Egyptian dialects to the fact that the two groups share the same culture and have, broadly speaking, the same phonology, especially in terms of the syllable type.

1.7.1 Research Limitations and Recommendations for Future Research

The main limitation of the research is the fact that the sample for the study is self-selected, leading to an unbalanced set of data skewed towards a majority of highly educated parents who are probably actively engaged in their child's language development, across education levels, which led to the null findings of the effect of SES. A wider profile of families across all SES strata should be considered in the future development of the Arabic CDI. This leads to another

limitation of the research which is the sampling technique of the data set, which is primarily based on opportunity. However, although a disadvantage of collecting most data through selected (and willing) nurseries was that SES profile of the parents largely reflected the areas where these nurseries were located (mid-high SES), the attrition rate was much lower as compared to the original attempt to collect data online. Future research should target a more balanced distribution of SES profiles through a stratified selection of nurseries, in accordance to the characteristics of the country. Another limitation is that the impact of multilingualism was not evaluated, and yet we would expect that bilingual children would know less words than their monolingual peers. Multilingualism is highly common in Lebanon and the UAE and of course in countries like the UK where immigration is common. However, the Arabic CDI can still be used in the UK by incorporating it to the UKBTAT (Floccia et al., 2018): in this tool, CDI measures from each language are weighted by factors such as amount of exposure and gender, to provide predicted scores of vocabulary. The Arabic CDI will be useful to complement the existing 12 languages which are currently available (Italian, German, etc).

Another research limitation is that the small number of participants in each individual dialect prevented us from looking at vocabulary differences between dialects. Future research should consider collecting data from each Arabic country individually through nurseries rather than social media, as we did in Egypt.

A development of this research is the promotion of the use of this tool in Egypt and beyond. To promote the Arabic CDI in Egypt and elsewhere, practitioners, SLTs, and nurseries should be directly contacted with information about the CDI and how to use it to ensure a fair and equal access to healthcare for all children. Additionally, healthcare offices where parents visit on a regular basis to give vaccinations to their children should be provided with information about the CDI to spread it out in the general public. Norms provided for the Arabic CDI

assess the child's Arabic dialect only; for children from countries where multilingualism is prevalent such as UAE and Lebanon, another assessment tool should be used for assessing the child's other language, or the Arabic CDI should be used in combination with an exposure measure as was recommended and tested in Floccia et al. (2018) for British toddlers. For practitioners, a reasonable threshold for suspecting a language delay is a score within the 10th percentile (Fenson et al., 2007; Rescorla, 2002; Tomblin, Records, & Zhang, 1996), so access to the CDI scores will allow practitioners to make an informed decision as to whether a referral might be necessary in a near future, or whether a wait and see approach is more appropriate.

1.7.2 Conclusion

The current study aimed at developing an easy-to-use freely available assessment tool that parents can use in most areas of the Arabic world, to assess the development of their children at an early age (between 8 to 30 months) and to identify children at risk of language delay. This would be the first tool of its kind which is usable to all Arabic Children from different Arabic backgrounds as it was developed in 17 dialects for 17 Arabic countries. It is a parental report tool and it does not take more than 10 minutes to complete. When examining the predictors of language development in Arabic-speaking children, no distinction was found between boys and girls in their comprehension and production vocabulary skills. No impact of the parent's education was found, particularly maternal education, on the children's vocabulary size. Finally, no impact of secondary variables was found on vocabulary knowledge, apart from the identity of the parent who filled in the CDI, with children whose mothers filled in the CDI having higher scores than their peers whose CDI were filled in by their fathers; in addition children whose mothers are the primary caregivers outperforming their peers. Based on these findings, norms of the Arabic CDI have been provided for use

with Egyptian children. Future research will be needed to establish firmly their usability with other dialect learners.

Part 2

2.1 Introduction

Assessing the development of language in bilingual children is a challenging process; however, it is vital for identifying children in need of early intervention, and designing a suitable planning and monitoring program. In addition, assessing children's vocabulary at an early age is helpful for other aims such as educational purposes or selecting participants for academic research (Thordardottir, 2011). One of the most robust predictors of vocabulary development in bilingual toddlers has been found to be the relative amount of exposure to each language. For example, Floccia et al. (2018) showed that the amount of exposure was actually the most important predictor of lexical knowledge in UK-raised 2-year-olds learning English and a Home Language (see also Gathercole & Thomas, 2009; Hoff et al., 2012; Pearson et al., 1997; & Thordardottir, 2011). Given the importance of the relative amount of exposure in predicting bilingual language development (Cattani et al., 2014), and the variety of questionnaires and approaches used to estimate this factor, this study aims primarily at empirically comparing different tools in order to inform researchers and practitioners about their relative interchangeability. In addition, since an estimate of the impact of the amount of exposure on language development cannot be reliable without estimating also the weight of other factors known to affect bilingual learning, we will examine how these different exposure tools predict vocabulary development once accounted for the presence of siblings, childcare attendance, code-switching in parental input and demographic variables such as age, gender, and SES.

2.1.1 Factors Affecting Language Development in Bilingual Children

Language development in all children, monolingual or bilingual, is modulated by a range of factors, both internal (e.g. working memory abilities) and external (e.g. SES), which can

interact with one another. Hence Hackman, Farah and Meaney (2010) define three categories of SES-related factors that shape the development of brain and cognition: prenatal influences, parental care, and home environment cognitive stimulation. The relative amount of exposure to each language may uncover a complex set of interactions between internal and external factors: for example, it may be that exposure varies with parental care, or that it is modulated by cognitive stimulation at home. It is however a useful, easily measurable construct which has the benefit of explaining a significant part of the variance in bilingual children language development (Cattani et al., 2014; Floccia et al. 2018).

2.1.2 Relative amount of exposure

According to Hurtado, Gruter, Marchman, and Fernald (2014), the relative amount of exposure is defined as the percentage of exposure to each language, i.e., how much each language is being used and whether the bilingual child receives a balanced or unbalanced exposure to the two languages. The difference in the degree to which each child is exposed to each language is an important modifier of bilingual children's achievements. This was confirmed by Bedore et al. (2012), who found that bilingual English-Spanish pre-kindergarten children differed in their performance on semantic and morphosyntax tasks in both languages according to the different levels of language exposure. Those were measured through parent questionnaire asking about age of first exposure and current language use in each language. Similarly, a longitudinal study with French-English bilingual children aged between 1;0 and 3;0 was conducted by David and Wei (2008) aiming at measuring the children's lexical development (using the MacArthur CDI: English and French versions) according to their exposure to both languages, based on parents' own estimate monthly. It showed that the vocabulary size of the children differed consistently according to the language exposure they received (see also Cattani et al., 2014; David & Wei, 2008; De

Houwer, 2009; Eilers, Pearson, & Cobo-Lewis, 2006; Gathercole, 2007; Gathercole & Hoff, 2007; Grüter et al., 2014; Hoff, 2014; Parra, Hoff, & Core, 2011; Place & Hoff, 2011; Poulin-Dubois et al., 2013; Scheele, Leseman, & Mayo, 2010). In addition to predicting vocabulary size, other researchers have demonstrated the impact of exposure on the development of other aspects of language such as the efficiency of processing (Hurtado et al., 2014), grammatical abilities (Gathercole, 2002a; 2002b; 2002c; Paradis, Tremblay, & Crago, 2014; Thordardottir, 2015), and phonological competencies (Law & So, 2006). According to Weisleder (2017), "'amount of exposure is an ecologically meaningful construct with considerable explanatory power"' (p. 35).

Assessing the relative exposure to each language

Across the field, different methods of assessment have been used to measure the amount of exposure to languages in bilingual children. By far the most common measurement tool has been the use of a parental report. There are many obvious advantages for using parental reports. Not only they are easy and inexpensive, but also the child's exposure can been assessed in a range of different situations and times, providing a comprehensive estimate of the child's input (Feldman et al., 2000).

Parental reports have been used in two forms. The first type of report is typically a daily diary during a week (De Houwer & Bornstein, 2003). Place and Hoff (2016) used the Language Input Diary developed by De Houwer and Bornstein (2003) to assess the the impact of input quality on language development in bilingual children. Parents recorded the child's exposure to English and Spanish, for example, during periods of 30 minutes throughout 7 days. The final measure included a calculation of the proportion of English only, Spanish only, and the mix of the two languages. Questions pertaining to the number of speakers in each language and the percentage of input provided by native speakers in each language were also included.

De Houwer's (2007) weekly diary is slightly different as language exposure is assessed through a scale measuring the homely amount of exposure from each person living at home (mother, father, child, or siblings).

The second category of reports are one-off questionnaires measuring the percentage of exposure during the child's lifespan, or in a typical week. For example in Gutierrez-Clellen and Kreiter (2003), the final amount of exposure is based on the calculation of the exposure to each language during every year of the child's life. More specifically, parents are asked to report which language(s) was used (i.e. English, Spanish, or both) at home and at school/preschool/day-care from the first year of life till 7-8 years. Additionally, Bedore et al. (2011) and Bedore et al. (2012) used a parental questionnaire designed by Gutierrez-Clellen and Kreiter (2003). It is used as a lifespan questionnaire to examine whether years of exposure to languages affect the bilingual performance as reported by parents and teachers of bilingual Spanish-English children from second grade; they found that parents' and teachers' reports could be reliably used to assess bilingual children's performance with pre-kindergarteners and kindergarteners to determine the possibility of comparing the results of different measures of language proficiency in pre-kindergarteners bilingual Spanish-English children. They found that using different language measures did not result in the same classification of language proficiency for bilingual children in the same age group. The idea stemmed from the difficulty of assessing the children themselves at this young age as they came from diverse backgrounds which might affect their language proficiency. Bosch and Sebastian-Galles (2001) used another parental questionnaire they designed in 1997 to evaluate the ability of 4 month-old bilingual children to discriminate between two languages belonging to the same rhythmic category such as Spanish and Catalan.

In contrast, Marchman and Martinez-Sussmann (2002) used an approach based on ‘a day in the life’ of the child. Parents of bilingual Spanish-English children living in the US within the age range of 23 to 34 months were asked to describe over the phone a child’s typical day’s schedule, separately for weekdays and weekends. They were asked about the child’s interaction with each person inside and outside the home; which language was used (English, Spanish, or both); and how many hours the child spent with each person per week. To estimate the percentage of exposure in each language, the number of hours of exposure was summed across all sources of contact with the child. This same approach has been used by Gruter et al. (2014) to estimate the percentage of exposure to Spanish and English and their interaction at home in bilingual Spanish-English children living in California.

Individual variability in relation to input quality is another important factor that affects the development of language in bilingual children. The input quality refers to the mode of exposure to each of the languages such as the source of input for each language, whether the speakers are native speakers or not, and the number of speakers who interact with the child in each language (Hoff et al., 2014). In their study of 59-month-old Spanish/English bilinguals, a correlation was found between mothers’ English proficiency and their children’s English language skills (Hammer et al., 2012). Hoff et al. (2013) suggested that the negative impact of parent’s use of non-native English on their children’s language skills would be due to the lack of diversity in their vocabulary (Hoff, Coard, & Señor, 2013). Another factor affecting bilingual language development is the number of speakers. According to Place and Hoff (2011), children within the age of 25-month-old who hear language from many different speakers have more vocabulary than their counterparts who hear language from fewer speakers during the same time. The explanation is that exposure to multiple speakers gives

the child the opportunity to be exposed to different lexical items in different contexts which affects his/her vocabulary positively (Unsworth, 2016).

Given the importance of the relative amount of exposure in predicting bilingual language development, and the variety of questionnaires and approaches used to estimate this factor, the aim of this research is to empirically compare different tools in order to inform researchers and practitioners about their relative interchangeability. We selected four one-off questionnaires which constitute a representative sample of the different approaches chosen by researchers: the Alberta Language Environmental Questionnaire (ALEQ) by Paradis (2011), the Child Multilingualism Questionnaire (CMQ) by Yang, Blume and Lust (2007), the Language Exposure Questionnaire (LEQ) by Bosch and Sebastian Galles (1997), and the Plymouth Language Exposure Questionnaire (Plymouth LEQ) developed by Cattani et al. (2014).

The Alberta Language Exposure Questionnaire 'ALEQ' (Paradis, 2011).

The ALEQ collects information about the child's language exposure inside home only through a range of questions about the child and the family's use of English at home. Inside home exposure is assessed through a calculation of the proportion of English used at home as answered by parents according to a scale rating from 0 to 4. For example English never/mother tongue always= 0, English seldom/Mother tongue usually= 1, English 50%, Mother tongue 50%= 2, English usually/Mother tongue seldom= 3, English almost always/Mother tongue almost never= 4.

The ALEQ was first used by Blom, Paradis, and Duncan (2012) to assess the factors that would predict the development of third-person singular in bilingual children learning English as a second language between the age ranges of 45 to 105 months, whose speech was followed over a 2-year period. They found an impact of months of exposure to English on

bilingual children's use of third-person singular as the children were more accurate after more months of exposure to English at home as measured by the ALEQ. Since then, it has been used by Paradis and Kirova (2014) to gather information about the home language environment of the children at a mean age of 58 months with the aim of understanding its impact on predicting the development of English proficiency in Canadian-born children and foreign-born children, according to their scores at a story-telling instrument. They found that although Canadian-born children had more exposure to English at home than foreign-born children, there was no difference between the two groups in regards to their story-telling scores. But this was attributed to the fact that although the parents of the Canadian-born children scored higher in self-rating of English fluency, the mothers' scores in both groups were not high, which might affect the quality of English exposure at home overall. Additionally, Rezzonico et al. (2015) used the ALEQ data to examine the impact of the dominant language at home (Cantonese), on narrative scores in bilingual Cantonese-English pre-schoolers. They found that children had higher grammatical scores in English narratives than in Cantonese and that they did not use any Cantonese words in their English stories, although they used English words when writing in Cantonese. The authors explained this by the fact that parents were likely to use input at home together with their native Cantonese, which might have affected their children's relative exposure to each language. Finally, the ALEQ was also recently used by Paradis and Jia (2017) to investigate the longitudinal impact of language environments on the performance of bilingual children between 8;5 and 10;5 years old. They were given standardized tests measuring vocabulary: the Peabody Picture Vocabulary Test (PPVT-4; Dunn & Dunn, 2007), the Clinical Evaluation of language Fundamentals-4 (CELF-4; Semel, Wiig, & Secord, 2003), Recalling Sentences sub-test, the CELF-4 Word Classes Receptive sub-test, the CELF-4 Word Classes Expressive sub-test, and general comprehension (the CELF-4 Understanding Spoken Paragraphs sub-test) every

year once they have had between 4.5 to 6.5 years of English use at school. It was found that the length of English exposure and the English richness as evaluated by the ALEQ predicted both the production and comprehension outputs of these children.

The Child Multilingualism Questionnaire 'CMQ' (Yang et al., 2007)

The CMQ assesses the child's language exposure through collecting information about the language(s) the child uses with each member in the family,the age of first exposure to each language, and their frequency of use. A 5-point scale (from 0 to 100%) is used to indicate the parent's estimation of the child's exposure to each language inside and outside home separately. For example for home exposure (and similarly for outside home exposure), exclusively L1= 100%, more L1 than L2= 80%, equally frequently=50%, more L2 than L1= (40%), exclusively L2= (0%). As reported by Lust et al. (2016), the CMQ was used as a caregiver report to relate parents' estimated quantity and quality of their children's bilingualism, to language assessment tools such as the Elicited Imitation task (EI) that tests the children's knowledge of sentence structure in English and Korean. Two case studies were conducted on two bilingual Korean-English children whose age was 4 years old. According to their caregiver's report using CMQ, the two children were identical in their language knowledge and general background. However, when using the Elicited Imitation task to assess the children's production of simple coordination in both Korean English, it was found that although there was no significant difference between the two children in relation to their estimated quality and quantity of bilingualism as estimated by the CMQ, there was a significant difference between their quantity and quality of bilingualism (production) as measured by the direct assessment tool (EI). So it was suggested that parental reports should be supplemented by direct assessment tool testing the child's abilities. However, we

shouldn't neglect the fact that in this study, data were collected from two children only and it was only language production that was assessed, so its findings shouldn't be generalized.

The CMQ has also been used by Kim et al. (2017) as an indirect assessment tool of the child's language proficiency and to provide information about the children's language environment and language use in Korean-English bilingual children, to examine the impact of simultaneous vs successive bilingualism on L1 performance at 4 years of age. They found that simultaneous bilinguals had higher vocabulary scores in English than Korean, while successive bilinguals often scored higher in Korean as compared to English. It has also been used by Yang et al. (2011) to study the development of executive functions in 4 years-old-Korean-English bilingual children in the US and three monolingual groups from different cultures: English monolinguals in the US, Korean monolinguals in the US, and Korean monolinguals in Korea. They used the CMQ to gather information about the language background and exposure at home and at school for the bilingual Korean English group. They found that the bilingual benefit transcended the cultural variation in relation to the attention processing and the inverse processing efficiency. However, for the monolingual group from Korea, the culture benefit favoured monolingual children' speed accuracy but that was at the cost of longer response time which favoured children from the Korean-English bilingual group.

Bosch and Sebastian Galles Language Exposure Questionnaire *'B&G LEQ' (Bosch & Sebastian Galles, 1997)*

This questionnaire provides an overall percentage of exposure during a span of the child's life by asking the parents about the languages used with the child inside and outside home since his/her birth. The percentage of exposure during the child's lifespan is automatically estimated in addition to an estimate of the daily and the weekly exposure to each language.

Examples of questions asked are “At what age did the child start receiving language input from Person A’’, “Has Person A’s interaction with your child been consistent in the past or were there times when he/she spent more or less time with your child, such as maternity leave’’, “During the week, what days is Person A interacting with your child?”, “On an average day, how many hours is your child exposed to Person A speaking in Language A?”. 20). The questionnaire has a strong internal consistency (α = .96). It was used by Friend et al. (2017) to compare the vocabulary size of monolingual children and their bilingual counterparts with a minimal dual language exposure at 22 months of age. Information about the child’s language environment was gathered with the aim of assessing the impact of minimal exposure and maternal education on the development of vocabulary size as measured by a parent-report measure. They found that there was no impact of minimal exposure on the vocabulary size in bilingual children at the age of 22 months, but there was an impact of maternal education only in English speakers. It was also used by Legacy et al. (2016) to gather information about the percentage of exposure the child receives from each interlocutor on a weekly basis, to search for a relation between language exposure, vocabulary size, and processing speed in bilingual French-English children between 16 and 22 months. It was found that language exposure significantly predicted the comprehension and production vocabulary at the two time points, whereas processing speed at 16 months predicted the vocabulary size at 22 months in bilingual children. The same questionnaire has also been used by Legacy et al. (2017) to determine whether the relative amount of exposure has an impact on the acquisition rate of translation equivalents in French-English children across three different developmental time-points (1;4, 1;10, 2;6). They found that the change in relative amount of exposure significantly predicted the changes in the proportion of translation equivalence between 1; 10 to 2; 6 only, when the change in relative vocabulary size is taken into account. They also used this exposure questionnaire to measure the

children's exposure to each language they hear on a weekly basis with the aim of comparing this parent report to a direct measure of translation equivalence (Computerized Comprehension Task Checklist; Friend & Keplinger, 2003) to explore whether parents over or under-report their children's translation equivalents. It was indeed found that parents tend to over report the number of translation equivalents in their children's vocabulary.

The Plymouth Language Exposure Questionnaire 'Plymouth LEQ' (Cattani et al., 2014)

This questionnaire provides an automatic estimate for the child's exposure to English during a week. It asks questions about the child's exposure to English inside and outside home such as "How many hours a week, on average, does your child spend with an English speaking nursery/day care/preschool/childminder/relative or friend", "How many hours a week, on average, does your child spend in an Additional Language speaking environment, without you or your partner (nursery/day care/pre-school/childminder/relative or friend)", "When you and your partner are together with this child, and you talk to each other, which language do you speak?", "Number of hours per week when your child is with the mother only", "Number of hours per week when your child is with the father only", etc. This questionnaire was originally developed by Cattani et al. (2014) to explore whether the bilingual children's production and comprehension scores on different tests were predicted by the percentage of exposure to English at the age of 2;6-years-old. The exact calculations can be found in the Appendix of Cattani et al. (2014). They found that the percentage of language exposure was an important predictor of vocabulary size in bilingual children and that bilingual children exposed to English at 60% or more have the same language performance skills in English as monolingual peers, on all tests. The Plymouth LEQ has been also used by Floccia et al. (2018) to estimate how much the LEQ data could predict English and Additional Language vocabulary scores in 2-year-old UK-raised bilingual toddlers. They released bilingual norms

for UK 2-year-olds who learn British English alongside any other additional language, using the outcome of the Plymouth LEQ as a key predictor.

Based upon the Plymouth LEQ, a dialect exposure questionnaire was derived by Durrant (2014) with the aim of studying the impact of long term exposure to variable input on the development of language in multi-dialectal children. Long term exposure to different dialects was found to have an impact on the children's representation of familiar words.

In summary, the four questionnaires that we selected have been often useful to predict language outcomes in young children. They have in common that they all provide information about the different languages spoken in the family and identify who are the speakers of these languages. All of them provide a final measure of the bilingual child's exposure to English, though in different ways: either estimated by the parent as in the CMQ, or according to a formula as in the Plymouth LEQ, the ALEQ, and the B&G LEQ.

The differences between the four questionnaires lie in specific points: the ALEQ provides a measure of exposure for inside the home; in the CMQ the parent's own estimation of the exposure inside and outside home is requested after a long list of questions designed to raise the parent's awareness of the degree and quality of her child's experience with the two languages; the B&G LEQ provides an overall estimate exposure to each language over the child's lifespan; the Plymouth LEQ provides a calculation of exposure obtained from a short set of questions pertaining to a typical week (and can be used for trilingual cases too).

In what follows we will briefly review the factors known to modulate bilingual children's vocabulary knowledge, since our aim is to apportion their effect out of that of the relative amount of exposure to each language.

Internal factors (age and gender)

Internal factors refer to the properties which are intrinsic to the learner. These properties include both biological properties such as chronological age, and cognitive abilities such as working memory or processing time (Sun et al., 2018), which have been found to predict language development in all children (Paradis, 2011). Several studies have found an impact of internal factors on the development of language vocabulary, morpho-syntax, and reading in bilingual children (Bohman et al., 2010; Jia & Fuse, 2007; Oller, Pearson, & Cobo-Lewis, 2007; Verhoeven, 2000). One of the main internal factors that has been found to predict language development in bilingual children is chronological age. This extends to age/time related variables such as age of exposure (Golberg, Paradis, & Crago, 2008; Hammer, Lawrence, & Miccio, 2007; Paradis, 2011; Unsworth & Marinis, 2011), length of exposure (Oller & Eilers, 2002), and age at the time of testing. In the present study, we will restrain our analysis to the age at testing as a predictor of vocabulary development (comprehension and production) in bilingual children living in the UK.

Findings relating to gender effect are highly mixed and it has been replicated cross-culturally. Bilingual girls usually outperform boys from the same SES backgrounds (Portes & Hao, 2002; Portes & Schauffler, 1994), especially in their production skills (Huttenlcher et al., 1991). Bornstein and Cote (2005) have conducted a comparative study between children in the age of 20-month-old at an early age in three countries (US, Italy, and Argentina) where they observed that girls acquire more words than boys at the same age. This supported findings by Eriksson et al. who examined data from children from 10 non-English language countries, with an age spanning from 8 to 30 months. They observed that girls outperformed boys in relation to gesture acquisition, word production, and word combination (Eriksson et al., 2012). It must be noted however that in the current thesis, we failed to observe an effect

of child gender on vocabulary in a large sample of Arabic-speaking children aged 8 to 30 months, raising the possibility that these gender differences might be culture specific. In bilingual children, Hammer, Davison, Lawrence, and Miccio (2009) reported that mothers of Spanish/ English boys at the age of 4 years tended to use 'more or all English' with their children more frequently than mothers with daughters. Consequently, Portes and Hao (2002) reported that bilingual girls were more likely to use the family's language than boys, and according to Hammer et al. (2012), this might be due to mothers tending to use the family's language with their daughters more often than when talking to their sons. The impact of gender on the development of vocabulary knowledge in bilingual children will be tested in the current research.

Childcare attendance

There has been mixed results over whether day-care attendance at an early age has positive or negative impact on child vocabulary development. Using the Peabody Picture Vocabulary Test, Lefebvre, Merrigan and Roy-Desrosiers (2011) found that Canadian publicly funded care has a negative effect on children's vocabulary scores at age 5 due to their attendance to low-quality child care when they were under three. In addition, Baker, Gruber, and Milligan (2008) found that publicly funded childcare had a significant negative impact on the development of language in Quebec children as compared to their counterparts in other areas in Canada who do not attend publicly funded care.

On the other hand, using a mother-child questionnaire that assesses the development of language of the child, Felfe and Lalive (2012) found that childcare attendance at an early age (0-1 year and 2-3 years) in Germany has a positive impact on the development of language in children. They also reported that younger children from low SES benefit more from childcare attendance than others who are older and from high SES. This finding was supported by

Cote, Doyle, Petitclerc, and Timmins, (2013) who used data in the British cohort from 13,000 children and found that children attending childcare (center-based care) at the age of 9 months and from low SES (low-educated mothers) had more cognitive advantage at the age of 3 over their counterparts who attended informal care until the school entry age (5 years). The reason for this is that informal care is more home-like setting that focuses more on free play. However, the same data from the UK Millennium cohort was used by Hansen and Hawkers (2009) to measure the impact of childcare attendance at 9 months of age for language production and of their cognitive skills at the age of 3 years, and they found no significant relation between formal group care attendance and vocabulary outcomes. The exception was grandparent care and to a lesser extent the formal non-group care and partner care that did have a significant impact on the vocabulary test score of the children from high SES. The reason for this could be that for grandparent care depends on a more frequent one to one interaction and talk, possibly to compensate the reduction of the physical activity (Tamis-LeMonda et al., 2004). Additionally, grandparents speak more slowly to the children and do not allow grammatical error in the child's speech which would in turn help to develop the child's language. In the present research, we measured how childcare attendance affects the vocabulary knowledge in bilingual children.

Number of siblings

Another factor which can modulate the amount of exposure to each language is the presence of siblings. Typically, firstborns tend to have more vocabulary than later-borns (Fenson et al. 1994; Jones & Adamson, 1987) possibly because firstborns get more attention from their parents, and because they generally get direct speech from their parents contrary to younger siblings. Further, Bates (1975) reported that firstborns with no siblings have more vocabulary and are more advanced on standardized measures of language development than late-borns.

However, in relation to bilingual children, who are the main participants in this study, the literature has provided ample evidence of the impact of older siblings who are at the school age on the development of vocabulary of younger ones as they represent an additional source of language input in bilingual homes, and generally bring in the societal language (Caldas, 2006; Pearson, 2007; Wang, 2008; Yip & Matthews, 2007; Zukow-Goldring, 2002). One possibility for this is that the English proficiency of these siblings, gained at school, leads them to use it as the language of communication at home (Jia & Aaronson, 2003; Kohnert, 2002). Once older siblings start to attend school, the use of the home language begins to diminish as they bring the majority language into the home. A study by Bridges and Hoff (2014) has observed that in general, young American bilingual children between 16 and 30 months with older siblings scored higher in their English vocabulary than their counterparts at the same age with no older siblings. Another study by Hoff and Bridges (2014) had compared the development of vocabulary in bilingual toddlers with school-aged older siblings and others with no school-aged siblings. They found that toddlers with school-aged siblings were more advanced in English than their counterparts with no school-aged siblings, who achieved a higher score in their heritage language (Spanish). In addition, they observed that mothers who have school-aged children used English in their everyday life more often than those who have no children at school yet, which could explain partially why English grows faster in their bilingual toddlers. Consequently, given that we have children in our study with two and three siblings, we decided to measure the impact of the number of siblings at home on the development of vocabulary knowledge (comprehension and production) in bilingual children with a focus on the role of older siblings in developing the language of the younger ones.

Socio-economic status (SES)

Regarding SES, the literature is rather consensual that, overall, social deprivation takes its toll on children's vocabulary in the early years (Feldman et al., 2000; Hart & Risley, 2003; Hoff et al., 2002). However, it must be noted that when vocabulary is measured with CDI questionnaires, the detrimental effect of low SES is often not observed (Fenson et al., 1994; Floccia et al., 2018), probably because of inadequate sampling.

The literature had attributed the fact that children from low SES have poorer language skills than their high SES counterparts (Rack, Snowling, & Olson, 1992) to the maternal education which affects the maternal input (Hoff, 2003). According to Hoff, Laursen, and Tardif (2002), higher SES mothers talk to their children more than mothers from low SES, with the aim of eliciting conversations with their children, unlike mothers from low SES whose speech with their children aims mainly at monitoring behaviour. These findings are consistent with those of other researchers who found that the total number of words heard by children from higher SES is larger and more diverse than that of children from low SES backgrounds (Feldman et al., 2000; Hart & Risley, 1995). They observed that the reason for this is that families from high SES spent more time interacting with their children and used more diverse vocabulary, in terms of nouns, tenses, and verbs than those used by parents from low SES. This appeared consistent with the findings that the language of college-educated mothers addressing their children is richer in vocabulary, includes many more questions, and contains fewer directives compared to that of high-school educated mothers (Hoff-Ginsberg, 1998). Similarly, Hoff (2003) observed that the size of the production vocabulary of high 24-months-SES children was larger than that of low SES children.

Regarding bilingual children, previous research did find an effect of the SES on the vocabulary size of bilingual children (Dixon et al., 2012). Golberg, Paradis, and Crago (2008) found that

bilingual children at a mean age of 5 years and 4 months with mothers from high education background outperformed their counterparts with mothers from low education one in their comprehension vocabulary (see also Paradis, 2009). Similarly, Calvo and Bialystok (2014) found that 5- to 6-years old bilingual children from higher SES background had richer vocabulary than their counterparts from low SES. Using a sample of 175 children, Calvo and Bialystok (2014) divided them into 4 groups according to their SES (middle class vs. working class) and language background (monolinguals vs. bilinguals) to assess their impact on the children's vocabulary decelopment. An impact of SES was found with middle-class children outperforming the working-class ones and the monolingual children outperforming the bilinguals in the language test (Peabody Picture Vocabulary Task of receptive vocabulary, 3rd edition , Dunn & Dunn, 1997) but no interaction between the two factors was found. Chiat and Polišenská (2016) reached the same conclusion as they found a significant effect of SES and bilingualism on children's comprehension vocabulary with no interaction between them in a sample of 4- to 7-year- old monolingual and bilingual children from mid-high and low SES backgrounds. This comes in line with findings from Meir and Armon-Lotem (2017) who found that monolingual Hebrew-speaking children aged 5;7–6;7 had more vocabulary size thanRussian-Hebrew bilinguals, with the children from mid-high backgrounds outperforming the low SES background children with no interaction between them suggesting that the SES affected the monolingual and the bilingual groups similarily. In the current research, the average of parents' education and occupation will be used to represent SES, and then SES will be tested as a predictor of language development.

2.1.3 Aims of The Research

The primary aim of the current research is to compare the estimate of relative exposure obtained through different tools, and examine if they would reliably predict vocabulary

knowledge in bilingual toddlers. We used a between-participant design in which children were asked to fill in the Plymouth LEQ plus one of the other three questionnaires. The focus on the Plymouth LEQ was decided as this tool has been recently successfully used in two influential studies linking language development and exposure in bilinguals. Indeed, Cattani et al. (2014) showed that 30-month-olds scoring at least 60% exposure to English on the Plymouth LEQ could be reliably assessed with a language tool aimed at monolinguals. Floccia et al. (2018) released bilingual norms for UK 2-year-olds who learn British English alongside any other additional language, using the outcome of the Plymouth LEQ as a key predictor.

We measured vocabulary knowledge with the Oxford CDI (Hamilton et al., 2000) and examined the effect of a range of other factors which are known to be robust indicators of language growth alongside exposure: age, gender, presence of siblings, childcare attendance, and SES.

2.1.4 Research Hypotheses

Given similarities between the four questionnaires in terms of key information, that is, the fact that they all ask about the different language(s) spoken in the family, the identity of the speakers, and the schedule of language exposure, we expected to find a positive correlations between exposure measured by all the four questionnaires. It is possible however that they vary in terms of absolute scale; that is, the CMQ might, for example, lead to a consistent over-evaluation of exposure to English as compared to the three others because it solely relies on a parent estimation. Similarly, it is possible that the ALEQ under-estimates the exposure to English because it focuses on home exposure only.

Because of the strong evidence of the impact of exposure on the development of comprehension and production (e.g., Hoff, 2014; Hoff et al., 2012), we expected exposure to predict the development of vocabulary when measured by all the four exposure questionnaires.

Additional robust predictors of vocabulary knowledge would be age, gender (at least on production), number of siblings, with less certainty about SES given that our Babylab population will not be recruited using a stratified sampling method.

2.2 Study 1

2.2.1 Method

Participants

Data were collected for a total of 50 bilingual children living in the UK and aged between 12 to 29 months. The data of an additional 6 children were discarded either because parents did not complete the study (N=3), or because they were trilingual (N=3). In the final sample of 50 bilingual families, children were aged 20.14 months (SD 5.14) and comprised 24 girls and 26 boys. They were all learning British English and one of 13 additional languages: Arabic (16), Czech (1), Dutch (4), French (6), German (5), Greek (1), Mandarin (1), Nigerian (2), Polish (5), Portuguese (1), Romanian (1), Spanish (5), Turkish (1), and Yoruba (1). All children were healthy and were no more than 6 weeks premature. They all came from middle to higher SES, as is common in lab-based research.

Procedures and instruments.

After signing the online consent form on the University of Plymouth Babylab database, parents first completed the Oxford CDI (Hamilton et al., 2000) on a secure web platform. Then parents filled one of three exposure questionnaires; two of them were sent by post and

one was filled in during a phone interview with the experimenter. The Alberta Language Exposure Questionnaire ('ALEQ'; Paradis, 2011) was sent by post and filled in by 17 families; the Child Multilingualism Questionnaire ('CMQ'; Yang, Plume, & Lust, 2007) was sent by post and completed by 17 families; the Language Exposure Questionnaire by Bosch and Sebastian-Galles ('B&S LEQ'; 1997) was completed over the phone by 16 families. Families were allocated randomly to one of these three conditions. When the questionnaire was sent by post, the researcher gave a call to the family at the time convenient to them to go through the various questions of the questionnaire, and make sure they were confident about what to do. Finally, for all families, the Plymouth Language Exposure Questionnaire 'LEQ' (Cattani et al., 2014) was completed by the researcher during a telephone interview with one of the parents, either in the beginning before completing one of the other three exposure questionnaires, or in the end after finishing the other exposure questionnaires. We counterbalanced the presentation of the questionnaires across participants: 26 parents completed the LEQ first, while 24 parents completed the LEQ second.

The ALEQ (Paradis, 2011). It contains 40 questions collecting information about family demographics and language use among family members at home, in addition to other aspects of the child's activities and experience in English. Specific questions focus on the time the family arrived in the country, when the child started to learn English (whether in a nursery or at preschool), parents' self-rated English fluency, parents' education, the child and siblings' use of English and the home language at home, and the child's experience of English both inside and outside home. It takes about 30 minutes to complete. For measuring language use at home, parents are asked to rate on a scale (0 to 4) the degree of use of language from the child with each family member and vice versa. These data are used to calculate the proportion of English used at home.

The CMQ (Yang et al., 2007). It consists of five parts, each including 5 to 8 questions. The first questions ask about the language the child currently uses with each member of the family, the time and place when the child was first exposed to each language, whether the child uses one language more dominantly than the other, and if the child is exposed to the two languages equally frequently. Once all these questions have been covered, the parent is asked to indicate on a 5-point scale (from 0 to 100%), how frequently the child is exposed to each language, once for home exposure and once for outside. In the present study, both percentages for inside and outside home will be used separately to compare to other questionnaires, and measure their impact on children's language development.

The B&G LEQ. The version of this questionnaire used in the present study was an electronic version of the original hardcopy designed by Bosch and Sebastian- Galles (1997). It is a one-page interview-based questionnaire which provides an overall percentage of exposure to each language the child is exposed to over his/ her life span. Parents are asked to list the people who have been regularly in charge of the child since birth, which language each of them uses, and the number of hours per day each person spends with the child. In case of children attending a day-care, similar questions are asked to get an idea about languages heard outside the home. These data are then entered into an electronic form, and an estimate of the proportion of time that the child is exposed to each language was then calculated. Altogether, this information leads to an estimate of the percentage of exposure to each language since the child's birth, in addition to an estimated daily and weekly exposure to each language (the first was used in the current study).

The Plymouth LEQ (Cattani et al., 2014). It is meant to provide an objective estimate of direct language exposure received by the child in English and the Additional Language in a typical week. It can be completed in a face-to-face interview or over the phone and does not

take more than 10 minutes. It includes questions about the number of hours the child spends in in an English- speaking day-care or additional language one, the number of hours the child spends sleeping, the frequency of speaking English versus the Additional Language from each parent, which parent speaks more to the child when both parents are together, and the number of hours the child spends with each parent alone. Answers for these questions together provide an estimate of the child's weekly exposure to English. The Plymouth LEQ questionnaire concentrates on parents' direct speech to the child. Whilst it is widely acknowledged that child-directed speech plays a central role in the development of language (e.g. Weisleder & Fernald, 2013), the claim that children can learn from overheard speech has received mixed support, with positive evidence (Akhtar, 2005) as well as null results (Schneidman & Godlin-Meadow, 2012; Weisleder & Fernald, 2013), explaining why the Plymouth LEQ concentrates primarily on speech directed at the child.

2.2.2 Results

In the first set of analyses, we examined how the percentage of exposure to English versus the home language as measured by the Plymouth LEQ correlated with that provided by each of the three other questionnaires, the ALEQ, the CMQ, and the B&G LEQ. In the second set of analyses we looked at how measures of exposure provided by the questionnaire predicted vocabulary scores, once controlled for other variables such as age, gender, SES, siblings, and childcare attendance.

2.2.2.1 Comparison of measures of exposure

Descriptive statistics for the three groups of children are provided in Table 25.

Table 25. *Mean and standard deviation for the percentage of exposure to English as measured with the Plymouth LEQ and ALEQ (N = 17), CMQ (N = 17), and B&G (N = 16)*

Measure	M	SD	Skewness
LEQ & ALEQ			
1. Plymouth LEQ exposure	49.88	19.46	.105
2. ALEQ inside home exposure	51.29	18.10	-.054
LEQ & CMQ			
1. Plymouth LEQ exposure	52.34	23.42	-.295
2. CMQ inside home exposure	53.12	23.01	-.580
3. CMQ outside home exposure	61.47	27.77	-.052
LEQ & 'B&G'			
1. Plymouth LEQ exposure	57.23	17.97	.099
2. B&G exposure	67.25	21.48	-.926

Plymouth LEQ vs. ALEQ. The ALEQ questionnaire provides a measure of exposure to English at home, whereas the Plymouth LEQ provides a general measure of exposure (see Table 25). The proportion of children's exposure to English as measured with the Plymouth LEQ strongly correlated with the score provided by the ALEQ inside home exposure ($N = 17$, $r = .85$, $p < .000$). This correlation is illustrated on Figure 5. There was no significant difference between the mean exposure score for the ALEQ inside home exposure ($M = 51.29$, $SD = 18.10$) and the score provided by the Plymouth LEQ ($M = 49.88$, $SD = 19.46$; $t(16) = -1.72$, $p = .104$). This suggests that the LEQ and the ALEQ inside home provide comparable estimates of exposure, and are similarly scaled.

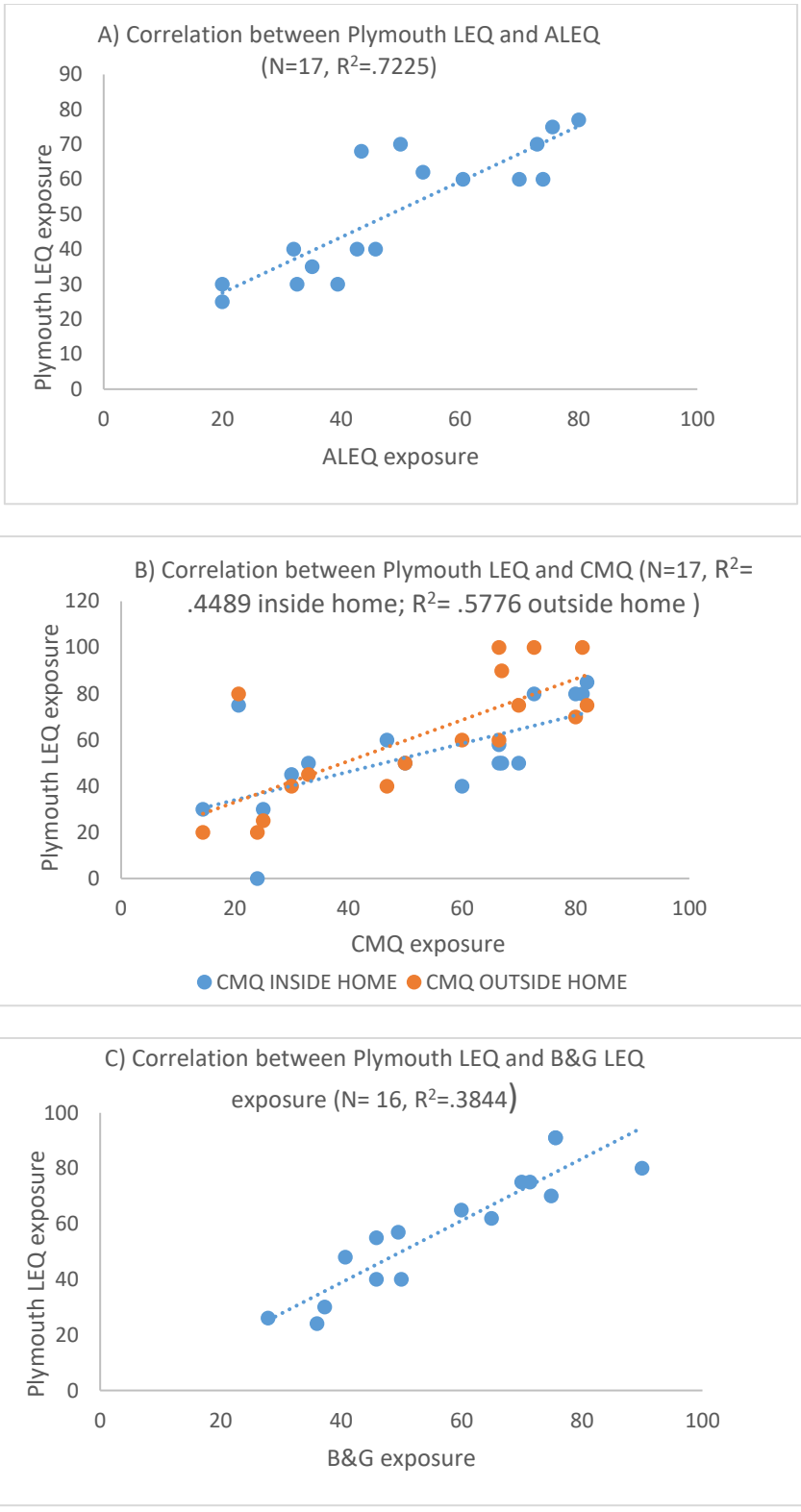


Figure 4. *Correlations between measures of exposure provided by the Plymouth LEQ and the ALEQ (a), the CMQ (b) and the B&G (c). For the CMQ, separate measures of exposure are provided for inside and outside home.*

Plymouth LEQ versus CMQ. The CMQ provides separate measures of exposure for inside and outside the home. A strong positive correlation was found between the scores provided by the Plymouth LEQ and the inside home exposure provided by the CMQ ($N = 17$, $r = .67$, $p = .003$), as well as the outside home exposure ($N = 17$, $r = .76$, $p < .000$). These correlations are illustrated in Figure4. In addition, the correlation between inside and outside home exposure was also significant ($N = 17$, $r = .76$, $p < .000$). Paired sample t-tests showed that there was no significant difference between the exposure percentage as measured by the Plymouth LEQ ($M = 52.34$, $SD = 23.42$) and the inside home CMQ ($M = 53.12$, $SD = 23.01$; $t(16) = -.17$, $p = .868$), while there was a tendency towards a significant difference between the Plymouth LEQ and outside home CMQ ($M = 61.47$, $SD = 27.77$; $t(16) = -2.07$, $p = .055$). The results suggest that the LEQ and the inside home CMQ provide comparable estimates of exposure on a similar scale, while the outside home CMQ home tends to provide higher scores than the Plymouth LEQ questionnaire.

Plymouth LEQ versus the B&G LEQ. Exposure as measured by the Plymouth LEQ ($M = 57.23$, $SD = 17.97$) significantly correlated with the B&G percentage of exposure ($N = 16$, $M = 67.25$, $SD = 21.48$; $r = .62$, $p = .010$) as shown in Figure4. Paired sample t-tests revealed that there was a significant difference between the exposure score from the B&G LEQ ($M = 67.25$, $SD = 21.48$) and the Plymouth LEQ ($M = 57.23$, $SD = 17.97$, $t(15) = -2.29$, $p = .037$), suggesting that the B&G LEQ provides higher scores of exposure to English than the Plymouth LEQ.

To sum, a strong positive correlation was found between the Plymouth LEQ and the other three exposure questionnaires, showing that all questionnaires agree on the trend of exposure. In terms of scaling, the Plymouth LEQ provided comparable estimates to the inside home

ALEQ and CMQ, while it tended to score lower than the outside home CMQ and the B&G LEQ.

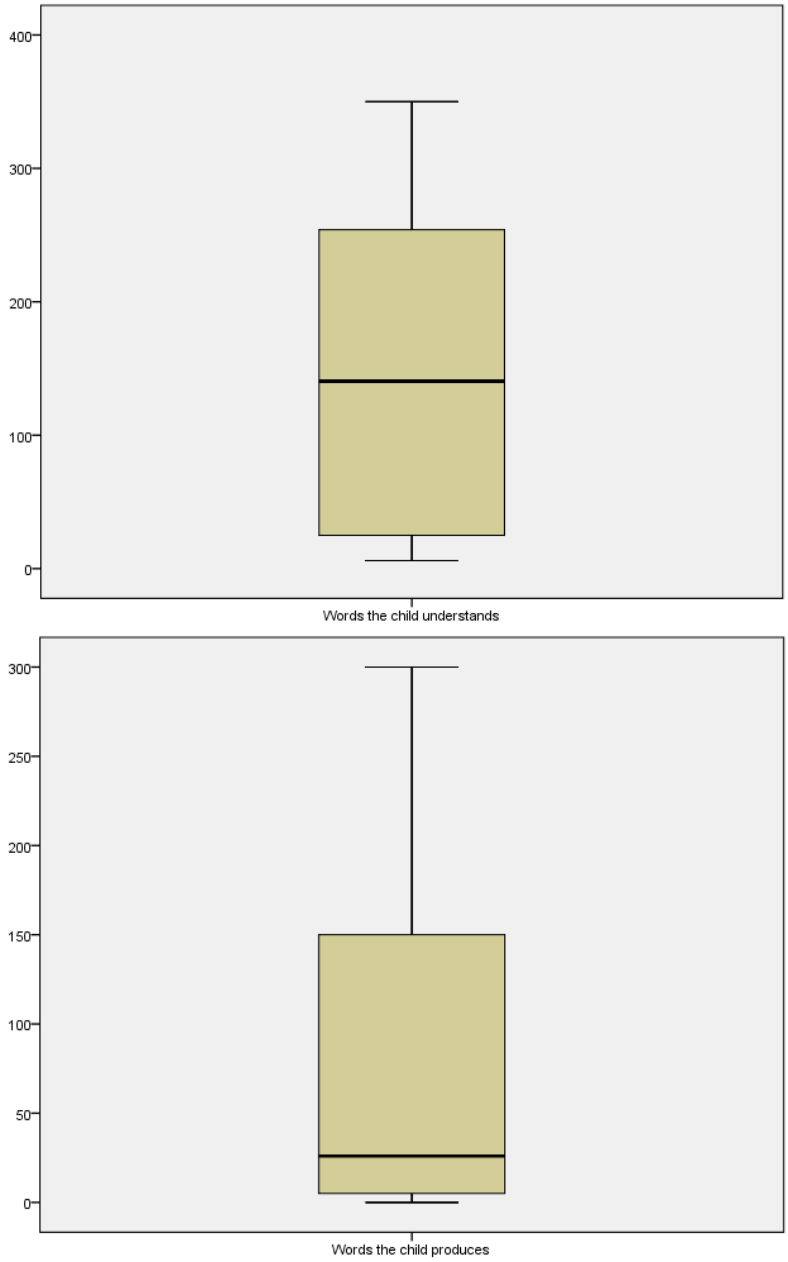
2.2.2.2 Relation between measures of exposure and vocabulary scores

In this second set of analyses we asked whether children's rate of vocabulary knowledge (comprehension and production separately) could be predicted by their amount of exposure to each language as measured by the different questionnaires, after having controlled for variables such as age and gender, SES (average of parents' occupation and education), siblings, and childcare attendance (see Table 26). To gain more power, we considered the full group of 50 children in the primary analyses, with each child having an exposure score measured by the Plymouth LEQ, and a score provided by one of the three other questionnaires. This latter measure will be referred as "Other LEQs" see Table 28 for the descriptive statistics of predictor variables and vocabulary scores in the three groups).

Table 26. *Descriptive statistics for the potential predictors of vocabulary development, and the vocabulary scores (N = 50)*

Factor	Mean	SD	Skewness
Age	20.14	5.14	
Gender	24 females; 26 males		
Exposure at LEQ	53.07	20.27	-.131
Other LEQs Exposure	55.50	21.17	-.143
Siblings	.84	1.09	
Childcare Attendance	1.02	.74	
SES	3.26	.78	
CDI Comprehension	147.88	113.06	.169
CDI Production	79.22	94.22	1.002

Note. Age = age of the child at testing in months (between 12 to 29 months); Gender = 1 for female and 2 male; Exposure at LEQ = % of weekly exposure to English; siblings = 0 to 4; childcare attendance = 0 no childcare attendance, 1 part-time attendance, 2 full-time attendance; SES (average percent calculated between parent's education ' with 1 represents A-Level' and 4 represents highest education'; Comprehension = number of words the child understands out of 416 on the Oxford CDI; Production = number of words the child says out of 416.



First, correlations between predictors were computed to identify potential multi-collinearity issues (see Table 27). There was a significant positive correlation between age and Other LEQs (N = 50, r = .45, p =.001), as well as between age and Plymouth LEQ (N = 50, r = .55, p < .00), likely due to the fact that older children tend to spend more time in day-care than younger ones, although the correlation between age and time in day-care did not reach significance (r = .24, p < .101). Expectedly, child care attendance significantly correlated

with Other LEQs childcare attendance (r = .46, p = .001) and with Plymouth LEQ (r = .44, p =.001): the more time spent in English daycare, the more exposure to the English language.

Table 27. *Pearson correlations between all predictors of the vocabulary knowledge (N = 50 children)*

	Age	**Gender**	**Plymouth LEQ**	**Siblings**	**Childcare**	**Other LEQs**	**SES**	**Comp**	**Prod**
Age	1								
Gender	-.08	1							
Plymouth LEQ	.55**	-.32*	1						
Siblings	.30*	.15	.33*	1					
Childcare	.24	-.36*	.44**	-.22	1				
Other LEQs	.45**	-.26	.83**	.25	.46**	1			
SES	.09	-.04	.001	-.29	.32**	.07	1		
Comp	.76**	-.23	.82**	.45**	.31*	.64**	-.03	1	
Prod	.73**	-.28	.73**	.35*	.37**	.56**	.06	.87**	1

*p<.05, **p<.01

Finally, as would be expected, SES significantly correlated with time spent in a day-care (r = .42, p = .002). It must be noted that time spent in daycare is part of the calculation of all exposure scores, which would invalidate its use in the same model as exposure anyway, so

we did not include it in the model. To check whether the multi-collinearity issues between age and exposure would affect the impact of other variables, a regression analysis was run with all IVs and VIF was checked. Since VIF for all IVs was < 5, we decided to include all IVs in the same model as seen in Table 29. A model was set to evaluate which factors predicted vocabulary knowledge (comprehension and production separately): with age, gender, siblings, SES, LEQ exposure and other LEQs.

Table 28. *Descriptive statistics for predictor variables and vocabulary scores in the three questionnaire groups*

	Factor	Mean	SD
ALEQ	Age	20.76	5.38
	Gender	6 females; 11	18.10
(N=17)	Inside home exposure	males	1.17
	Siblings	51.29	.78
	SES	1.35	112.92
	CDI Comprehension	3.12	95.06
	CDI Production	146.24	
		76.06	
CMQ	Age	18.94	5.18
(N=17)	Gender	9 females; 8	23.01
	Inside home exposure	males	27.77
	Outside home exposure	53.12	1.07
	Siblings	61.47	.89
	SES	0.53	126.70
	CDI Comprehension	3.09	93.42
	CDI Production	134.71	
		67.29	
B&G LEQ (N=16)	Age	20.81	4.93
	Gender	9 females; 7	21.48
	Percentage of exposure	males	1.06
	Siblings	67.25	.56
	SES	.75	102.78
	CDI Comprehension	3.13	98
	CDI Production	163.63	
		95.25	

ALEQ group: Inside home exposure: a calculation derived from the percentage of English spoken among family members in the home. CMQ: Inside home exposure: parents' estimated percentage of exposure to each language at home according to a 5-point scale; the higher the score, the less they are exposed to English. Outside home

exposure: parents' estimated proportion of exposure outside home according to the same scale as above. B&G LEQ: Percentage of exposure: overall estimated percentage of the child's exposure to English during a lifespan.

Relationships between vocabulary scores and age, gender, siblings, SES, LEQ Exposure, and Other LEQs

For the first regression analysis predicting the child's comprehension from age, gender, siblings, SES, LEQ exposure, and Other LEQs, the full model was fitting the data, F (6,43) = 34.57, p <.000 with a high R^2 (.83, .80 adjusted). Thus 80% of the variability in comprehension scores was predicted by the model (see Table 29 for the full model). It must be noted that only age, LEQ exposure, and siblings provided a significant contribution to the prediction.

Table 29. *Full model of prediction for vocabulary comprehension as a function of age, gender, siblings, SES, LEQ exposure, and Other LEQs (N=50)*

Predictors	***B***	***SE***	***β***	***t***	***p***	***VIF***
(Constant)	-174.614	49.358		-3.538	.001	
Age	9.484	1.709	.431	5.550	.000	1.511
Gender	-11.145	15.665	-.050	-.711	.481	1.224
Siblings	15.070	7.682	.146	1.962	.056	1.385
SES	-3.935	9.847	-.027	-.400	.691	1.148
LEQ Exposure	3.233	.710	.580	4.553	.000	4.060
Other LEQs	-.414	.608	-.077	-.680	.500	3.250

This was confirmed when using a stepwise regression procedure to find the best fitting model, whose results are in Table 30. This model retained age, siblings, and LEQ exposure

and accounted for 81% of the variance in comprehension score, (F (3.46) = 71.44, p <.000, R^2 = .81).

Table 30. *Stepwise regression model results for comprehension scores as a function of age, gender, siblings, SES, and exposure*

Predictors	***B***	***SE***	***β***	***T***	***p***	***VIF***
(Constant)	-210.52	28.85		-7.30	.000	
Age	9.29	1.65	.42	5.63	.000	1.471.15
Siblings	14.84	6.85	.14	2.17	.036	1.147
LEQ Exposure	3.00	.42	.54	7.08	.000	1.50

For children's word production, the same full model was also fitting the data, F (6,43) = 17.51, p <.000, with a high R^2 (.71, .67 adjusted). Thus 67% of the variability in production scores was predicted by the model (see Table 31 for the full model). Here, age and LEQ exposure contributed significantly to predict production scores.

Table 31. *Full model of prediction for vocabulary production as a function of age, gender, siblings, SES, LEQ exposure, and Other LEQs (N=50)*

Predictors	***B***	***SE***	***β***	***t***	***p***	***VIF***
(Constant)	-176.121	53.495		-3.292	.002	
Age	8.376	1.852	.457	4.522	.000	1.511
Gender	-23.764	16.978	-.127	-1.400	.169	1.224
Siblings	9.989	8.326	.116	1.200	.237	1.385
SES	6.884	10.672	.057	.645	.522	1.148
LEQ Exposure	2.433	.770	.524	3.162	.003	4.060
Other LEQs	-.670	.659	-.151	-1.017	.315	3.250

When a stepwise regression procedure was used to find the best fitting model (Table 32), age and LEQ exposure were included in the model, which accounted for 67% of the variance in production score, $F(2,47) = 50.82$, $p < .000$, $R^2 = .67$.

Table 32. *Stepwise regression model results for production scores as a function of age, gender, siblings, SES, LEQ exposure, and Other LEQs.*

Predictors	***B***	***SE***	***β***	***T***	***p***	***VIF***
(Constant)	-209.81	31.53		-6.65	.000	
Age	8.58	1.80	.47	4.76	.000	1.43
LEQ Exposure	2.19	.46	.47	4.81	.000	1.43

To summarise, the analyses including age and the other IVs (siblings, gender, SES, Plymouth LEQ, and Other LEQs) showed that vocabulary comprehension was predicted by age, siblings and LEQ exposure while vocabulary production was predicted by age and LEQ exposure only.

As expected, a strong positive correlation was found between the Plymouth LEQ and the other three exposure questionnaires which suggests that the four questionnaires agree on the trend of exposure because of the similarities between them in terms of the key information. Also, as expected, they varied in relation to scaling as the Plymouth LEQ scored lower than the outside home CMQ, given that exposure in CMQ is based on parents' own estimation of exposure, and the B&G LEQ, since it provides a percentage of exposure based on a span of the child's life. In line with previous literature and as expected, exposure as measured by the Plymouth LEQ, but not Other LEQs, predicted vocabulary knowledge. Unlike our expectation, gender did not predict vocabulary knowledge, probably because it is too early for the children to show vocabulary differences in this age or due to the small size of the

sample. As expected, SES did not predict vocabulary knowledge probably due to the sampling characteristics that were primarily made of middle class parents.

2.3 Study 2

Introduction

Parents' estimation

An alternative method of exposure assessment relies on parents' own estimation of the proportion of input in each language spoken to the child, from each conversational partner, per day or per week. Although there are doubts over the precision of parents' own estimation of their children's exposure in the L2 in particular (English in most cases), Pearson et al. (1997) found a strong correlation between parents' estimates of exposure and their children's vocabulary size in English and Spanish languages when they used parents' global estimate of exposure at English and Spanish. On the other hand, Gutierrez-Clellen and Kreiter (2003) found that parents' estimated exposure was reliable only for the Spanish vocabulary skills for bilingual Spanish-English children. This was justified by the fact that Spanish was only spoken at home with parents, so that only parents could really estimate their children's exposure to this language. On the other hand, teachers at English-only schools could provide a reliable estimation of the children's exposure to English only. The aim of the current study is to examine whether parents' own estimation of their children's language exposure would predict their vocabulary development as efficiently as other exposure questionnaires (Plymouth LEQ or Other LEQs). We hypothesize that parents' own estimation of their children's exposure to English will not consistently relate to that measured by the Plymouth LEQ nor the Other LEQs.

Language mixing (Code-switching)

Another aim of the current study was to investigate if there was an impact of caregiver's language mixing on the vocabulary knowledge of the children. Previous research has found that bilingual children experience language from their bilingual parents in two different ways: some of the bilingual parents use only one language at a time while others mix their L1 and the societal language (L2) (Barron-Hauwaert, 2004; Lanza, 1997). Language-mixing occurs when parents borrow words from two languages in the same sentences, or when switching from one language to the other in the same conversation (Myers-Scotton, 1992; Poplack, 1980). Byers-Heinlein (2013) developed the 'Language Mixing Scale Questionnaire' to measure the percentage of code-switching and borrowing words from two languages in parental speech with children aged 18 months. A negative correlation between parents' use of code switching and the development of their children's comprehension of English was found, but no significant correlation with the children's production at the same age. On the other hand, when the impact of parents' code-switching on children's production at the age of 24 months was measured, it showed a marginal effect. Using the language Mixing Scale (Byers-Heinlein, 2009), Byers-Heinlein found that the degree of language mixing impedes the early vocabulary development at bilingual children exposed to English and another additional language according to their vocabulary scores in the MacArthur CDI. On the other hand, Hoff et al. (2014) used the same 'Language Mixing Scale Questionnaire' (Byers-Heinlein, 2013) to examine if bilingual parents' code switching has an impact on the development of language in 25 to 30-month-old bilingual Spanish/ English children. No effect of language mixing was found, neither in English nor Spanish. Place and Hoff (2016), using the same 'Language Mixing Scale' (Byers-Heinlein, 2013), also found that there was little evidence that the frequency of language mixing has a negative impact on the language skills of bilingual English-Spanish children living in the US. Similarly, Place and Hoff (2011) measured

language mixing using the language Diary developed by De Houwer and Bornstein (2003) to gather information about the persons who interacted with the child and in which language according to 30 minutes periods during which the child was exposed to English and Spanish. Using the MacArthur CDI (English and Spanish versions) to measure language development, there was no impact of language mixing on the development of neither English nor Spanish at the children at the age of 25 months.

Given the inconclusive results about the effect of language mixing on bilingual language development, and the clinical importance of this topic in clinical practice and recommendations to parents,in the current research, an experiment was run to find out if there was an impact of parents' language mixing on the development of vocabulary knowledge of their bilingual children.

2.3.1 Method

Participants

Data were collected from 20 bilingual children, living in the UK and aged between 12 to 29 months. Given that previous research had found some impact of language-mixing on language development between this age range (18 months for Byers-Heinlein, 2013; 25 to 30 months for Hoff et al., 2014), we decided to include children within a similar age range and slightly before, to examine if there would be an impact of language mixing on the development of vocbulary knowledge of their bilingual children. The average of the children's age was 20.90 months and comprised 8 girls and 12 boys. They were all exposed to British English and one of 7 additional languages: Arabic (10), Dutch (2), French (1), Greek (1), Polish (2), Spanish (3), and Yoruba (1). All children were healthy and were no more than 6 weeks premature. They all came from middle to higher SES, as is common in lab-based research.

Procedures and instruments

The same procedure of the first study was followed but after filling in one of the 3 exposure questionnaires described in Study 1, two additional steps were taken. First, a language mixing questionnaire (Byers Heinlein, 2014) was filled in by parents to investigate if there was an impact of caregiver's language mixing on the vocabulary knowledge of the children. The Language- Mixing questionnaire was sent by post and the family was later contacted by phone to make sure they were confident about what to do. Second, as in Experiment 1, all families completed the Plymouth LEQ during a telephone interview with one of the parents, either in the beginning before completing one of the other three exposure questionnaires. However, the following question was asked to the parent prior to starting the Plymouth LEQ: 'In a typical week, what do you think is the proportion of English your child hears as compared to your home language?' The aim of this question was to find out whether parents' own estimate is as accurate as any other questionnaires.

The Language Mixing Questionnaire. This questionnaire comprises 8 questions (A to H) and it aims at giving parents a self-assessment of their language mixing practice at the sentence level. The first three questions ask the parent about the situations when s/he speaks each language (English / additional language) to the child, as well as their own estimation of the percentage of interaction in each language with the child, with the aim of refreshing their memory about his/her interaction with the child in the two languages. The last 5 questions comprise the 5-item language mixing scale itself. It is a 7-point scale, with 1 indicating 'very true' which means 'frequent language mixing', and 7 'Not at all true' with the meaning of 'no mixing at all'. Within the five item scale, the first two items ask about the frequency of mixing between the two languages in the same sentence, while the second two items follow up to investigate about occasions when the parent borrows words from one language when

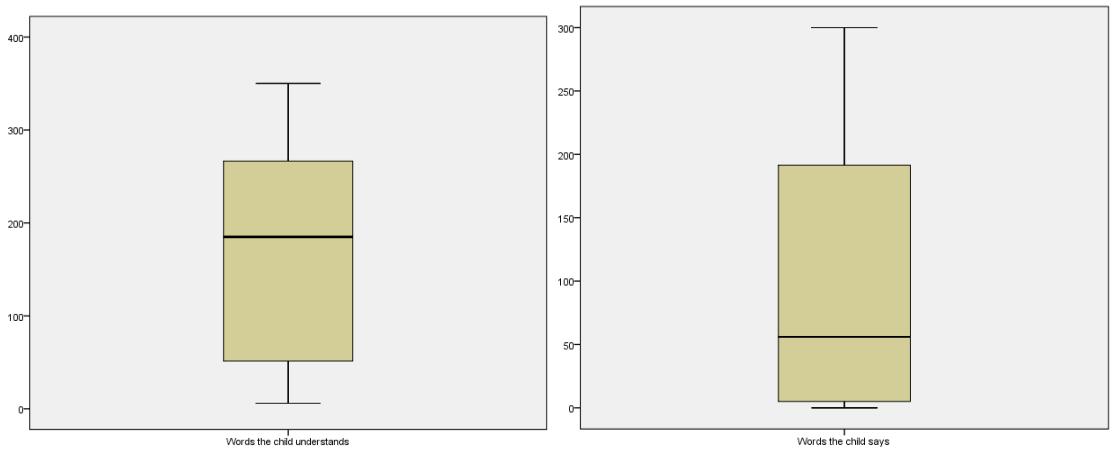
speaking the other, the last item asks about the global mixing between the two languages. To get the overall score of language mixing, the value scored for each item in the five item scale are summed and this value is subtracted from the total maximum value which is 35 (i.e., 5 items X 7 which is 'the top of the scale') to get a percentage of language mixing.

2.3.2 Results

Descriptive statistics for the group are provided in Table 33.

Table 33. *Descriptive statistics for the group (N = 20)*

	M	SD	Skewness
CDI Comprehension	166.95	115.45	-.046
CDI Production	105.25	112.07	.637
Plymouth LEQ	58.72	18.73	-.425
Other LEQs	60.18	16.78	-.541
Estimated Exposure	83.50	10.95	-1.063
Language Mixing	16.95	10.07	-.039



First, we examined through Pearson's correlations whether parents' own estimation of exposure was accurately related to that measured by the Plymouth LEQ, or the other LEQs taken together. As can be seen in Table 34, parents' own estimation did not correlate with the Plymouth LEQ measure, nor with the other LEQs.

Table 34. *Pearson correlations between measures of exposure in Study 2 (N=20)*

	Plymouth LEQ	**Other LEQs**	**Estimated Exposure**
Plymouth LEQ	1		
Other LEQs	.88**	1	
Estimated exposure	.36	.28	1

*p<.05, **p<.01

Then to find out whether the Plymouth LEQ, Other LEQs, or parents' estimation were predictors of vocabulary scores, a stepwise regression has been run on vocabulary knowledge (comprehension and production separately) with age and one of these three exposure scores. For the two models including either the Plymouth LEQ or Other LEQs, both , age, and exposure (Plymouth LEQ or Other LEQs) were predictors of comprehension and production scores.. On the other hand, in the model with age and parents' estimated exposure, only age predicted the comprehension and production scores (see Table 35).

Table 35. *Stepwise regression on vocabulary knowledge with 3 exposure scores and age.*

Dependent Variables	Independent Variables	*B*	SE	*β*	T	*P*
Plymouth LEQ						
Comprehension	Constant	-255.696	42.852		-5.967	.000
	Age	13.945	2.045	.701	6.818	.000
	Plymouth LEQ	2.234	.634	.363	3.527	.003
Production	Constant	-278.575	55.585		-5.012	.000
	Age	10.969	2.653	.568	4.135	.001
	Plymouth LEQ	2.633	.822	.440	3.203	.005
Other LEQs						
Comprehension	Constant	-278.159	51.753		-5.375	.000
	Age	15.469	2.068	.778	7.482	.000
	Other LEQs	2.024	.715	.294	2.831	.012
Production	Constant	-297.946	68.056		-4.378	.000
	Age	12.921	2.719	.669	4.752	.000
	Other LEQs	2.213	.940	.331	2.354	.031
Estimated Exposure						
Comprehension	Constant	-194.632	50.128		-3.883	.001
	Age	17.301	2.315	.870	7.473	.000
Production	Constant	-206.63	62.57		-3.30	.004
	Age	14.92	2.89	.77	5.16	.000

Second, to examine whether parents' language mixing habits had any impact on vocabulary scores, we ran a step wise regression on comprehension scores with the following variables: Plymouth LEQ, language mixing scores, and age, and then another stepwise regression was run on the production scores with the same IVs. The predictors together accounted for a significant proportion of the variance in comprehension scores, R = .96, R^2 = .90, p < .000. It is only age and language-mixing that survived as predictors of comprehension scores. For the production scores, the predictors together also accounted for a significant proportion of the variance in production scores, R = .87, R^2 = .72 p < .000, and it is only age and the exposure percentage as measured by the Plymouth LEQ that survived as predictors of the production ones (see Table 36)

Table 36. *Stepwise regression on vocabulary knowledge with language, age, and exposure.*

Dependent Variables	**Independent Variables**	***B***	**SE**	***β***	**T**	***P***
Comprehension	Constant	-176.512	36.530		-4.832	.000
	Age	19.921	1.789	1.001	11.134	.000
	Language Mixing	-4.301	1.032	-.375	-4.169	.001
Production	Constant	-278.58	55.59		-5.01	.000
	Age	10.97	2.65	.57	4.14	.001
	Plymouth LEQ	2.63	.82	.44	3.20	.005

To summarize, parents' own estimation of their children's language exposure did not predict their children's vocabulary knowledge as compared to other exposure questionnaires. In addition, the rate of parents' language mixing did predict the children's comprehension but not their production.

As expected, parents' estimation of their children's vocabulary knowledge was not consistently related to exposure as provided by exposure questionnaires. One explanation for this is that, as suggested by previous literature (i.e., Gutierrez-Clellen & Kreiter, 2003), parents cannot provide an accurate estimation of their children's English exposure since most of them speak only the additional languages at home.

In relation to the impact of language-mixing on language development; there was no impact of parents' language-mixing on the children production, though it predicted the comprehension scores. This contradicts findings from Byers- Heinlein (2013) who found that language mixing affects the children's comprehension negatively, at the age of 1.5 years which is nearly the mean age in our study, but in line with our findings, she also found that it does not have an impact on their production before 2 years.

2.4 Discussion

This research aimed at comparing how different language exposure assessment questionnaires estimate the relative exposure to each language in bilingual children, and to assess their reliability in predicting vocabulary knowledge. This was done to provide practitioners and researchers with information regarding their relative interchangeability. Data was collected from 50 bilingual children between the ages of 12 to 29 months old, who are living in the UK and are exposed to English and one of 13 additional languages. The four questionnaires (Plymouth LEQ, Cattani et al., 2014; ALEQ, Paradis, 2011; CMQ, Yang et al., 2007; B&G LEQ, Bosch & Sebastian-Galles, 1997) had been specifically selected because they constitute a representative sample of different approaches. We adopted a between-participant design where each parent was asked to fill in either the ALEQ, the B&G or the CMQ, but all were asked to complete the Plymouth LEQ. We found that the four exposure questionnaires agreed on the trend of exposure, and that in terms of scale, some of them showed comparable estimates (Plymouth LEQ and ALEQ & Plymouth LEQ and CMQ inside home exposure) while the others tended to score lower (Plymouth LEQ scored marginally lower than CMQ outside home, and significantly lower than the B&G LEQ). Therefore, our first hypothesis of a correlation between exposure as measured by Other LEQs and Plymouth LEQ was established, and the reason for this is likely that the set of questions used in each of the four questionnaires, the answers of which lead to a calculation of the exposure percentage, are very similar across all four questionnaires. They all provide information about languages spoken in the family, by whom, and frequency of use of these languages.

It was also anticipated that the four questionnaires may vary in relation to the absolute scaling. Contrary to our expectation, the ALEQ and the Plymouth LEQ provided comparable estimates of exposure; we speculate that siblings input to the child is taken into account in the

ALEQ which might compensate for the absence of outside home exposure, whereas outside home exposure is measured through childcare attendance in the Plymouth LEQ. Also, against our expectation, the CMQ measuring outside home exposure provided an over-evaluation of exposure to English as compared to the Plymouth LEQ and this is potentially because it depends only on parents' estimation rather than a calculation. These may lack the necessary information to correctly estimate the language exposure their children receive outside home, leading to an overestimation as found in Study 2 that parents overestimated their children's exposure as compared to the Plymouth LEQ or Other LEQs In relation to the inside home exposure, the CMQ provided comparable estimates of exposure to the Plymouth LEQ, as the questions asked in both of them and which provide information for the calculation of exposure or estimation of exposure in the CMQ are nearly the same.

The B&G LEQ overestimated the percentage of exposure as compared to the Plymouth LEQ. A difference (one way or another) was expected as the B&G LEQ provides an estimation for the child's exposure to English during her lifespan, unlike the Plymouth LEQ which provides a measure for a typical, recent week.

The second aim of this research was to find out how well bilingual children's comprehension and production vocabulary could be predicted by their amount of exposure to each language, as measured by the different exposure questionnaires, after controlling for some robust predictors of language development such as age, gender, number of siblings, and SES. As expected, exposure to English was found to be a strong positive predictor of both the comprehension and production scores as measured by the Plymouth LEQ which is in line with findings from most of previous studies (see Cattani et al., 2014; Place & Hoff, 2011; Hoff et al., 2012; Thordardottir; 2011). Unlike our expectation, exposure as measured by other LEQs did not predict the children's vocabulary knowledge which could be due to the

variations between the four selected questionnaires in relation to the method of measuring exposure. In relation to the impact of the external factors of language development, as expected, the number of siblings accurately predicted the comprehension scores. Children with three siblings had higher scores in their vocabulary comprehension than their counterparts with no siblings or less siblings.The explanation for this may be that any of these siblings could be older or in the school age which positively affects the language development of the younger ones in English, given that English would be the language of communication preferably used by school aged children when engaging with other children. This finding comes in line with findings from Hoff and Bridges, (2014) that younger American children with older siblings scored more in their English vocabulary compared to other children with no older siblings. As expected earlier in our hypothesis, there was no impact of SES on the development of vocabulary knowledge in bilingual children. This comes in line with some previous studies that found either very small or no impact of SES on vocabulary development in bilingual children (Fenson et al., 1994; Floccia et al., 2018), probably because of inadequate sampling, which is probably the reason behind the null result found in the current study.

In relation to the internal predictors, unlike our expectation, gender did not predict vocabulary knowledge, neither in production nor in comprehension. This is consistent with previous research that found no impact of vocabulary knowledge on comprehension scores, but still an impact on production was found with girls outperforming boys in production (see Bleses et al., 2008; Bornstein & Cote, 2005; Eriksson et al., 2012, & Huttenlcher et al., 1991; Fenson et al., 1994, 2007). As discussed in the first part, the first reason for the absence of gender effect could be due to absence of SES impact given that the data for this study was collected through Plymouth Babylab, and our Babylab population is not be recruited using a stratified sampling method (self-selected, opportunity sample). Previous research found that maternal education

has an impact on the language skills of boys and girls. Boys with mothers from high educational backgrounds tend to score lower than girls with mothers from lower educational backgrounds at 18 and 36 months, but between these ages first-born boys of high maternal education scored higher on comprehension (Zambrana et al., 2012). One other reason could be that gender differences in relation to vocabulary knowledge appear after only the age of 24 months. Marjanovic-Umek and Fekonja-Peklaj (2017) found that the effect size of gender increases with age and depends on the language measure tested. They found that the effect size is largest in studies that included children between 4 to 6 years where language production was assessed. So it could be too early for the children in our study to reveal any substantial vocabulary differences between boys and girls. However, Floccia et al. (2018) found an impact of gender on vocabulary knowledge with girls outperforming boys, especially in relation to the production vocabulary in the same age group as our study. One additional and main reason for the absence of the gender effect is the small number of the sample as compared to other studies (Bornstein et al., 2004 ; Leaper & Smith, 2004). However, Luijk and colleagues (2015) ran a study that included a large sample of about 5000 children between the age of 1 to 6 years old and they found no difference between them in relation to the children's vocabulary skills (Luijk et al., 2015).

In a second, follow-up study (Study 2), we investigated whether the additional factor of parents' language mixing would add to the predictive value of the models and whether it does predict their children's vocabulary knowledge. In addition, we examined whether parents' own estimate of their children's language exposure is as accurate as any other exposure questionnaires. To address these two questions, 20 bilingual children between the ages of 12 to 29 were tested.

First, we found that parents couldn't estimate the amount of exposure for their children's English language as accurately as other questionnaires like the LEQ or the other questionnaires did. The reason for this maybe simply because it is not a simple estimation to make, as it needs to take into account a variety of parameters, as exemplified in the complex calculations underlying the LEQ (Cattani et al., 2014). This comes in line with findings from Gutierrez-Clellen and Kreiter (2003) who found that parents of bilingual Spanish-English children could only estimate their children's exposure for the Spanish language, but not for the English one, given that they couldn't accurately estimate how much English exposure their children received outside home where English was only spoken. This contradicts findings from Pearson et al. (1997) who found a strong correlation between parents' estimation of their children's exposure and the vocabulary size of the children between the ages of 8 and 30 months.

We also found that parents' language mixing did predict the children's comprehension scores, but not their production skills. The more the parents mixed the two languages in their speech, the more the children understood words in English. Our findings contradict the findings of Byers-Heinlein (2013) who found a negative impact of language mixing on comprehension development at the age of 18 months, but in line with our findings, she found no impact on their production at the same age but a marginal one at the age of 2 years. Findings from Hoff et al. (2014) and Place and Hoff (2011, 2016), are also not consistent with some findings from our study. They found no impact of parents' language mixing in their speech on the vocabulary development of their children at the age of 30 months, between 25 to 30 months, and at 25 months respectively. The reason for our positive finding in relation to the impact on comprehension development is potentially due to the difference in relation to the size of the sample between these studies, with our finding being a false positive. In addition, all of these previous studies used a sample of children learning only

English in addition to Spanish, whereas in our sample, children were learning English and one of 13 additional languages, some of which are linguistically distant and others are close languages which might lead to different impacts of language mixing.

2.4.1 Research Limitations and Recommendations for Future Research

One limitation to this research is that we did not include in our selection of questionnaires a weekly diary like De Houwer (2011) has developed, which should allow the most precise estimate of all approaches. In future research it would be interesting to explore whether the gain in precision is useful in predicting vocabulary scores.

One finding of this research is that, though measuring the same construct, there are variations between the four selected questionnaires in relation to the method of measuring exposure. While the ALEQ, Plymouth LEQ, and B&G questionnaires follow an automatic formula to calculate the percentage of exposure, the CMQ depends on parents' own estimation of their children's percentage of exposure. Additionally, the four questionnaires measure exposure differently in relation to the quantity of exposure; while the ALEQ provides percentage of exposure for inside home only, the CMQ provides estimated percentage of exposure for inside and outside home separately, the B&G provides estimate of exposure over the child's lifespan, and the Plymouth LEQ provides a calculation of exposure during a typical week. This affected the scaling of exposure resulting in the Plymouth LEQ tending to score lower than the outside home CMQ and B&G questionnaires. This is a main reason for the insignificant impact of Other LEQs exposure on vocabulary knowledge and the significant impact of the Plymouth LEQ exposure . Therefore, future research should take into consideration the suitability between the questionnaires in relation to length, time of administration, and method of measurement of exposure. In terms of operationalisation,

Plymouth LEQ is highly recommended to be used in future research to measure language exposure as all the participants preferred it due to being short to administer.

2.4.2 Conclusion

The current research has compared between the estimates of exposure provided by four questionnaires, which would inform researchers and practitioners about the relative interchangeability between them in predicting vocabulary knowledge. It was found that the four of them agreed on the trend of exposure, though some of them slightly differed from the others in terms of scaling. The second aim of this research was to explore whether the relative amount of exposure as measured by different exposure questionnaires was a predictor of vocabulary knowledge in bilingual children while controlling for robust predictors of vocabulary knowledge such as age, gender, siblings, and SES. We found that the relative amount of exposure was a strong positive predictor of vocabulary comprehension and production in bilingual children. Additionally, age and siblings were found to be strong predictors of vocabulary comprehension and production in bilingual children as well. The second study aimed at exploring whether parents' language mixing was a predictor of their children's vocabulary knowledge and it was found that parents' mixing in the same sentence or between languages was a positive predictor of their children's comprehension skills only and not their production. This second study aimed also at finding out whether parents' own estimation of their children's amount of exposure to English was as accurate as that provided by exposure questionnaires and we found that parents could not successfully predict their children's English exposure as accurately as exposure questionnaires, either because of overestimating it, or for their lack of knowledge of the accurate percentage of exposure their children receive outside home.

General Conclusion

Throughout this research, we have validated and standardised a new Arabic assessment tool (the Arabic CDI) that parents and practitioners in 17 Arabic-speaking countries, with 17 Arabic dialects, can use to assess the development of their children's comprehension and production and to identify children at risk for language delay amongst this populations within the age range between 8 to 30 months. Additionally, the Arabic CDI will be a useful assessment tool to evaluate the development of language in Arabic-English bilingual children living in the UK from different Arab backgrounds. Given that previous research has demonstrated the significant impact of amount of language exposure on the development of bilingual children's vocabulary, in the second part of this research we have compared the interchangeability of different exposure questionnaires and we found that measuring exposure through different exposure questionnaires would equally predict language knowledge in bilingual children, though some of them overestimate or underestimate it compared to others. Additionally, we found that language acquisition in bilingual children could be predicted by the amount of exposure to each language as measured by the Plymouth LEQ. Additionally, in relation to user-friendliness, Plymouth LEQ is highly recommended to use, being short, easy to administer, and providing a calculation of exposure during a typical week.

This thesis has provided practitioners and researchers with a new tool to assess language in Arabic-learning children, and has firmly established the Plymouth LEQ as a reliable and easy to use questionnaire for evaluating exposure in bilingual children. Together with the Plymouth LEQ, the Arabic CDI has the potential to be used to assess language development in bilingual Arabic-English children living in the UK for example, or in any multilingual Arabic countries like UAE or Lebanon. Our next steps will be to disseminate this new knowledge in the Middle East and the rest of the world, in the years to come.

Throughout this thesis, two unexpected findings have emerged. First, no impact of gender was found to affect language performance in monolingual Arabic-speaking children. One explanation is cultural: Arabs tend to pay more attention to the education of male offspring than female ones (Iqbal & Riad, 2004), which could compensate for the usual finding that boys lag behind girls in other cultures in relation to their language development; indeed in the Arab culture boys are the focus and receive greater affection, particularly from their mothers (Awareness, 2006). Alternatively, this finding is perhaps consistent with Marjanovic-Umek and Fekonja-Peklaj (2017) who found out that gender differences increase with age and cannot be spotted at an early age. Therefore, at the moment the norms developed for the Arabic CDI can be used equally for Arabic-speaking boys and girls within the age range of 8 to 30 months. This finding is consistent with CDI norming studies that used parental report such as Fenson and colleagues (1994, 2007) where gender accounted for a very small variance in vocabulary scores between boys and girls before the age of 24 months, and in Bleses et al. (2008) where gender had no impact on children's vocabulary development until the age of 1;2 months. The age factor has been found to be another reason for the lack of impact of SES on the children's vocabulary knowledge (our second surprising finding), also reported by Fenson et al. (1994) who, using the original MacArthur CDI, reported that SES affect children's language performance only after 3 years of age. Similarly, Dodd et al. (2003) found no impact of the caregiver's educational background on the development of language production in English children aged between 3;0 and 6;11 years. It also comes in line with findings from Hamilton et al (2000) where no impact of SES was found to affect children's language development. As previously suggested, the reason for this could be our self-selected sample as our parent participants may have been particularly engaged in their child's language development, across the different SES profiles. This means that parents and practitioners can use the norms of the Arabic CDI for assessing Arabic-speaking children

from different SES backgrounds, keeping in mind that the data may over-represent a particular range of the population (highly educated parents). Looking at less established factors that could predict language development in monolingual children, as expected, only the identity of the parent who filled in the CDI and identity of the primary caregiver did predict the vocabulary knowledge. This goes in line with results from previous studies that mothers know more accurate information about their children's language development, especially given that in the Arabic culture, fathers are the primary bread winners (Barakat, 2005) while the majority of mothers don't work and spend most of their time with their children. Children whose primary caregiver is the mother were also found to acquire more vocabulary knowledge than their counterparts who have other primary caregivers such as fathers, grandparents, babysitters or day care. This finding is consistent with previous findings in the literature as Hoff-Ginsberg (1991) found that mothers are a rich source of input for children, providing them with rich linguistic interaction that enhance children's syntactic skills. Following, we recommend that the Arabic CDI be filled by mothers rather than fathers or other caregivers. In relation to birth order, in part 1, we predicted an advantage of first-borns as children in our sample were monolinguals (Fenson et al., 1994; Jones & Adamson, 1987); however, in part 2, we predicted the advantage of late-borns as children who took part in the study were bilinguals and therefore would benefit from their older siblings' English input. In part 1, there was no impact of birth order on monolingual children's vocabulary; in contrast in part 2, there was a positive impact of the number of siblings on bilingual children's vocabulary with children with three siblings scoring the highest scores in their vocabulary comprehension than their counterparts with no siblings or with less siblings (Caldas, 2006; Pearson, 2007; Wang, 2008; Yip & Matthews, 2007; Zukow-Goldring, 2002).

A uniqueness of our approach was to tackle the multi-dialectal aspect of Arabic, by comparing vocabulary scores across 17 dialects. We found that the dialect of the country did not affect the children's language development. Although preliminary, these results suggest that the cultural and linguistic differences are minimal between Arabic dialects, at least in terms of factors driving language acquisition. Unlike findings from Tardif et al. (2009) who reported differences in the learning of Mandarin and Cantonese Chinese, phonological differences between Arabic dialects might have a minimal impact. This suggests that the the norms of the Arabic CDI can be used by parents and practitioners living in any of the countries selected in the study to assess their children's language development.

How do the results of this thesis fit into what we currently know about trajectories of vocabulary development across languages? A comparison of our Arabic CDI data with those compiled by Bleses et al. (2008) for 13 languages and dialects in comprehension production provides an interesting picture. In comprehension, the progression of the median vocabulary scores in Arabic between 8 and 15 months (which the age bracket analysed by Bleses et al.) shows that Arabic children, like Danish children, show a steady linear progression, which contrasts with all other 12 languages/dialects analyses by Bleses et al. For these 12 other languages, an acceleration in word comprehension is observed between 10 and 12 months. In production on the other hand (again between 8 and 15 months), the shape of the learning curve for Arabic is very similar to what is observed in the majority of the other languages, although the number of items produced per age bin puts Arabic in the category of languages where learning appears the slowest, together with Danish, Basque, British English and French. One possibility could be that Arabic-speaking parents fill out the CDI forms differently than parents from another language background, but it would remain to be explained what common factor would explain a similar behaviour in Danish parents and Arab parents. More likely, the slow learning curve of Arabic children might stem from exposure

and/or linguistic differences between Arabic and most other languages that would initially slow down the process of understanding words (the delay in production is not as clearcut as that of comprehension). One possibility would be that the complex consonant-based morphological structure of Arabic would delay word comprehension, however Hebrew children, who have to learn the same type of rules, catch up with vocabulary quicker than Arabic children (Bleses et al., 2008). Another possibility could be down to the characteristics of the input provided to Arabic-learning infants, such as the qualities of infant-directed speech which has been argued to explain the slowest rate of word learning in British English children and American English children (Hamilton et al., 2000) or the use of decontextualized language by caregivers between 18 and 42 months which has been found to predict later vocabulary outcomes (Rowe, 2012).

In addition to having developed a suitable tool for assessing language development in Arabic, we also worked toward providing practitioners and researchers with a tool that can reliably and easily measure the relative amount of exposure to each language, to be used in bilingual children. Our comparison of a selection of exposure questionnaire measuring exposure showed that they provided comparable estimates of exposure, and were similarly sensitive to language-predicting factors, but the Plymouth LEQ proved to the easiest and the shortest to administer, which leads us to recommend using the Plymouth LEQ in addition to the Arabic CDI to assess the impact of language exposure on children's language development in multilingual Arabic-speaking countries. Our research delivered two tools for assessing language development in Arabic-speaking children, monolingual or bilingual. The promotion of the use of these tools amongst practitioners and families in the Middle East would ensure a fair and equal access to healthcare for all children.

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APPENDICES

APPENDIX A: Arabic CDI (Egyptian dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
نياو نياو		
مااااو مااو		
مم مم		
أسماء الحيوانات		
كَلْبْ		
حُمَارْ		
بَطَّة		
أَسَدْ		
إِزْدْ		
فَارْ		
عَنْكَبُوت		
سِنْجَاب		
وسائل المواصلات		
عَجَلَة		
عَرَبيَّة		
عَرَبيَّة نَقْلْ		
ألعاب		
بَلُّونَه		
لِعْبَه		
أطعمه (مأكولات و مشروبات)		
بَسْكُوت		
كورن فليكس		
شِيكُولَاتَه		
آيس كْرِيم		
عَصِيرْ		
لَبَنْ		
بُورْتُوآن		
زِبِيبْ		
ملابس		
بَفْتَّه		
بَامْبَرْز		
نَضَّارَة		
بيجَامَة		
أجزاء الجسم		
عِينْ		
وِشْ		
رُكْبَة		

الكلمه	يفهم	يفهم و يقول
مَنَاخِير		
لِسَانْ		
أجزاء المنزل و المفروشات		
بَانْيُو		
بُوتُاجَازْ		
بَاب		
جَرَاج		
حيطة		
شِبَّاك		
أدوات منزليه صغيره		
مأشة		
جردل		
ساعة حيطه		
مشط		
كمبيوتر		
شاكوش		
دوا		
فلوس		
فوطة		
أشياء خارج المنزل		
وردة		
أمر		
طرِئ		
زحليئة		
نجمة		
أشخاص		
ولد		
صاحب		
جدو		
ماما		
ناس		
ظابط		
ألعاب و روتين يومى		
باى/ مع السلامة		
يصأف		
يأيل		
لو سمحت		
هوس		
شكرا		
أفعال		
يكسر		
ينضف		
يئطع		
يرسم		
يشرب		
يخلص		

الكلمه	يفهم	يفهم و يقول
عنده		
يضرب		
يجر		
يرى		
يئول		
ينام		
يشم		
يبتسم		
يتمرجح		
يغسل		
كلمات خاصه بالوقت		
الصُبح		
الليل		
صفات		
كبير		
نضيف		
وسخ		
فاضى		
سخن		
متعور		
عجوز		
أحمر		
أصفر		
ضمائر		
ده (للبعيد)		
انت		
صيغ استفهام		
ازاى		
مين		
ظروف المكان و حروف الجر		
فى		
هناك		
صيغ العدد		
أكتر		
مفيش		

APPENDIX A: Arabic CDI (Iraqi dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
مياااو مياااو		
مااااو مااااو		
هم هم		
أسماء الحيوانات		
تشلب (چلب)		
زِمَال		
بَطَّة		
أَسَدْ		
قِرْد		
فَارْ		
عَنْكَبُوت		
سِنْجاب		
وسائل المواصلات		
بَايسْكِل		
سَيَّاره		
لُورِى/ شَاحِنْ		
ألعاب		
نَفَّاخَة		
أَلْعَاب		
أطعمه (مأكولات و مشروبات)		
بِسْكِيت		
حْبُوب- كورن فليكس		
نِسْتلَه		
آيس كْرِيم		
عَصِيرْ- شِرْبِتْ		
حَلِيبْ		
بُزْتُقَالْ		
زَبِيبْ		
ملابس		
مَرْيَلَه- صَدْرِيَّه		
حَفَّاظَه		
مَنَاظِر		
بيجَامَة		
أجزاء الجسم		
عَيْن		
وَجِه		
رُكْبَة		
خَشم		

الكلمه	يفهم	يفهم و يقول
لِسَانْ		
أجزاء المنزل و المفروشات		
بَانْيُو- حَمَّام		
طَبَّاخ		
بَاب		
كَرَاجْ		
حايط		
شباك- چام		
أدوات منزليه صغيره		
مكناسة		
سَطل		
ساعة		
مشط		
حاسبة		
چاكوچ		
دوا- علاچ		
فلوس		
خاولى / برنص		
أشياء خارج المنزل		
وردة		
كمر (قمر)		
شارع		
زحليئة- زحلقانة		
نجمة		
أشخاص		
ولد		
صاحب- صديق		
جدى		
ماما- يُمْ		
ناس		
شرطى		
ألعاب و روتين يومى		
مع السلامة- فى أمان الله		
يصفق		
قيلولة		
رچاءا- بلا زحمة		
اش- هش		
شكرا		
أفعال		
يكسر		
ينظف		
يقطع		
يرسم		
يشرب		
يخلص		
يملك/عنده		

الكلمه	يفهم	يفهم و يقول
يضرب/يظرب/يبصط		
يجر/يسحب		
يقرأ- يقرى		
يحكى		
ينام		
يشم		
يبتسم		
يتمرجح		
يغسل		
كلمات خاصه بالوقت		
صباح		
ليل		
صفات		
چبير/كبير		
نظيف		
وسخ		
فارغ		
حار		
مجروح/متعور		
عجوز/شايب		
أحمر		
أصفر		
ضمائر		
هذاك (للبعيد)		
انت		
صيغ استفهام		
شلون		
منو		
ظروف المكان و حروف الجر		
في/ بال/ چوا		
هناك		
صيغ العدد		
في/ بال/ چوا		
هناك		

APPENDIX A: Arabic CDI (Moroccan dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
تـتْعـُوك/ مْيَاااااااوْ		
تـتْمُوكْ /مُوووووووو		
أمنمنمنمنمْ /هْمْمممممممم		
أسماء الحيوانات		
كَلْبْ / قَانُوعْ		
حْمَارْ / كيدَار		
بَطَّة		
السْبَعْ/أَسَدْ		
لْقَرْدْ/قِرْد		
لْفَارْ/ فَارْ		
عَنْكْبُوت		
نَمْسْ		
وسائل المواصلات		
بِيشْكْلِيطَا		
طوموبِيلْ		
كَامِيُون/كَامِيُّو		
ألعاب		
نَفَّاخَة /بَالَونْ		
لُعْبَه		
أطعمه (مأكولات و مشروبات)		
بِيسْكْوِي/بِيمُو		
كورن فليكس		
شُكْلاَطْ		
لَا كْلاصْ/فْلاسْ		
عَصِيرْ		
لَحْلِيبْ		
اللِّيمُونْ		
زْبِيبْ		
ملابس		
رِيَّاقَة		
لِيكُوشْ		
نَظَّارَات		
بِيجَامَة		
أجزاء الجسم		
عِينْ		
لُوجَهْ		
رَكْبَة		
مْناخَرْ		

		لِسَانْ
		أجزاء المنزل و المفروشات
		بَانْيُو
		بُوطَا
		بَابْ
		كَرَاجْ
		حِيطْ
		سَرْجَمْ
		أدوات منزليه صغيره
		شَطّابَة
		دْلُو
		مَكَانَة
		مَشْطَة
		كُمبْيوتَرْ / بِّ س
		مْطَرْقَة
		دْوا
		فْلُوسْ
		فُوطَة
		أشياء خارج المنزل
		وَرْدَة
		قَمْرَة/ كَمْرَة
		طْرِيقْ
		زَلِّيقَة
		نَجْمَة
		أشخاص
		وَلْدْ
		صَاحْبِي
		جَدْ
		امِّي /ما ما
		نَاسْ
		بُولِسِي
		ألعاب و روتين يومى
		بَايْ بَايْ مَعَ السَّلَامَة
		كَيْضْرَبْ الرَّشْ
		الْقَايْلَة / لَا سْيِيسْتْ
		إلَا سْمَحْتِ
		هَوَسْ
		شُكْراً
		أفعال
		تَيْهَرَّسْ
		كَيْنَظَّفْ
		كَيْقطَعْ
		كَيْرْسَمْ
		كضيْشْرَبْ
		كَيْسَالِي / كَيْفَضِّي
		عَنْدُ/ تَيْمْلَكْ
		تَيْضْرَبْ

		تَيْجَرْ / تَيْجْبَدْ
		تَيْقْرَا
		تَيْقُولْ
		تَيْنْعَسْ
		تَيْشَمْ
		تَيْتْبَسَّمْ
		تَيْتْرَعْلَلْ
		تَيْغْسَلْ
		كلمات خاصه بالوقت
		صباح
		اللّيلْ
		صفات
		كْبِيرْ
		نْقِي / نْظِيفْ
		مْوَسَّخْ
		خَاوِي
		سْخُونْ / حَامِي
		مَفقوسْ / مْغَيْدَدْ
		شَارَفْ
		حْمَرْ
		صْفَرْ
		ضمائر
		هَدَاكْ لْهِيهْ
		أَنْتَ
		صيغ استفهام
		كِفَاشْ
		شْكُونْ
		ظروف المكان و حروف الجر
		فِي/لْدَاخَلْ
		هْنَاكْ
		صيغ العدد
		كْتَرْ
		مَا كَايْنْشْ

APPENDIX A: Arabic CDI (Saudi dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
مْياااو		
مُووو		
مَمْ مَمْ/ يم يم		
أسماء الحيوانات		
كَلْبْ		
حِمَار		
بِطَّه		
أَسَدْ		
قِرْد		
فَارْ		
عَنْكَبُوت		
سِنْجاب		
وسائل المواصلات		
عَجَله/ سَيْكِل		
سَيَّاره		
شَاحِنَة		
ألعاب		
بَالُونَه		
لِعْبَه		
أطعمه (مأكولات و مشروبات)		
بَسْكُوت		
كورن فليكس		
شِكْلاطَه/ شِيكُولاتَة		
آيس كْرِيم		
عَصِيرْ		
حَلِيبْ		
بُزْتُقَالْ		
زِبِيبْ		
ملابس		
مَرْيَلَه		
بَامْبَرْز/ حَفَّاضَة		
نَظَّارَه		
بيجَامَه		
أجزاء الجسم		
عْيُون		
وَجِه		
رُكَب		
خَشْم/ أَنْف		

		لِسَانْ
		أجزاء المنزل و المفروشات
		بَانْيُو
		فِرْن
		بَاب
		جَرَاج
		جْدار
		شُباك
		أدوات منزليه صغيره
		مَجَشه
		جَرَّه
		ساعه
		مِشِطْ
		كمبيوتر
		مَطْرَجه
		دُوا
		فْلوس
		فُوطة
		أشياء خارج المنزل
		وَرْده
		قَمر
		شَارِع
		زِحليجه/ زحليقة
		نَچمَه
		أشخاص
		وَلد
		صَديق
		جَدْ
		أَمْ/ أمى
		ناس
		بوليس
		ألعاب و روتين يومى
		مع السلامة
		بِصَفِج/ يصفق
		غَفْوه
		لو سمحت
		شششش
		شُكرا
		أفعال
		يكسر
		بِنظِف
		بِجطع
		يَرْسُم
		بِشرب
		بِخَلِص
		عِندُه
		يُظْرِب

		يِشد
		يِجرا/ يقرأ
		يِجول/ يقول
		يِنام
		يَشُم
		يِظحَك
		يِتمَرچَح
		يِتْسَبَّح/يغسل
		كلمات خاصه بالوقت
		صباح
		مَساء
		صفات
		كُبير
		نَظيف
		وَسِخ
		فَارِغ
		حَار
		مَچروح
		عجوز
		أَحْمَر
		أَصفر
		ضمائر
		هَذا
		أَنْتْ
		صيغ استفهام
		كِيف
		مَن
		ظروف المكان و حروف الجر
		فى
		هْناك
		صيغ العدد
		وايض/أكتر
		لا يُوچَد

APPENDIX A: Arabic CDI (Syrian dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
مياااو مياااو		
موووو/ مااوماااو		
نينه هم/ نينه		
أسماء الحيوانات		
كَلْبْ		
حْمَارْ		
بَطَّة		
أَسَدْ		
إِرْد		
فَارْ-فَارَه		
عَنْكَبُوت		
سِنْجاب		
وسائل المواصلات		
بَسْكِليتَّه		
سَيَّاره		
شَاحِنَه/تِرِيلَّه		
ألعاب		
بَالُونْ		
لِعْبِه		
أطعمه (مأكولات و مشروبات)		
بَسْكُوتِه		
كورن فليكس		
شِيقُلاتَه/شِيكُولَا		
آيس كْرِيم/ بُوظَه		
عَصِيرْ		
حَلِيبْ		
بِرِدْآن		
زَبِيبْ		
ملابس		
مَرْيُولَه/مَرْيُولْ		
حَفُّوضَه		
كِزْلَوك/نَضَّارَات		
بيجَامَه		
أجزاء الجسم		
عَيْن		
وِشْ		
رِكْبِه		
مناخير/أنف		

		لِسَانْ
		أجزاء المنزل و المفروشات
		بَانْيُو
		غَارْ
		بَاب
		مَوْءَف
		حِيط
		شِباك
		أدوات منزليه صغيره
		مِشِطْ
		سِطل/ بيدون
		ساعة حيط
		مِشِطْ
		كمبيوتر
		شاكوشه
		دوا
		مصارى
		بشكير/مِنشفِه
		أشياء خارج المنزل
		وِردِة
		أمر (القمر)
		طَرِيْ
		ظِحليطة
		نَجمِة
		أشخاص
		ولد/صَبى
		رِفيْ
		جدو
		ماما
		ناس/ عَالَم
		شرطى
		ألعاب و روتين يومى
		باى/ مع السلامة
		يِزأَف/يِسأَف
		طصطيحة
		لو سمحت/ممكن
		هُش
		شكرا
		أفعال
		يِكسر
		يِنضَّف
		يئطع
		يِرسُم
		يشرب
		يخلِص/يِنهى
		عِنده
		يضرب

يشد/ يِسحب		
يِقرأ		
يحكى		
ينام		
يشم		
يِضَحَك		
يِتمرچح		
يِغَسِّل		
كلمات خاصه بالوقت		
صباح		
ليل		
صفات		
كبير		
نضيف		
وَسِخ		
فاضى		
صِخْن		
مجروح		
عجوز/خِتيار		
أحمر		
أصفر		
ضمائر		
هِداك		
اِنت		
صيغ استفهام		
شِلون/كيف		
مين		
ظروف المكان و حروف الجر		
چوا/چوات		
هُونيك/هِنيك		
صيغ العدد		
أكتر		
ولا فى/ما فى		

APPENDIX A: Arabic CDI (Palestinian dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
مياااو مياااو		
موووء موووء		
مم مم		
أسماء الحيوانات		
كَلْبْ		
حِمَار		
بَطَّة		
أَسَدْ		
قِرْد		
فَارْ		
شَعْشَبُون		
سِنْجاب		
وسائل المواصلات		
بِسْكَلِيت		
سَيَّاره		
شَحْنْ		
ألعاب		
بَالُونْ		
لِعْبَه		
أطعمه (مأكولات و مشروبات)		
بَسْكُوت		
كورن فليكس		
شِيكُولَاتَه		
بُوظَه		
عَصِيرْ		
حَلِيبْ		
بُردقَان		
زَبِيبْ		
ملابس		
مَرْيُولْ		
بَامْبَرْز		
نَضَّارَة		
بيجَامَة / تْرِنْق		
أجزاء الجسم		
عَيْن		
وَجِه		
رُكْبَة		
خَشم		

		لِسَانْ
		أجزاء المنزل و المفروشات
		بَانْيُو
		غَارْ
		بَاب
		كَرَاج
		حيطة
		شباك
		أدوات منزليه صغيره
		مشط
		سَطل / جردل
		ساعة
		مشط
		كمبيوتر / لاب توب
		شاكوش
		دوا
		مَصاري
		مَنشفة / بَشكير
		أشياء خارج المنزل
		وردة
		قمر
		شارع
		زحليقة
		نجمة
		أشخاص
		ولد
		صاحب
		جدو
		ماما
		ناس
		شرطي
		ألعاب و روتين يومى
		باى/ مع السلامة
		يزقف
		يقيل
		لو سمحت
		هوس
		شكراً
		أفعال
		يكسر
		ينضف
		يقطع
		يرسم
		يشرب
		يخلص
		عنده
		يضرب

		يجر
		يقرا
		يحكي
		ينام
		يشم
		يبستم
		يتمرجح
		يغسل
		كلمات خاصه بالوقت
		صباح
		الليل
		صفات
		كبير
		نضيف
		وسخ
		فاضي
		سخن / حامي
		مجروح
		عجوز
		أحمر
		أصفر
		ضمائر
		هاداك
		انت
		صيغ استفهام
		كيف
		مين
		ظروف المكان و حروف الجر
		في/ جوا
		هناك
		صيغ العدد
		اكتر
		مافي

APPENDIX A: Arabic CDI (Tunisian dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
مياو مياو		
مووووه مووووه		
مم مم -ميام ميام		
أسماء الحيوانات		
كَلْبْ		
حْمَار		
بَطَّة		
صَيْدْ - أَسَدْ		
قِرْد		
فَأْر		
عَنْكَبُوت		
سِنْجاب		
وسائل المواصلات		
بِسْكِلاتْ		
كَرْهَبَا		
كَمْيُونَة		
ألعاب		
أَمْبُولَة		
لِعْبَه		
أطعمه (مأكولات و مشروبات)		
بِسْكِوِيت		
كورن فليكس		
شُوكُولاتَة		
قْلاَسْ		
عَصِيرْ		
حَلِيبْ		
برقْدَان		
زَبِيبْ		
ملابس		
بِفْوَار		
كُوشْ		
مَرَايَاة		
بيجَامَة		
أجزاء الجسم		
عَيْن		
وَجِه		
رُكْبَة		
خشم		

		لِسَانْ
		أجزاء المنزل و المفروشات
		بَانُو
		فَازْ
		بَاب
		مِيكَانِيسيَان
		حيط
		شباك
		أدوات منزليه صغيره
		خلّاص
		سطل
		منقالة
		خلّاص
		أردياتور
		مطرقة
		دوا
		فلوس
		منشفة
		أشياء خارج المنزل
		وردة
		قمر
		طريق
		زحليقة
		نجمة
		أشخاص
		وليّد
		صاحب
		جدي
		ماما
		عباد
		بوليس
		ألعاب و روتين يومى
		باى/ بالسلامة
		يصفق
		يقيّل
		من فضلك- يعيشك
		أسّ
		شكرا
		أفعال
		يكسر
		ينظف
		يقصّ
		يصوّر
		يشرب
		يكمّل
		عندو
		يضرب

		يجبد
		يقرأ
		يقول
		يرقد
		يشم
		يتبسّم
		يدرجح
		يغسل
		كلمات خاصه بالوقت
		صباح
		الليل
		صفات
		كبير
		نظيف
		مّسّخ
		متفاضي
		سخون
		مجروح
		عزوز
		أحمر
		أصفر
		ضمائر
		هذاكا (للبعيد)
		انت
		صيغ استفهام
		كيفاش
		شكون
		ظروف المكان و حروف الجر
		فى لداخل
		غادي
		صيغ العدد
		أكثر
		مفمّاش

APPENDIX A: Arabic CDI (Algerian dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
مياااو مياااو		
موووو		
مَمْ مَمْ/ممى ممى		
أسماء الحيوانات		
كَلْبْ		
حْمَار		
بَطَّة		
أَسَدْ /صَيْدْ		
شَادِى/قِرْد		
فَارْ		
زْتِيلَة		
سِنْجاب		
وسائل المواصلات		
بِسْكِلاتْ		
طُونُوبيل		
كَامْيُون		
ألعاب		
نَابُولَة		
لِعْبَه		
اطعمه (مأكولات و نشروبات)		
بِسْكِوِيت		
كورن فليكس		
شِيكُولَه		
آيس كْرِيم/ لاكريم		
عصير/ الچي		
حَلِيبْ		
تْشِينَه/ التِينَه		
زَبِيبْ		
ملابس		
طَانْلِيَّه		
لِيكُوش		
نَوَاظِر		
بيجَامَة		
أجزاء الجسم		
عَيْن		
وَچه		
رَكبة		
خشم/ نيف		

لِسَانْ		
أجزاء المنزل و المفروشات		
لَاڤابُو/ بِنْوَار		
قُورْ		
بَاب		
ڤرَاچ/ جَرَاچ		
حيط/ حيظ		
طاقة		
أدوات منزلية صغيره		
مشطة		
سطل		
ساعة		
مشطة		
كمبيوتر		
مارطو		
دوا		
دراهم		
منشفة		
أشياء خارج المنزل		
وردة/ نوارة		
قمر		
طريق		
زجليقة		
نجمة		
أشخاص		
ولد		
صاحب		
جدى/ بابى		
ماما/الوالدة/ما		
ناس		
بوليس		
ألعاب و روتين يومى		
باى/ مع السلامة		
بِصفِق		
فيَّل/ لا سْيَاسْت		
وِ راسك/ دِيرمزيه		
شششْ		
شُكْراً		
أفعال		
بِكسَر		
بِنَفِّى/بِنَضِف		
يَقطع		
يَرسُم		
يَشرب		
بِخلص		
عِندُه		
يَضرُب		

		يِجبِذ
		يَقرأ
		يَقُول
		يَرقُد
		يَشُم
		يَبتسم
		يِتجعلِل
		يَغسِل
		كلمات خاصه بالوقت
		صباح
		الليل
		صفات
		كَبير
		نَضِيف
		وَاسخَه/ موَسَّخ
		فَارِغ
		ساخِن/ سخُون
		مجرُوح
		عَجُوز
		أحمر
		أصفر
		ضمائر
		هَذاك
		أنت
		صيغ استفهام
		كِيفاه/ كِيفاش
		شُكُون/ مين
		ظروف المكان و حروف الجر
		فِى/ داخِل
		لهيك
		صيغ العدد
		أكثر
		ماكناش

APPENDIX A: Arabic CDI (Libyan dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
مياو مياو		
موووو		
مم مم/ هم هم/ أممم		
أسماء الحيوانات		
كَلْبْ		
حْمَار/ زِمَال		
بَطَّة		
أَسَدْ		
قِرْد		
فَارْ		
عَنْكَبُوت/زْنِيلَة		
سِنْجاب		
وسائل المواصلات		
بِشكِليطْ / دَرَّاجَه		
سَيَّاره		
شَاحِنَة/طَانْطَا/ بْطَاحْ		
ألعاب		
أَنْبُولَة		
لِعْبَه		
أطعمه (مأكولات و مشروبات)		
بِسْكُوت/ بِشْكُوط		
كورن فليكس		
شِيكُولَاتَه		
جِيلاتِي/ جُولاطِي		
عَصِيرْ		
حَلِيبْ		
بُرْتُقَال/لِيمْ		
زَبِيبْ		
ملابس		
مَرْيَقَه		
حَفَّاظَه/ قُطْن		
شَمَالات/ نَظَّارَة		
بيجَامَة/ بَاجَامَه		
أجزاء الجسم		
عَيْن		
وَجِه		
رُكْبَة		
خشم		

		لِسَانْ
		أجزاء المنزل و المفروشات
		حُوضْ/بَانْيُو
		يُوتاجاز/ غَاز
		بَاب
		گراج
		حيط
		روشن
		أدوات منزليه صغيره
		مشط
		سطل
		ساعة
		مشط
		كمبيوتر
		قادومة
		دواء
		فلوس
		فوطة
		أشياء خارج المنزل
		زهرة
		قَمر
		طريق
		سلحيبة
		نجمة
		أشخاص
		ولد
		صاحب/ صديق
		جد
		أمى / ماما
		ناس
		شرطى
		ألعاب و روتين يومى
		السلام عليكم / سلام
		يصفق
		قيلولة
		لو سمحت
		إِششششْ
		شكرا
		أفعال
		يكسر
		ينظف
		يقطع
		يرسم
		يشرب
		يكمل
		عنده
		يضرب

		يجبد
		يقرأ
		يقول
		يرقد
		يشم
		يضحك
		يدرجح
		يغسل
		كلمات خاصه بالوقت
		الصبح
		الليل
		صفات
		كبير
		نظيف
		امصخ
		فارغ
		سخون
		مجروح
		شيبانى
		أحمر
		أصفر
		ضمائر
		هذاك
		انت
		صيغ استفهام
		كيف
		منو
		ظروف المكان و حروف الجر
		فى
		غادى
		صيغ العدد
		أكتر
		مفيش

APPENDIX A: Arabic CDI (Omani dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
نياو نياو		
مااااو مااو		
ممي		
أسماء الحيوانات		
كَلْبْ		
حْمَار		
بَطَّة		
أَسَدْ		
قِرْد		
فَارْ		
عَنْكَبُوت		
سِنْجاب		
وسائل المواصلات		
سَيْكِلْ		
سَيَّاره		
تِرِيلَّه		
ألعاب		
بَالُونَة		
لِعْبَه		
أطعمه (مأكولات و مشروبات)		
بِسْكُوت		
كورن فليكس		
شِكْلِيتْ		
آيس كْرِيم		
عَصِيرْ		
لَبَنْ		
برتْغَال		
زَبِيبْ		
ملابس		
مَرْيُولْ		
حَفَّاظ		
نَظَّارَة		
بيجَامَة		
أجزاء الجسم		
عَيْن		
خَشْم		
رُكْبَة		
نعفه		

		لِسَانْ
		أجزاء المنزل و المفروشات
		بَانْيُو
		بُوتُوجَازْ
		بَاب
		جَرَاج
		جدار
		شبك
		أدوات منزليه صغيره
		مشط
		دلو
		ساعة
		مشط
		كمبيوتر
		مطرقة
		دوا
		غوازي
		فوطة
		أشياء خارج المنزل
		وردة
		قمر
		درب
		مزحلوقة
		نجم
		أشخاص
		ولد
		ربيع
		حبابي
		ماما
		ناس
		ضابط
		ألعاب و روتين يومى
		باى/ مع السلامة
		يسقف
		يقيل
		لو سمحت
		اششش
		شكرا
		أفعال
		يكسر
		ينظف
		يقطع
		يرسم
		يشرب
		يخلص
		عنده
		يضرب

يسحب		
يقرأ		
يقول		
يرقد		
يتوح		
يضحك		
يتأرجح		
يغسل		
كلمات خاصه بالوقت		
صباح		
الليل		
صفات		
كبير		
نظيف		
وسخ		
فاضي		
ساخن		
متعور		
شايب		
أحمر		
أصفر		
ضمائر		
هذاك		
انته		
صيغ استفهام		
كيف		
من		
ظروف المكان و حروف الجر		
في/ داخل		
هناك		
صيغ العدد		
أكثر		
ماشي		

APPENDIX A: Arabic CDI (Yemeni dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
مياو مياو		
موو موو		
مممم		
أسماء الحيوانات		
كَلْب		
حْمَار		
بَطَّة		
أَسَدْ		
رِيْجِي/قِرْد		
جِرْذ		
عَنْكَبُوت		
سِنْجاب		
وسائل المواصلات		
سَيْكِلْ		
بَابُور/سَيَّاره		
قَاطِرَة/تِربِلَّه		
ألعاب		
زْمَاطَة/بَالُونْ		
لِعْبَه		
أطعمه (مأكولات و مشروبات)		
بِسْكِت		
كورن فليكس		
شِيكُولَاتَه		
سْكرِيم		
عَصِيرْ		
لَبَنْ		
بُرتُقَال		
زَبِيبْ		
ملابس		
مَرْيَلَه		
حَفَّاضَة		
نَظَّارَات		
بْجَامَة		
أجزاء الجسم		
عَيْن		
وَجِه		
رُكْبَة		
خشم		

لِسَانْ		
أجزاء المنزل و المفروشات		
بَانْيُو		
شَوْلَة		
بَاب		
جِيرَاش		
جدار		
طاقة		
أدوات منزليه صغيره		
مشط		
بالدي		
ساعة		
مشط		
كمبيوتر		
مطرقة		
دواء		
فلوس		
منشفة		
أشياء خارج المنزل		
وردة / زهرة		
قمر		
طريق		
طلحاسة		
نجم		
أشخاص		
ولد		
صاحب/ صديق		
جدي		
اماه		
ناس		
شرطي		
ألعاب و روتين يومى		
مع السلامة		
يصفق		
قيلولة		
لو سمحت		
اسكت / صة		
شكرا		
أفعال		
يكسر		
ينظف		
يقص		
يرسم		
يشرب		
يكمل		
معه		
يلبج / يضرب		

يسحب		
يقرا		
يقول		
ينام		
يشم		
يبتسم / يضحك		
يتدرهن / يتمرجح		
يغسل		
كلمات خاصه بالوقت		
صباح		
الليل		
صفات		
كبير		
نظيف		
وسخ		
فارغ / فاضي		
حامي		
معور		
عجوز/شيبه		
احمر		
اصفر		
ضمائر		
ذاك / هذا		
انته		
صيغ استفهام		
كيف		
من		
ظروف المكان و حروف الجر		
في / داخل		
هناك		
صيغ العدد		
اكثر		
مافيش		

APPENDIX A: Arabic CDI (Qatari dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
مياااو		
مووووو		
مَممْ مَممْ		
أسماء الحيوانات		
تشَلب		
حِمار		
بَطَّه		
أَسد		
جِرد		
فَأر		
عَنْكَبُوت		
سِنْجاب		
وسائل المواصلات		
سَيكِل		
سَيَّاره		
شاحِنه		
ألعاب		
نُفِيخه		
لُعبه		
أطعمه (مأكولات و مشروبات)		
بَسكُوت		
كورن فليكس		
تافِي		
أَسكرِيم		
عَصيِر		
حَليب		
بُرتقال		
زَبيب		
ملابس		
مَريُول		
حفَّاظه		
نظَّاره		
بيجامه		
أجزاء الجسم		
عَين		
وَيه		
رُكبَه		
خَشم		

		لِسان
		أجزاء المنزل و المفروشات
		مسبح/ بَانيو
		بُوتوجاز
		بَاب
		گراج
		طُوفه
		دَرِيشه
		أدوات منزليه صغيره
		مشط
		سَطل/ دَلو
		سَاعه
		مشط
		كمبيوتر
		مِطرقه
		دَواء
		مَصارى/ فلُوس
		مِنشفه
		أشياء خارج المنزل
		وَرده
		قَمر
		شَارِع
		زحلِيقه/ زِحليجه
		نَجمه
		أشخاص
		وَلد
		صَديق
		جَد/ سِيدو
		أُمى
		ناس
		شُرطِى
		ألعاب و روتين يومى
		مَع السلامه
		تَصفِيق/ بِصجح
		قَيلُوله
		لو سَمحت
		إِششششْ
		شُكرا
		أفعال
		يَكسر
		يِنظِّف
		يَقُص
		يَرسُم
		يَشرب
		يِخلص
		عِندِى
		يَضرِب

		يِسحب
		يَقرأ
		يِقُول/ يِجُول
		ينام
		يَشُم
		يَبتسم
		يتمرجح
		يَغتسِل
		كلمات خاصه بالوقت
		صباح
		الليل
		صِفات
		كَبير
		نَظِيف
		وَصِخ
		مخلِص
		حَار
		مجرُوح
		كبير السن
		أحمر
		أصفر
		ضمائر
		هاذِي
		أنت
		صيغ استفهام
		كِيف/ شلُون
		مَنْ
		ظروف المكان و حروف الجر
		داخِل/ فِى
		هناك
		صيغ العدد
		أكثر
		ولا شِى

APPENDIX A: Arabic CDI (Emirati dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
مياو		
مااااء/ أمباع		
أَمْ أَمْ		
أسماء الحيوانات		
كَلْب/ شَلْب		
حِمَار		
بَطَّه		
أَسَد		
قِرْد		
فَأْر		
عَنكبُوت		
سِنْجَاب		
وسائل المواصلات		
سَيْكِل		
مُوتر/ سَيَّاره		
تِرِيلا		
ألعاب		
نفاخه		
لُعْبه		
أطعمه (مأكولات و مشروبات)		
بِسكُوت		
كورن فليكس		
كاكاو		
أَسْكرِيم		
عَصِير		
لَبَن		
بُرتُقَال		
زَبِيب		
ملابس		
مَرْيُول		
بامبرز/ حَفَّاضه		
نَضَّارَة		
كندُوره نُوم		
أجزاء الجسم		
عَيْن		
وَجِه		
رُكْبَه		
خَشْم		

		لِسان
		أجزاء المنزل و المفروشات
		بَانيُو
		بُوتوجاز
		باب
		قَراج
		بِدار
		جامه/ دريشه
		أدوات منزليه صغيره
		مِشِط
		سَطل
		سَاعه
		مِشِط
		گمبيوتر
		مِطرَقه
		دُواء
		فلوس
		فُوطه
		أشياء خارج المنزل
		وَرْده
		قمر
		دَرْب
		زحليقة/ زحلقانه
		نَجمه
		أشخاص
		ولد
		ربيع
		بِدْ (جِدْ)
		ماما
		ناس
		ظابط
		ألعاب و روتين يومى
		باى
		يصفِق
		قيلوله
		لو سمحت
		شش
		شكرا
		أفعال
		يِكسر
		يِنَظِف
		يَقطع
		يَرسُم
		يَشرب
		يِخلِص
		يملُك
		يِضْرُب

		يَسحَب
		يَقرأ
		يَقول
		يَنام
		يَشُم
		يبتسم
		يتمرَيح
		يتغسِل
		كلمات خاصه بالوقت
		صباح
		الليل
		صفات
		كبير
		يَلِق/ نَظيف
		وَسِخ
		فاضى/ فَارِغ
		شاخِن/ حَار
		منجرح
		عَيَوز/ شيبه
		أحمر
		أصفر
		ضمائر
		هذا
		أنت
		صيغ استفهام
		كِيف
		منُو
		ظروف المكان و حروف الجر
		فى/ داخِل
		هُناك
		صيغ العدد
		أكثر
		مَافِى

APPENDIX A: Arabic CDI (Jordanian dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
ميو ميو		
مااو مااو		
مم مم		
أسماء الحيوانات		
كَلْب		
حْمَار		
بَطَّة		
أَسَدْ		
قِرْد		
فَارْ		
عَنْكَبُوت		
سِنْجاب		
وسائل المواصلات		
بِسْكَلِيت		
سَيَّاره		
شَاحِنَة/ قَلّابْ		
ألعاب		
بَلُّونْ		
لِعْبَه		
أطعمه (مأكولات و مشروبات)		
بِسْكُوت		
كورن فليكس		
شِيكُولَاتَه		
كْرِيمَة/ بُوزَة		
عَصِيرْ		
حَلِيبْ		
بُرتُقَال		
زَبِيبْ		
ملابس		
مَرْيَلَه		
حَفَّاظَه		
نَظَّارَة		
بْجَامَة		
أجزاء الجسم		
عَيْن		
وَجِه		
رُكْبَة		
خشم/ مناخير		

		لِسَانْ
		أجزاء المنزل و المفروشات
		بَانْيُو
		فُرن/ غَاز
		بَاب
		گراج
		جِدار
		شبَّاك
		أدوات منزليه صغيره
		مِشط
		دَلو
		سَّاعه
		مِشط
		كُمبيوتر
		شَاكوش
		دُواء
		نُقود
		بَشكِير
		أشياء خارج المنزل
		وَرده
		قَمر
		طَرِيق
		زُحلِيقه
		نَجم
		أشخاص
		ولد
		صَدِيق
		جَد
		ماما
		نَاس
		شُرطِي
		ألعاب و روتين يومى
		بَاى
		زَقّف
		قَيلُوله
		لو سمحت
		هُوس
		شُكراً
		أفعال
		بِطِش
		يُنظّف
		بِقطَع
		يَرسُم
		يَشرب
		بِخلِص
		عندُه
		بِظرَب

		يَسحب
		يَقرأ
		يَقُول
		يَنام
		يَشُم
		يَبتسم
		يتمرجَح
		يَغسِل
		كلمات خاصه بالوقت
		الصُبح
		الليل
		صفات
		كَبير
		نَظِيف
		وَسِخ
		فاضى
		سُخْن
		مَجرُوح
		ختيار
		أحمر
		أصفر
		ضمائر
		هاظ
		إلك
		صيغ استفهام
		كِيف
		مين
		ظروف المكان و حروف الجر
		جُوا
		هناك
		صيغ العدد
		أكثر
		مفِيش

APPENDIX A: Arabic CDI (Lebanese dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
مياو مياو		
مااااو مااو		
مم مم		
أسماء الحيوانات		
كَلْب		
حْمَار		
بَطَّة		
أَسَدْ		
سَعْدَان		
فَارْ		
عَنْكَبُوت		
سِنْجاب		
وسائل المواصلات		
بِسْكِلاتْ		
سَيَّاره		
شَاحِنَة		
ألعاب		
بَالُونة		
لِعْبَه		
أطعمه (مأكولات و مشروبات)		
بِسْكُوت		
كورن فليكس		
شِيكُولَا		
آيس كْرِيم		
عَصِيرْ		
حَلِيبْ		
لَيْمُونْ		
زَبِيبْ		
ملابس		
مَرْيُولْ		
حَفَّاضْ		
عْوِينَات		
بيجَامَة		
أجزاء الجسم		
عَيْن		
وِشْ		
رُكْبَة		
مناخير		

		لِسَانْ
		أجزاء المنزل و المفروشات
		بَانْيُو
		غَارْ
		بَاب
		جَرَاج
		حيطة
		شباك
		أدوات منزليه صغيره
		مشط
		جردل
		ساعة
		مشط
		كمبيوتر
		شاكوش
		دوا
		فلوس
		فوطة
		أشياء خارج المنزل
		وردة
		قَمر
		طريْ
		زحليئة
		نجمة
		أشخاص
		ولد
		صاحب/ صديق
		جدو
		ماما
		ناس
		ظابط
		ألعاب و روتين يومى
		باى/ مع السلامة
		يصأف
		قيلولة
		لو سمحت
		هوس
		شُكْراً
		أفعال
		يكسر
		ينضف
		يئطع
		يرسم
		يشرب
		يخلص
		عنده
		يضرب

		يجر
		يئرى
		يئول
		ينام
		يشم
		يبتسم
		يتمرجح
		يغسل
		كلمات خاصه بالوقت
		الصبح
		الليل
		صفات
		كبير
		نضيف
		وسخ
		فاضى
		سخن
		متعور
		عجوز
		أحمر
		أصفر
		ضمائر
		هيداك
		انت
		صيغ استفهام
		كيف
		مين
		ظروف المكان و حروف الجر
		فى
		هونيك
		صيغ العدد
		أكتر
		مفيش

APPENDIX A: Arabic CDI (Sudanese dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
مياو مياو		
مااااو مااو		
مم مم		
أسماء الحيوانات		
كَلْب		
حْمَار		
بَطَّة		
أَسَدْ		
قِرْد		
فَارْ		
عَنْكَبُوت		
سِنْجاب		
وسائل المواصلات		
عَجَلَة		
عَرَبِيَّة		
شَاحِنَة		
ألعاب		
بَالُونَة / هَمْبُوكَة		
لِعْبَه		
أطعمه (مأكولات و مشروبات)		
بِسْكِوِيت		
كورن فليكس		
شُوكُولاتَة		
آيس كْرِيم		
عَصِيرْ		
لَبَنْ		
برتْكَان		
زَبِيبْ		
ملابس		
مَرْيَلَه		
بَامْبَرْز		
نَضَّارَة		
بِيجَامَة		
أجزاء الجسم		
عَيْن		
وِشْ		
رُكْبَة		
نخرة		
لِسَانْ		
أجزاء المنزل و المفروشات		

		بَانْيُو
		بُوتُوجَازْ
		بَاب
		قَرَاش
		حيطة
		شباك
		أدوات منزليه صغيره
		مُشُط
		جردل
		ساعة
		مُشُط
		كومبيوتر
		شاكوش
		دوا
		قروش
		فوطة
		أشياء خارج المنزل
		وردة
		قمر
		طريق
		زحلقانية
		نجمة
		أشخاص
		ولد
		صديق
		جد
		أمى
		ناس
		ظابط
		ألعاب و روتين يومى
		مع السلامة
		يصفق
		يقيل
		لو سمحت / من فضلك
		هوس
		شكراً
		أفعال
		يكسر
		ينضف
		يقطع
		يرسم
		يشرب
		يخلص
		عِندو
		يضرب
		يجر
		يقرأ

يقول		
ينوم		
يشم		
يبتسم		
يتمرجح		
يغسل		
كلمات خاصه بالوقت		
صباح		
الليل		
صفات		
كبير		
نضيف		
وسخان		
فاضى		
سُخُن		
مجروح		
عجوز		
أحمر		
أصفر		
ضمائر		
داك		
إنت		
صيغ استفهام		
كيف		
منو		
ظروف المكان و حروف الجر		
فى/ جوة		
هناك		
صيغ العدد		
أكتر		
ما فى		

APPENDIX A: Arabic CDI (Bahraini dialect)

للكلمات التى يفهمها طفلك فقط و لم يقولها بعد ضع علامة √ تحت يفهم، و للكلمات التى يفهمها و يقولها أيضا ضع علامة √ تحت يفهم و يقول

الكلمه	يفهم	يفهم و يقول
صوت الحيوانات		
ميو ميو		
مااااو مااو		
مَم مَم		
أسماء الحيوانات		
جلب		
حِمار		
بطه		
أسد		
سبال		
فار		
عنكبوت		
سنجاب		
وسائل المواصلات		
سيكل		
سياره		
شاحنة		
ألعاب		
نفاخه		
لعبه		
أطعمه (مأكولات و مشروبات)		
بستوك		
كورن فليكس		
كافي		
عسكريم		
عصير		
حليب		
برتقال		
زبيب		
ملابس		
مريله		
حفاضه		
نظاره		
بيجامه		
أجزاء الجسم		
عين		
ويه		
ركبه		
خشم		

		لسان
		أجزاء المنزل و المفروشات
		بانيو
		فرن
		باب
		كراج
		طوفه
		دريشه
		أدوات منزليه صغيره
		مشط
		زيله
		ساعة طوف
		مشط
		كمبيوتر
		مطرقه
		دوه
		فلوس
		فوطه
		أشياء خارج المنزل
		وردة
		قمر
		طريج
		زحليقه
		نجمه
		أشخاص
		ولد
		صديق
		يدي (جدى)
		يمه
		أوادم / ناس
		شرطي
		ألعاب و روتين يومى
		باي / مع السلامه
		يسلم
		قيلوله
		لو سمحت
		اسكت
		شكرا لك
		أفعال
		يكسر
		ينظف
		اقص
		يرسم
		يشرب
		خلص
		عنده
		يطق

يسحب		
يقريْ		
يقول		
ينام		
اشم		
يضحك		
يتمريح		
يغسل		
كلمات خاصه بالوقت		
الصبح		
فالليل		
صفات		
كبير		
نظيف		
وصخ		
فاضى		
حار		
متعور		
عيوز		
أحمر		
أصفر		
ضمائر		
ذك		
انت		
صيغ استفهام		
شلون		
من		
ظروف المكان و حروف الجر		
فى		
هناك		
صيغ العدد		
وايد		
مافى		

APPENDIX B: The number of words per frequency bins, with category 1 referring to the least frequent words to category 15 comprising the most frequent words.

Cat. 1	Cat. 2	Cat. 3	Cat. 4	Cat. 5	Cat. 6	Cat. 7	Cat. 8	Cat. 9	Cat. 10	Cat. 11	Cat. 12	Cat. 13	Cat. 14	Cat. 15
Little	Read	Have	Cut	Pull	Dirty	Finish	Break	Draw	Hit	Clean	car	Sleep	Eye	Drink
Yellow	Old	Empty	Clean	Big	Tongue	Push	Smell	Hot	Dog	Smile		Duck	Biscuit	Door
Spider	Knee	Squirrel	Red	Monkey	Pyjamas	Swing	Wash	Who	Window	Arm		milk	Bye	mommy
Cereal	Bib	Road	Mouse	Orange	Cooker	Donkey	Lion		Shush	Diaper			meow	
Garage	Raisin	People	Ice-cream	Sorry	Clap hands	Mine	Face		Medicine	Chocolate				
Upstairs	Star	More	Potty	Slide	flower	None	Jacket		Moo	Grandpa				
moon	Friend	Clock	Lunch	Boy		Money	Juice		Balloon	Comb				
Policeman	How	Tomorrow	Up	Bucket		Yum yum	Thank you							
hammer	Truck		You	Bicycle		toy	There							
			Broom	night			Computer							
							Towel							