

**THE NORMING OF THE 'EVALUATION DU LANGAGE ORAL' AND
THE PREVALENCE OF SPEECH AND LANGUAGE DISORDERS IN
FRENCH-SPEAKING PRESCHOOL AGED CHILDREN FROM
YAOUNDÉ (CAMEROON)**

Student: Lilly Tchoungui Oyono

Student Number: TCHLIL001

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**Faculty of Health Sciences
University of Cape Town**

Supervisor: A/Prof Shajila Singh

Co-supervisor: Dr Michelle Pascoe

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ABSTRACT

Research suggests that speech and language disorders are among the most prevalent childhood disabilities in many countries. Identification and intervention for children with communication disorders are sought at an early stage, to avoid the consequences of untreated childhood speech and language problems that can lead to academic underachievement and even persist into adulthood. However, no study has been reported on the prevalence of speech and language disorders in the general population in Cameroon. Despite the published literature on the national burden of disease suggesting that a significant number of Cameroonian children might have limitations in their speech and language abilities. This descriptive cross-sectional study aimed to determine the prevalence of speech and language disorders, specifically, articulation, expressive language, receptive language, fluency and voice disorders; in a representative sample of French-speaking preschool children in Yaoundé, the capital city of Cameroon. A total of 460 children aged 3 to 5 years were recruited from the seven communes of Yaoundé city using multi-stage random sampling method. As there was no validated speech and language test available for the population of French-speaking preschool aged children in Cameroon, this study has contributed in its first part, to provide norms on three subtests of a standardised French speech and language test, the 'Evaluation du Langage Oral' (ELO) for this population. These norms can be used for clinical practice and research purpose in Cameroon. In order to determine the prevalence of articulation, expressive and receptive language disorders, a cut-off of two Standard Deviations (SD) below the normative mean was applied. The identification of fluency and voice disorders among participants was based on clinical judgement. All the assessments were performed by the researcher who is a qualified speech-language therapist with experience of practice in Cameroon. The findings indicated that the prevalence of articulation disorders was 3.6%, expressive language disorders was 1.3%, receptive language disorders was 3%, fluency disorders was 8.4% and voice disorders was 3.6%. The overall prevalence of speech disorders was 14.7%, language disorders 4.3% and speech and language disorders 17.1%. There was no significant difference in the prevalence of speech and language disorders according to gender. The prevalence of speech and language disorders in the present study was higher than that of many previous investigations conducted in other countries. The findings of this research reveals and emphasises the urgent need to build a strategy to develop speech and language services to serve the Cameroonian population.

Keywords: prevalence, speech and language disorders, normative data, children, Cameroon.

GLOSSARY OF TERMS

Accent: The pronunciation features of a language variety (Skandera & Burleigh, 2005).

Consonant: Sounds produced by blocking the vocal air stream partially or totally (Skandera & Burleigh, 2005).

Cross-linguistic : Relationships accross two languages (Geva & Wiener, 2015).

Disyllabic words: words with two syllable (Goldstein, Whalen & Best, 2006).

International Phonetic Alphabet (IPA): Standardised set of symbols which are internationally recognised for transcription of consonants and vowels in all languages (APA, 1999).

Morphosyntax: The study of grammatical categories and linguistic units that have both morphological and syntactic properties (Prévost, 2015).

Multilingual: A person who is fluent in more than two languages (Geva & Wiener, 2015).

Nasal: Sounds pronounced with the mouth completely closed, with a release of air through the nose (e.g. /m/, /n/, /ŋ/) (Fagyal, Kibbee & Jenkins, 2006).

Nasalisation: The production of a sound while the velum is lowered, so that some air escapes through the nose during the production of the sound by the mouth (Hayes, Kirchner & Steriade, 2004).

Oral: Sounds produced with the velum raised to prevent the passage of air through the nose; (De Lacy, 2007).

Phoneme: The smallest significant contrastive unit in the sound system of a language (e.g. /b/ in the word ‘banana’) (Geva & Wiener, 2015).

Phonology: Study of the speech sound patterns that occur within languages (Odden, 2005).

Syllable: Basic unit of pronunciation in spoken language that can be used to form words segments of a word which are phonologically significant (e.g. ta-ble) (Skandera & Burleigh, 2005).

Vowels: Open, unobstructed speech sounds which are formed by relatively free movement of the air stream through the vocal tract (Skandera & Burleigh, 2005).

LIST OF ABBREVIATIONS

- IPA International Phonetic Alphabet (IPA Handbook, 1999)
- SD Standard Deviation
- PS ‘Petite Section’ is the first grade of preschool in Cameroon
- MS ‘Moyenne Section’ is the second grade of preschool in Cameroon
- GS ‘Grande Section’ is the third year of preschool in Cameroon
- ELO ‘Evaluation du Langage Oral’
- CLD Culturally and Linguistically Diverse

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CHAPTER ONE: INTRODUCTION AND CONTEXT OF THE STUDY

1.0 Introduction

The aim of this chapter is to describe the situation of speech and language services in Cameroon. Background information about Cameroon and Yaoundé, the capital city of the country and the context of the study are presented. The rationale for the study is provided particularly in light of the need for speech and language prevalence data.

Speech and language development is a useful indicator of a child's overall emotional and social well-being and is considered by experts as the most important aspect of their development and cognitive competence (Binu, Sunil & Baburaj, 2014). It ensures their ability to communicate effectively and provides a strong foundation for further learning to take place (Pascoe & Smouse, 2012; Tickell, 2011; Tokgöz-Yılmaz et al., 2013). A number of studies suggest that, childhood speech and/or language disorders may disrupt other aspects of development, extend into psychosocial domains, affecting academic performance, and vocational choices later in adulthood if not addressed (Snowling, Bishop, Stothard, Chipchase & Kaplan, 2006; Soleimani, Mohammadi, Khazaei & Ertiahi, 2011). For these reasons, identification and intervention of children with speech and language disorders are sought at an early stage, prior to formal school, as this might improve their speech and language skills, academic achievement and emotional and social development (Law, Boyle, Harris, Harkness & Nye, 1998; McLeod & Harrison, 2009; Shetty, 2012; St Clair, Pickles, Durkin & Conti-Ramsden, 2011; Tokgöz-Yılmaz et al., 2013).

Speech and language disorders are the most prevalent problem among preschool and school-age children (Jessup, Ward, Cahill & Keating, 2008; Law Garrett & Nye, 2003; McLeod & Harrison, 2009; Tokgöz-Yılmaz et al., 2013). In western countries where data is available, at least 5% of preschool and school-age children are reported to have speech and /or language disorders (Law, Boyle, Harris, Harkness & Nye, 2000). There is limited information and little contextually relevant research focusing on the prevalence of speech and language disorders in low-income countries especially in sub-Saharan Africa (Nwanze, 2013; Olusanya, Ruben &

Parving, 2006). Yet, approximately 80% of the global population with disabilities resides in developing countries (Haig, Im, Adewole, Nelson & Krabek, 2009; United Nations, 2008). There are some useful indicators in the literature that suggest that the prevalence of communication disorders could be higher in low-income countries than that reported in developed countries (Biritwum, Devres, Ofosu-Amaah, Marfo & Essah, 2000; Haig et al., 2009; Hartley & Wirz, 2002; Jochmann, 2006; United Nations, 2008). Indeed, where data is available as in Uganda, Ghana, and Kenya, the prevalence of communication disorders is reported to range from 10% (Jochmann, 2006; Muga, 2003) to 25.5% (Biritwum et al., 2000). In order to conceptualise and deliver services for people with communication impairments in developing countries, the World Health Organization (WHO) and the World Bank (2011) recommend obtaining a clear understanding of the issues through prevalence data.

To the best of our knowledge, the prevalence of speech and language disorders in Cameroon is unknown. With a population of about 20 million inhabitants, there are only two speech-language therapists currently practicing and no professional training programme exists (Gupta, Castillo-Laborde & Landry, 2011). In order to understand the nature of communication disorders and to plan for appropriate services that meet the needs of the population, data on the prevalence of speech and language disorders in developing countries including Cameroon is required in both children and adults (Enderby & Pickstone, 2005; Olusanya et al., 2006; WHO & the World Bank, 2011). This study will focus on determining the prevalence of speech and language disorders in children between the ages of three and five years as the preschool years are the most ideal for the early identification and intervention of communication disorders and delays (Binu et al., 2014).

1.1 Context of the study: Cameroon and Yaoundé

Situated in central Africa and bounded by Nigeria, Chad, Central African Republic, Equatorial Guinea, Gabon and Congo, Cameroon is a low-income country with a rapidly increasing population, which was estimated at about 20 million individuals (Institut National de la Statistique du Cameroun, 2013). Yaoundé is the capital of Cameroon and the second largest city in the country. Located in the Central region it has a population of approximately four million people (Institut National de la Statistique du Cameroun, 2013). Yaoundé city is divided into seven communes which are: Yaoundé I, Yaoundé II, Yaoundé III, Yaoundé IV, Yaoundé V, Yaoundé VI, and Yaoundé VII (Figure 1) (Communauté Urbaine de Yaoundé, 2007). As Yaoundé is 75% urban and 25% rural; the socio-cultural context in that city could be described

as a mix of modern and traditional cultures, as all the features of an urban city coexist with the elements of the African tradition (Ruffieux et al., 2009).



Figure 1. Yaoundé's communes (Communauté Urbaine de Yaoundé, 2007)

1.1.1 Language situation in Cameroon and Yaoundé

In order to assess the speech and language of the Cameroonian children, it is important to understand the linguistic context in which they live. Cameroon is characterised by the coexistence of 250 indigenous languages and two official languages, English and French that are the legacies of Franco-British rule in Cameroon following the First World War and independence (Ndongo-Semengue & Sadembouo, 1999; Echu, 2014; Kouega, 2007).

In Cameroon, about 80% of the population are formally educated in French and only 20% are educated in English (Echu, 2013). There is no specific language covering the entire Cameroonian territory. In fact, the populations referred to, as Anglophone or Francophone are actually multilingual as they speak various indigenous languages (Echu, 2013; Ngefack, 2010). Given the substantial number of indigenous languages spoken in Cameroon, three different lingua franca are used in different zones: the Pidgin English lingua franca zone in the west, the Fulfulde lingua franca zone in the north and the French lingua franca zone in the rest of the country, including Yaoundé the capital city (Wolf, 2001). French as a language in Cameroon dates back to 1916 when France was the administering authority of the country (Echu, 2014). The French language in Cameroon has several distinct functions: firstly, French is an official language, that is almost exclusively used at instruction and administration level (Echu, 2014; Kouega, 2007; Onguene Essono, 1999); secondly, French is used for most communication as 80% of Cameroon is French-speaking and more than 87% of children in the Francophone Regions in Cameroon speak French (Echu, 2014); thirdly, French is used as a lingua franca in most of the regions in Cameroon among speakers from different ethno-linguistic groups (Kouega, 2007).

There are two main varieties of French spoken in Cameroon: The Standard Cameroonian French and the Cameroon Popular French (Echu, 2014). The Standard Cameroonian French is used in formal contexts such as education, media and legal documents (Echu, 2014). The Standard Cameroonian French is comparable to the standard French from France with some typical phonological features, and a lexicon influenced by the local context (Bassolé-Ouédraogo, 2004; Gombé-Apondza, 2015). In contrast, the Cameroon Popular French which is used mostly in informal contexts and situations is quite different from the standard French from France as it borrows lexical items from Cameroon Pidgin English, Cameroon English and also from the local indigenous languages (Echu, 2014). In Yaoundé, like in the rest of the

country, French is a lingua franca among people from different ethnic groups (Bitja'a Kody, 2001), but particular to the capital city is the fact that one-third of young people living there do not speak any Cameroonian indigenous languages. French is their only language of communication (Bitja'a Kody, 2001; Echu, 2014).

1.1.2 Cameroon basic education system

In Cameroon, the literacy rate of the total population in 2012 was estimated to be 71% (UNICEF, 2013). The Cameroonian basic educational system is made up of two subsystems: the Anglophone subsystem of education based on the Anglo-Saxon model and the Francophone subsystem based on the French model (UNESCO, 2011). The Francophone subsystem is present in eight of the ten Cameroonian administrative Regions (Echu, 2005). The Cameroonian francophone basic educational subsystem consists of preschool and primary education. The preschool is not a compulsory component of the basic educational system in Cameroon and is mostly available in urban cities (Echu, 2005).

The preschool level is comprised of three grades that enrolls children aged three to six years. The first grade of preschool is called 'Petite Section' (PS), the second grade is 'Moyenne Section' (MS) and the third grade is 'Grande Section' (GS). The number of schools across the country is split between the public schools owned by the government and private schools owned by individuals or various religious entities. Yaoundé has the highest density of schools in the country and there are officially twice as many private preschools as public preschools (UNESCO, 2011). It should be specified that even though the school levels are similar to those in France, the legal school starting age is not always respected in Cameroon, as it is not subjected to stringent regulations (Tosam, 2015; UNICEF, 2002). Indeed, some pupils start school later than expected and others at a younger age than recommended guidelines. Some children even skip a whole grade (Ruffieux et al., 2009; Tosam, 2015; UNICEF, 2002).

1.1.3 Speech and language problems in Cameroon

To the best of our knowledge, the prevalence of speech and language disorders in children in the general population in Cameroon is unknown. Nevertheless, the national burden of diseases includes several medical conditions that could be associated with childhood speech and

language disorders as illustrated by clinical and hospital-based studies that evidenced the burden of cerebral malaria (Achidi et al., 2012); Human immunodeficiency virus (HIV) (Yone, Kuaban & Kengne, 2012); strokes in children (Njamnshi et al., 2006); congenital deafness (Wonkam et al., 2013); epilepsy (Nguefack et al., 2010); and mental disabilities (Miller, 2012). The findings of these studies suggest that speech and language disorders might be prevalent conditions in Cameroon. Moreover, the few studies that report information on speech and language disorders in Cameroon indicate the possibility of high burden of childhood speech and language disorders. For example, the study by Njamnshi et al. (2007), which aimed to determine the risk and precipitating factors associated with epilepsy among 1898 children and adults from a village situated near Yaoundé reported that 4.3% of participants had a language disorder. In a neurology unit in a hospital in Yaoundé, Nguefack et al. (2013) conducted a study among children less than 6-years-old and found that the second main developmental area of parental concern was the language.

The density of allied health professional associated with rehabilitation is low in Cameroon. With approximately 20 million inhabitants, the only two speech-language therapists in the country are both private practitioners (Gupta et al., 2011). There are no speech and language pathology services in the health and education public sector and there are no speech and language pathology education and training programmes at the universities in the country. The low levels of coverage by the limited speech and language pathology services available suggests that a significant number of Cameroonian children might have undiagnosed limitations in their speech and language abilities (Gupta et al., 2011; Hartley, 1998).

Literature recommends that standardised speech and language assessments tools developed and normed for the use of a specific population should only be used for that populations, if not, test bias might result leading to over- or under-diagnosis (Banerjee & Guiberson, 2012; Bedore & Peña, 2008; Carter et al., 2005; McLeod, Verdon & Bowen, 2013; Teoh, Brebner & McCormack, 2012). There is a growing recognition and demand for culturally and linguistically appropriate speech and language assessment tools for clinical and research purpose in developing countries, especially to assess the children who have been exposed to infectious diseases (Carter et al., 2006; McLeod et al., 2013; Pascoe & Norman, 2011; Ruffieux et al., 2009; Takam Taguenné, 2011).

As there are no validated speech and language tests available for the population of 3 to 5-year-old French-speaking children from Yaoundé, in order to ensure least bias in the present study,

speech and language assessments were performed using a French standardised test that was purposefully renormed for that population (Banerjee & Guiberson, 2012; Carter et al., 2012; Cheng, Chen, Tsai, Chen & Cherng, 2009; McLeod & Harrison, 2009; Teoh et al., 2012). This methodological approach has been used and validated in several cross-sectional studies that aimed to establish norm values for a specific population or to determine the prevalence of speech and language disorders in a population (Cheng et al., 2009; Johannisson et al., 2009; McLeod & Harrison, 2009; Rvachew et al., 2013).

1.2. Rationale and purpose of the study

Research suggests that speech and language disorders are among the most prevalent childhood disabilities in several countries (Jessup et al., 2008; Law, Garrett & Nye, 2003; McLeod & Harrison, 2009; Prelock, Hutchins & Glascoe, 2008; Tokgöz-Yılmaz et al., 2013). No population-based study has been reported on the prevalence of speech and language disorders in Cameroon. Furthermore, there are currently no validated speech and language tests available for the population of French-speaking children from the ages of 3 to 5 in Yaoundé. Nevertheless, the published literature on the national burden of diseases that could be associated with speech and language disorders and the low levels of coverage by the limited speech-language pathology services existing in the country suggest that a significant number of Cameroonian children might have limitations in their speech and language abilities (Achidi et al., 2012; Gupta et al., 2011; Hartley, 1998; Nguiefack et al., 2010; Ruffieux et al., 2009; Trotta et al., 2011; Wonkam et al., 2013).

The present study represents an initial attempt to determine the prevalence of speech and language disorders among a representative sample of French speaking preschool aged children, in Cameroon and to provide normative data on a French standardised speech and language test that could be used for clinical practice and research in Cameroon. The study could: (1) facilitate advocacy with stakeholders, government, universities, healthcare and education professionals to build a strategy to develop speech and language pathology education, training programmes and services that meet the needs of the population; (2) establish priorities when planning speech-language pathology services; and (3) suggest the direction for future research in the field of speech-language pathology in Cameroon and in Africa. Furthermore, the study findings may be useful in providing normative data on a standardised speech and language tests that can be used to identify children at risk for speech and language difficulties. These norms can be

used by the few speech-language therapists practising in Cameroon or to other healthcare and education professionals.

1.3. Overview of the study

This dissertation consists of six Chapters: **Chapter one**, already presented, serves as a background to the study and outlines the rationale of the research. **Chapter two** will provide a review of the relevant literature on the prevalence of childhood speech and language disorders in western countries and Africa. Speech and language assessments with culturally and linguistically diverse populations are also discussed. **Chapter three** presents the aim and objectives of the study, describes the design used to carry out the study and details the methods, procedures and materials used to collect data. Data analysis, validity, reliability measures and ethical considerations are also provided. **Chapter four** provides a detailed description of the findings, and **Chapter five** details the interpretation of those findings. **Chapter six** discusses the clinical implications and limitations of the study. This last chapter also includes recommendations for future research and conclusions of the study.

CHAPTER TWO: LITERATURE REVIEW

This chapter aims to provide an account of the key literature available on the prevalence of speech and language disorders in children and to highlight the main concepts that build the framework and basis for this study. This review explores the factors influencing the prevalence of speech and language disorders. Data on the prevalence of speech and language disorders in children in developed and developing countries, including Africa, is presented. The challenges associated with the identification and diagnoses of speech and language disorders in culturally and linguistically diverse (CLD) children from developing countries will also be discussed.

2.1. Factors influencing the prevalence of speech and language disorders

How many children have speech and/or language disorders? This question is important to parents, professionals, policymakers and researchers who wish to understand communication disorders and optimise assessment and intervention services for these children (Enderby & Pickstone, 2005). The answer to this question requires estimates of prevalence. However, measurement of accurate estimates of the number of children with speech and language disorders is challenging, as it is affected by a complex range of variables including differences in the definitions of what constitutes a case status (Eadie et al., 2015; McLeod & Goldstein, 2012; Roulstone & Harding, 2013); in the nature of the surveyed populations and sample sizes (Somefun, Lesi, Danfulani & Olusanya, 2006; Van Borsel et al., 2006); in the methods used to gather the information (Carter et al., 2012; Cordier, Munro, Wilkes-Gillan, Speyer & Pearce, 2014; Gačnik & Van ryckeghem, 2014; Law et al., 2000; Sachse & von Suchodoletz, 2008); and in the age of the participants (Boyle et al., 2011; Craig, Hancock, Tran, Craig & Peters, 2002; McKinnon, McLeod & Reilly, 2007; Van Borsel et al., 2006).

2.1.1. Definition of case status

Speech and language disorders are complex developmental conditions with varied behavioural manifestations, this is why there is little consensus on how best to define and identify them (Nelson, Nygren, Walker & Panoscha, 2006). Prevalence studies have used different definitions for case status to identify speech and language disorders in children (McLeod & Goldstein, 2012; Roulstone & Harding, 2013). These criteria include specific definition of

symptoms (McKinnon, McLeod & Reilly, 2007), standard score performances (Eadie et al., 2015) and cut-off points below the normative mean (McLeod & Harrison, 2009). In studies using assessment via standardised tools, the prevalence of speech and language disorders may vary according to the definition of case status or the cut-off applied. Typically, higher rates are reported in studies using cut-off criteria close to 1 SD below the mean to determine case status while lower estimates may be the result of less stringent criteria, like cut-off criteria close to 2 SD (Bishop & McDonald, 2009; Kalnak, Peyrard-Janvid, Forssberg & Sahlén, 2014).

2.1.2 Population and sample size

It is established that the prevalence of speech and language disorders is most relevant when obtained from representative community samples (Law et al., 2000). Clinical samples are not optimal for determining the prevalence of speech and language disorders, as children who are referred for speech and language services are a high-risk population (Johnson et al., 1999; Zhang & Tomblin, 2000). Population-based studies usually lead to lower rates than hospital-based studies (Karbasi, Fallah & Golestan, 2011; McKinnon, McLeod & Reilly, 2007; Somefun et al., 2006; Stich, Baune, Caniato, Mikolajczyk & Krämer, 2012).

Another important parameter to determine the prevalence of speech and language disorders in a population is the sample size (Arya, Antonisamy & Kumar, 2012). In prevalence studies, the sample size needs to be large enough to be representative of the entire population. Large sample sizes often lead to a prevalence rate close to the international average (e.g. McKinnon, McLeod & Reilly, 2007), while small samples sizes tend to lead to high prevalence rates (e.g. Gad-Allah, Abd-Elraouf, Abou-Elsaad & Abd-Elwahed, 2012; Jessup et al., 2008).

2.1.3 Diagnostic methods employed for determining prevalence of speech and language disorders

The optimal method for assessing speech and/or language in children for research and clinical purposes remains a matter of intense debate (Feldman et al., 2005; Law et al., 2000). Although there is no uniformly accepted assessment technique to identify childhood speech and language disorders in prevalence studies, two routes are usually used: the direct method using formal procedures like standardised tests and the indirect method using parents or teacher questionnaire reports (McLeod & Harrison, 2009). Each of these identification methods has some advantages and weaknesses (McLeod & Harrison, 2009).

2.1.3.1 Direct assessment methods

Direct assessment methods involve the use of psychometric tests or clinical judgement by a speech-language therapist or trained research assistant (McLeod & Harrison, 2009). The validity and reliability of direct assessment methods in identifying speech and language difficulties in children have been demonstrated in several studies (e.g. Carter et al., 2012; Cordier et al., 2014; Gačnik & Vanryckeghem, 2014). The main advantage of these methods is to allow the researcher or the clinician to compare the child's performance on a specific task to the normative data (Bishop & McDonald, 2009).

However, recently, the validity of the direct assessment methods for certain populations have been criticised as the application of standardised tests developed and normed for the use of a specific population to a culturally and linguistically different group may introduce multiple sources of potential bias (Banerjee & Guiberson, 2012; Bhatia, Shriharsh, Adlakha, Bisht, Garg & Deshpande, 2007; Bishop & McDonald, 2009). Moreover, direct assessment with standardised tests can be difficult to perform on young children who may have difficulty interacting with unfamiliar adults, thus the results may not represent the child's abilities (Feldman et al., 2005). In prevalence studies, the main disadvantage of the direct assessment method is that it is time consuming and incurs high costs and for that reason, many studies rely on cost-effective alternatives such as indirect methods to identify speech and language disorders in children (Pinborough-Zimmerman et al., 2007).

2.1.3.2 Indirect methods

Parent's reports

Parent reports are based on questionnaires or checklists seeking information related to their child's background and speech-language development (Bishop & McDonald, 2009). This method is based on a representative sample of the child's utterances from a wide variety of naturalistic situations (Sachse & von Suchodoletz, 2008). Parents are required to fill in a questionnaire based on their knowledge and experience with their child (Bishop & McDonald, 2009). The major advantage of the parent report method is that it is quick, easy to use and cost effective in relation to direct speech and language assessments (Sachse & von Suchodoletz, 2008).

Some studies have established the validity and reliability of parental reports for the identification of speech and language disorders, especially in toddler or preschool aged children (e.g. Bishop & McDonald, 2009; O'Neill, 2007; Sachse & von Suchodoletz, 2008; Zubrick, Taylor, Rice & Slegers, 2007). However, some reservations have been raised about the objectivity of parents' reports in identifying speech and language disorders in school-aged children, for whom the expectations are high and direct assessment is more feasible (Sachse & von Suchodoletz, 2008). Indeed, parents might not be able to identify speech and language difficulties in their child because of their lack of knowledge and adequate training, especially if the child presents with subtle or mild disorders (Bishop & McDonald, 2009; Laing, Law, Levin & Logan, 2002; Massa, Gomes, Tartter, Wolfson & Halperin, 2008; Rescorla, 2005).

Teacher's reports

Another route for identifying children with speech or language disorders using indirect screening is to rely on teacher reports (Pinborough-Zimmerman et al., 2007; McLeod & Harrison, 2009). Teacher report measures are commonly used to determine the prevalence of speech and/or language disorders in school-aged children to avoid the high costs associated with direct assessment (Pinborough-Zimmerman et al., 2007; Hall & Segarra, 2007). There are several reasons for collecting prevalence data based on teacher reports. These include the fact that school-aged children spend significant amount of time in class with their teachers. Based on daily comparisons among students over a wide range of activities, teachers are able to provide useful information about their language abilities (McKinnon, McLeod & Reilly, 2007). The validity of teacher reports has been demonstrated in several studies in which teacher diagnoses were confirmed by the speech-language therapists' assessments (McKinnon, McLeod & Reilly, 2007; McLeod & Harrison, 2009). Even though teacher reports are considered to be useful for identification of speech and language disorders in children, some studies have demonstrated the weakness of this approach by reporting low specificity or low sensitivity of the method (e.g. Jessup et al., 2008; Williams, 2006).

Each of the different methods presented above provides valuable insights for the determination of the prevalence of speech and language disorders in children (McLeod & Harrison, 2009). However, the prevalence of speech and language disorders may vary according to the source of information used to identify the problem in children (Law et al., 2000). Lower prevalence rates are typically derived from parent or teacher reports (e.g., Duff, Proctor & Yairi, 2004; Van Borsel et al., 2006) and higher rates reported using direct assessment techniques (e.g.,

Jessup et al., 2008; Shriberg, Tomblin & McSweeney, 1999). However, higher prevalence rates are reported in some studies that have used parent or teacher reports compared to direct assessment (Carding, Roulstone, Northstone & ALSPAC, 2006). For example, McLeod and Harrison (2009) reported a high prevalence of receptive language disorders in children aged between 4 and 5 years in Australia using teacher's report (16.9%) when compared to direct assessment (13.0%). Similarly in the UK, Carding et al. (2006), reported the prevalence of dysphonia in 8-year-old children to be 6% using direct assessment and 11% using parent reports.

The source of information used to identify speech and language disorders in children is an important consideration in prevalence studies (McLeod & Harrison, 2009). The methods chosen for a study should depend on both the age of participants and the setting (McKinnon, McLeod & Reilly, 2007). Direct assessment by a speech-language therapist or a trained assistant is considered to be a reliable method to identify speech and language disorders in children as this provides an objective assessment of measurable features of the impairment (Pinborough-Zimmerman et al., 2007; Hall & Segarra, 2007; McLeod & Harrison, 2009). However, studies regularly use parent or teacher reports for their efficiency, as well as to avoid the high costs associated with direct assessment of children (McLeod & Harrison, 2009). Parent report measures are commonly used in children of preschool age, whereas teacher report measures are preferred for school-aged children (Jessup et al., 2008; McKinnon, McLeod & Reilly, 2007).

2.1.4 Age of participants

The prevalence estimates for speech and language disorders might vary according to the age of the children sampled (Law et al., 2000). A number of studies have acknowledged the decrease in the prevalence of communication disorders with the age of participants (e.g. Boyle et al., 2011; Craig et al., 2002; McKinnon, McLeod & Reilly, 2007; Van Borsel et al., 2006). Typically, higher prevalence rates are reported for younger children (e.g. Campbell et al., 2003; Craig et al., 2002; Eadie et al., 2015) and lower rates for older children (e.g. McKinnon, McLeod & Reilly, 2007; Van Borsel et al., 2006). Moreover, the nature of speech and/or language disorders may change as children mature, thereby influencing prevalence estimates. Thus, speech and language disorders prevalence data should be collected across the lifespan (Campbell et al., 2003; Craig & Tran, 2005).

2.2 The need for data on the prevalence of speech and language disorders

Research suggests that speech and language disorders are among the most prevalent childhood disabilities in many countries (Nelson, Nygren, Walker & Panoscha, 2006). Several countries have made progress in the identification and measurement of speech and language disorders in the paediatric populations (Olusanya et al., 2006) (Table 1). In developed countries, speech-language deficits are seen as one of the most common childhood disabilities as it affects about 5% to 8% of preschool children (Beitchman, Nair, Clegg, Ferguson & Patel, 1986; Law et al., 2000). However, there is limited information and few contextually relevant studies focusing on the prevalence of speech and language disorders in low-income countries, especially in sub-Saharan Africa (Nwanze, 2013). Yet, approximately 80% of the global population with disabilities resides in those regions (United Nations, 2008; Haig et al., 2009).

There are some useful indicators in the literature that suggest that the prevalence of communication disorders could be higher in low-income countries especially in sub-Saharan Africa as compared to that reported for developed countries (Biritwum et al., 2000; Hartley & Wirz, 2002; Jochmann, 2006). Indeed, the morbid consequences of infectious diseases, poor nutrition, social disruption and poverty in resource-poor countries indicate potential neuro-cognitive impairments and speech and language disorders in children (Carter et al., 2005). For instance, malaria which is common in sub-Saharan Africa is responsible of 18.6% mortality and 10.9% of survivors are discharged with gross neurological deficits including communication disorders (Bangirana, Idro, John & Boivin, 2006; Carter et al., 2005; Nansseu, Noubiap, Ndoula, Zeh & Monamele, 2013; Christensen & Eslick, 2015; WHO, 2011). A study among children previously admitted with cerebral malaria in Kenya, who were assessed 20 months after discharge, revealed that 11.2% had speech and language disorders (Idro, Carter, Fegan, Neville & Newton, 2006). Congenital or early onset of hearing impairment is often associated with communication disorders in early childhood (Olusanya et al., 2006). In 2015, the global estimate of people with hearing impairments was 360 million, and two-thirds of individuals with these conditions living in developing countries (WHO, 2016). So it can be estimated that speech and language disorders associated with hearing deficiency is a widespread condition in developing countries. Similarly, HIV is reported to be a prevalent condition in sub-Saharan African countries (Yone et al., 2012; Gómez-Olivé et al., 2013). Children infected with HIV are at risk for impairments in cognitive functioning and language (Blanchette, Smith, King, Fernandes-Penney & Read, 2002; Baillieu & Potterton, 2008). With

about 2.9 million children living with HIV in Sub-Saharan Africa, it can be assumed that a significant number of children infected with HIV might have limitations in their speech and language abilities (Joint United Nations Programme on HIV/AIDS, 2012). Childhood disability affects millions of children around the world, most of whom are in low- and middle-income countries (Eide & Loeb, 2005). Surveys carried out in Pakistan (Miles, 1985), Uganda (Hartley, 1998) and Zimbabwe (Ministry of Health, Zimbabwe, 1997), indicate that between 38% and 49% of people from the disabled population have communication disabilities (Hartley & Wirz, 2002).

Literature relating to speech and language disorders in developing countries is rarely the primary focus of documentation and is difficult to locate. However, some data on the prevalence of communication disorders can be found in international health disability related literature (Hartley & Wirz, 2002). For example, speech prevalence data in surveys carried out in different low-income countries using the Ten Question Questionnaire (Durkin et al., 1994), a screening tool constructed to identify motor, visual, hearing, speech and cognitive disabilities in children aged between 2 and 9 years. The Ten Questions was designed for applicability across cultures by focusing on universal abilities that are typically acquired by children in all cultures (Eide & Loeb, 2005; Kakooza-Mwesige et al., 2014). This questionnaire has been applied in large studies that provided some information on the prevalence of childhood speech problems in low-income countries. These studies reported the proportion of children with speech problems to be 10% in Kenya (Muga, 2003), 5.7% in Pakistan (Durkin, Hasan & Hasan, 1998) and 2.4% in South Africa (Couper, 2002).

Speech and language disorders prevalence data in developing countries, especially in sub-Saharan Africa remains an aspiration. Few studies have focused on determining the prevalence of speech and language disorders in these parts of the world (Maulik & Darmstadt, 2007; Wylie, McAllister, Davidson & Marshall, 2013). Although literature suggests that the prevalence of speech and language disorders in children in the general population in developing countries could be higher than that reported in developed countries (Couper, 2002; Mung'ala-Odera et al., 2006; Wylie et al., 2013). Apart from studies that reported surprisingly high prevalence rates, probably due to unclear identification criteria such as that carried out by Hartley (1998) which estimated that 49.4% of the population in Uganda, had a verbal communication problem, several studies have reported prevalence rates that are reasonably high. For example, where data is available as in Uganda, the prevalence of communication

disorders is reported to be 10% (Jochmann, 2006). In Ghana, Biritwum et al. (2000) carried out a study that aimed to establish the prevalence of children with disabilities among 2,556 children under 15 years of age, 25.5% were reported as having difficulty with hearing and speech (Biritwum et al., 2000). In Kenya, Muga (2003) conducted a study to screen for disability in a community setting among the 2–9 year olds and 399 children participated in the study. Among them, 10% presented with speech difficulties. In a rural district of Kenya, Mung'ala-Odera et al. (2006) conducted a survey of neurological impairments in 10,218 children aged 6–9 years and found that 17.5% of those with neurological impairment had speech and language disorders.

A summary of the results of the prevalence studies conducted in low-income countries is provided in Table 2. Even if some of those figures cannot be generalised to a population level, as they were conducted in clinical settings, they may still indicate a view of the prevalence of communication disorders in developing countries (Wylie et al., 2013).

Table 1. Summary of studies of prevalence on the speech and language disorders in children in developed countries published since 2000

Study	Country	No of participants	Age of participants	Prevalence	Area of speech or language problem	Data collection method
Keating et al. (2001)	Australia	12,388	0–14 years	1.7%	Speech	Parent report
Craig et al. (2002)		12,131	1-99 years	0.72%	Stuttering	Interview
McKinnon, McLeod & Reilly (2007)		10,425	5–12 years	0.33%	Stuttering	Teacher report and direct assessment
				0.12%	Voice	
				1.06%	Speech-sound	
				1.5%	Speech	
McLeod & McKinnon (2007)		14,514	5–18 years	13.0% (wave1)	Communication	Teacher report and direct assessment
		14,533		12.4% (wave2)		
Zubrick et al. (2007)		1,766	2 years	13.4%	Language	Parent report
Jessup et al. (2008)		308	5-6 years	14.9%	Speech and language	Direct assessment
				8.7%	Speech	
				18.2%	Language	
Reilly et al. (2009)		1,619	2-3 years	8.5%	Stuttering	Parent and speech therapist report
McLeod & Harrison (2009)		4,983	4-5 years	25.2% (parents report)	Expressive language	Parent, teacher report and direct assessment
				9.5% (parents report)	Receptive language	
	22.3% (teacher report)			Expressive language		
	16.9% (teacher report)			Receptive language		
	1.7% (direct assessment)			Receptive language		
Taylor et al. (2011)	4,317	6-7 years	19.6%	Language (receptive)	Direct assessment	
		8-9 years	15.0%			
Eadie et al. (2015)	1,494	4 years.	3.4%.	Speech-sound	Direct assessment	
Centers for Disease Control and Prevention (2003)	US	5,071	8 years	4.4%	Stammering, stuttering	Telephone survey
King et al. (2005)		513	3 years	10% (2 SDs) 49% (1 SD)	Language	Direct assessment
Pinborough-Zimmerman et al. (2007)		26,315	8 years	6.34%	Communication	Review of records
Proctor et al. (2008)		3,165	2-5 years	2.6%	Stuttering	Teacher and parent report
Boyle et al. (2011)		119,367	3-10 years	1.6%	Stuttering	Survey
Duff et al. (2004)		2,445	2–6 years	3.9%	Voice	Teacher, parent report and direct screening

Stich et al. (2012)	Germany	13,182	5- 6 years	13.8%	Articulation	Direct assessment
				3.1%	Rhythm of speech	
Carding et al. (2006)	UK	7,389	8 years	6% (Direct assessment) 11% (Parent report)	Voice	Direct assessment and parental report
Van Borsel et al. (2006)	Belgium	21,027	6-10 years	0.58%	Stuttering	Teacher report
Kolasińska & Rabe-Jabłońska (2004)	Poland	7,881	8 years	2.9%	Language	Direct assessment
Chevrie-Muller et al. (2005)	France	2,059	3-5 years	More frequent in boys than in girls	Language	Teacher report
Okalidou & Kampanaros (2001)	Greece	1,113	Preschool children	6.9%	Articulation	Teacher report
				7.2%	Expressive language	
				6.4%	Receptive language	
				2.2%	Fluency	
				2.8%	Voice	

Table 2. Summary of studies of prevalence on the speech and language disorders in children in developing countries

Study	Type of study	Country	No of participants	Age/grade of participants	Prevalence	Area of speech or language problem	Data collection method
Paul et al. (1992)	Population-based	Jamaica	5,468	2-9 years	1.4%	Speech	Survey
Andrade (1997)	Population-based	Brazil	2,980	1-11 years	4.2%	Speech-language	Direct assessment
Hartley (1998)	Population-based	Uganda	1,041	0 to 18 years	49.4%	Communication	Survey
Biritwum et al. (2000)	Population-based	Ghana	2,556	under 15 years	25.5%	Speech	Survey
Couper (2002)	Population-based	South Africa	2,036	under 10 years	2.4%	Speech	Survey
Muga (2003)	Population-based	Kenya	399	2-9 years	10%	Speech	Survey
Kilic et al. (2004)	Population-based	Turkey	617	7-16 years	16.9%	Voice (vocal fold nodules)	Direct assessment
Eapen et al. (2004)	Population-based	United Arab Emirates	694	3 years	9.9%	Language delay	Direct assessment
					6.5%	Language disability	
Somefun et al. (2006)	Hospital-based	Nigeria	184	6 months-15 years	23.9%	Speech	Direct assessment
					2.2%	Stuttering	
					6.5%	Central speech	
Mung'ala-Odera et al. (2006)	High-risk population	Kenya	10,218	6-9 years	17.5%	Speech and language	Survey
Soleimani et al. (2011)	Population-based	Iran	600	7 to 10 years	11.2%	Speech	Direct assessment

Karbasi et al. (2011)	Population-based	Iran	7,881	Primary school students	14.8%	Speech	Direct assessment
					13.8%	Speech-sound	
					1.2%	Stuttering	
					0.47%	voice	
Aremu et al. (2011)	Hospital-based	Nigeria	89	0-5 years	22.4%	Speech delay	Review of medical record
					14.6%	Impaired Speech	
					1.1%	Stuttering	
Tavares et al. (2011)	Population-based	Brazil	2,000	4-12 years	6.1% (parent report)	Voice	Parent report and direct assessment
					11.4% (direct assessment)		
Gad-Allah et al. (2012)	Population-based	Egypt	852	3-5 years	44.4%	Speech and language	Caregiver and teacher report
					30.8%	Language	
					24%	articulation	
					17.8%	Dysfluency	
Jacob (2013)	Clinical and population-based	India	450	0-6 years	5.5 %	Speech and language	Direct assessment
					2.4%	Voice	
Melchioris Angst et al. (2015)	Population-based	Brazil	262	4 to 6 years and 11 months	21,37%	Speech	Direct assessment
					4,58%	Language	

2.3 Prevalence of speech and language disorders

Prevalence is the ‘proportion or percentage of cases in a given population at a specified time, for a normal rather than clinical population’ (Law, Boyle, Harris, Harkness & Nye, 2000, p. 166). In their systematic review of the literature, Law et al. (2000) found that, on average, 5.95% of typically developing children had primary speech and language impairments. Several studies have been conducted to determine the prevalence of speech and language disorders in children in developed countries (McLeod & Harrison, 2009) (Table 1). However, in low-income countries, especially in sub-Saharan Africa, only few population-based studies reported on the prevalence of speech and language disorders in children (Gad-Allah et al., 2012; Karbasi et al., 2011) (Table 2).

2.3.1 Prevalence of articulation disorders

Articulation disorders are speech sound disorders characterised by substitutions, omissions, additions or distortions of phonemes that may interfere with intelligibility and may be associated with structural or motor-based difficulties (ASHA, 1993; Ball, 2015; Pennington & Bishop, 2009). Given that it is sometimes difficult to differentiate the aetiology of articulation

and phonological disorders, some authors use the term ‘speech sound disorders’ when referring to that condition (e.g., Dodd, 2014; Shriberg et al., 2010). However, speech sounds disorders may have their origin in the phonological component of language rather than in the articulatory system (Bernthal, Bankson & Flipsen, 2012).

Articulation disorder involves the impaired ability to produce adequately various expected speech sounds that are appropriate for a person’s developmental age and dialect (Heward, 2006; Waring & Knight, 2013). Before determining if a person has articulation problems, regional, social or cultural/ethnic variations of speech should be taken into account. Accent variations within a language are not basis for diagnosing a child with articulation disorders (Hambly, Wren, McLeod & Roulstone, 2013).

There is a wide variation in the reported prevalence rates of speech sound and articulation disorders in children. Among the studies reviewed for this dissertation, the prevalence estimates ranged from 1% (McKinnon, McLeod & Reilly, 2007) to 24% (Karbasi et al., 2011). Some of the reasons that explain the variation in the prevalence of articulation disorders in children include the different method used to gather the information (Law et al., 2000). Typically, studies that use parent or teacher reports techniques report lower prevalence figures (e.g. Keating et al., 2001; McKinnon, McLeod & Reilly, 2007) while studies that use direct assessment report higher prevalence rates (e.g. Eadie et al., 2015; Karbasi et al., 2011; Soleimani et al., 2011). Variation in the population age range among studies can also explain the difference in the prevalence figures of articulation disorders. Typically, higher prevalence rates are reported for younger children (Campbell et al., 2003) and lower rates are reported in the older ones (McKinnon, McLeod & Reilly, 2007). Lower prevalence rates at an older age is consistent with the fact that some articulation problems may resolve over time as a result of intervention, or spontaneous recovery (e.g., McKinnon, McLeod & Reilly, 2007; McLeod & Harrison, 2009; Rvachew, 2014).

Few studies on the prevalence of speech sounds or articulation disorders have been conducted in low-income countries and most of them reported high rates. For example, in Iran, Karbasi et al. (2011), assessed 7,881 primary school students and reported the prevalence of speech sounds disorders to be 13.8%. Also in Iran, but with a smaller sample size of 600 primary school children, Soleimani et al. (2011) reported the prevalence of speech disorders, using phonetic tests and speech-language therapist judgement method, to be 11.1%. In Egypt, Gad-

Allah et al. (2012) established via a caregiver and teacher questionnaire, the prevalence of articulation disorders among 852 children aged between 3 and 5 years to be 24%.

Articulation disorders are conditions that often develop in the preschool years (Eadie et al., 2015; Karbasi et al., 2011). Deficient articulation might have a negative impact on individual's social and emotional well-being as well as his/her reading abilities (Gordon-Brannan & Weiss, 2007; Sices, Taylor, Freebairn, Hansen & Lewis, 2007). However, the prognosis for children with articulation disorders who received treatment is generally good, as it optimises speech sounds discrimination and production, and increases intelligibility in multiple communication contexts (Gordon-Brannan & Weiss, 2007).

2.3.2 Prevalence of fluency disorders

Fluency disorders include cluttering and stuttering (Haynes, Moran & Pindzola, 2006). Stuttering, the most common fluency disorder, is a multifactorial speech disorder characterised by repetitions (sounds, syllables, words and phrases), sound prolongations, blocks, interjections and revisions, which may affect the rate and rhythm of speech (ASHA, 1993; Deiner, 2010; Maguire, Yeh & Ito, 2012). Cluttering is a fluency disorder characterized by a rapid and/or irregular speech rate, erratic rhythm, and language and/or phonological errors (St. Louis & Schulte, 2011; Van Zaalen-op't Hof, Wijnen & De Jonckere, 2009). Fluency disorders may be accompanied by secondary behavioural and emotional characteristics such as excessive physical tension, and avoidance of sounds, words or speaking situations (Deiner, 2010; Maguire et al., 2012).

There is wide variation in the reported prevalence rates of fluency disorders. Among the studies reviewed, the prevalence estimates ranged from 0.3% (McKinnon, McLeod & Reilly, 2007) to 17.8% (Gad-Allah et al., 2012). Some reasons that explain the variation in the prevalence figures of fluency disorders in children include the age of participants (Craig et al., 2002; Yairi & Ambrose, 2005). Most reports indicate higher rates of stuttering among younger children, especially those under six, and lower rates for older children, adolescents or adults (e.g. Boyle et al., 2011; Craig et al., 2002; McKinnon, McLeod & Reilly, 2007; McLeod & Harrison, 2009; Van Borsel et al., 2006).

The sex of participants in a study might also influences the prevalence of fluency disorders, as the greatest risk for developing these conditions occurs in males (Oliveira, Cunha & Santos,

2013). The male-to-female ratio of stuttering is reported to be 4:1 or greater in older children and adults (Craig et al., 2002), while in preschool children close to stuttering onset, smaller gender ratios such as 2:1 (Yairi & Ambrose, 2005), or 1:1.6 (Kloth et al., 1995; Mansson, 2000) are reported.

The challenges associated with the accurate identification of fluency disorders in the paediatric population include the controversy about whether to base identification only on the presence of dysfluencies or also on the presence of secondary behavioural and emotional characteristics (Deiner, 2010). Another challenge comes from the fact that in young children, it is difficult to distinguish the repetitions and hesitations that might occur in typical speech from those that constitute the disorder in older children (Maguire et al., 2012).

Few studies on the prevalence of fluency disorders have been conducted in low-income countries. In Egypt, Gad-Allah et al. (2012) reported the prevalence of fluency disorders in 852 children aged 3-5 years to be as high as 17.8%. However in Iran, Karbasi et al. (2011) reported the reasonable rate of 1.2% in 7,881 primary school students.

Childhood fluency disorders are prevalent condition that often begins during the preschool years, with an insidious or more sudden onset (Haynes et al., 2006; Yairi & Ambrose, 2005). Among children who begin to stutter, spontaneous recovery occurs in about 75% within the first year or two of onset without any professional intervention (Maguire et al., 2012; Manson, 2000). However, in many cases it persists into adulthood (Maguire et al., 2012; Manson, 2000). Some studies have shown that, in case of fluency disorders, the earlier an intervention is instituted, the more favourable the outcome, especially in young children (Conture & Curlee, 2011; Einarsdóttir & Ingham, 2008).

2.3.3 Prevalence of voice disorders

Even though no fixed uniform standard of abnormal voice exists, it is widely acknowledged that voice disorders occur when the vocal quality, pitch, loudness, resonance and/or duration differs from the voices of others of similar age, sex, and cultural group (ASHA, 1993; Heward, 2006; Wolraich, 2003; Aronson & Bless, 2011). Voice disorders are more common in adults than in children, however, children may also present with voice disorders (Kilic, Okur, Yildirim & Güzelsoy, 2004; McKinnon, McLeod & Reilly, 2007). There is little data on the prevalence of voice disorders in children (Carding et al., 2006; Casper & Leonard, 2006; McKinnon,

McLeod & Reilly, 2007). Among the studies reviewed for this dissertation, the prevalence estimates of voice disorders ranged from 0.1% (McKinnon, McLeod & Reilly, 2007) to 30.2% (Kilic et al., 2004). This large variation in the prevalence rate for voice disorders in children is the result of different methodologies used (McKinnon, McLeod & Reilly, 2007).

The most frequently recommended methods to identify voice disorders in children include: perceptual acoustic or physiological measurement, and direct laryngeal examination (Duff et al., 2004; Oates, 2009). However, some studies relied on questionnaires completed by parents or teachers, even though these methods are reportedly less reliable for that purpose, as these informants tend to under-report voice disorders (Tavares, Brasolotto, Santana, Padovan & Martins, 2011) or to over-identify the symptoms in children (Carding et al., 2006). Another explanation of the variation might be the fact that some studies have reported physiological vocal problems as voice disorders, and this increases the number of participants affected (Kilic et al., 2004; Tavares et al., 2011).

Few studies on the prevalence of voice disorders have been conducted in low-income countries. In Iran, Karbasi et al. (2011) assessed 7,881 primary school students and reported the prevalence of voice disorders to be 0.4%. In Egypt, Gad-Allah et al. (2012) established via a caregiver and teacher questionnaire the prevalence of voice disorders among 852 children aged 3-5 years olds to be 2.4%.

Childhood voice disorders are conditions that might negatively affect the lives of children by inviting negative attention and limiting their participation in important events (Connor et al., 2008). Identification and intervention of vocal disturbances in children are sought at an early stage, to avoid the consequences of untreated childhood voice problems that negatively affect their self-esteem, school performance and, might lead to lifelong communication and other problems (Angelillo, Di Costanzo, Costa, Barillari & Barillari, 2008; Ma & Yu, 2013).

2.3.4 Prevalence of speech disorders

Speech disorders include articulation, fluency, and /or voice disorders (Karbasi et al., 2011; McKinnon, McLeod & Reilly, 2007; Nelson et al., 2006). There is a wide variation in the prevalence rates of childhood speech disorders. In their systematic review of the literature, Law et al. (2000) found that between 2.3% and 24.6% children had primary speech impairment. Estimates based on data collected via screening or direct assessment technique reported higher

prevalence rates, typically between 5% and 15% (Jessup et al., 2008; Pascoe et al., 2015; Soleimani et al., 2011). In contrast, questionnaires or surveys filed by parents or teachers reported lower rates of speech disorders (e.g. Couper, 2002; Keating et al., 2001).

Few population-based studies report on the prevalence of speech disorders in low-income countries. Where data are available, the prevalence reported is high. For example, in Ghana, Biritwum et al. (2000) estimated that 25.5% of 2,556 children under 15 years had speech difficulties through the use of questionnaire surveys. In Kenya, Muga (2003) also used questionnaire surveys and estimated that 10% of 399 children, aged 2-9 years presented with speech disorders. In Iran, Karbasi et al. (2011) determined the prevalence of speech disorders in 7,881 primary school students using direct assessment technique to be 14.8%. In the same country, Soleimani et al. (2011) reported the prevalence of speech disorders in 600 school-aged children using direct assessment technique to be 11.2 %, and in South Africa, Pascoe et al. (2015) estimated a prevalence of 6.6% for speech disorders in three-year old children using direct assessment.

Childhood speech disorders have been reported to be a widespread condition in several countries (Jessup et al., 2008; Karbasi et al., 2011; Pascoe et al., 2015; Soleimani et al., 2011). However, in low-income countries, especially sub-Saharan Africa, there is a lack of data on the prevalence of speech disorders. The few studies available are clinical and/or survey based, or conducted with very small sample sizes that do not allow potential generalisation of the findings.

2.3.5 Prevalence of language disorders

Language disorders involve impaired expressive and/or receptive communication development (Pennington & Bishop, 2009; Ndung'u & Kinyua, 2009). A child with receptive language disorders has difficulties with understanding spoken language. He/she might also have difficulties processing and retaining auditory information and following instructions (Heward, 2006; Wicks-Nelson & Israel, 2015). A child with expressive language disorders has difficulties with the production of language. He/she might have a very limited vocabulary, use incorrect words and phrases, have difficulties in describing, defining, explaining, and in retelling stories/events or may not even speak at all (Heward, 2006; Wicks-Nelson & Israel, 2015). In most cases, children with receptive language disorders also have expressive language problems (Van Agt, 2011).

According to the systematic review by Law et al. (2000), the median prevalence of language impairment was 7.4% (range = 2%–19%). One reason that might explain the variation in the reported prevalence of language disorders could be the difference in the domain of language assessed (Law et al., 2000; Pinborough-Zimmerman et al., 2007). Indeed, some studies reported the prevalence figures for expressive and receptive language disorders combined, while others determined the prevalence of language disorders with either expressive or receptive language disorders (e.g. Kolasińska & Rabe-Jabłońska, 2004; Okalidou & Kampanaros, 2001). Another explanation of the wide variation in the reported prevalence rates of language disorders is the age of the participants. Typically, higher prevalence figures are reported for the younger children, while lower rates are reported for the older ones (Kolasińska & Rabe-Jabłońska, 2004; Law et al., 2000).

The cut-off criterion used to determine the case status can also explain the variation in the reported prevalence of language disorders (Law et al., 2000; Pinborough-Zimmerman et al., 2007). Typically, higher prevalence rates are reported in studies that applied cut-off criterion close to 1 SD below the mean to determine case status and lower prevalence rates are reported using cut-offs closer to 2 SD (Bishop & McDonald, 2009; Kalnak et al., 2014).

There are few population-based studies reporting on the prevalence of language disorders in low-income countries, but where data are available, the reported figures are high. For example, in Egypt, Gad-Allah et al. (2012) determined the prevalence of language disorders among 852 children aged 2-3 years using caregiver and teacher report to be 30.8%. In the United Arab Emirates, Eapen et al. (2004) determined the prevalence of language delay among 694 children aged 3 years to be 9.9% using direct assessment (Eapen, Zoubeidi & Yunis, 2004). Childhood language disorders have been reported as prevalent conditions in several countries (Law et al., 2000; Kolasińska & Rabe-Jabłońska, 2004; Pinborough-Zimmerman et al., 2007). In low-income countries, especially in sub-Saharan Africa, there is little data on the prevalence of language disorders (McLeod & Harrison, 2009).

2.3.6 Co-occurrence of childhood speech and language disorders

Co-occurrence is defined as the presence of more than one specific disorder in a person at a specific point in time (Bax & Gillberg, 2010). High rates of co-occurrence have been reported in children with communication disorders, particularly speech-sound and language disorders (Eadie et al., 2015; Keating et al., 2001; Rvachew, 2014).

Estimates of the co-occurrence of speech sounds disorders and language disorders vary with the age of participants (Rvachew, 2014). Typically, high rates are reported for younger children (Eadie et al., 2015) whereas lower rates are reported for older groups (Arndt & Healy, 2001; Beitchman et al., 1986; Shriberg et al., 1999). This might be because recovery from speech deficit occurs more often than from language problems so that, co-occurrence of the two disorders are more difficult to detect in older children (Gordon-Brannan & Weiss, 2007; Rvachew, 2014). For example, Eadie et al. (2015) determined the comorbidity of speech sounds disorders with language disorders to be as high as 40.8% in a sample of 1,494 children aged 4 years in Australia.

High rates of co-occurrence among stuttering, speech-sound disorders and language disorders have been reported (Arndt & Healey, 2001; Blood, Ridenour, Qualls & Hammer, 2003). However, controversy exists about the conclusions from studies about co-occurrence of speech and language disorders in children who stutter (Blood et al., 2003). Some studies stressed that language deficits are not associated with stuttering onset, persistence or severity (Gregg & Yairi, 2007; Nippold, 2012). For example, Gregg and Yairi (2007), conducted a study to investigate the mutual relations between stuttering and different aspects of language, including phonology in 28 preschool children ranging in age from 25 to 38 months, they found no co-occurrence. Similarly, in the study by Nippold (2012), the findings suggested that language deficits were not associated with stuttering onset or persistence, and that stuttering has little or no impact on language development.

However, in contrast, other studies argue that the prevalence of communication disorders in the population of children who stutter is greater than in the population of children who do not (Arndt & Healey, 2001; Conture, 2001). For example, in the study by Arndt and Healey (2001) the speech-language therapists reported that 44% of the children on their caseload who stuttered had at least one communication disorder in addition to stuttering.

Articulation disorders, language disorders, fluency and voice disorders are conditions that have traditionally been viewed as separate, as they can occur in pure form (Pennington & Bishop, 2009). However, the nature of the interaction between speech and language disorders has been reported and can be explained in different ways, including the fact that one causal factor might affect more than one aspect of speech and/or language (Bowen, 2009; Pennington & Bishop, 2009). Alternatively, a domain-specific disorder might affect other aspects of speech and/or language (Bowen, 2009; Rvachew, 2014).

2.4 Speech and language assessment with culturally and linguistically diverse (CLD) children

A child with a CLD background is a child whose language, culture and experiences are different from those of middleclass, mainstream children from western countries that often make up the normative samples for the development of standardised tests (Caruso, Concepcion-escano & Elleseff, 2015; Terry & Irving, 2010). It can be challenging for speech-language therapists to distinguish between a speech and language difference, and a speech and language disorder among CLD children (Caruso et al., 2015). Indeed, a speech and/or language difference is associated with systematic variation in a person's speech and language skills that deviate in some way from the standard usage of that language in the main stream culture (Bland-Steward, 2005; Caruso et al., 2015; Paul, 2007). Whereas a speech and/or language disorder refers to a significant discrepancy in speech and language skills compared to other individuals of the same age and cultural/ linguistic background (Bland-Steward, 2005; Caruso et al., 2015; Paul, 2007). Over identification of CLD children as having language disorders commonly occurs because a difference is observed and incorrectly interpreted between a language used in a particular community and that of the majority culture (Bland-Steward, 2005; Craig & Washington, 2000; Prelock et al., 2008). For that reason, in order to avoid biased conclusions, literature recommends interpreting CLD children' speech and language performance in light of ethnographic information (Banerjee & Guiberson, 2012; De Lamo White & Jin, 2011).

Research suggest that compared to monolinguals peers whose input and output is concentrated in one language, bilingual children who have less practice in each language might acquire one or both of the languages more slowly than their monolingual peers (Kohnert, 2010; Paradis, 2007; Peña, Gillam, Bedore & Bohman, 2011). Some research supports the fact that the risk for developmental speech and/or language disorders is not related to the number of languages spoken (Bialystok, Craik & Luk, 2008; Hambly et al., 2013; Peña et al., 2011). However, when language disorders are present in a bilingual child, they are observed in both languages (Bedore & Peña, 2008; Hakansson, Salameh & Nettelbladt, 2003; Paradis & Navarro, 2003). Knowledge about typical second language acquisition is critical to understand in order to avoid the confusion between speech and language disorders, and speech and language differences that occur in typical developing children with culturally and linguistically diverse background (Guiberson, Barrett, Jancosek & Yoshinaga-Itano, 2006).

2.5 Challenges associated with the assessment of CLD children in resource-poor countries

There is a growing demand for culturally and linguistically appropriate speech and language assessment tools for research purpose and rehabilitation services in developing countries with few assessment resources (Carter et al., 2005; Pascoe & Norman, 2011). However, only limited assessment tools are available in low-income countries especially in sub-Saharan Africa (Carter et al., 2005; McLeod et al., 2013; Ruffieux et al., 2009; Takam Taguemné, 2011). It is now established that the use of speech and language assessment tools designed for a population that is culturally and linguistically different might lead to over- or under-diagnosis due to test bias (Teoh et al., 2012; Mcleod et al., 2013).

The speech-language therapists who are practicing in countries where there are few assessment resources rely primarily on speech and language assessments tools imported from western countries like the US, UK, France, Belgium or Canada (Topouzkhania & Mijiyawa, 2013). These tools, designed according to a culture and specific standards, are not appropriate to a culturally and/or linguistically different context (Topouzkhania & Mijiyawa, 2013; Pichori, 2013).

In resource-poor countries, speech-language therapists are facing several challenges in conducting speech and language assessments for CLD children. These challenges include the lack of valid and reliable standardised tests (Hartley & Wirz, 2002; Carter et al., 2005; Carter et al., 2012; Gladstone et al., 2010; Pascoe & Norman, 2011; Seymour, Roeper & De Villiers, 2003; Teoh et al., 2012; Williams & McLeod, 2012), and the presence of multiple bias and limitations when using standardised tools (Banerjee & Guiberson, 2012; Bhatia et al., 2007; Bedore & Peña, 2008).

2.5.1 Lack of speech and language assessment tools for CLD children

There are widespread reports of a paucity of culturally and linguistically appropriate tools for the assessment of CLD children's speech and language (Hartley & Wirz, 2002; Carter et al., 2005; Carter et al., 2012; Gladstone et al., 2010; Pascoe & Norman, 2011; Teoh et al., 2012; Williams & McLeod, 2012). One explanation for the lack of development of speech and language assessment tools in Africa is the fact that often, research on clinical linguistic theory

and normal language acquisition which is essential for the development of new tools has never been conducted in some of those regions (Alcock & Alibhai, 2013; Carter et al., 2012).

One of the main barriers in the assessment of speech and language ability in CLD children is the lack of standardised tests that are valid and reliable for that purpose (Bedore & Peña, 2008; McLeod et al., 2013). In the absence of appropriate speech and language assessment tools, it is difficult to establish differential diagnoses between speech and language disorders and speech and language difference (McLeod et al., 2013). Moreover, it is established that the use of speech and language tests designed for a monolingual population in a CLD population might cause the speech-language therapists to be less confident in determining the presence of a speech and /or language disorder (Carter et al., 2005; Seymour et al., 2003; McLeod et al., 2013; Williams & McLeod, 2012). Under-diagnosis can lead to poor outcomes for children with speech and/or language disorders who do not receive intervention (Law et al., 2000; McCormack, McLeod, McAllister & Harrison, 2009), while, over-diagnosis may impact upon the self-esteem of children who receive intervention for a misdiagnosed speech and /or language disorder. This can also lead to the overuse of speech-language pathology time and expertise (McLeod et al., 2013).

2.5.2 Bias and limitations in the assessment of CLD children

The application of standardised tests that are developed and normed for use with a specific population to another culturally and linguistically different group may introduce multiple sources of potential bias (Bhatia et al., 2007; Banerjee & Guiberson, 2012). Indeed, test bias occurs when two people of the same ability but from different cultural groups do not have the same probability of success on a test (Goldstein et al., 2006). This might occur when a CLD child is assessed using a speech and language tool designed and standardised for a culturally and linguistically different population group.

2.5.2.1 Cultural bias

Cultural bias occurs when the assessment requires a child to engage in the testing situation or procedure that is unfamiliar or inappropriate in his or her home culture or when he/she is asked to identify unfamiliar content in the standardised assessments (Banerjee & Guiberson, 2012; Teoh et al., 2012; Van de Vijver & Tanzer, 2004). Indeed, as content in standardised speech and language assessments are often designed for children from a specific culture, those from

another culture may not have been exposed to the same language concepts and vocabulary (Mulenga et al., 2001; Teoh et al., 2012). For example, in some cultures, children are to remain respectful and silent around adults, as verbally displaying knowledge may be considered a challenge to the adults' authority (Caruso et al., 2015). As reported by Carter et al. (2005), it is unusual for Kenyan children to sit and converse with a strange adult. The expectation of most language and cognitive assessments for a child to interact with an adult might be an unfamiliar activity for most of the Kenyan children and, therefore, will probably have a negative impact on the way they respond and perform on different tasks proposed.

Another cultural bias might come from the use of pictures in the assessment of CLD children's speech and language skills (Caruso et al., 2015). Indeed, most Western children learn to perceive pictures from story books, television and even electronic games. However, those activities are unavailable to most rural African children and, therefore, will probably impact on the way they interpret picture stimuli during an assessment (Carter et al., 2005). In order to minimise diagnostic errors, cultural variables must be taken into account in the design or administration of existing speech and language assessment tools to a population that is culturally different (Banerjee & Guiberson, 2012).

2.5.2.2 Linguistic bias

Linguistic bias occurs when a CLD child is expected to understand and respond to a language standard that matches the one used by the population for whom the test is designed (Teoh et al., 2012). Indeed, most speech and language assessments are designed to measure monolingual standard language development while most young CLD children speak a non-standard form of language (Teoh et al., 2012). As the content and structure of some of the Western monolingual speech and language assessments may be unfamiliar to CLD children, the test result might not be representative of their language abilities (Carter et al., 2005). For example, given that vocabulary knowledge in a specific language is influenced by cultural backgrounds; it can be assumed that when assessing the vocabulary knowledge of CLD children using standardised tests developed for monolingual children, the evaluation will be biased (Caruso et al., 2015; Banerjee & Guiberson, 2012).

2.6 Approaches to the development of speech and language assessments in resource-poor countries

One of the main barriers in the assessment of speech and language ability in Resource-Poor Countries is the lack of valid and reliable standardised tests (Bedore & Peña, 2008; McLeod et al., 2013). However, the development of completely new tools is often impractical within the time and resource constraints of most research or clinical situations, as it necessitates accumulation of knowledge on clinical linguistic theory and normal language acquisition (Alcock & Alibhai, 2013). Alternative approaches to standardised tests include modifying existing standardised assessments, using dynamic assessment techniques to assess a child's 'modifiability', using criterion-referenced tests, using clinical judgement and renorming assessments tools for the target population (Carter et al., 2005; Carter et al., 2012; McLeod et al., 2013; Seymour et al., 2003). Each of these approaches has advantages and weaknesses.

2.6.1 Modifying existing standardised assessment tools

The test modification approach involves amending standardised assessments by rewording or expanding instructions, providing additional cues or response times, skipping items that are inappropriate for the child, providing credit for the use of dialect and using real items and objects if the participants lacked experience of books and pictures, or using alternate scoring rubrics (Carter et al., 2012; Saenz & Huer, 2003). These modifications are undertaken to reduce test bias in assessing CLD children (Roseberry-McKibbin & O'Hanlon, 2005). The main advantage of modifying a test is that the content and/or tasks become culturally appropriate for the target population (Carter et al., 2012; Lubinski & Hudson, 2012). Modifying a speech and language test also has disadvantages including that once tests are adapted, the norms became invalid and inappropriate for comparison (Carter et al., 2012; Lubinski & Hudson, 2012).

2.6.2 Dynamic assessment

Dynamic assessment is advocated as an alternative and/or supplemental testing approach to traditional standardised testing with CLD children (De Lamo White & Jin, 2011; Gutierrez-Clellen, Simon-Cereijido & Wagner, 2008; Peña et al., 2006). Procedures for the dynamic assessment of speech and language involves the administration of the same assessment in a sequence of testing that include a pre-test, a teaching element and post-testing (Shipley & McAfee, 2015). A modifiability score based on the level of examiner's effort, the child's

responsiveness/motivation and demonstration of the transfer of learning is determined (De Lamo White & Jin, 2011). This technique can be described as diagnostic therapy because assessment and therapy occur simultaneously (De Lamo White & Jin, 2011).

The main advantage of dynamic assessment is that following a teaching session, test scores may rise consistently allowing differentiation for children with language disorders from those achieving poor language scores for other reasons (Kapantzoglou, Restrepo & Thompson, 2012; Peña, Iglesias & Lidz, 2001; Peña et al., 2006; Ukrainetz, Harpell, Walsh & Coyle, 2000). The main disadvantage of this approach is that it is time consuming and might lead to loss of concentration from children (Saenz & Huer, 2003; Hasson & Joffe, 2007). Moreover, the validity and reliability of the dynamic assessment procedures has been questioned (Haywood & Tzuriel, 2002). A particular concern being the fact that the teaching elements are not always standardised, which compromises the reliability and validity of the scores (Saenz & Huer, 2003).

2.6.3 Criterion-referenced measures

Speech and language criterion-referenced measure compares a child's performance on a specific domain or concept to independently predetermined criteria (Shipley & McAfee, 2015; De Lamo White & Jin, 2011). Criterion-referenced measures allow considering the social context in which communication occurs and how language is used by the culture (De Lamo White & Jin, 2011). The main advantage of using criterion-referenced measures is that the approach might help to reduce cultural/linguistic bias as the clinician can design and use language, materials, contexts and interaction patterns that are familiar to the child (Laing & Kamhi, 2003; De Lamo White & Jin, 2011). Moreover, as many criterion-referenced tests are widely recognised, and used by researcher and clinician, comparison of test results is possible (Shipley & McAfee, 2015).

The main disadvantage of using criterion-referenced measures is the lack of well-established developmental information on certain CLD population groups that makes it difficult to define valid criteria for mastery of specific linguistic forms (Laing & Kamhi, 2003). Moreover, because language acquisition patterns differ across languages, the used of criterion-referenced measures to compare children's skills across two or more languages is not recommended (Thordattottir, 2005; Paradis, 2005). For example, Thordattottir (2005) found that French-speaking children had a higher mean length of utterance but smaller vocabulary size than

English-speaking children. Given these limitations, Laing and Kamhi (2003) recommended to supplement the use of speech and language criterion-referenced measures with other alternative assessment procedures.

2.6.4 Clinical judgement

Clinical judgement, or informed opinion, refers to the knowledgeable perceptions of professionals about a child's capabilities (Bagnato, Smith-Jones, Matesa & McKeating-Esterle, 2006). Speech-language therapists' clinical judgement has been used extensively in research and clinical practice to assess voice disorders in children (Duff et al., 2004; Mumby, Bowen & Hesketh, 2007). For example, in the study by Duff et al. (2004), the presence of voice disorders characterised by hoarseness in a total of 2,445 African-American and European-American preschool children between 2 and 6 years of age was identified through clinical judgement of two speech-language therapists. Similarly, in the study by Soleimani et al. (2011), in Iran, the prevalence of speech disorders in 600 school children was determined via phonetic test and speech and language clinical judgement. Moreover, voice auditory perceptual evaluation which is based on clinical judgement is one of the most widely methods used by speech-language therapists for identifying voice disorders (Behrman, 2005; Lopes, Barbosa Lima, Alves Almeida, Cavalcante & de Almeida, 2012; Webb et al., 2004). This method has been reported to have good reliability. For example, Lopes et al. (2012) indicated a good correlation between perceptual and acoustic data in identifying the severity of voice deviation in children.

Speech-language therapists' clinical judgement has been also used extensively in research and clinical practice to assess fluency disorders in children (Reilly et al., 2009). For example, in the study by Reilly et al. (2009) that aimed to document the onset of stuttering in a cohort of 1,619 children aged 2 years in Australia, the case status was confirmed by clinical judgement. In Iran Karbasi et al. (2011) also relied on clinical judgement to identify different speech disorders including stuttering in children. The reliability of speech-language therapist clinical judgement has been demonstrated to be a reliable assessment method for diagnosing the presence of different speech and language disorders (Mumby et al., 2007). This method is considered effective as it involves measurement and decision-making strategies that integrate and synthesise information about multiple aspects of children's development (Mumby et al., 2007). However, this method could be considered less valid than standardised measures, as it is not subject to external validation and not easy to replicate (Law et al., 2000).

2.6.5 Renorming a standardised assessment test

Good quality normative data is essential for clinical and research practice in speech-language pathology. Such data allows comparisons and to determine if an individual child's developmental trajectory is delayed or disordered when compared to his or her peers from the same cultural or linguistic background (Rvachew et al., 2013).

The main advantage of the renorming approach is that the performance of each child can be compared to that of their peers of the same linguistic and/or cultural background (Saenz & Huer, 2003). The renorming approach has been successfully used in several studies conducted in developing countries where there is a lack of appropriate speech and language assessment tools. For example, Ruffieux et al. (2009) established normative data on psychometric tests to assess the cognitive functioning of Cameroonian school-aged children suffering from Sickle Cell Disease. In Senegal, Boivin (2002) established normative data on the Kaufman Assessment Battery for Children (K-ABC) and on the Test of Variables of Attention (TOVA). In Kenya, Holding et al. (2004) established normative data on the K-ABC battery. In Nigeria, Aina and Morakinyo (2005) established normative data for children on screening and performance instruments, the Developmental Screening Inventory (DSI) and the Bayley Scales of Infant Development (BSID).

The renorming approach also has some disadvantages including the fact that it requires substantial resources and time to assess enough typically developing children to provide meaningful norms (Saenz & Huer, 2003). The process may require the adaptation of some of the original words, concepts and pictures resulting in the necessity of establishing the reliability and validity of the renormed assessment tool (Carter et al., 2005). Moreover, given that CLD children exhibit diversity in the number of languages and dialects spoken, as well as differences in proficiency in each language knowledge and use, normative data can be difficult to establish and to apply (McLeod et al., 2013).

However, in the absence of available culturally and linguistically appropriate standardised tools for speech and language assessment, an alternative solution for resource-poor countries could be to rely on normative data established on existing tools (Carter et al., 2005; Saenz & Huer, 2003).

As communication is influenced by others aspects of development, speech and language disorders can be challenging to evaluate especially in CLD children (Shipley & McAfee, 2015). No single approach to identify speech and language disorders in CLD children is effective on its own (Saenz & Huer, 2003; Chu & Flores, 2011). When assessing CLD children, the interpretation of speech and language test results should be made in light of ethnographic information (Banerjee & Guiberson, 2012; De Lamo White & Jin, 2011), if not, test bias might occur and lead to over-identification (Artiles, Rueda, Salazar & Higareda, 2005; Guiberson, 2009).

2.7 Summary

This chapter aimed to review studies that focused on determining the prevalence of speech and language disorders in children from developed and developing countries. It was found that speech and language disorders are among the most prevalent childhood disabilities in several countries. A review of the factors influencing the prevalence of speech and language disorders was undertaken to allow for understanding of the variations in the prevalence of speech-sound disorders reported in the literature. In low-income countries, and especially in the African continent, where data is available, there are some useful indicators that suggest that the prevalence of communication disorders could be higher than that reported for developed countries. The challenges faced by the speech-language therapists in the assessment of CLD children from resource-poor countries were discussed and alternative approaches presented. The next chapter presents a detailed description of the methodological procedures used in this study.

CHAPTER THREE: METHODOLOGY

This chapter describes the methods used in the study and gives a rationale for all the methodological approaches. Aims and objectives are described and an overview of the research design is given. The selection of participants, material used, assessment procedures, data collection and data analysis are detailed. The chapter also presents ways in which validity and reliability were managed, and provides details on how ethical considerations pertinent to the study were addressed.

3.1 Aims & objectives

3.1.1 Aim

The aim of this study was to determine the prevalence of speech and language disorders in a representative sample of French-speaking preschool aged children in Yaoundé, Cameroon.

3.1.2 Objectives

The objectives of this study were:

1. To establish norms for the (i) Word Repetition, (ii) Linguistic Production, and (iii) Sentence Understanding subtests of the ELO battery, for French-speaking children aged 3–5 years in Yaoundé population; and to compare the performance of the Cameroonian participants with the results obtained by French and Tahitian participants in other studies using the same assessment test;
2. To determine the prevalence of articulation, expressive and receptive language disorders in the study sample based on speech and language assessments using the new Cameroonian norms of the ELO battery;
3. To determine the prevalence of fluency and voice disorders in the study sample;
4. To determine the overall prevalence of speech disorders, language disorders, and speech and language disorders in the study sample;
5. To determine the co-occurrence of speech and language disorders in the study sample;

6. To determine the association between the prevalence of speech and language disorders and demographic factors, specifically gender, age, number of languages spoken, parents' level of formal education, and medical history.

3.2 Research design

For the present study, a descriptive cross-sectional design was used to determine the prevalence of speech and language disorders in a representative sample of 460 French-speaking preschool aged children in Yaoundé (Babbie, 2011). This design is typically used to identify already existing conditions, and determine the prevalence of a disease or a condition in a defined population (Kaura, 2013). This design was considered appropriate for this study as it allows the researcher to gain information on the prevalence of speech and language disorders in preschool age children in Yaoundé, which can be generalised and used to plan appropriate educational and public health interventions (Babbie, 2011).

3.3 Population/participants

3.3.1 Selection criteria

Eighty per cent of the general population in Cameroon are educated in and speak French (Bilola & Echu, 2008), so the inclusion criteria for selection of the preschools was: public and private francophone mainstream preschools located in Yaoundé. Participants were included in the study if:

- 1) they attended one of the selected francophone preschool situated in Yaoundé;
- 2) they were aged between 36 months and 71 months at the time of data collection;
- 3) they were willing to participate in the study;
- 4) they had parental/guardian consent.

Participants were excluded from the study if they presented with a developmental or health condition that would hinder them from performing the speech and language assessments.

3.3.2 Sample size

Prior to conducting the present study, the sample size required to ensure accurate results was calculated (Antonisamy, Christopher & Samuel, 2010; Poolman, 2013). using the following sample size formula for cluster sampling: $nk = p(1-p)(1.96/d)^2$. Where:

- k is the number of clusters (public and private preschools selected within the city of Yaoundé);
- n is the average sample size within each cluster;
- p is the proportion of speech and language problems being estimated;
- 1.96 is the two-sided value from the normal distribution for a 95% significance level;
- $d = 0.05$ is the degree of accuracy.

Given that there was no prior information available on the prevalence of speech and language disorders in children in Cameroon, the researcher decided to assume possible value for $p = 0.25$. This was based on the maximum prevalence rates reported in the different studies across countries where data is available, which range from 2.3% to 24.6% (Law et al., 2000; McLeod & Harrison, 2009). As recommended in the literature, it was decided to use the highest prevalence rate previously reported to estimate the sample size needed for the study. This was done to ensure a large sample size (Naing, Winn & Rusli, 2006). Typically, larger sample size leads to a greater power and increase the chance of detecting statistical significances (Noordzij et al., 2010; Suresh & Chandrasekhar, 2012). Given these assumptions, the sample size needed if the clusters were totally uncorrelated with each other would have been: $nk = p(1-p)1536.64 = 276.59$.

One major limitation of cluster sampling technique is the possibility of a high degree of intra-cluster homogeneity that may lead to misleading results from statistical analysis (Gorard, 2013). This means that cases within the clusters could be more similar to each other in some respects than they would have been in the general population (Lavrakas, 2008). To prevent this problem, it was anticipated that the clusters could be correlated, and the following formula that included the design effect was applied $nk = (1 + (m - 1)*\text{Rho})*153.66$. This equation was simplified to: $m = nk(1-\text{Rho}) / (k - 276.59 \text{ Rho})$.

The correlation coefficient was set at 0.01 ($\text{Rho} = 0.01$) (Killip, Mahfoud & Pearce, 2004) and the number of clusters (number of public and private preschools selected within the city of

Yaoundé) was set at 20 ($k=20$). Based on these assumptions, the average cluster size (number of participants per preschool) was 16 ($m = 15.88$), and the subsequent minimum sample size needed for the present study was evaluated at $N = 320$. After the recruitment was completed, a sample size of $N = 460$ was achieved, which is higher than the required sample size estimated prior to conducting the study.

3.3.3 Sampling Method

3.3.3.1 Sampling of preschools

In order to draw up a representative sample of preschools in Yaoundé, a multi-stage sampling method known as Probability Proportional to Size (PPS) Cluster Sampling technique was applied (Christensen, Johnson & Turner, 2011). This method ensured that different types of preschools with pupils from different socio-economic backgrounds in Yaoundé were represented (Adler, Clark & Adler, 2011). Given that in Yaoundé, the number of private preschools is almost the double of the number of public preschools (UNESCO, 2011), one public and two private preschools were selected from each of the seven Communes of Yaoundé. A simple random sampling technique generated by Microsoft Excel 2013 was used to select the preschools. They were selected from all registered francophone public and private mainstream preschools located in Yaoundé according to their location, using a list obtained from the Cameroonian Ministry of Basic Education.

3.3.3.2 Sampling of participants

A simple random sampling technique generated by Microsoft Excel 2013 was used to select the participants according to their age from the schools pupil lists, which was provided by the principals of each selected preschool. Given that the minimum sample size needed was $N = 320$ and anticipating a 50% non-response rate as achieved in previous similar studies (Njamnshi et al., 2009; Navti, Ferrari, Tange, Bechtold-Dalla Pozza & Parhofer, 2014), 640 pupils were randomly selected and approached to request consent from their parents/guardians to participate in the study. A total of 460 children with the consent of their parents/guardians participated in the study representing a response rate of 71.8% ($460/640 \times 100 = 71.8\%$).

3.3.4 Description of the participants

The participants in the present study were 460 preschool French-speaking children (236 males and 224 female), aged from 36 months (3 years old) to 71 months (5 years old) who lived in Yaoundé city. The participants were recruited from seven public preschools and 13 private preschools spread across the seven Communes in Yaoundé.

Table 3. Socio-demographic characteristics of participants

Characteristics	Categories	Female (n=224)	Male (n=236)	Overall (n=460)	p-values
Age (Months)	Min	36	36	36	0.338
	Max	71	71	71	
	Mean	55.0	54.22	54.6	
	SD	9.44	9.93	9.69	
Number of years spent in Yaoundé <i>n</i> (%)	< 3 years	39 (17.6)	39 (16.6)	78 (17.1)	0.783
	≥ 3 years	183(82.4)	196 (83.4)	379 (82.9)	
School type <i>n</i> (%)	Private	134 (59.8)	151 (64.0)	285 (61.9)	0.1897
	Public	90 (40.2)	85 (36.0)	175 (38.1)	
Grade <i>n</i> (%)	PS	24 (10.7)	43 (18.2)	67 (14.5)	<0.0001
	MS	79 (35.3)	78 (33.1)	157 (34.2)	
	GS	121 (54.0)	115 (48.7)	236 (51.3)	
Number of languages spoken <i>n</i> (%)	1	134 (60.1)	120 (51.1)	254 (55.5)	0.082
	2	71 (31.8)	82 (34.9)	153 (33.5)	
	3	8 (8.1)	31 (13.2)	49 (10.6)	
	4	0 (0)	2 (0.9)	2 (0.4)	
Fathers Level of Formal Education <i>n</i> (%)	Tertiary (University)	83 (38.8)	100 (42.9)	189 (40.9)	0.141
	Secondary (Technical high school)	53 (24.8)	46 (19.7)	99 (22.1)	
	Secondary (Regular High school)	55 (25.7)	62 (26.6)	117 (26.2)	
	Primary	23 (10.7)	20 (8.6)	43 (9.6)	
	No formal education	0 (0)	5 (2.1)	5 (1.1)	
Mothers Level of Formal Education <i>n</i> (%)	Tertiary (University)	52 (23.5)	55 (23.5)	107 (23.5)	0.069
	Secondary (Technical high school)	38 (17.2)	54 (23.1)	92 (20.2)	
	Secondary (Regular High school)	46 (20.8)	33 (14.1)	79 (14.4)	
	Primary	14 (28.0)	8 (15.7)	22 (21.8)	
	No formal education	0 (0)	4 (1.7)	4 (0.9)	

Note. PS is the first year of preschool, MS is the second year of preschool, and GS is the third year of preschool

There was no significant difference between male and female participants in this study with regard to age, number of years spent in Yaoundé, school type, number of languages spoken and parents' level of education (Table 3). The majority of participants spoke only one home language, which was French, had spent at least three years in Yaoundé and attended a private school (Table 3). Of the parents of the participants, 53.3% reported having completed primary

school, which is comparable to the 55.1% from the general population of Yaoundé as published by the Institut National de la Statistique and ORC Macro (2004).

3.4 Description of the tools/materials

3.4.1 The Biographical Information Sheet

The biographical information sheet of the present study gathered information from the parents on their child's medical history, developmental history, as well as social and linguistic background (Appendix I & J). It also contained some open- and close-ended questions structured as simple as possible (Grimm & Schulz, 2014) and was translated into French in order to be easily understood by the participants' parents using forward- and back-translations (Nixon, Wild & Muehlhausen, 2015). The forward-translation into French was done by the researcher who is a qualified speech-language therapist. She is knowledgeable in the English language but her mother tongue is French. The back-translation was done by an independent translator, whose mother tongue is English (Liamputtong, 2010; Nixon et al., 2015). Discrepancies were discussed and further work was done until a satisfactory version of the documents was achieved (Schenker, Castañeda & Rodriguez-Lainz, 2014).

3.4.2 The 'Evaluation du Langage Oral' (ELO)

The ELO (Khomsy, 2001) was chosen as the speech and language assessment tool to identify articulation, expressive and receptive language disorders in participants in the present study. The ELO battery is a French speech and language test standardised on a total of 970 preschool and school aged children aged from 3 to 10 year olds (Khomsy, 2001). The ELO aims to describe various aspects of oral language functioning of children from 3 to 11 years of age (Khomsy, 2001). The ELO manual provides only limited information on the psychometric properties of the test (Khomsy, 2001). However, in the study by Leclercq, Quémart, Magis and Maillart (2014), that aimed to assess the diagnostic accuracy and construct validity of a sentence repetition task used for the identification of French children with specific language impairment, the level of diagnostic accuracy of the Linguistic production and Sentence Understanding tasks of the ELO was reported high.

The ELO battery comprises six different tasks which are: Receptive Vocabulary, Expressive Vocabulary, Word Repetition, Sentence Understanding, Sentence Completion, and Sentence

Repetition. Among these six tasks, the following three: Word Repetition, Sentence Understanding and Linguistic Production were selected and used to assess articulation, expressive and receptive language respectively. These subtests were selected with the aim of determining the prevalence of articulation, expressive and receptive language disorders in the population of preschool aged French-speaking children in Yaoundé.

ELO battery was chosen to assess the participants in this study because: (1) Three of its tasks assess the articulation, expressive and receptive language which were the objectives of our study; (2) It is an easy to use and convenient speech and language assessment tool, quick to administer as it takes approximately 30 minutes per child to complete all the tasks; (3) ELO battery is a speech and language tool in frequent use among speech-language therapists in western francophone countries such as France, Belgium, Switzerland, and Canada (Gaul Bouchard, Fitzpatrick & Olds, 2009; Guibert & Frossard, 2010), as well as in French-speaking developing countries such as New Caledonia (Nocus, Florin, Guimard & Vernaudon, 2007) or Tahiti where 75% of speech therapists reported using it (Bruyere, 2013); (4) ELO battery has been used extensively in research to assess the speech and language of children in the general population in France (Labat et al., 2014; Leroy, Maillart & Parrisé, 2014; Mellier & Marret, 2011; Morsomme, Minel & Verduyck, 2011) or children with culturally and linguistically diverse backgrounds in different countries including France (Llerena, 2013), Tahiti (Bruyere, 2013), Swiss Romande (Guibert & Frossard, 2010), New Caledonia (Nocus et al., 2007) and Reunion (Mercier & Hamon, 2012). Moreover, ELO battery has been used to assess children with developmental impairment such as intellectual disability (Nader-Grosbois & Thomée, 2007; Nader-Grosbois & Vieillevoye, 2012) or autism (Demouy et al., 2011).

3.4.2.1 Word Repetition

The Word Repetition subtest was used to assess articulation skills (Dulguerov & Remacle, 2009). This subtest contains two different series of 16 words each. The first series dedicated to children from the first year of preschool (PS) to the second year of preschool (MS) comprises 16 words. These words are considered by the authors as ‘easy’ to produce even for young children as it contains only short, familiar and disyllabic words, with few consonants groups ending with an oral vowel (Khomsî, 2001). The second series dedicated to children from the third year of preschool (GS) to the last year of primary school also comprises 16 items. That second series contains longer words with many consonants groups, which are more difficult to produce (Khomsî, 2001). There is no demonstration item for this subtest. Instruction is as

follows: «Now, you are going to repeat exactly what I say. Listen carefully, I won't repeat». Each correct answer is scored as one point, and the maximum score is 16 for each series.

3.4.2.2 Sentence Understanding

The Sentence Understanding subtest was used to assess receptive language skills (Khomsî, 2001). This subtest contains two different series: the first series of 20 sentences is dedicated to children from the first year of preschool (PS) to the second year of preschool (MS); the second series of 21 sentences is dedicated to children from the third year of preschool (GS) to the last year of primary school. The two series assess comprehension strategies and morphosyntactic skills such as: lexical comprehension, picture comprehension, propositional comprehension, narrative comprehension, inferential comprehension, and meta-discursive strategies. This subtest involves selection of one of four pictures in response to a verbal statement by the examiner. The examiner presents to the child each page of a booklet which contains four pictures. The child is asked to select one of the four pictures in response to a verbal statement by the examiner. There are two demonstration items, and instruction is as follows: «Show me the picture that means». Each correct answer is scored as one point, and the maximum score is 20 for the first series and 21 for the second series.

3.4.2.3 Linguistic production

The Linguistic production subtest was used to assess expressive language skills (Khomsî, 2001). This subtest contains only one series of 25 sentences dedicated to children from the first year of preschool (PS) to the third year of preschool (GS). The two series assesses morphosyntactic skills such as noun gender (feminine or masculine), contracted article, negative form, noun and adjective agreement, verb agreement, irregular plural, conjugation and passive form. The examiner presents to the child each page of a booklet which contains two pictures. The examiner comments on the first picture, and the child is asked to complete the examiner's sentence based on what he/she sees on the second picture. There are three demonstration items. One of the demonstration items is as follows «*Here, the boy is running, there the boy... (is not running)*». Each correct answer is scored as one point, and the maximum score is 25.

3.4.3 Criteria to determine fluency and voice disorders

In order to identify fluency and voice disorders, the researcher evaluated the speech and language samples collected from each child during the administration of the ELO test (Karbasi et al., 2011). The voice and fluency assessment required simply a present/absent judgement by the researcher with no further attempt to characterise the dysfluencies or the dysphonic quality of the voice (Carding et al., 2006).

The criteria used for the identification of fluency disorders in the present study were: repetition or prolongation of sounds, syllables and/or words; the presence of speech postures; and the disfluencies occur in more than 10% of the words spoken (Karbasi et al., 2011; Theys et al., 2009). The criteria used for identification of voice disorders in the present study were: consistently hoarse or breathy voice with some periods of voice loss; voice has a nasal quality; and voice is too soft/ loud/ high/low for his/her age or his/her sex (Karbasi et al., 2011).

3.5 Research personnel

The research personnel included the researcher who is a Masters student in Speech-Language Pathology and a qualified speech-language therapist trained in Belgium. Originally from Cameroon, her first language is French; as she has lived and worked as a speech-language therapist in Yaoundé for more than eight years, she was competent to carry out the data collection. Other personnel included a research assistant who has a degree in linguistics. Her role was to assist the researcher in the distribution and collection of completed forms. An additional collaborator was a speech-language therapist who assessed the participants for the interrater reliability test. She is a French-speaking qualified speech-language therapist who has practised in Yaoundé for over 12 years.

3.6 Procedure

Once permission was obtained from the University of Cape Town, Faculty of Health Sciences Human Research Ethics Committee (Ref: 245/2014, Appendix A), and from the Authorities of the Cameroonian Ministry of Basic Education (N° 10/L/MINEDUB/DREBC/DDEB-MF/IAEB, Appendix C), one public and two private preschools were randomly selected from each of the seven Communes of Yaoundé. A letter with information describing the purpose of the study and requesting permission to conduct the research in their preschools was sent to the

principals of seven public and 14 private preschools situated in different communes of Yaoundé (Appendix D & E). Whenever a principal refused to grant permission to conduct the research in his school, another preschool in the same commune was randomly selected and permission was sought. The principals of two private preschools refused to grant permission to conduct the study at their preschools. Permission from principals was granted to conduct the study in 20 preschools (Appendix F).

In order to select participants, the list of preschool pupils was obtained from the principal of each preschool. A number was assigned to each pupil in the preschool and a simple random sampling technique generated by Microsoft Excel 2013 was used to select the participants. In each of the 20 preschools in which permission had been granted by the principal, the parents or guardians of 32 randomly selected children was sent, via the teachers, an information letter explaining the rationale of the study, a consent form and a biographical information sheet translated into French using forward and backward translation as explained earlier, and were invited to complete and return to the school (Appendix G, H, I & J). They were informed through the information letter/consent form that participation of their child in the study was voluntary, that they were free to withdraw from the study at any time without any penalty, that confidentiality would be maintained and that they would receive feedback following the completion of the study. Only children whose parents/legal guardians consented to their participation in the study were enrolled. In order to reduce the non-response rate, a week later a second set of documents was sent to the same parents who did not respond as a reminder.

3.7 Data collection

The data collection was carried out over a period of six months. The recruitment was done between May and June 2014, then stopped during the school holidays and resumed from September 2014 until November 2014. The speech and language assessments were conducted in each preschool in a quiet room provided by the principal with appropriate lighting, desks and chairs. The research assistant accompanied each participant to the assessment room and introduced him/her to the researcher. The researcher and participant were seated on opposite sides of the desk facing each other.

Prior to the assessment, the researcher explained to the participants that they will be doing some activities like repeating some words and sentences, looking at books and pointing at pictures. A comfortable atmosphere was established by asking the child participant some few

general questions like ‘what is your name?’ ‘do you have a favourite toy?’. In all the preschools, a teacher, an assistant teacher, or a school staff were present during the assessments.

As the earliest age at which assent is recommended is set at seven years (Human Research Ethics Committee, Faculty of Health Sciences, University of Cape Town, 2013), participants in this research were too young to give assent. However, during the data collection process, the researcher and the research assistant monitored the participants for behaviour indicating that they no longer wished to take part in the study such as refusing to cooperate or crying. When a participant demonstrated such behaviour, the procedures were discontinued and depending on the situation, the assessment was resumed at another time or cancelled.

Two children with parental consent were excluded from the study and their results were not used. One of them was excluded because he did not meet the inclusion criteria as he could not speak, follow the instructions and was not able to interact efficiently with anyone in the school including his teacher. The parents of that child were provided with a referral letter, indicating the nature of the problem and the health professionals to consult (Appendix M & N). For the second child, the assessment session was cancelled because each time we tried to interact with him, he became upset and cried, even after the researcher allowed him to take a break.

The subtests were presented in the same order for all participants: the first subtest to be presented was the receptive language test, as it was judged by the researcher to be less intrusive as it did not require participants to speak, but only to point at pictures. The second subtest to be presented was the articulation test and the last subtest to be presented to the participants was the expressive language test, as it was judged by the researcher as quite intrusive as it required participants to speak and express themselves in front of a stranger.

All the participants were individually assessed by the researcher who is a qualified speech-language therapist. Each assessment was approximately 30 minutes long and consisted of two parts: the three subtests of the ELO battery to assess articulation, expressive and receptive language and the assessment of fluency and voice. As recommended in the ELO battery manual (Khomsi, 2001), throughout the process of assessment, the researcher maintained a neutral tone, to avoid inadvertently influencing the participant’s response. Positive reinforcements such as smiling, and verbal reinforcements like ‘say something, or try’ were used throughout the sessions to encourage the participants. Participants’ responses were recorded on the test recording sheet using the International Phonetic Alphabet (IPA) transcription convention and

marked onsite according to the standard assessment procedures described in the ELO test manual (AppendixK) (Khoms, 2001). Once the assessment session was over, the participant was thanked by the researcher for taking part in the study. Every attempt was made to ensure that the participants did not miss any important school activities and was able to take breaks when fatigued (Hegde & Pomaville, 2008).

3.8 Pilot study and assessment adaptation

The pilot study was conducted before beginning the data collection for the main study, just after the ethical approval from the University of Cape Town Faculty of Health Sciences Human Research Ethics Committee and the authorisation to conduct the study was granted by the Ministry of Basic Education in Cameroon. Data was collected from 10 children that met the inclusion criteria (Maxwell & Satake, 2006). The pilot study enabled the researcher to become more familiar with administration, interpretation, transcription and marking of the selected subtests of the ELO battery and with the criteria to determine fluency and voice disorders (Daniel & Sam, 2011). The purpose of the pilot test was to assess whether the words, sentences and illustrations of the ELO battery were appropriate and recognisable to the preschool age Cameroonian children. It allowed for providing clarification of the design, to identify some assessments issues and to make adjustments to the procedures employed (Daniel & Sam, 2011). In the light of the pilot test, some test adaptation were made.

The first assessment adaptation that have been done in the present study was to categorise participants from the present study into age groups instead of school grades as indicated in the ELO test manual. This was done because, if in France, there is no substantial variation in the children's age in one grade (Fleury, 2011), as the legal school starting age is respected. In Cameroon, the situation is different, as even though the school levels are similar to the French, the population of children attending a specific grade can be different in terms of age as this is not subject to stringent regulations. Indeed, some pupils start school later than expected, others at a younger age than guidelines recommend and some of the children skip a whole grade (Ruffieux et al., 2009; Tosam, 2015; UNICEF, 2002). For these reasons, the participants in the present study were categorised into three groups according to age namely, 36-47 months, 48-59 months and 60-71 months (Table 4). These age groups correspond approximately with the ELO battery participants' test construction mean ages in PS, MS and GS as indicated in the Test Manuel (Khoms, 2001).

Table 4. Age characteristics of Cameroonian and ELO participants in France

	Group 1		Group 2		Group 3	
	Cameroonian (3 year olds)	French (PS)	Cameroonian (4 year olds)	French (MS)	Cameroonian (5 year olds)	French (GS)
<i>N</i>	118	68	188	191	154	158
Mean (months)	41.25	39	54.55	51	64.90	63
SD (months)	3.77	3	3.22	3	3.73	3

The second assessment adaptation that was done in the present study was the modification of the picture of the third item of the Linguistic Production subtest. During the pilot study, some of the participants experienced difficulties in recognising the picture of the third item of the Linguistic Production subtest: they identified the image of a cat as a mouse. In order to verify the cultural appropriateness of the ELO battery, a discussion panel was organised with one French-speaking teacher from a public preschool and one French-speaking teacher from a private preschool situated in Yaoundé. The pictures, words and sentences of the three selected ELO battery subtests were presented to these teachers and they were required to identify any item that might be culturally challenging for the preschool aged children from Yaoundé. They also identified the third item of the Linguistic Production subtest as possibly challenging for the preschool pupils and recommended modification of that image by replacing the cat on that picture by a bigger cat standing on four legs instead of sitting.

In order to ensure that the wrong answer for that question was not due to a misidentification of the picture stimuli, it was decided to provide the participants in the main study who failed that question with the modified picture (Cruz-Ferreira, 2010) (Appendix L). This was done in order to avoid the wrong answers on that question being due to a misinterpretation of the picture stimuli and to give to the participants who failed that item a chance to get the mark if they gave the correct answer with the aid of that additional picture stimuli. Since that specific item was intended to assess the contracted article and not the vocabulary, the alternative picture stimuli did not modify its aim nor the complexity.

3.9 Validity of the tools

Validity was being addressed explicitly as an objective of this study by renorming the subtests of ELO battery on the population of preschool children in Yaoundé and using the revised norms as a basis for determining whether participants had speech and/or language disorders (Banks, 2012). This was done in order to increase the validity and lower potential linguistic and cultural

test bias that might arise when using a speech and/or language test standardised in a specific population to another population who is culturally and linguistically different (Goodwin, 2008; Hodges & Videto, 2011).

Face validity that ensures that a test truly measures what it claims to measure and content validity that requires that the test's contents are representative of the skills being assessed was addressed in this study (Babbie, 2011; Shipley & McAfee, 2015). Indeed, all the instruments used in this study were reviewed by the researcher's peers, including the speech-language therapist currently practicing in Yaoundé and two lecturers from the University of Cape Town, Division of Communication Sciences & Disorders as they are experienced in the field of speech-language pathology (Fertman & Allensworth, 2010). Moreover, the selection of the ELO battery subtests and the criteria to determine fluency and voice disorders were supported by an in-depth literature review (Bruyere, 2013; Demouy et al., 2011; Duff et al., 2004; Guibert & Frossard, 2010; Karbasi et al., 2011; Llerena, 2013; Mercier & Hamon, 2012; McKinnon, McLeod & Reilly, 2007; Mumby et al., 2007; Tappen, 2011; Soleimani et al., 2011) in order to ensure that they were able to collect data on the speech and language domains intended to be assessed in this study.

Construct validity that refers to the ability of a test to measure the concept that it claims, or purports to be measuring, was addressed in the present study (Goodwin, 2008). The new norms of ELO battery, demonstrated in the study population, one of the most known theoretical construct based on language development studies, which is that children's language skills improve with age (Babbie, 2011; Shipley & McAfee, 2015).

In addition to the different type of validity that was address in the present study, the followings measures were adopted in order to lower cultural bias that could have arisen during the assessments. Firstly, it was ensured that the speech and language test used had a broad cross-cultural application, indeed, the ELO battery have been renormed and used in different populations (Bruyere, 2013; Demouy et al., 2011; Guibert & Frossard, 2010; Llerena, 2013; Mercier & Hamon, 2012). Secondly, the researcher who is native of Cameroon was the only one to assess the participants. This was done in order to reduce 'the distance' between the examiner and the examinee, and to lower testing bias (Ardila, 2005). Thirdly, in the light of the pilot test, one item of the Linguistic Production subtests was modified by providing the participants who failed that question with an additional picture judged to be more contextually appropriate for the Cameroonian children. This was done in order to avoid the wrong answers

on that question being due to a misinterpretation of the picture stimuli and to give to the participants who failed that item a chance to get the mark if they gave the correct answer with the aid of that additional picture stimuli.

3.10 Reliability of the tools

Reliability of an assessment instrument mirrors its capacity to produce stable and consistent results (Stolarova, Wolf, Rinker & Brielmann, 2014). The stability and the consistency of the three subtests of the ELO battery and the criteria to identify fluency and voice disorders were assessed specifically by determining test-retest reliability and the interrater reliability using percentage agreement method (Tappen, 2011). This method was judged suitable for this study as the ratings values were binary, the number of raters were only two and the sample used was relatively small (McHugh, 2012; Tappen, 2011).

The percentage agreement for each of the three subtests of the ELO was determined using a pass/fail classification based on the cut-off point of 2 SD deviation below the mean applied on the participant's scores (Möltner, Tımbıl & Jünger, 2015; Puhan & Gall, 2012). The presence or absence of fluency and voice disorders was determined based on a pass/fail classification based on clinical judgement (Lidz, 2002). The percentage agreement for each test was obtained by adding up the number of times both judges agreed on case status and dividing that number by the total number of cases rated (McHugh, 2012).

3.10.1 Test-retest reliability

In order to satisfy test-retest reliability, the researcher randomly selected ten participants that she had assessed previously and assessed them for a second time (Tommerdahl & Kilpatrick, 2013). The blinding of the researcher to the original data was addressed by performing the re-administration following a one-week interval and by using new recording sheets (Case-Smith & O'Brien, 2010).

Table 5. Percent agreement results for test-retest reliability

Speech and language area	Time one No. children identified (%)	Time two No. children identified (%)	% agreement between time one and time two
Articulation	5 (50)	4 (40)	90.0
Expressive language	1 (10)	1 (10)	100
Receptive language	0 (0)	0 (0)	100

fluency	0 (0)	0 (0)	100
voice	2 (20)	1 (10)	90.0

The percentage agreement results ranging from 90% to 100% indicate the good test-retest reliability of all the speech and language tests (Loizou, 2013) (Table 5). However, these results should be taken with caution, given the limited sample size of participants.

3.10.2 Interrater reliability

In order to satisfy interrater reliability, a second researcher (a qualified speech-language therapist who is currently practicing in Yaoundé) independently assessed five participants randomly selected from the list of participants assessed by the researcher (Tommerdahl & Kilpatrick, 2013). The assessment and scoring were performed independently and blindly (Blaney & Millon, 2008). The second rater assessed the participants at a different time in the absence of the first rater (the researcher).

Table 6. Percent agreement results for interrater reliability

Speech and language area	Rater one No. children identified (%)	Rater two No. children identified (%)	% agreement between the two raters
Articulation	2 (40)	1 (20)	80.0
Expressive language	1 (20)	1 (20)	100
Receptive language	0 (0)	0 (0)	100
fluency	0 (0)	0 (0)	100
voice	1 (20)	0 (0)	80.0

The percentage agreement results, ranging from 80% to 100% indicate the good interrater reliability of all the speech and language tests (Loizou, 2013) (Table 6). However, these results have to be taken with caution, given the limited sample size of participants.

3.11 Data Analysis

Participants from this study were categorised into three groups according to age, namely, 36-47 months (3 year olds); 48-59 months (4 year olds); and 60-71 months (5 year olds). Data was coded, tabulated and analysed using the Statistical Package for the Social Sciences (SPSS), Version 20.0. The characteristics of the sample were summarised using means and standard deviations for quantitative variables and percentages for categorical variables. Chi-square test was used to compare categorical variables (Tullis & Albert, 2008), *t*-test was used to compare

populations mean (Ramachandran & Tsokos, 2009), and *p*-values were considered statistically significant if <0.05 .

In order to provide norms for the population of French-speaking preschool aged children from Yaoundé on the Word Repetition, Sentence Understanding, and Linguistic Production subtests of the ELO battery, participants' raw scores for each of the three age groups were standardised and converted into percentiles rank as in the ELO battery manual (Giudici, Ingrassia & Vichi, 2013; Hegde & Pomaville, 2008). In order to identify articulation, expressive language and receptive language disorders in the study sample, participant's raw scores on the ELO battery subtest were standardised and a predetermined cut-off was applied (McLeod & Harrison, 2009). Participants who performed 2 SD below the mean were reported as having articulation, expressive or receptive language disorders (Johannisson et al., 2009; McLeod & Harrison, 2009; Rvachew et al., 2013). The cut-off point of 2 SD below the mean was chosen as it is the most frequently recommended in the literature as a criterion to determine speech or language disorders in children when using a standardised test (Bishop & McDonald, 2009; Johannisson et al., 2009; Kalnak et al., 2014; McLeod & Harrison, 2009; Paul & Norbury, 2012; Rvachew et al., 2013; Wynn et al., 2013).

In addition, a cut-off of 1.25 SD below the mean was used to identify children eligible for speech and language services (Eisenberg & Guo, 2013; Cheng et al., 2009; McLeod & Harrison, 2009; Reilly et al., 2014; Stein-Rubin & Fabus, 2011). The identification of fluency and voice disorders in participants was based on clinical judgement (Broomfield & Dodd, 2004; Law et al., 2000).

The prevalence was calculated using the number of participants who demonstrated speech and/or language disorders in the sample as numerator and the total number of participants as denominator. Prevalence was calculated with 95% confidence intervals (WHO, 2011). In determining the overall prevalence of speech disorders, language disorders and speech and language disorders, cases of co-occurrence of multiple speech and /or language conditions in a participant only counted once (Lancioni & Singh, 2014; Mathers, Fat & Boerma, 2008). Chi-square statistics test was used to determine the co-occurrence of speech and language disorders and the association between the prevalence of articulation, expressive language, receptive language, fluency and voice disorders with biographical variables (Cao, Hripcsak & Markatou, 2007). The stability and the consistency of the three subtests of the ELO battery and the criteria

to identify fluency and voice disorders were assessed specifically by determining test-retest reliability and the interrater reliability using percentage agreement method (Tappen, 2011).

3.12 Ethical considerations

This study adheres with the ethical principles outlined in the Declaration of Helsinki (World Medical Association Declaration of Helsinki et al., 2013). The following ethical principles were applied in this research.

3.12.1 Autonomy

Parents/guardians were informed that their child's participation in the study was voluntary, that they can refuse to allow him/her to participate and can withdraw from the study at any time without any consequences. They were required to provide signed informed consent. As the earliest age at which assent is recommended is seven years (Human Research Ethics Committee, Faculty of Health Sciences, University of Cape Town, 2013), participants in this research were too young to give assent. However, during the data collection process, the researcher and the research assistant monitored the participants for behaviour indicating that they no longer wish to take part in the study such as refusing to cooperate or crying. When a participant demonstrates such behaviour, the procedures were discontinued and depending on the situation, the testing was resumed at another time or cancelled.

3.12.2 Confidentiality

Every effort to preserve the principle of individual and institutional confidentiality was made by the researcher including the following: a reference number was assigned to each participant and all data concerning him/her carried only this reference number; all the participants' names and contact details were kept in a confidential file which is stored in a locked filing cabinet, accessible only to the researcher and research supervisor (Babbie, 2011). No identifying information has been used in this report. All identifying materials will be destroyed when no longer necessary for research.

3.12.3 Beneficence

There were no direct benefits associated with participation in this project. Participants did not receive any payment for taking part in this study. However, all the participants identified as having a speech, language or developmental problems were referred to the relevant health professionals. A brochure that contains some speech and language developmental milestones, warning signs for speech and language disorders and strategies to develop children's speech and language skills was sent to the parents of all participants who took part in this study (Appendix O & P) (CASLPA, 2013). The parents of each participant identified as having a speech and/or language problem were provided with a referral letter, indicating the nature of the problem and the health professionals to consult, the letters were sent through the school (Appendix M & N). In addition, the participants' parents will have access to the study results through the principal of their child's preschool.

3.12.4 Non-maleficence

There were no risks associated with participation in this study. In order to respect the principle of non-maleficence, all the assessments were carried out in the preschool premises and a teacher, an assistant teacher or a member of the school's staff was always present. Every attempt was made to ensure that participants was able to take breaks when fatigued and did not miss any important school activities.

3.12.5 Justice

In this study, all participants were treated equally and fairly during all stages of the research. Participants in this study were selected using a random sampling technique and data was integrated and treated with equal respect. The principle of distributive justice which mandates a fair distribution of the benefits and burdens of research to the study community was addressed; as even though the participants in this study are not likely to benefit directly from this study, the research results will be used to benefit all the children from francophone private and public preschools in Yaoundé (Mertens & Ginsberg, 2009).

3.13 Summary

This chapter has detailed the methods employed in the study in order to ensure that other researchers would be able to replicate the process. The aims and objectives were presented and an overview of the research design was detailed. The sample selection, sample size and sampling method were discussed. The description of the instruments and the procedures used to collect the data were detailed. The statistical procedures applied to analyse the data were explained. A cross-sectional approach was used to determine the prevalence of speech and language disorders in a representative sample of 460 preschool aged children in Yaoundé (Cameroon). Given the lack of validated speech and language assessment designed for the Cameroonian children, an important component of the research was the renorming and validation of the assessment material. The chapter also provided ways in which validity and reliability were addressed, and concluded with the ethical considerations taken into account while the study was conducted. The next chapter will present the results of the study.

CHAPTER FOUR: RESULTS

The aim of this descriptive study was to determine the prevalence of speech and language disorders in a representative sample of preschool French-speaking children aged 36-47 months, 48-59 months and 60-71 months (referred to as 3, 4 and 5 year olds, respectively) in Yaoundé, Cameroon. There is no validated speech and language test available for 3 to 5-year-old French-speaking children from Yaoundé. In order to ensure the least bias in determining the prevalence of speech and language disorders in the present study, speech and language assessments were performed using three subtests of a French speech and language test: ELO battery. This speech and language assessment test was renormed on a representative sample of French-speaking preschool aged children in Yaoundé for that purpose. This chapter describes the findings of the study. Data is presented in line with the objectives of the study. The characteristics of the sample are summarised using means and standard deviations for quantitative variables and percentages for categorical variables.

4.1 Participants' performance on the Word Repetition, Linguistic Production and Sentence Understanding subtests of the ELO battery

Comparison was not possible between the 4 and 5-year-old groups on the Word Repetition and Sentence Understanding subtests due to the presence of stop levels included in the ELO test that required the 5-year-old participants to perform different sections of these two subtests. A comparison of mean scores between the 3 and 4-year-old groups was done. The results presented in Table 7 indicate that the difference between the two group mean scores was statistically significant on all the subtests. The performance of the 4-year-old group was higher than that of the 3-year-old group.

For the Linguistic Production subtest, for which comparison between the 4 and 5-year-old groups was possible, the results showed no significant difference between these groups. However, the 5-year-old group's mean score was higher than that of the 4-year-old one (Table 7).

Table 7. Comparison of the participants' performances on the ELO subtests according to age

Age groups		ELO subtests											
		Word Repetition				Linguistic Production				Sentence Understanding			
		Raw scores (%)	<i>t</i>	<i>df</i>	<i>p-values</i>	Raw scores (%)	<i>t</i>	<i>df</i>	<i>p-values</i>	Raw scores (%)	<i>t</i>	<i>df</i>	<i>p-values</i>
3 year olds <i>(n = 118)</i>	Mean	9.6 (60)				2.3 (9.5)				5.7 (28.5)			
	SD	2.5 (15.6)	5.93	304	<0 .0001	1.7 (6.9)	8.20	304	<0 .0001	2.4 (12.0)	2.45	304	<0 .0001
4 year olds <i>(n = 188)</i>	Mean	11.3 (70.6)				4.9 (19.8)				9.7 (48.7)			
	SD	2.4 (15)				3.1 (12.56)				2.9 (14.8)			
5 year olds <i>(n= 154)</i>	Mean	20.61 (64.4)	*	*	*	5.0 (20.2)	2.25	340	0.7966	10.3 (49.0)	*	*	*
	SD	9.95 (31.0)				2.4 (9.8)				2.4 (11.4)			

Note. *p-values* represent a comparison of mean scores between the 3 and the 4 year old groups and between the 4 and the 5 year old groups.

* Comparison was not possible between the 4 and 5-year-old groups on the Word Repetition and Sentence Understanding subtests due to the presence of stop levels included in the ELO test that required the 5-year-old participants to perform different sections of these two subtests

4.2 Standardisation of the participants' scores on the ELO subtests

In order to standardise the participants' performances on the three ELO subtests, the raw scores for the 3, 4 and 5-year-old groups were converted into z-scores using SPSS® statistical software, version 20. The distribution of the z-scores for each age group and each ELO subtest are illustrated in Figure 2 (Crawford, 2004; Dorfman & Hersen, 2013; Singh, 2007). The continuous variables were inspected to determine if the distributions of the participants' scores were consistent or not with a Gaussian distribution (Diepeveen, Kroon, Dusseldorp & Snik, 2013). A visual inspection was carried out and the distributions of variables were found to be symmetric about the means. The arithmetic means, modes and medians had almost the same values for each age and for the three subtests (Ghasemi & Zahediasl, 2012; Motulsky, 2013) (Figure 2). In addition, a normality test was performed to supplement the graphical inspection using the D'Agostino-Pearson omnibus test (Ghasemi & Zahediasl, 2012; Motulsky, 2013). The result reported in Table 8 indicate that all the distributions were consistent with a Gaussian distribution except for the 3 and 4-year-old groups on the Word Repetition subtest and the 3-year-old group on the Linguistic Production subtest.

Usually, non-parametric procedures are most recommended when the data is not normally distributed, as these do not assume normal distribution. However, the parametric t-test has been shown to be robust enough to normality deviations, especially when the sample size is large enough ($n > 30$) (Aitken, Broadhurst & Hladky, 2010; De Winter & Cahusac, 2014). For that reason, in the present study, parametric t-tests were appropriate to test the mean values among all the groups. Non-parametric chi-square tests were appropriate to compare categorical data among all the groups (Tullis & Albert, 2008).

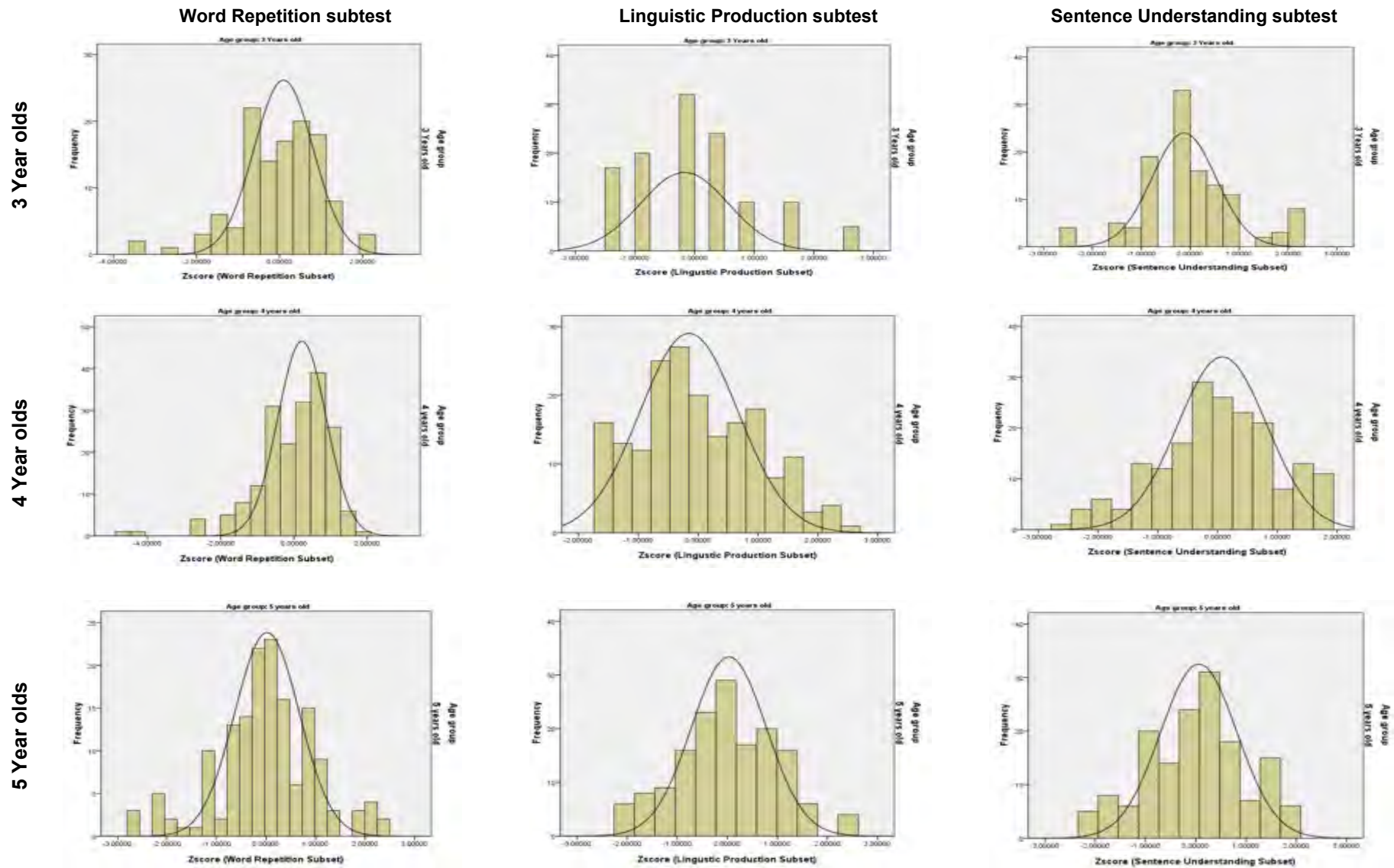


Figure 2. Distributions of participants' scores on the ELO subtests

Table 8. D’Agostino-Pearson omnibus *p*-values to assess the normality of the distributions

Age groups	ELO subtests		
	Word Repetition	Linguistic Production	Sentence Understanding
3 Year olds	= 0.002	= 0.016	= 0.206
4 Year olds	< 0.001	= 0.059	= 0.223
5 Year olds	= 0.123	= 0.734	= 0.336

Note. D’Agostino-Pearson omnibus test results equal or greater than 0.05 indicate that the distribution is consistent with a Gaussian distribution

4.3 ELO norms for the population of French-speaking preschool aged children in Yaoundé

Participants’ raw scores for each age group were converted into percentile ranks, as in the ELO manual (Giudici et al., 2013). This was done to provide norms for the population of French-speaking preschool aged children from Yaoundé on the Word Repetition, Sentence Understanding and Linguistic Production subtests of the ELO battery. These norms are reported in Table 9.

Table 9. Cameroonian norms in percentile on the ELO battery

Age groups	Percentiles	ELO Subtests raw scores associated with percentiles		
		Word Repetition	Linguistic Production	Sentence Understanding
3 year olds	10 th	6	0	3
	25 th	8	1	4
	50 th	10	2	5
	75 th	11	3	6
	90 th	12	5	9
4 year olds	10 th	8	1	6
	25 th	10	3	8
	50 th	12	5	10
	75 th	13	7	12
	90 th	14	9	14
5 year olds	10 th	16	2	7
	25 th	18	3	8
	50 th	21	5	11
	75 th	23	7	12
	90 th	25	9	14

Note. The stop levels that required 5 year olds participants to perform different sections of the subtests are represented by thicker lines

4.4 Comparison of Cameroonian results with French and Tahitian participants on the ELO battery

In order to assess the need to renorm the ELO battery, the ages and scores of the Cameroonian participants was compare with that of those in France who had formed the normative sample for the ELO battery.

4.4.1 Ages comparison between the Cameroon and French participants from the ELO battery sample

Cameroonian participants' mean age were compared with those of the children in France who had formed the normative sample for the ELO battery. For the reasons explained in the methodology section, participants in the present study were categorised into the three age groups as follows: 3 year olds, 4 year olds and 5 year olds, rather than into three different preschool grades (i.e. PS, MS, and GS as for the participants in France). These three age groups of the Cameroonian participants approximated the mean age of the French ELO battery participants in the three preschool grades, as indicated in the Test Manual (Khomsni, 2001). The differences in the mean age between the two populations was statistically significant and ranged from 1.9 to 3.5 months, with Cameroonian participants being older in the three groups (Table 10). An age comparison could not be done between the participants of the present study and those in the study conducted in Tahiti as their mean age per group was not available (Bruyere, 2013).

Table 10. Age comparison between the Cameroonian participants and the ELO test construction participants in France

	Group 1					Group 2					Group 3				
	French (PS)	Cameroonian (3 year olds)	Descriptive statistics			French (MS)	Cameroonian (4 year olds)	Descriptive statistics			French (GS)	Cameroonian (5 year olds)	Descriptive statistics		
			<i>t</i>	<i>df</i>	<i>p-values</i>			<i>t</i>	<i>df</i>	<i>p-values</i>			<i>t</i>	<i>df</i>	<i>p-values</i>
<i>N</i>	68	118	4.21	184	< 0.0001	191	188	11.10	377	< 0.0001	158	154	4.96	310	< 0.0001
Mean (months)	39	41.25				51	54.55				63	64.90			
SD (months)	3	3.77				3	3.22				3	3.73			

4.4.2 Comparison of mean scores of the Cameroonian participants with those obtained by French and Tahitian children in other studies using the ELO battery

A comparison of mean scores of the participants in the present study with those in France who had formed the normative sample for the ELO battery was done. The results indicated that the difference between the two populations' mean scores was statistically significant on all the subtests and across the three age groups; with the performance of the French participants being higher than the Cameroonian ones (Table 11).

In addition, a comparison of mean scores of the Cameroonian participants with those in the Tahitian study using the ELO battery was undertaken (Bruyere, 2013). The results were mixed and indicated that there was no significant difference between the two populations' mean scores on the Word Repetition subtest across the three age groups (Table 11). However, for the Sentence Understanding subtest, the difference between the two populations' mean scores was statistically significant in the three age groups; the performance of the Tahitian participants was higher than the Cameroonian ones (Table 11). For the Linguistic Production subtest, the difference between the two populations' mean scores was statistically significant in the 3 and 4-year-old groups; the performance of the Cameroonian participants was higher than the Tahitians ones. However, there was no significant difference between the two populations' mean scores in the 5 year old group (Table 11).

Table 11. Comparison of Cameroonian, French, and Tahitian mean scores on the ELO subtests

Age	Settings	N	Word Repetition subtest				Linguistic Production subtest				Sentence Understanding subtest			
			Mean ± SD	t	df	p-values	Mean ± SD	t	df	p-values	Means ± SD	t	df	p-values
3 year olds	Cameroon	118	9.6 ± 2.5	2.30	184	0.0221	2.3 ± 1.7	6.85	184	< 0.0001	5.7 ± 2.4	18.23	184	< 0.0001
	France	68	10.7 ± 4.0				4.7 ± 2.9				12.9 ± 2.9			
	Cameroon	118	9.6 ± 2.5	1.55	159	0.1219	2.3 ± 1.7	4.25	159	< 0.0001	5.7 ± 2.4	10.35	159	< 0.0001
	Tahiti	43	8.9 ± 2.6				1.1 ± 1.6				10.5 ± 3.1			
4 year olds	Cameroon	188	11.3 ± 2.4	8.94	377	< 0.0001	4.9 ± 3.1	8.30	377	< 0.0001	9.7 ± 2.9	21.92	377	< 0.0001
	France	191	13.6 ± 2.6				7.9 ± 3.7				15.9 ± 2.6			
	Cameroon	188	11.3 ± 2.4	0.91	225	0.3588	4.9 ± 3.1	2.33	225	0.0202	9.7 ± 2.9	6.35	225	< 0.0001
	Tahiti	39	11.7 ± 2.8				3.7 ± 2.8				13.0 ± 3.2			
5 year olds	Cameroon	154	20.6 ± 3.9	10.29	310	< 0.0001	5.0 ± 2.4	17.1	310	< 0.0001	10.3 ± 2.4	21.87	310	< 0.0001
	France	158	26.1 ± 5.4				10.5 ± 3.1				7			
	Cameroon	154	20.6 ± 3.9	0.91	196	0.3639	5.0 ± 2.4	1.46	196	0.1434	10.3 ± 2.4	4.53	196	< 0.0001
	Tahiti	44	21.2 ± 3.7				4.4 ± 3.0				12.4 ± 3.6			

4.5 The prevalence of articulation, expressive language, receptive language, fluency and voice disorders among French-speaking children from Yaoundé (Cameroon)

In order to identify articulation, expressive language and receptive language disorders in the study sample, participant's raw scores on the ELO battery subtest were standardized and a predetermined cut-off was applied (McLeod & Harrison, 2009). Participants who performed 2 SD below the mean were reported as having articulation, expressive language and/or receptive language disorders (Johannisson et al., 2009; McLeod & Harrison, 2009; Rvachew et al., 2013). A predetermined cut-off of 1.25 SD below the mean was used to identify participants eligible for speech and language services (Eisenberg & Guo, 2013; Cheng et al., 2009; McLeod & Harrison, 2009; Reilly et al., 2014; Stein-Rubin & Fabus, 2011). The identification of fluency and voice disorders in participants was based on clinical judgement (Broomfield & Dodd, 2004; Law et al., 2000). Prevalence was calculated with 95% confidence intervals (WHO, 2011). Differences were considered significant at $p < 0.05$.

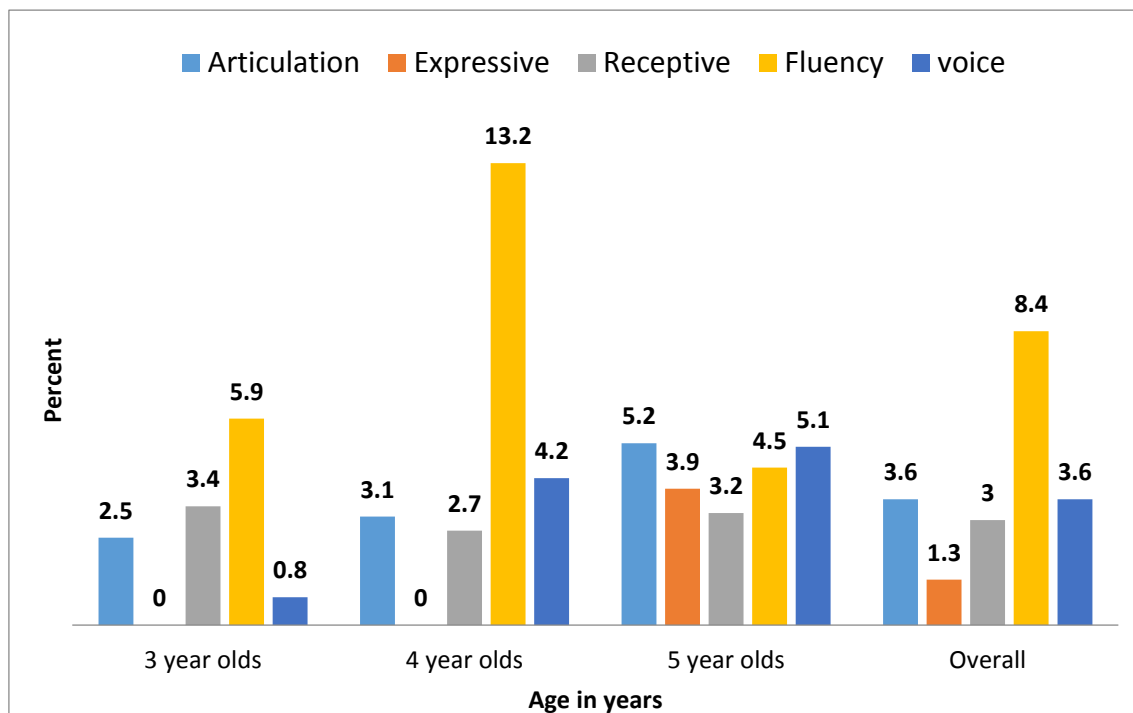


Figure 3. The prevalence of articulation, expressive language, receptive language, fluency and voice disorders

The overall prevalence of disorders using the - 2 SD cut-off criterion was: articulation 3.6%, expressive language 1.3%, receptive language 3%, fluency 8.4% and voice 3.6% (Figure 3).

Comparison of prevalence rates across the three age groups indicated no significant difference in the prevalence of articulation, receptive language and voice disorders (Table 12). However, there was a significant difference in the prevalence of expressive language disorders and fluency disorders between the three age groups. Post-hoc analysis indicated that the prevalence of expressive language disorders was higher in the 5-year-old group compared with the 3- and 4-year-old groups: $\chi^2(1, N = 272) = 4.70, p = 0.0301$; and $\chi^2(1, N = 342) = 7.45, p = 0.0063$, respectively. The prevalence of fluency disorders was higher in the 4-year-old group when compared to the 3- and 5-year-old groups: $\chi^2(1, N = 306) = 4.20, p = 0.0404$; $\chi^2(1, N = 342) = 7.64, p = 0.0056$, respectively.

Table 12. The prevalence of articulation, expressive and receptive language, fluency and voice disorders according to participants' age

Area of difficulty	% Prevalence [95% CI]				χ^2	df	p-values
	3 year olds n = 118	4 year olds n = 188	5 year olds n = 154	Overall N = 460			
Articulation	2.5[- 0.3-5.3]	3.1[0.6-5.5]	5.2[1.6-8.7]	3.6[1.9-5.3]	1.54	2	0.4611
Expressive language	0[0-0]	0[0-0]	3.9[0.6-6.9]	1.3[0.2-2.3]	12.08	2	0.0023
Receptive Language	3.4[0.1-6.6]	2.7[0.3-5.0]	3.2[0.4-5.9]	3.0[1.4-4.5]	0.16	2	0.9215
Fluency	5.9[1.6-10.1]	13.2[8.3-18.0]	4.5[1.2-7.7]	8.4[5.8-10.9]	9.68	2	0.0078
Voice	0.8[-0.8-2.4]	4.2[1.3-7.9]	5.1[1.6-8.5]	3.6[1.9-5.3]	3.82	2	0.1475

Note. P-values comparing the prevalence among the three age groups.

A comparison of prevalence according to participants' gender indicated that there were no gender-related differences in the prevalence of articulation, receptive language and fluency disorders (Table 13). However, there was a significant difference in the prevalence of expressive language disorders between the male group and the female group with the female group rates being higher (Table 13). There was a significant difference in the prevalence of voice disorders between the male and female group with the male group rates being higher (Table 13).

Table 13. The prevalence of articulation, expressive and receptive language, fluency and voice disorders according to participants' gender

Area of difficulty	% Prevalence [95% CI]		χ^2	df	p-values
	Males n = 236	Females n = 224			
Articulation	3.8 [1.3-6.2]	3.5 [1.0-5.9]	0.01	1	0.8903
Expressive language	0 [0-0]	2.6 [0.5-4.6]	6.40	1	0.0113
Receptive Language	2.9 [0.7-5.0]	3.1 [0.8-5.3]	0.01	1	0.9203
Fluency	9.3 [5.5-3.0]	7.5 [4.0-10.9]	0.44	1	0.5047
Voice	5.5 [2.5-8.4]	1.7 [0.0-3.3]	4.47	1	0.0343

The difference between the prevalence of fluency disorders and the rates of articulation, expressive language, receptive language and voice disorders was statistically significant. The prevalence of fluency disorders was higher than the prevalence of articulation, expressive language, receptive language and voice disorders: $\chi^2(1, N = 920) = 9.20, p = 0.0024$; $\chi^2(1, N = 920) = 25.44, p < 0.0001$; $\chi^2(1, N = 920) = 12.51, p = 0.0004$; and $\chi^2(1, N = 920) = 9.20, p = 0.0024$; respectively.

The proportion of participant eligible for services using the - 1.25 SD cut-off criterion was: 9.1% for articulation problems, 13.0% for expressive language problems and 12.2% for receptive language problems (Table 14).

Table 14. The proportion of participants eligible for services for articulation, expressive and receptive language problems

Area of difficulty	% Prevalence [95% CI]			
	3 year olds n =118	4 year olds n =188	5 year olds n = 154	Overall N = 460
Articulation	10.1 [4.6-15.5]	10.1 [5.7-14.4]	7.8 [3.5-12.0]	9.3 [6.6-11.9]
Expressive language	14.4 [8.0-20.7]	15.4 [10.2-20.5]	9.1 [4.5-13.6]	13.0 [9.9-16.0]
Receptive language	7.6 [2.8-12.3]	14.9 [9.8-19.9]	12.3 [7.1-17.4]	12.2 [9.2-15.1]

4.6 Proportion of participants identified as having speech and language disorders if the French ELO norms were used

The French ELO norms were applied to the population of French-speaking children in Yaoundé to determine the proportion of that group that would have been identified as having speech and

language problems if the French ELO norms were used. The clinical cut-off of the French ELO norms (which is below the 10th percentile) (Khomsi, 2001), and the Cameroonian norms at 1.25 SD were applied to the participants in this study. The findings indicate a significant difference between the proportion of Cameroonian participants identified as having expressive and receptive language disorders when the French norms were used, as compared to when the Cameroonian norms established in this study were applied (Table 15). The prevalence of expressive and receptive language disorders was higher when the French ELO norms were used. Moreover, the proportion of Cameroonian participants identified as having articulation disorders using the French ELO norms was also higher compared to when the Cameroonian norms were applied, even though there was no significant difference between the two proportions (Table 15).

Table 15. Proportion of participants identified as having speech and language disorders using Cameroonian vs French norms

Area of difficulty	% Prevalence [95% CI]		χ^2	df	p-values
	Cameroonian norms (1.25 SD below the mean) N = 460	France norms (below the 10 th percentile) N = 460			
Articulation	9.3 [6.6-11.9]	11.5 [8.5-14.4]	1.16	1	0.2808
Expressive language	13.0 [9.9-16.0]	35.5 [31.2-39.9]	63.82	1	< 0.0001
Receptive language	12.2 [9.2-15.1]	87.3 [84.2-90.3]	520.51	1	< 0.0001

4.7 The prevalence of speech disorders and the prevalence of language disorders

The prevalence of speech disorders in this study was determined as the percentage of the population identified as having articulation, fluency and/or voice disorders (ASHA, 1993; Deiner, 2010). The prevalence of language disorders was determined as the percentage of the population identified as having expressive or receptive language disorders (Beitchman & Brownlie, 2012). In determining the overall prevalence of speech disorders and language disorders, cases of co-occurrence of multiple speech and/or language conditions in a participant were only counted once (Lancioni & Singh, 2014; Mathers et al., 2008).

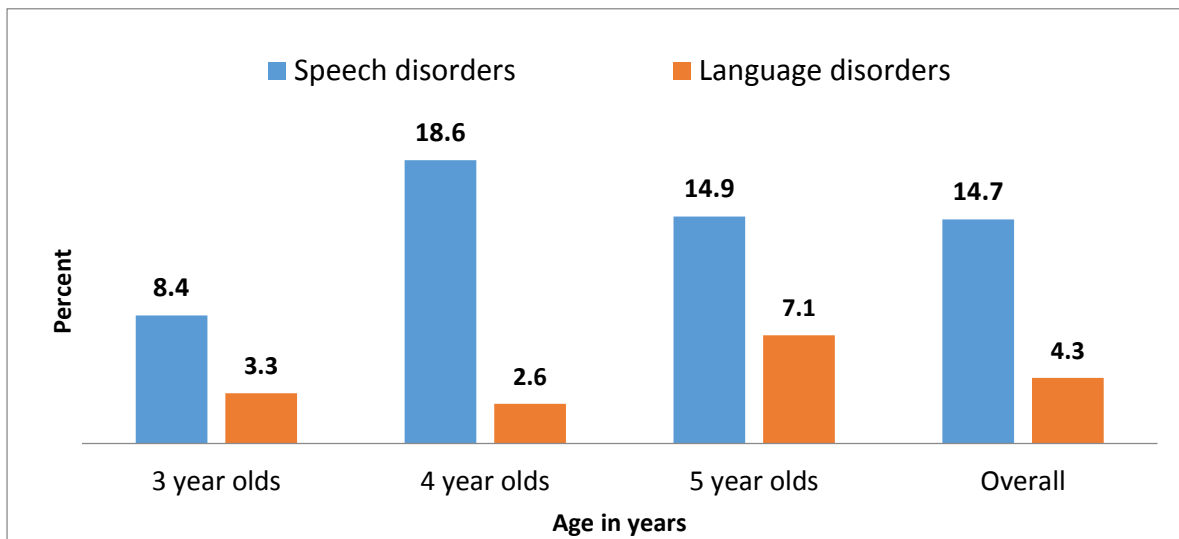


Figure 4. The prevalence of speech and language disorders

The overall prevalence of speech disorders using - 2 SD cut-off criterion was 14.7% (Figure 4). The overall prevalence of language disorders was 4.3% (Figure 4). The difference between the prevalence of speech disorders and language disorders was statistically significant, with the overall prevalence of speech disorders being higher than the overall prevalence of language disorders $\chi^2 (1, N = 920) = 28.95, p < 0.0001$.

The comparison of prevalence of speech disorders across age groups indicated that there was no significant difference among the three age groups (Table 16). Post-hoc analysis indicated a significant difference between the 3 and 4-year-old groups. The participants aged 3 years had fewer speech disorders when compared with the 4-year-old group: $\chi^2 (1, N = 306) = 5.94, p = 0.0147$. However, there was no significant difference between the 3 and 5-year-old groups: $\chi^2 (1, N = 272) = 2.61, p = 0.1057$. The comparison of prevalence of language disorders across age groups indicated no significant difference among the three age groups (Table 16). The proportion of participants eligible for services for speech problems using the - 1.25 SD cut-off criterion was 19.3% and for language problems was 18.9% (Table 17).

Table 16. The prevalence of speech disorders as well as language disorders in the different age groups

Area of difficulty	% Prevalence [95% CI]				χ^2	df	p-value
	3 year olds n = 118	4 year olds n = 188	5 year olds n = 154	Overall N = 460			
Speech	8.4 [3.4-13.5]	18.6 [13.0-24.1]	14.9 [9.2-20.5]	14.7 [11.4-17.9]	5.92	2	0.0512
Language	3.3 [0.0-6.5]	2.6 [0.3-4.8]	7.1 [3.0-11.1]	4.3 [2.4-6.1]	4.44	2	0.1085

Note. P-values comparing the prevalence among the three age groups.

Table 17. Proportion of participants identified as having speech or language problems using the 1.25 SD below the mean cut-off criterion

Area of difficulty	% Proportion [95% CI]			
	3 year olds n = 118	4 year olds n = 188	5 year olds n = 154	Overall N = 460
Speech	16.1 [9.4-22.7]	23.9 [17.8-30.0]	16.2 [10.3-22.0]	19.3 [15.6-22.9]
Language	15.2 [8.7-21.6]	23.4 [17.3-29.4]	16.2 [10.3-22.0]	18.9 [15.3-22.4]

4.8 The overall prevalence of speech and language disorders

The prevalence of speech and language disorders in this study was determined as the percentage of the sample identified as having articulation, fluency, voice, expressive or receptive language disorders (ASHA, 1993; Beitchman & Brownlie, 2012; Deiner, 2010). In determining the prevalence of speech and language disorders, cases of co-occurrence of multiple conditions in a participant were only counted once (Lancioni & Singh, 2014; Mathers et al., 2008).

The overall prevalence of speech and language disorders using - 2 SD cut-off criterion was 17.1% (Figure 5). The comparison of the prevalence of speech and language disorders across age groups indicated no significant difference among the three age groups (Table 18). The comparison of prevalence according to participants' gender indicated no gender-related difference for speech and language disorders (Table 19). The proportion of participants eligible for services for speech and language problems using the - 1.25 SD cut-off criterion was 30.2% (Table 20).



Figure 5. The overall prevalence of speech and language disorders

Table 18. The prevalence of speech and language disorders in the different age groups

Area of difficulty	% Proportion [95% CI]				χ^2	df	p-value
	3 year olds n = 118	4 year olds n = 188	5 year olds n = 154	Overall N = 460			
Speech and language	10.1 [4.6-15.4]	20.2 [14.4-25.9]	18.8 [12.6-24.9]	17.1 [13.6-20.5]	5.58	2	0.0611

Note. P-values comparing the prevalence among the three age groups.

Table 19. The overall prevalence of speech and language disorders according to participants' gender

Area of difficulty	% Prevalence [95% CI]		χ^2	df	p-value
	Males n = 236	Females n = 224			
Speech and language	18.6 [13.6-23.5]	15.7 [10.8-20.3]	0.73	1	0.3909

Table 20. Proportion of participants identified as having speech and language problems using the 1.25 SD below the mean cut-off criterion

Area of difficulty	% Proportion [95% CI]			
	3 year olds <i>n</i> = 118	4 year olds <i>n</i> = 188	5 year olds <i>n</i> = 154	Overall <i>N</i> = 460
Speech and language	23.7 [16.0-31.3]	36.7 [29.8-43.5]	27.2 [20.1-34.2]	30.2 [26-34.4]

4.9 Co-occurrence of speech and language disorders

Co-occurrence refers to the presence of two or more disorders at the same time in an individual (Schwartz, 2011; Wicks-Nelson & Israel, 2015). Considering -2 SD cut-off criterion, overall, 13.9% of participants with speech and language disorders presented with two or more disorders (Table 21). None of the participants presented with four or more speech and language disorders. The most frequent association was receptive language disorders and articulation disorders (Appendix Q).

Considering -1.25 SD as the cut-off criterion, overall 33.8% of the participants with speech and language disorders presented with two or more disorders (Table 22). None of the participants presented with five or more speech and language disorders. The most frequent association was receptive language disorders and articulation disorders (Appendix Q).

Table 21. Summary of the co-occurrence of speech and language disorders using 2 SD cut-off criterion

Number of speech and language area affected	Proportion among the population with speech and language disorders <i>n</i> (%)			
	3 year olds <i>n</i> = 12	4 year olds <i>n</i> = 38	5 year olds <i>n</i> = 29	Overall <i>n</i> = 79
2	0 (0)	4 (10.5)	5 (17.2)	9 (11.3)
3	1 (8.3)	1 (2.6)	0 (0)	2 (2.5)

Table 22. Summary of the co-occurrence of speech and language using 1.25 SD cut-off criterion

Number of speech and language area affected	Proportion among the population with speech and language disorders Cut-off = -1.25 SD <i>n</i> (%)			
	3 year olds <i>n</i> = 28	4 year olds <i>n</i> = 69	5 year olds <i>n</i> = 42	Overall <i>n</i> = 139
2	5 (17.8)	16 (23.1)	9 (21.4)	30 (21.5)
3	4 (14.2)	5 (7.2)	4 (9.5)	13 (9.3)
4	1 (3.5)	3 (4.3)	0 (0)	4 (2.8)

4.10 Associations between the prevalence of speech and language disorders and biographical variables

The association between the prevalence of articulation, expressive language, receptive language, fluency and voice disorders and biographical variables were determined. The prevalence of speech and language disorders tended to be affected by only a few biographical variables (Table 23). Positive history of ‘language-related problems’ without any precision, as reported by the participants’ parents was the single factor that was significantly and consistently associated with the prevalence of speech and language disorders. Among the participants identified as having speech and/or language disorders by the tests, using the 2 SD below the mean cut-off criterion, 16.5% ($n = 13$) were reported by their parents as having the same condition (Table 23). Using the 1.25 SD below the mean cut-off criterion, 21.5% ($n = 30$) of them were reported by their parents as having a speech and/or language problem (Table 23).

Table 23: Factors affecting the prevalence of speech and language disorders among participants

Biographical variables		Age groups											
		3 year olds				4 year olds				5 year olds			
		-2 SD n (% of total)	P-values	-1.25 SD n (% of total)	P-values	-2 SD n (% of total)	P-values	-1.25 SD n (% of total)	P-values	-2 SD n (% of total)	P-values	-1.25 SD n (% of total)	P-values
Type of school	Private	6(5.1)	0.103	19(16.1)	0.026	7(3.7)	0.804	27(14.4)	0.088	7(4.5)	0.197	13(8.4)	0.051
	Public	0(0.0)		2(1.7)		5(2.7)		25(13.3)		10(6.5)		19(12.3)	
Grade	GS	0(0.0)	0.272	0(0.0)	0.071	3(1.6)	0.659	14(7.4)	0.068	13(8.4)	0.085	26(16.9)	0.033
	MS	1(0.8)		7(5.9)		8(4.3)		34(18.1)		1(0.6)		1(0.6)	
	PS	5(4.2)		14(11.9)		1(0.5)		4(2.1)		2(1.3)		3(1.9)	
	SIL	0(0.0)		0(0)		0(0.0)		0(0.0)		1(0.6)		2(1.3)	
Gender	Female	2(1.7)	0.558	9(7.6)	0.834	8(4.3)	0.191	25(13.3)	0.956	10(6.5)	0.547	16(10.4)	0.804
	Male	4(3.4)		12(10.2)		4(2.1)		27(14.4)		7(4.5)		16(10.4)	
Number of spoken Home languages	1	3(2.5)	0.063	14(11.9)	0.254	9(4.8)	0.502	29(15.4)	0.581	10(6.6)	0.788	15(9.9)	0.828
	2	0(0.0)		3(2.5)		2(1.1)		19(10.1)		6(3.9)		14(9.2)	
	3	3(2.5)		4(3.4)		1(0.5)		4(2.1)		1(0.7)		3(2.0)	
	4	0(0.0)		0(0.0)		0(0.0)		0(0.0)		0(0.0)		0(0.0)	
Number of years spent in Yaoundé	< 3 years	2(1.7)	0.380	6(5.1)	0.247	4(2.2)	0.187	14(7.6)	0.068	1(0.6)	0.356	4(2.6)	0.927
	≥ 3 years	4(3.4)		15(12.7)		8(4.3)		37(20.0)		16(10.4)		28(18.2)	
Fathers level of formal education	Tertiary	1(0.9)	0.135	7(6.1)	0.182	1(0.6)	0.036	15(8.3)	0.039	5(3.3)	0.254	8(5.3)	0.552
	Secondary (technical)	2(1.8)		4(3.5)		4(2.2)		11(6.1)		7(4.6)		9(5.9)	
	Secondary (regular)	3(2.6)		7(6.1)		6(3.3)		14(7.7)		4(2.6)		12(7.9)	
	Primary	0(0.0)		3(2.6)		1(0.6)		5(2.8)		1(0.7)		1(0.7)	
	No formal education	0(0.0)		0(0.0)		0(0.0)		1(0.6)		0(0.0)		1(0.7)	
Mothers level of formal education	Tertiary	2(1.7)	0.638	4(3.4)	0.945	3(1.6)	0.794	13(7.1)	0.005	1(0.6)	0.322	3(1.9)	0.232
	Secondary (technical)	1(0.8)		6(5.1)		1(0.5)		3(1.6)		6(3.9)		6(3.9)	
	Secondary (regular)	3(2.5)		9(7.6)		6(3.3)		23(12.6)		5(3.2)		12(7.8)	
	Primary	0(0.0)		2(1.7)		1(0.5)		8(4.4)		5(3.2)		10(6.5)	
	No formal education	0(0.0)		0(0.0)		0(0.0)		3(1.6)		0(0.0)		1(0.6)	
Medical history reported by parents	Vision impairment	0(0.0)	0.597	0(0.0)	0.288	0(0.0)	0.621	0(0.0)	0.086	0(0.0)	0.475	0(0.0)	0.299
	Hearing impairment	0(0.0)	0.816	0(0.0)	0.640	1(0.5)	0.039	1(0.5)	0.207	0(0.0)	0.726	1(0.6)	0.666
	Speech/language problems	2(1.7)	0.146	6(5.1)	0.027	7(3.7)	0.004	16(8.5)	0.026	4(2.6)	0.248	8(5.2)	0.052
	General health problem	0(0.0)	0.638	0(0.0)	0.344	1(0.5)	0.965	6(3.2)	0.139	3(1.9)	0.148	5(3.2)	0.101

4.11 Summary

This chapter has described in details the findings of the study aligned with the aim and objectives. The first part of the chapter focused on establishing Cameroonian norms for francophone preschool children on three subtests of a French speech and language test, the ELO battery. A normalisation of the participants' scores performances on three ELO subtests was undertaken. Cameroonian norms on the Word Repetition, Linguistic Production and Sentence Understanding subtests were established. The comparison of the mean scores of the participants in this study with those in France, who had formed the normative sample for the ELO battery, indicated that the performance of the French participants was higher than that of the Cameroonian participants in all the subtests and across the three age groups. The comparison of the mean scores of the participants in the present study with those in a study conducted in Tahiti indicated that Cameroonian' participants performed higher than the Tahitians ones in some subtests and lower in others. The second part of this chapter focused on determining the prevalence of speech and language disorders in French-speaking children from Yaoundé, Cameroon, using the new norms of the ELO battery established in this study. The findings indicated that the prevalence of articulation disorders was 3.6%, expressive language disorders 1.3%, receptive language disorders 3%, fluency disorders 8.4% and voice disorders 3.6%. The overall prevalence of speech disorders was 14.7%, language disorders 4.3% and speech and language disorders 17.1%. There was no significant differences in the prevalence of speech and language disorders according to gender. The next chapter will provide an in-depth interpretation and discussion of these findings.

CHAPTER FIVE: DISCUSSION

The aim of this study was to determine the prevalence of speech and language disorders in a representative sample of French speaking preschool aged children in Yaoundé, Cameroon. Given that there was no validated speech and language tests available for the population of 3 to 5-year-old French-speaking children from Yaoundé. The study began with the determination of the norms for the (i) Word Repetition, (ii) Linguistic Production, and (iii) Sentence Understanding subtests of the ELO battery, for the 3, 4 and 5 year olds among the Cameroonian French-speaking preschool children. The prevalence of articulation, expressive and receptive language disorders was determined using the ELO battery Cameroonian norms established in the present study. The identification of fluency and voice disorders among participants was based on clinical judgement. The research involved 460 French-speaking preschool aged children in Yaoundé, Cameroon. This chapter aims to provide a detailed interpretation of the findings, and is organised according to the aims and objectives of the study. The major findings are summarised and discussed in light of current and relevant literature.

5.1 The need for normative speech and language data in Cameroon

The majority of speech and language tests available are normed on monolingual groups from western developed countries such as the UK, US and France (Carter et al., 2005; Carter et al., 2012; Gladstone et al., 2010; Hartley & Wirz, 2002; Pascoe & Norman, 2011; Teoh et al., 2012; Williams & McLeod, 2012). There are only a few culturally and linguistically appropriate speech and language assessment tools available for developing countries. As there were no speech and language measures available in Cameroon to assess French-speaking preschool aged children, an existing standardised French assessment tool, the ELO battery, was renormed in this population. This approach is recommended to assess culturally and linguistically diverse children for clinical and research practice in speech-language pathology, especially in countries where there is a lack of appropriate speech and language assessment tools (Aina & Morakinyo, 2005; Carter et al., 2005; Holding et al., 2004; Ruffieux et al., 2009; Saenz & Huer, 2003).

The need to renorm the ELO battery to identify speech and language disorders in participants in the present study was evaluated. A comparison of mean scores of the participants of this

study with those in France who had formed the normative sample for the ELO battery was done. The results indicated that the performance of the French participants was higher than that of the Cameroonian ones in all the subtests, and across the three age groups (Table 11). In addition, a comparison of mean scores of the participants in the present study with those of a study conducted in Tahiti using the ELO battery (Bruyere, 2013) revealed that Cameroonian' participants performed higher than Tahitian ones in some subtests, but lower in others (Table 11). These results suggested that the performance of Cameroonian children could not be compared with those of the French nor Tahitian ones.

Further analysis was done and the proportion of Cameroonian participants identified as having articulation, expressive language or receptive language disorders if the French ELO norms were used was determined. The results revealed that a higher proportion of Cameroonian participants would have been identified as having speech and/or languages disorders if the French ELO norms were used (Table 15). These results highlighted the fact that the application of speech and language assessments tools developed for other languages and populations are not appropriate for the Cameroonian population because they do not take into account the unique aspects of the language and culture of that country. Moreover, these results confirmed the risk of diagnosing children who do not have any disorders when culturally and linguistically inappropriate speech and language assessment tools are used (Banerjee & Guiberson, 2012; Bhatia et al., 2007; Goldstein et al., 2006).

5.2 Challenges and issues with speech and language assessments in Cameroon

The performance of the Cameroonian participants was generally lower than that of the children in France. The proportion of Cameroonian participants identified as having a speech and/or language disorders was higher when French ELO norms were used as compared to when the Cameroonian norms established in this study were applied. These results indicated that comparison of the speech and language performance of a population like that in Cameroon who exhibit diversity in the number of languages and dialects spoken, as well as differences in proficiency in each language, using the French norms could introduce multiple source of potential bias (Carter et al., 2005; McLeod et al., 2013; Pascoe & Norman, 2011).

5.2.1 Linguistic bias

For several reasons, linguistic bias might explain the challenges experienced by the participants of the present study with some of the ELO items including: 1) the fact that 44.3% of them were reported as bilingual or multilingual as they spoke more than one language (Table 3). For that reason, it can be anticipated that, due to cross-linguistic influences, they might have wrongfully transferred items and structures from the Cameroonian languages to the French (Nicoladis, 2012; Paradis & Navarro, 2003); 2) the fact that the French spoken by Yaoundé dwellers is different from the standard French spoken in France, as it borrows lexical items from Cameroon Pidgin English, Cameroon English and also from the local indigenous languages (Bassolé-Ouédraogo, 2004; Echu, 2014; Gombé-Apondza, 2015). This could have been a challenge given that some of the ELO items required them to understand and respond to standard French while they speak a non-standard form of the language; 3) given that in the present study the speech and language assessments were performed only in French, the language abilities of the participants in their other languages was ignored (Peña et al., 2011; Theoh et al., 2012). However, it is well recognised that bilingual or multilingual children do not acquire the same proficiency in each language at the same time as their monolingual peers (Kohnert, 2010; Paradis, 2007).

The comparison between the performance of the Cameroonian participants and those from the study conducted in Tahiti indicated mixed outcomes: the Cameroonian participants performed higher than the Tahitian ones in some subtests, and lower in others. These results emphasise the fact that it is also not appropriate to apply normative data established for a linguistically diverse population to another, since the two populations exhibit diversities in the number of languages and dialects spoken, as well as differences in proficiency in each language knowledge and use (McLeod et al., 2013).

5.2.2 Cultural bias

The lack of familiarity with materials, content, procedures and different aspects of the testing situation in children from different cultural groups is reported as the possible reasons for low performance levels in speech and language assessment (Laing & Kamhi, 2003).

The assessment procedure of the Linguistic Production and Sentence Understanding subtests required the Cameroonian participants to engage in unfamiliar activities, such as interacting

with an adult or completing a sentence. This could be an explanation for why their performances dropped for these particular subtests when compared to the French ones. In contrast, their performance on the Word repetition subtest, where the procedure was more familiar, as it was close to the teaching situation they experienced in class, the difference between the Cameroonian and the French participants' performances was less noteworthy.

The result of this part of the study contributed to demonstrating that the norms obtained from the children in France who had formed the sample for the ELO (Khomsi, 2001) and the norm determined in another study conducted in Tahiti using the ELO battery (Bruyere, 2013) were not appropriate for the French-speaking preschool aged participants in this study. Renorming the ELO battery for the French-speaking preschool aged children from Cameroon was necessary to provide a measure that allowed comparison with peers from the same cultural and linguistic background (Carter et al., 2005; Saenz & Huer, 2003). This approach was essential in order to avoid identifying some participants as having speech and/or language disorders when their communication abilities were actually commensurate with similar age peers. That risk was confirmed by the fact that the proportion of participants with speech and language disorders was higher when using the French norms in comparison to when the Cameroonian norms established in this study were used (Table 15).

Despite a few limitations, the Cameroonian norms on the ELO battery established in the present study for the Word Repetition, Linguistic Production and Sentence Understanding subtests appear to be a useful measure to identify articulation, expressive language and receptive language disorders in French-speaking preschool children in Yaoundé, until an improved generalizable tool becomes available. The Cameroonian ELO norms will facilitate the determination of whether an individual Cameroonian child's speech and language developmental trajectory is delayed or disordered when compared with his or her peers from the same cultural and linguistic background (Rvachew et al., 2013; Saenz & Huer, 2003).

5.3 The prevalence of speech and language disorders in Cameroon is high

The prevalence of speech and language disorders is important to parents, professionals, policymakers and researchers to understand communication disorders and optimise assessment and intervention services (Enderby & Pickstone, 2005). The current study provides, for the first time, data on the prevalence of speech and language disorders on a representative sample of French-speaking preschool children in Yaoundé Cameroon.

The results of this study were compared with those of other similar studies. However, comparison of prevalence figures determined in the present study with those reported in studies conducted in other countries should be taken into account with caution, given the differences in the sample size, methodological approach used and criteria determining case status.

Comparison was done with studies that were population based and conducted with preschool or school-age children. Priority was given to studies in which the definition of case status was determined either by standardised measures of speech and/or language or by clearly defined clinical judgement (Law et al., 2000). However, given that there is limited information and little contextually relevant research focusing on the prevalence of speech and language disorders in low-income countries and on the African continent, exception was made by including studies conducted in those parts of the world even if they were clinical or survey based.

The primary finding from the present study is that speech and language disorders in preschool aged children in Yaoundé (Cameroon) are highly prevalent, with an estimate of 17.1% (Figure 5). This figure is higher than that reported in most of the studies conducted in western countries including the review by Law et al. (2000), who estimated the median prevalence of speech and language disorders in the UK in typically developing children up to 7 years as 5.9% (range = 2.2% – 6.6%); or the study by Tomblin et al. (1997) who estimated that 7.4% of typically developing children in the US have speech and language disorders.

The prevalence of speech disorders in this study was 14.7% (Figure 4). This figure is higher than that reported by McKinnon, McLeod and Reilly (2007) who estimated, using direct assessment the prevalence of speech disorders among 10,425 children aged 5-12 years in Australia to be 1.5%. This is also higher than the 8.7% reported by Jessup et al. (2008) among 308 children aged 5-6 years in the same country using the same method. However, this figure is comparable to the 14.8% reported by Karbasi et al. (2011) on 7,881 school-age children in Iran using direct assessment. In contrast, this figure is lower than that reported by Biritwum et al. (2000) who found that 25.5% of 2,556 children under 15 years in Ghana had a speech disorder. This figure is also lower than that reported by Melchioris Angst et al. (2015) in Brazil who estimated using direct assessment that 21.3% of 262 children aged 4 to 6 years had speech disorders (Melchioris Angst, Pase Liberalesso, Marafiga Wiethan & Mota, 2015).

Similarly, the findings indicated that overall, the estimated prevalence of specific speech disorders, namely, articulation, fluency and voice disorders in the present study was higher than that of many previous investigations. The estimated prevalence of fluency disorders in the present study was 8.4% (Figure 3). This figure is higher than the 0.33% reported by McKinnon, McLeod and Reilly (2007) in Australia among 5-12-year-old children and by Stich et al. (2012) in Germany who reported that 3.1% of children aged 5-6 had problems with their rhythm of speech.

The prevalence of voice disorders in the present study was 3.6% (Figure 3). This is higher than the 0.12% reported by McKinnon, McLeod and Reilly (2007) among 7,389 children aged 8 years in the UK. This figure is also higher than that of one of the few population-based prevalence studies of voice disorders conducted in low-income countries by Karbasi et al. (2011) who reported that only 0.47% of 7,881 primary school students in Iran had voice disorders. However, this figure is comparable to the 3.9% reported by Duff et al. (2004) in the USA among 2,445 children aged between 2 and 6 years.

The estimated prevalence of articulation disorders in the present study was 3.6% (Figure 3). This figure is higher than the 1.06% reported by McKinnon, McLeod and Reilly (2007), among 5-12-year-old Australian children. However, it is lower than that reported in the study conducted in Iran by Karbasi et al. (2011) who estimated that 13.8% of school-aged children had a speech-sound disorder, or in South Africa where Pascoe et al. (2015) reported the prevalence of speech disorders among 3-year old children to be 6.6%.

The prevalence of language disorders in this study was 4.3% (Figure 4). This figure is comparable to the 4.5% reported by Melchioris Angst et al. (2015) in Brazil among 262 children aged 4 to 6 years using the direct assessment method. However, this figure is lower than the 18.2% reported by Jessup et al. (2008) in Australia among 308 children aged 5-6 years and by King et al. (2005) in the US among 513 children aged 3 years who estimated that 10% of them had a language disorder.

The prevalence of receptive language disorders in the present study was 3% (Figure 3). This is within the range reported by Law et al. (2000), which was 2.6% to 3.9% among children up to 5 years old in the UK. However, the prevalence of receptive language disorders found in the present study was greater than the figures reported by McLeod and Harrison (2009) who found,

using 2 SD as cut-off criterion that 1.7% of Australian children aged 4 to 5 years had receptive language disorders.

The prevalence of expressive language disorders was 1.3% (Figure 3), this was the only figure to be lower than most of the previous investigations. This figure is lower than reported in the review by Law et al. (2000) who estimated the prevalence of expressive language disorders in children 5 years old and younger in the UK to range from 2.2% to 4.7%.

One explanation for this low prevalence of expressive language disorders is that, in the present study, the cut-off criterion to identify the speech and language disorders was 2 SD below the mean. However, most of the studies that report on the prevalence of language disorders used a cut-off of 10th percentile or 1.25 SD below the mean (e.g. Eisenberg & Guo, 2013; Gabani et al., 2009; Paul & Norbury, 2012; Tomblin et al., 1997). As expected, studies using cut-off criterion close to 1.25 SD below the mean leads to higher prevalence rates compared to those using 2 SD criterion as in the present study. When applying the 1.25 SD below mean cut-off criterion, a higher number of participants with expressive language were captured and the overall proportion of participants with expressive language problems was 13.0%, which is higher than the range reported in the review by Law et al. (2000). The choice of the cut-off score to identifying speech and language disorders in a study is often arbitrary (Bishop, 2014; Law et al., 2000). In the present study, the cut-off criterion of 2 SD below the population mean was used to identify speech and language disorders to improve the sensitivity and the specificity of the test (Bishop & McDonald, 2009; Eisenberg & Guo, 2013).

Overall, the prevalence rates found in the present study were higher than that of many previous investigations. The explanations for the high prevalence of speech and language disorders found in the present study are multiple and includes the nature and specificities of the Cameroonian population, the high burden of diseases and risk factors associated with communication disorders, as well as the limited access to speech and language services. Another possible reason for the higher prevalence figures found in the present investigation is the age range of the participants. A number of studies have indicated that as children become older, the prevalence of speech and language disorders decreases as a result of intervention or spontaneous recovery (e.g., McKinnon, McLeod & Reilly, 2007; McLeod & Harrison, 2009; McLeod & McKinnon, 2007). Given that the age ranges of the participants in most of the studies reviewed in the present dissertation were higher than that of the present study, thus they reported lower prevalence rates.

5.4 Factors affecting the prevalence of speech and language disorders in Cameroon

5.4.1 Methodological procedures used to gather the information

The high of the estimate figures of speech and language disorders found in the present study could be partly attributed to the differences in methodological procedures used to gather the information. Typically, studies that use direct assessment techniques, like the current study report higher prevalence figures than those that use parent or teacher reports (e.g. Keating et al., 2001; Law et al., 2000; McKinnon, McLeod & Reilly, 2007; Van Borsel et al., 2006).

5.4.2 Age of participants

A number of studies have acknowledged that as children become older, the prevalence of speech and language disorders decreases (e.g., McKinnon, McLeod & Reilly, 2007; McLeod & Harrison, 2009; McLeod & McKinnon, 2007). Typically, higher prevalence rates are reported for younger children and lower figures for the older ones (Craig et al., 2002; Van Borsel et al., 2006; Boyle et al., 2011). However, inconsistent with what has been reported in the literature, in this study, the overall prevalence of speech and language disorders was not lower in the 5-year-old group when compared to the 3- and 4-year-old groups (Table 12, 16 & 18). These results could be attributed to the narrower age range of the participants in the present study.

5.4.3 Participants' gender

A significant association between male gender and increased risk for speech and/or language disorders has been reported in several studies (e.g. Chevrie-Muller, Watier, Arabia, Arabia & Dellatolas, 2005; Proctor et al., 2008; Reilly et al., 2009; Zubrick et al., 2007). In accordance with the literature, the prevalence of speech and language disorders found in this study was higher in the male group (Table 19). Accordingly, the prevalence of voice disorders was higher in the male group (Table 13). This result could be expected as male gender is reported to be a risk factor for childhood dysphonia (Angelillo et al., 2008; Carding et al., 2006; Sederholm, McAllister, Dalkvist & Sundberg, 1995), even though after puberty, that condition becomes more prevalent in women than in men (Yu, Garrel, Nicollas, Ouaknine & Giovanni, 2007). The prevalence of fluency disorders in the present study was higher among males (9.3%) than

females (7.5%) (Table13). The male: female ratio of fluency disorders in the present study was approximately 1.5:1. This ratio is in consonance with the ratio of 2:1 reported by Yairi and Ambrose (2005) for preschool children close to the age of stuttering onset.

5.4.4 The nature of the surveyed population

The prevalence figures of speech and language disorders found in the present study was generally lower than reported in the other African studies. One explanation to this could be that most of these African studies were conducted in clinical settings. Indeed, the prevalence of speech disorders found in the present study was 14.7% while in Nigeria, Somefun et al. (2006) reported the prevalence of speech disorders in a clinic population to be as high as 30.4%. Similarly, also in a clinic population, Aremu et al. (2011) reported that 22.4% of 89 children aged 0-5 years had a speech disorder. It is established that the prevalence of speech and language disorders is most relevant when obtained from population-based samples that are more representative of the entire population rather than high-risk samples from clinical settings, which often have the disadvantages of oversampling care-recipients and inflating prevalence rates (Law et al., 2000).

5.5 Factors associated with speech and language disorders

In the literature, several factors have been reported to be associated with paediatric speech and language disorders. These factors include: male gender as discussed earlier, having ongoing hearing problems (Harrison & McLeod, 2010), having a family history of speech and language disorders or health problems (Silva, Couto & Molini-Avejonas, 2013). In the current study, the single factor that was significantly and consistently associated with the prevalence of speech and language disorders was a positive history of language issues as reported by parents. This result is not surprising as some studies have reported good sensitivity and specificity of parents' reports in identifying speech and language disorders, particularly in young children (O'Neill, 2007; Rescorla & Alley, 2001).

5.6 Co-occurrence of speech and language disorders

Among the participants with speech and/or language disorders, the co-occurrence of speech and/or language disorders was 13.9%. This figure is higher than the 1.3% reported by Shriberg et al. (1999) or the 4.6% reported by Beitchman et al. (1986) for the co-occurrence of speech-

sound and language disorders. However, this result is lower than the figures from the study by Eadie et al. (2015) in Australia who determined the co-occurrence of speech-sound disorders and language disorders in 4-year-old children to be 40.8% and by Arndt and Healey (2001) in the US, who reported it to be as high as 44%. The discrepancies in the rates of co-occurrence of speech and language disorders across studies can be explained by the differences in the methodological approaches employed.

In the present study, the most frequent co-occurring disorders in participants were receptive language disorders and articulation disorders. This result is consistent with the high rates of co-occurrence of speech-sound disorders and language disorders reported in several studies (Beitchman et al., 1986; Eadie et al., 2015; Keating et al., 2001; Rvachew, 2014). In accordance with the literature, these findings suggest that there is an interaction between different speech and language domains, especially articulation and language disorders. However, limited conclusions may be drawn due to difference in the methodological approaches used (Gordon-Brannan & Weiss, 2007; Pennington & Bishop, 2009; Rvachew, 2014).

5.7 The need for speech and language services in Cameroon

In the present study, the proportion of children eligible for services for speech and language problems was determined to be 30.2 % (Table 20). This figure is higher than the incidence rate of referrals who attended services for primary speech and language disability in a year in UK, which was 14.6% (Broomfield & Dodd, 2004). From these information, it can be concluded that a high number (almost a third) of French-speaking Cameroonian preschool aged children are eligible for speech and language services and emphasises the need for speech and language services in Cameroon. When extrapolating the number of children eligible for services found in the present study to the population of children attending francophone preschool in Yaoundé, which is about 111,000 (Institut National de la Statistique du Cameroun, 2013), it can be estimated that 33,300 children from that group are eligible for speech and language services.

However, in Cameroon at present, as in many other low-income countries, children and adults with speech and language disorders are under-served by speech and language services. Indeed, given that there are only two speech-language therapists who are currently practising in the country (Topouzkhaniyan & Mijiyawa, 2013), the patient-to-speech-language therapist ratios is 4,000,000: 1 for the paediatric population and 10,000,000: 1 for the whole population. This Cameroonian ratio is high when compared to the patient-to-speech-language therapist ratios in

the US, UK, Australia, and Canada, which is about 2500–4700:1 (Wylie, McAllister, Marshall, Wickenden, Davidson, 2012). When applying the US ratio to the population of children in Cameroon, it can be estimated that more than 1500 speech-language therapists are required to meet the need of the under-served children with speech and language disorders in Cameroon. This number underestimates the speech-language therapists required, since the needs of adults are not considered.

There is an urgent need for speech and language services to serve the growing number of children with speech and language disorders in Cameroon. In order to meet that need, and in line with the recommendation of the World Report on Disability (WHO & the World Bank, 2011), the Cameroonian government should build a strategy to provide speech and language pathology education/trainings programmes similar to those recently started in developing African countries such as Uganda and Togo (Barrett & Marshall, 2013; Topouzkhania & Mijiyawa, 2013).

5.8 Summary

This chapter has focused on describing and interpreting the main findings of this study in relation to previous literature and has provided preliminary normative data on a French speech and language assessment tool which can be used clinically to identify preschool French-speaking children with speech and language disorders in Cameroon. The prevalence of childhood speech and language disorders in the general population in Cameroon was unknown. This study represents an initial attempt to determine the prevalence of speech and language disorders in a representative sample of preschool children from Yaoundé, Cameroon. Due to the presence of potential multiples risk factors associated with communication disorders and also, because of the limitation of speech and language services in Cameroon, it was anticipated that the prevalence of speech and language disorders in the population will be higher compared to that reported in other populations, especially in developed countries. The findings have confirmed and revealed that speech and language disorders are highly prevalent in Cameroon and that a significant number of children in need of speech and language services are left under-served. The present study has provided prevalence data on speech and language disorders in the paediatric population in Cameroon. These data are of interest to health professionals, policymakers and researchers who wish to understand communication disorders. In addition, these findings can help to conceptualise and deliver speech and language services for children

in Cameroon (McLeod & Harrison, 2009; Roulstone & Harding, 2013; WHO & the World Bank, 2011).

CHAPTER SIX: CLINICAL IMPLICATIONS, LIMITATIONS, AND RECOMMENDATIONS

This final chapter summarises the main findings of the research and presents its originality and strengths. The clinical implications of the findings for speech-language therapists and other health professionals working with children in Africa and beyond will be presented. Limitations of the present study and recommendations for future research are discussed.

6.1 Originality and strength

To the best of our knowledge, there was no previous research on the prevalence of speech and language disorders in French-speaking preschool aged children in Cameroon. The present study has contributed to filling this gap. In summary, the findings have indicated that speech and language disorders are high prevalence conditions in Cameroon, as it was found that 17.1% of French-speaking preschool aged children in Yaoundé were affected. In addition, the present study revealed and highlighted the urgent need for speech and language services in the country, as it was found that as many as 30.2% preschool aged French-speaking children in Yaoundé were eligible for speech and language services. Moreover, the study provided normative data on a French speech and language assessment test which can be used clinically and in research to identify speech and language disorders among Cameroonian children.

The first strength of the present study is that, case status was determined via direct assessment procedure with a standardised test that was renormed on a representative sample of French speaking preschool aged children from Yaoundé for that purpose. This test was administered by the researcher who is a professional speech-language therapist with experience of practice in Cameroon; this adds to the validity and reliability of the results, and provides additional support for the outcomes of the study (McLeod & Harrison, 2009; Bishop & McDonald, 2009; Cordier et al., 2014).

Another strength of this study is that a representative sample of randomly selected preschool aged French-speaking children in Yaoundé was used, allowing generalisation of the results, as it is established that the prevalence of speech and language disorders is most relevant when

obtained from population-based studies rather than from high-risk populations like those from clinical settings (Law et al., 2000).

Moreover, the population age itself was also important, given that early identification of children with speech and language disorders is sought during the preschool years, when chances for improvement are best, as this might offset the associated negative impacts on literacy development and academic attainment (Eadie et al., 2015; Shetty, 2012; Tokgöz-Yılmaz et al., 2013). In addition, the reasonable number of participants involved in this study, and that they were selected through a multi-stage random sampling method ensured that it represented the population of French-speaking preschool children in Yaoundé. This is also an important strength that could allow for potential generalisation of the findings.

6.2 Clinical implications

Speech-language therapists require normative data to allow them to draw accurate conclusions about whether a given child has a delay, disorder or simply a language difference (Caruso et al., 2015; Terry & Irving, 2010). The findings of the present research have emphasised the fact that speech and language tests developed for a monolingual western population cannot be applied to a linguistically and culturally diverse population like that in Cameroon. This study has contributed to provide norms for French-speaking preschool aged children in Yaoundé on a standardised French tests that can be used in similar populations in Cameroon (Table 9). Given the shortage of speech-language therapists working in Cameroon, the norms could be disseminated to other health care and education professionals and used to identify children at risk for speech and language difficulties. However, these findings should be used with the caution as the research has some limitations.

6.3 Bias and limitations of the study

The first possible limitation of the present study is the sample size of 460 participants. This is modest in comparison with the sample size of some large-scale nationwide studies that used more than 1,000 participants (e.g. McKinnon, McLeod & Reilly, 2007; McLeod & Harrison, 2009). A larger sample size could have yielded more detailed information, especially on the associated factors of speech and language disorders. However, the study provides useful information on the prevalence of speech and language disorders in French-speaking preschool aged children in Yaoundé.

A second shortcoming was the fact that assessing Cameroonian participants in the present study with a speech and language test designed for French children could have resulted in a cultural and linguistic bias that might have affected the results. Although the test was renormed in the Cameroonian population, its cross-cultural validity has not been established. Indeed, a few challenges were faced with the Linguistic Production subtest: first, the pilot test revealed the need to adapt one of the pictures in this subtest; second, the participants' performances were generally low, leading to what seems to appear as a homogenisation of competences between the 4 and 5 year old groups. In order to address the limits of the Linguistic Production subtests and to avoid misidentification, it is important to keep in mind that the norms proposed in the present study should not be the only facet of the diagnosis. This subtest must be supplemented by other elements such as a qualitative analysis of children's productions or the use of parental questionnaire to find out the level of proficiency of the child in the other languages he/she speaks (Carter et al., 2012; Roseberry-McKibbin & O'Hanlon, 2005).

In order to ensure a more culturally and linguistically valid speech and language assessment in this study, a possible solution could have been the use of criterion-referenced measures. This approach is considered to be less culturally or linguistically biased than standardised testing and allows the clinician/researcher to design and use language, materials, contexts, and interaction patterns that are familiar to the child (De Lamo White & Jin, 2011; Laing & Kamhi, 2003). Another possible solution could have been the use of a dynamic assessment approach (Peña et al., 2006), as this method allows the differentiation of children with speech and language disorders from those achieving poor scores for other reasons (Peña et al., 2001; Ukrainetz et al., 2000). However, even if these two methods are considered to be relevant for culturally and linguistically diverse populations, they also have some weakness that need to be taken into consideration, such as the fact that they are not conducive for rapid screening/identification purpose.

The third possible limitation of the present study is the used of clinical judgement to identify fluency and voice disorders in participants. Although this method is commonly used in research to identify speech and language disorders (e.g. Karbasi et al., 2011; McKinnon, McLeod & Reilly, 2007), some studies have reported its possible lack of validity as compare to standardised measures (Law et al., 2000).

In order to ensure a more valid voice assessment, formal perceptual assessments commonly used among clinicians to rate voice quality during spontaneous speech like the GRBAS scale

(Grade, Roughness, Breathiness, Asthenia, Strain) (Dejonckere, Obbens, De Moor & Wieneke, 1993) or the CAPE-V (Consensus of Auditory Perceptual Evaluation of Voice) (Behlau, 2003) could have been used. To ensure a more valid assessment for stuttering, normative data on paediatric disfluency disorders like the ‘Normative disfluency data for early childhood stuttering’ (Ambrose & Yairi, 1999) or severity scales like the ‘Stuttering Severity Instrument’ (Riley & Bakker, 2009) and in French, the ‘Examiner un Begaiement’ (Estienne & Bijleveld, 2012) could have been used.

To some extent, the findings of the present study can be related to other French-speaking populations in Cameroon and in Africa. However, this should always be done with caution given that it is likely that the French language spoken in Yaoundé may be slightly different to that spoken in the other French-speaking regions of Cameroon or Africa. As the finding of the present study indicated that it is not recommended to compare the speech and language performance of bilingual or multilingual children from one setting with those from another setting.

6.4 Recommendations for future research

The present study focused on determining the prevalence of childhood speech and language disorders. Given that the prevalence of hearing impairment in Cameroon is also unknown, it would be beneficial to extend the research to also determine the prevalence of hearing impairments, as childhood speech and language development is directly impacted by the hearing abilities.

The findings of this research indicate that a high proportion of Cameroonian children have speech and language disorders and underlines the urgent need to extend the studies on a nationwide scale in Cameroon and in other sub-Saharan African countries. These large-scale epidemiological studies will allow for a better understanding of the prevalence of speech and language disorders in these areas and obtain more detailed and generalisable results. Prior to this, improved culturally and linguistically valid norms should be established, and speech and language assessment tools should be developed.

6.5 Conclusion and perspectives

Given the lack of research focusing on establishing speech and language norms for the population of French-speaking preschool aged children in Cameroon, the findings of this study greatly contribute to the limited pool of data.

Identification and intervention of children with speech and language disorders is sought at an early stage to avoid the consequences of untreated childhood speech and language disorders that can lead to social and behavioural challenges, academic failure and affect his/her vocational choices later in adulthood (Nelson et al., 2006; St Clair et al., 2011). The prevalence of speech and language disorders found in the present study, which happen to be high, are of interest to Cameroonian policymakers and health and education professionals (Binu et al., 2014; Pascoe & Smouse, 2012; Tickell, 2011).

With the findings of the present research, it is estimated that more than 1,500 speech-language therapist are needed to meet the need of the population of children in Cameroon. Since speech-language therapists in Cameroon are in extremely short supply, in order to meet the need of the population as recommended by the World report on disability, one possible solution is to develop appropriate speech and language training programmes (Wylie et al., 2013). Until speech-language therapists are being trained, other health care and education professionals can be educated to identify children with speech and language disorders and refer them to the relevant healthcare professionals if needed. In addition, promotion campaigns could be launched on Cameroonian television, radio and print press to raise awareness and to provide helpful and easy to understand information about the early warning signs of speech and language delay/disorders. Moreover, parents should be more involved in the process as the findings of this study indicated that they have relatively good ability in identifying whether their children have speech and language delay/disorders.

Given the high prevalence of speech and language disorders in Cameroon and the need for speech and language services, it is hoped that the outcomes of this study will contribute to facilitate advocacy with stakeholders (government, universities, healthcare and educational system), in order to build the strategies to provide speech and language pathology education, training programmes and services that meet the needs of the Cameroonian population, and specifically, the need of the population of children as they are future of the nation.

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APPENDICES

Appendix A

Ethical approval from university of cape



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



Room E52-24 Old Main Building
Groote Schuur Hospital
Observatory 7925

Telephone [021] 406 6338 • Facsimile [021] 406 6411

Email: shuretta.thomas@uct.ac.za

Website: www.health.uct.ac.za/research/humanethics/forms

25 April 2014

HREC REF: 245/2014

A/Prof S Singh
Health & Rehab
Occupational Therapy
F45, OMB

Dear A/Prof Singh

PROJECT TITLE: THE NORMING OF THE 'EVALUATION DU LANGAGE ORAL' AND THE PREVALENCE OF SPEECH AND LANGUAGE DISORDERS IN PRE-SCHOOL AGED CHILDREN FROM YAOUNDE (CAMEROON)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30th April 2015

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/research/humanethics/forms)

We acknowledge that the student, Lilly Tchoungui Oyono is also involved in this study.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please quote the HREC reference no in all your correspondence.

Yours sincerely

pp Tuburgess

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN ETHICS

Federal Wide Assurance Number: FWA00001637.

Institutional Review Board (IRB) number: IRB00001938

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP) and Declaration of Helsinki guidelines.

HREC 245/2014

The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

HREC 245/2014

Appendix B

Letter to the Authorities of the Cameroonian Ministry of Basic Education

Dear Sir/ Madam

Re: Permission to conduct a research study in Yaoundé

Title of the study: The norming of the ‘Evaluation du Langage Oral’ and the prevalence of speech and language disorders in French speaking preschool aged children from Yaoundé (Cameroon).

I am a Cameroonian speech-language therapist registered for a Master’s degree in Speech Language Pathology at the University of Cape Town. In order to fulfil the requirements of my degree I have to conduct a research study.

What is the study about?

I am intending to conduct a research to determine the prevalence of speech and language disorders among a representative sample of Cameroonian preschool children and to establish norms for a French speech and language test (ELO battery) for the Cameroonian population as there are currently no valid tests for this population. There will be 585 children randomly selected among 21 preschools located in Yaoundé who will take part in this study. I have obtained approval from the University of Cape Town, Faculty of Health Sciences Human Research Ethics Committee to conduct the proposed study (REF number: 245/2014).

What is expected from participants?

Parents will be expected to provide informed consent and to complete a biographical information sheet on the child’s birth history, developmental history, medical history, and speech and language development, which should take no more than five minutes. The child’s speech and language will be assessed by the researcher who is a qualified speech-language therapist. Children will be expected to repeat some words and sentences and point to pictures. The assessments should not take more than 30 minutes per child participant. Care will be taken to schedule the assessments at a time when the child will not miss important school activities.

Voluntary participation

Participation in this study is strictly voluntary, written permission will be obtained from the principals and, written informed consent will be obtained from the parents. The researcher and the research assistant will monitor children for behaviour indicating that they no longer wish to take part in the study such as refusing to cooperate or crying. If a child demonstrates such behaviour, the procedures will be discontinued. The ethical guidelines outlined in the proposal will be applied.

Confidentiality

Confidentiality will be respected by giving each child participant a reference number and all data concerning him/her will carry only this reference number. All the participants’ names and contact details will be kept in a confidential identification file that links each name to a specific number. All the documents with identifying information will be kept in a locked filing cabinet accessible only to the researcher and the research supervisor. When no longer necessary for research, all identifying materials will be destroyed.

Benefits to participants

There are no direct benefits associated with participation in this project. Participants will not receive any payment for taking part in the study. However, if a child is found to have a speech and/ or language problem, the researcher will send a referral letter to his/her parents in which she will describe the nature of the problem and indicate which health professional to consult. A brochure that contains some speech and language developmental milestones, some warning signs for speech and language disorders, and some tips to develop children's speech and language skills will be sent to the parents of all children who take part in this study. Parents/guardian may contact the principal to ask about the results of the study once the research has been completed.

Risks of participation

There are no known risks to participation in the present study. The University of Cape Town carries a No Fault Clinical Liability policy for participants who suffer a research-related injury in researcher-initiated clinical research.

I hereby request permission to conduct my research in preschools located in Yaoundé. Thank you for considering this request. Please find the detailed research proposal attached.

If you have any questions or concerns regarding the participants' rights or welfare, you may contact Professor Marc Blockman who is the Chair of the University of Cape Town, Faculty of Health Sciences Human Research Ethics Committee (HREC) at: Tel: +27 21 406 6492. Email: marc.blockman@uct.ac.za. If you require further information or if you have any questions please feel free to contact me or my supervisor (details below).

Yours Faithfully,

Lilly Tchoungui Oyono

The Researcher:

Lilly Tchoungui Oyono
E-mail: lillyto@hotmail.com
Tel: 00237 99 30 92 39 (Cameroon)
/00277 789228112 (South Africa).
University of Cape Town.

The supervisor:

Professor Shajila Singh
University of Cape Town
shajila.singh@uct.ac.za

Appendix C

Approvals from the Cameroonian Ministry of Basic Education

REPUBLIQUE DU CAMEROUN
 Paix - Travail - Progrès
 MINISTERE DE L'EDUCATION DE BASE
 DELEGATION REGIONALE DU CENTRE
 DELEGATION DEPARTEMENTALE
 DU MEKONG
 INSPECTION D'ARRONDISSEMENT DE
 L'EDUCATION DE BASE DE YAOUNDE V
 22 22 91 88



REPUBLIC OF CAMEROON
 Peace - Work - Progress
 MINISTRY OF BASIC EDUCATION
 CENTRAL REGIONAL DELEGATION
 DEPARTMENTAL DELEGATION
 FOR MEKONG
 YAOUNDE SUBDIVISIONAL
 INSPECTORATE

YAOUNDE, LE

N° *JUMINEDUB/DREBC/DDEB-MF/AEB YDE V*

L'INSPECTEUR D'ARRONDISSEMENT DE L'EDUCATION
DE BASE DE YAOUNDE V

A

MADAME TCHOUNGUI OYONO LILLY Epse WONKAM

OBJET :

Autorisation d'accès dans deux écoles maternelles de Yaoundé 5^e

MADAME,

En réaction à votre lettre au 26 Mai 2014 par laquelle vous sollicitez une autorisation d'accès dans ma circonscription scolaire afin de mener une étude sur le langage.

Je vous informe que je marque mon accord de principe pour la tenue de ladite activité dans 02 (deux) écoles de votre choix, dans la période située entre le 27 Mai et le 31 Octobre 2014.

Toutefois, aucune perturbation au déroulement normal des cours ne sera tolérée. Il ne vous sera pas non plus permis de changer l'objet pour lequel cette autorisation vous a été délivrée.

Vous serez responsable de tout incident qui pourrait survenir au cours du déroulement de vos activités. Pour ce faire, vous prendrez attache avec les Directrices d'écoles sollicitées ainsi que les parents des élèves ciblés, afin de convenir du meilleur moment de la tenue de cette activité.

A la fin de l'activité, vous voudrez bien me tenir un rapport détaillé du déroulement de vos activités dans ma circonscription scolaire.

L'INSPECTEUR,

Chère Madame Lilly Tchoungui Oyono
Inspection d'Arrondissement de l'Éducation de Base de Yaoundé V
le 27 Mai 2014

Appendix D

Letter to the principals

To the Principal of,
School name _____
P.O. Box:
Yaoundé/Cameroon

Dear Sir/ Madam

Re: Permission to conduct research at your preschool

Title of the study: The norming of the ‘Evaluation du Langage Oral’ and the prevalence of speech and language disorders in French-speaking preschool aged children from Yaoundé (Cameroon).

I am a Cameroonian speech-language therapist; I am registered as a Master’s student in the Speech Language Pathology Program at the University of Cape Town. In order to fulfil the requirements of my degree I have to conduct a research study.

What is the study about?

I am intending to conduct a research to determine the prevalence of speech and language disorders among a representative sample of Cameroonian preschool children and to establish norms for a French speech and language test (ELO battery) for the Cameroonian population as there are currently no valid tests for this population. There will be 585 children randomly selected among 21 preschools located in Yaoundé who will take part in this study. I have obtained approval from the University of Cape Town, Faculty of Health Sciences Human Research Ethics Committee to conduct the proposed study (REF number: 245/2014), and from the Authorities of the Cameroonian Ministry of Basic Education (No 10/L/MINEDUB/DREBC/DDEB-MF/IAEB).

What is expected from participants?

If you grant permission for your preschool to participate in this research, twenty eight of your pupils will be randomly selected to participate in this study. Their parents will be expected to provide informed consent and to complete a questionnaire on the child’s birth history, developmental history, medical history, and speech and language development, which should take no more than five minutes. The child’s speech and language will be assessed by the researcher who is a qualified speech-language therapist. Children will be expected to repeat some words and sentences and point to pictures. The assessments should not take more than 30 minutes per child participant. Care will be taken to schedule the assessments at a time when the child does not miss important school activities.

Voluntary participation

Participation in this study is strictly voluntary, written permission will be obtained from you as principal and, written informed consent will be obtained from the parents. The researcher and the research assistant will monitor children for behaviour indicating that they no longer wish to take part in the study such as refusing to cooperate or crying. If a child demonstrates such behaviour, the procedures will be discontinued. The ethical guidelines outlined in the proposal will be applied.

Confidentiality

Confidentiality will be respected. The name of your institution and of all participants will be kept confidential and available only to the researcher and the research supervisor. Reference numbers will be used to refer to children. All the documents with identifying information will be kept in a locked filing cabinet accessible only to the researcher and the research supervisor. All records with identifying information will be deleted once the study is completed.

Benefits to participants

There are no direct benefits associated with participation in this project. Participants will not receive any payment for taking part in the study. However, if a child is found to have a speech and/or language problem, the researcher will send a referral letter to his/her parents in which she will describe the nature of the problem and indicate which health professional to consult. A brochure that contains some speech and language developmental milestones, some warning signs for speech and language disorders, and some tips to develop children's speech and language skills will be sent to the parents of all children who will take part in this study. The parents that have participated in this study will have access to the study results through the principal of the preschool.

Risks of participation

There are no known risks to participation in the present study. The University of Cape Town carries a No Fault Clinical Liability policy for participants who suffer a research-related injury in researcher-initiated clinical research.

I hereby request permission to conduct my research in your preschool. Thank you for considering this request. Please find attached the parent's information letter, consent form and questionnaire. If you have any questions or concerns regarding your pupils' rights or welfare as research participants, you may contact the University of Cape Town, Faculty of Health Sciences Human Research Ethics Committee (HREC) at: Professor Marc Blockman. Chair: Faculty of Health Sciences. Human Research Ethics Committee. Tel: +27 21 406 6492. Email: marc.blockman@uct.ac.za. If you require further information or if you have any questions please feel free to contact me or my supervisor (details below).

Yours Faithfully,

Lilly Tchoungui Oyono

The Researcher:

Lilly Tchoungui Oyono
E-mail: lillyto@hotmail.com
Tel: 00237 99 30 92 39 (Cameroon)
/00277 789228112 (South Africa).
University of Cape Town.

The supervisor:

Professor Shajila Singh
University of Cape Town
shajila.singh@uct.ac.za

**Sub-divisional inspectorate
of the Cameroonian Ministry
of Basic Education**
Tel: 00237 22229189

Appendix E

Letter to the Principals in French

A l'attention du Directeur de l'école

.....
BP:
Yaoundé/Cameroun

Objet: Permission de mener une étude dans votre école

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants des l'écoles maternelles francophones à Yaoundé (Cameroun).

Cher Madame/ Monsieur

Je suis une orthophoniste Camerounaise, je suis inscrite comme étudiante en Master en Speech Language Pathology à l'Université de Cape Town. Afin de répondre aux exigences de mon diplôme, je dois réaliser une étude.

En quoi consiste cette étude?

J'ai l'intention d'effectuer une étude afin de déterminer la prévalence des troubles de la parole et du langage auprès d'un échantillon représentatif d'enfants camerounais d'âge préscolaire et d'établir des normes d'un test d'orthophonie (batterie ELO) pour la population camerounaise étant donné qu'il n'existe pas de tests valides pour cette population. Il y aura 585 enfants choisis au hasard parmi les 21 écoles maternelles situées à Yaoundé qui prendront part à cette étude. J'ai obtenu l'autorisation de University of Cape Town, Faculty of Health Sciences Human Research Ethics Committee, REF: 245/2014, and from the Authorities of the Cameroon Ministry of Basic Education (No 10/L/MINEDUB/DREBC/DDEB-MF/IAEB) pour mener cette étude.

Qu'est ce qui est attendu des participants?

Si vous autorisez votre école à participer à cette étude, certains de vos élèves de la Maternelle seront choisis au hasard et leurs parents devront signer un consentement éclairé afin d'autoriser leur participation à cette étude; ils devront aussi remplir un questionnaire qui ne devrait pas prendre plus de cinq minutes sur le développement et les antécédents médicaux de leur enfant. La parole et le langage de l'enfant seront évalués par le chercheur qui est une orthophoniste qualifiée. Durant l'évaluation, les enfants seront invités à répéter des mots et des phrases et pointer des images. L'évaluation ne devrait pas prendre plus de 30 minutes par enfant. Nous prendrons soin de programmer les évaluations à un moment où les enfants ne manqueront pas les activités scolaires importantes.

Participation volontaire

La participation à cette étude est strictement volontaire, une autorisation écrite sera obtenue auprès de vous en tant que Directeur de l'établissement et un consentement éclairé signé sera obtenu des parents de chaque enfant. Durant l'évaluation, le chercheur et l'assistant de recherche vont observer les enfants afin de noter tout comportement indiquant qu'ils ne souhaitent pas prendre part à l'étude comme le refus de coopérer ou pleurer. Si un enfant montre

un tel comportement, les procédures seront arrêtées. Les principes éthiques énoncés dans le protocole de l'étude seront appliqués.

La confidentialité

La confidentialité sera respectée. Le nom de votre institution et de tous les participants seront gardés confidentiels et accessibles uniquement au chercheur et au directeur de recherche. Des numéros de référence seront utilisés pour désigner les enfants. Tous les documents avec des informations d'identification seront conservés dans un classeur verrouillé accessible uniquement au chercheur et au directeur de recherche. Tous les enregistrements avec des informations d'identification seront supprimés une fois l'étude terminée.

Bénéfices aux participants

Il n'y a pas de bénéfices directs liés à la participation à cette étude. Les participants ne recevront aucun paiement pour participer à l'étude. Toutefois, si un enfant se trouve à avoir un problème de parole ou de langage, le chercheur enverra une lettre de recommandation à ses parents dans laquelle elle décrira la nature du problème et indiquera quel professionnel de la santé de consulter. Une brochure qui contient les étapes du développement du langage, certains signes avant-coureurs des troubles de la parole et du langage, et quelques conseils pour développer les compétences linguistiques des enfants sera envoyée aux parents de tous les enfants qui participeront à cette étude. Une fois l'étude publiée, nous vous communiquerons les résultats afin que vous puissiez si nécessaire les transmettre aux parents dont les enfants ont participé à l'étude.

Risques liés à la participation

Il n'y a pas de risques connus pour la participation à la présente étude. L'Université de Cape Town dispose d'une assurance pour les participants qui souffriraient d'une blessure liée à une recherche initiée par eux .

Je viens auprès de vous solliciter la permission de mener cette étude dans votre école Maternelle. Merci de considérer cette demande. Veuillez trouver ci-joint la lettre d'information, le formulaire de consentement éclairé et le questionnaire destiné aux parents. Si vous avez des questions ou des préoccupations concernant les droits ou le bien-être de vos élèves en tant que participants à cette étude, vous pouvez contacter le comité d'éthique de la Faculté des sciences de la santé humaine de l'Université de Cape Town, dont le président est: Professeur Marc Blockman Tél : +27 21 406 6492, Email : marc.blockman @uct.ac.za. Si vous avez besoin de plus amples informations ou si vous avez des questions s'il vous plaît n'hésitez pas à me contacter ou à contacter mon superviseur (détails ci-dessous).

Cordialement,
Lilly Tchoungui Oyono

The Researcher:

Lilly Tchoungui Oyono
E-mail: lillyto@hotmail.com
Tel: 00237 99 30 92 39 (Cameroon)
/00277 789228112 (South Africa).
University of Cape Town.

The supervisor:

Professor Shajila Singh
University of Cape Town
shajila.singh@uct.ac.za

**Sub-divisional inspectorate
of the Cameroonian Ministry
of Basic Education**
Tel: 00237 22229189

Appendix F
Consents from the principals

GROUPE **S**COLAIRE **B**ILINGUE
DE **L'**E**x**cellence

A QUI DE DROIT

Nos réf : /14/GSBE/F/D
Objet :
Autorisation de mener une étude dans notre Ecole

Titre de l'Etude : Etalonnage du test « Evaluation du Langage Oral » et prévalence des troubles de la parole et du langage chez les enfants de l'Ecole Maternelle à Yaoundé (Cameroun).

Je soussignée Mme MENGUE Blandine, Directrice du Groupe Scolaire Bilingue de l'Excellence AHALA II (Yaoundé III).

Atteste par la présente que Mme TCHOUNGUI OYONO Lilly, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre Etablissement Scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la Maternelle.

En foi de quoi le présent document est délivré pour servir et valoir ce que de droit.

Fait à Yaoundé, le 1^{er} MAI 2014



Madame MENGUE Blandine

BILINGUAL NURSERY
AND PRIMARY SCHOOL DORCAS

BP: Yaoundé/Cameroun

Téléphone: 75 11 55 62

94 85 97 66

22 03 55 94



A QUI DE DROIT

Objet: Autorisation de mener une étude dans votre école.

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun)

Je soussigne M. **NDIFONTAYONG AWUDU F.**

Director
de
BNPS DORCAS

Atteste par la présente que Mme Tchoungui Oyona Lilly, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.



Fait à Yaoundé le **14 MAI 2014**

ÉCOLE MATERNELLE PUBLIQUE

NKOLISSAN - A.....

BP : Yaoundé/Cameroun

Téléphone : 99 77 96 64 / 22 76 85 22

A QUI DE DROIT

Objet: Autorisation de mener une étude dans notre école

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigné M..... *Lilly Tchoungui Oyono*.....

..... *I.S.G.*..... de

Atteste par la présente que Mme Tchoungui Oyono Lilly, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.

Yaoundé le 9 MAI 2014
.....

École maternelle de.....
Moundouma II, Groupe II
BP: Yaoundé/Cameroun
Téléphone: 77 89 11 38

A QUI DE DROIT

Objet: Autorisation de mener une étude dans votre école.

Titre de l'étude: Ecartage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigné M..... **MBALLA MFEQ épouse EDENE**
Directrice de l'Enseignement Maternel
..... de
.....

Atteste par la présente que Mme Tchoungui Oyono Lilly, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.

Fait à Yaoundé le 19 Mars 2014



Groupe scolaire.....
La Ruche.....

BP : Yaoundé/Cameroun

Téléphone : 94 - 15 - 08 - 76

A QUI DE DROIT

Objet: Autorisation de mener une étude dans votre école

Titre de l'étude: Ecalonnage du test 'Évaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigné M..... *Mme Ouyga Epas Tchoungui Madelaine*.....

Directeur de..... *Groupe scolaire La Ruche*.....

Atteste par la présente que Mme Tchoungui Oyono Lilly, Etudiante à l'université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de 30 de nos élèves de la maternelle.

En foi de quoi le present document est délivré pour servir et faire valoir ce que de droit.

Fait à Yaoundé le... *05*... *JUN* 2014


Mme Ouyga Epas Tchoungui Madelaine

École Maternelle de Nsessa A'

BP: Yaoundé/Cameroun

Téléphone :

A QUI DE DROIT

Objet: Autorisation de mener une étude dans votre école

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigné M. *Nyongé Mbé*
..... de

Atteste par la présente que Mme Tchoungui Oyoso Lily, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.

 à Yaoundé le *21/5/2014*
[Signature]

G.S.B. Djonou A.

BP : Yaoundé/Cameroun

Téléphone :

A OUI DE DROIT

Objet: Autorisation de mener une étude dans votre école

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigné M.....

DEKASSI FUSHELLI OMER
Maître en Histoire

de

Atteste par la présente que Mme Tchoungue Oyono Lily, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.

Fait à Yaoundé le 20/11/2014

Ecole Maternelle les Sapins

BP: Yaoundé/Cameroun

Téléphone : 99 35 61 38

A QUI DE DROIT

Objet: Autorisation de mener une étude dans notre école

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigné M^{me}.....A. Mogo.....Madeline.....
Directeur de l'école.....maternelle.....les.....Sapins.....
Atteste par la présente que Mme Tchoungui Oyono Lilly, Etudiante à l'université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de 30 de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.

Fait à Yaoundé le...23/05/2014



G.S.B. les Mangalaines

99

BP : Yaoundé/Cameroun

Téléphone : 99 87 58 63

A QUI DE DROIT

Objet: Autorisation de mener une étude dans votre école.

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigne M.....*Mme Moustang Nkomo*.....

.....*Directrice*..... de

.....
Atteste par la présente que Mme Tchoungui Oyone Lilly, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.

Fait à Yaoundé le

21/05/2014

ECOLE Maternelle de
NSIMEYONG.....
BP: Yaoundé/Cameroun
Téléphone: 99 39 78 32

A QUI DE DROIT

Objet: Autorisation de mener une étude dans votre école

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

AMBO IYONO Hélène Handette
Spécialiste OLANANA AWONO

Je soussigné M.....E.S.....

..... de
ECOLE MATERNELLE
NSIMEYONG.....

Atteste par la présente que Mme Tchoungor Oyono Lilly, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.

Fait à Yaoundé le 1^{er} MAY 2011



Ecole Maternelle de
MENDONG S/C II

BP : Yaoundé/Cameroun

Téléphone : 22-31-60-02

A QUI DE DROIT

Objet: Autorisation de mener une étude dans votre école

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigné M. **Mme NGOUNEN Pascaline**
Euse MELOND
IEG de

Atteste par la présente que Mme Tchoungui Oyono Lilly, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.



Mme NGOUNEN Pascaline
Euse MELOND
IEG
Fait à Yaoundé le... 27... MAY... 2014...

G&B Les MARTINETS
Yaoundé E. Mballo

BP : Yaoundé/Cameroun

Téléphone : 97593855

A QUI DE DROIT

Objet: Autorisation de mener une étude dans notre école

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigné M. KIEBOU Bienvenue
IEG
Licencié en Sciences éco.

Atteste par la présente que Mme Tchoungui Oyono Lilly, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.

Fait à Yaoundé le 12 MAI 2014



*École Maternelle Publique de Messa
groupe B*

BP : Yaoundé/Cameroun

Téléphone :

A QUI DE DROIT

Objet: Autorisation de mener une étude dans votre école

Titre de l'étude: Etalonnage du test 'L'évaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Mme Eyo'o Ango Lucie

Je soussigne M. IPEG

Directeur de *l'École Maternelle Publique de Messa groupe B*

Atteste par la présente que Mme Tchoungai Oyono Lilly, Etudiante à l'université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de 30 de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et être valoir ce que de droit.

Fait à Yaoundé le *21 Mai 2014*



[Signature]
Mme Eyo'o Ango Lucie
IPEG

ECOLE MATERNELLE ET PRIMAIRE
BILINGUE MILLENIUM

BP : Yaoundé/Cameroun

Téléphone : 77 61 07 07

A QUI DE DROIT

Objet: Autorisation de mener une étude dans votre école

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigné M. Dr. Marguise FUTO


Directeur de

Atteste par la présente que Mme Tchoungui Oyono Lilly, Etudiante à l'université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de 30 de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.

Fait à Yaoundé le 27/03/2016




M. Marguise FUTO
Spécialiste Mathématiques
Tél 77 61 07 07

Ecole Maternelle de
Mbalha II Groupe B.
BP: Yaoundé/Cameroun
Téléphone: 99 84 30 60

A OUI DE DROIT

Objet: Autorisation de mener une étude dans votre école

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigné M.....

Mme. T. Oyono Lilly
Ensignante

..... de

.....
Atteste par la présente que Mme Tehoungui Oyono Lilly, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.

Fait à Yaoundé le..... 2. MAL 2014



G.S.B. LES "MINETTES"
 S.S. FACE FIN BARRIÈRE LYCÉE BILINGUE
 BP: Yaoundé/Cameroun - ESSOS-
 Téléphone: 96-14-90-87
 73-02-19-20

A QUI DE DROIT

Objet: Autorisation de mener une étude dans votre école

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigné M.
 Mme Marguente AKAM
 Epse MBALLA T.E.G
 DIRECTRICE

Atteste par la présente que Mme Tchoungui Oyono Lilly, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.

Fait à Yaoundé le: 30-07-2014
 Mme Marguente AKAM
 Epse MBALLA T.E.G

Grande école des petits
Chérissés du Lac
BP: 1265 Yaoundé/Cameroun
Téléphone: 20 03 56 26

A QUI DE DROIT

Objet: Autorisation de mener une étude dans votre école


Titre de l'étude: Etalonnage du test 'évaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigné M. Mme EMENKIE Bethe Marie
DIRECTRICE de

Atteste par la présente que Mme Tchoungui Oyeno Lilly, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.

Fait à Yaoundé le 03/05/2011



**ÉCOLE MATERNELLE
PUBLIQUE DE NKOMO I A**

BP: Yaoundé/Cameroun
Téléphone: Tel: 99 65 18 38

A QUI DE DROIT

Objet: Autorisation de mener une étude dans votre école

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigné M. **ABODO NGONU**
Epse **OMBOU**

DES STATISTIQUE PUBLIQUES

de l'École Maternelle publique de **Nkomo I A**

Atteste par la présente que Mme Tottoungui Oyono Lilly, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.



Fait à Yaoundé le... **02 JUIL 2014**...

[Signature]

ÉCOLE MATERNELLE ET PRIMAIRE BRUNHE

HEBERTY-DUMPTY

BRUNHE HERBERTY-DUMPTY SCHOOL

BP: 2913 Yaoundé/Cameroun

Téléphone: 77 72 65 12

A QUI DE DROIT

Objet: Autorisation de mener une étude dans votre école

Titre de l'étude: Etalonnage du test 'Évaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigné M. **NIJI JOSEPH A**

..... de

Atteste par la présente que Mme Tchoungui Oyono Lilly, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.

Fait à Yaoundé le



GRANDE... Scolaire Bilingue
"Les MIGNONS"

BP : Yaoundé/Cameroun

Téléphone 77243757 / 98623715

A QUI DE DROIT

Objet: Autorisation de mener une étude dans votre école

Titre de l'étude: Etalonnage du test 'Evaluation du langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Je soussigne M^{me} GWEI Eulalie Monique

Atteste par la présente que Mme Tchoungui Oyono Lilly, Etudiante à l'Université de Cape Town a reçu notre accord pour mener l'étude sus mentionnée dans notre établissement scolaire. Elle est de ce fait autorisée à évaluer la parole et le langage de nos élèves de la maternelle.

En foi de quoi le présent document est délivré pour servir et faire valoir ce que de droit.

Fait à Yaoundé le 02/06/2014



Appendix G

Information letter and consent form for the parents

Dear Ms/Mr

Re: Invitation for you and your child to participate in a research study.

Title of the study: The norming of the ‘Evaluation du Langage Oral’ and the prevalence of speech and language disorders in preschool aged children from Yaoundé (Cameroon).

I am a Cameroonian speech-language therapist; I am registered as a Master’s student in the Speech Language Pathology Program at the University of Cape Town. In order to fulfil the requirements of my degree I have to conduct a research study.

What is the study about?

I am intending to conduct research to determine how many children in Yaoundé have speech and/or language disorders and to obtain some guidelines on how a French speech and language test (ELO battery) can be used with Cameroonian preschool children as there are currently no valid tests for this group. There will be 585 children from 21 preschools in Yaoundé who will take part in this study. I have obtained approval from the University of Cape Town, Faculty of Health Sciences Human Research Ethics Committee to conduct the proposed study (REF number: 245/2014), and from the Authorities of the Cameroonian Ministry of Basic Education (No 10/L/MINEDUB/DREBC/DDEB-MF/IAEB).

Why have you been approached?

Because your child is a preschool pupil and he/she attends one of the preschools randomly selected for this study.

What will be required of you?

If you grant permission for your child to participate in this study, you will be asked to complete a questionnaire on your child’s birth history, developmental history, medical history, and speech and language development, which should take no more than five minutes. Your child’s speech and language will be assessed by me (I’m a qualified speech-language therapist) using a speech and language test called “Evaluation du Langage Oral”. The speech and language assessments will take place at the school premises, in a room allocated for that purpose by the principal. Your child will be asked to repeat some words and phrases, describe and select pictures. The assessment should not take more than 30 minutes. I will do this at a time when your child will not miss out on any important school activities.

Voluntary participation

The principal of your child’s preschool has given permission for this study to be conducted at your child’s preschool. Your child’s participation in this study is completely voluntary. You as parents can decide whether you want your child to take part in this study. You and your child can decide to withdraw at any time without any penalty. My assistant and I will pay careful attention to any behaviour indicating that your child no longer wishes to take part in the study such as refusing to cooperate or crying. If your child demonstrates such behaviour, the assessment will be stopped and depending on the situation, the testing will be continued at another time or another child will be selected as replacement.

Confidentiality

Your name and the name of your child will be kept confidential in a locked filing cabinet. It will be available only to the researcher and research supervisor. Codes will be used to refer

to your and your child and, all records with your child's details will be deleted once the study is completed.

Benefits of taking part in the study

There are no direct benefits associated with taking part in this study. You and your child will not receive any payment for taking part in the study. However, if your child is found to have a speech or a language, I will send you a referral letter in which I will describe the nature of the problem and indicate which health professional to consult. All the parents of the children that participate in this study will receive a brochure that contains information on how speech and language develops, some warning signs for speech and language problems, and some tips that might help improve your child's speech and language skills. You may contact the principal of your child's preschool to ask about the results of the study once the research has been completed.

Risks of participation

There are no known risks to participation in the present study. The University of Cape Town carries a No Fault Clinical Liability policy for participants who suffer a research-related injury in researcher-initiated clinical research.

I am asking for your permission to assess your child's speech and language. If you agree to let your child take part, please complete the consent form and the questionnaire attached. Please send-back all those documents to the class teacher by -- -- 2014. If you have any questions or concerns regarding yours or your child's rights or welfare in taking part in this study, you may contact Professor Marc Blockman who is the Chair of the Faculty of Health Sciences Human Research Ethics Committee at Tel: +27 21 406 6492. Email: marc.blockman@uct.ac.za.

If you require further information or if you have any questions please feel free to contact me or my supervisor (details below).

Yours Faithfully,

Lilly Tchoungui Oyono

The Researcher:

Lilly Tchoungui Oyono
E-mail: lillyto@hotmail.com
Tel: 00237 99 30 92 39 (Cameroon)
/00277 789228112 (South Africa).
University of Cape Town.

The supervisor:

Professor Shajila Singh
University of Cape Town
shajila.singh@uct.ac.za

Sub-divisional inspectorate of the Cameroonian Ministry of Basic Education

Tel: 00237 22229189

Appendix H

Information Letter to the Parents and Consent form in French

Lettre d'information et consentement éclairé pour les parents

Objet: Autorisation d'évaluer la parole et le langage de votre enfant

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Cher parents

Je suis une orthophoniste Camerounaise, je suis inscrite comme étudiante en Master en Speech Language Pathology à l'Université de Cape Town. Afin de répondre aux exigences de mon diplôme, je dois réaliser une étude.

En quoi consiste cette étude?

J'ai l'intention de mener des recherches afin de déterminer combien d'enfants à Yaoundé ont des troubles de la parole et du langage et d'adapter un test de langage (batterie ELO) peut être utilisés avec des enfants d'âge préscolaire camerounais, car il n'y a pas de tests valides pour cette population. Il y aura 585 enfants de 21 écoles maternelles à Yaoundé qui prendront part à cette étude. J'ai obtenu l'autorisation de University of Cape Town, Faculty of Health Sciences Human Research Ethics Committee (REF numéro:), et du Comité National d'éthique du Cameroun, Ministère de la Santé publique (REF numéro:) pour mener cette étude.

Pourquoi avez-vous été sollicité?

Parce que votre enfant fréquente l'une des écoles Maternelles sélectionnée au hasard pour cette étude

Que sera t'il attend de vous?

Si vous autorisez votre enfant à participer à cette étude, vous serez invité à remplir un questionnaire qui ne devrait pas prendre plus de cinq minutes concernant le développement de votre enfant. La parole et le langage de votre enfant seront évalués par moi en tant que orthophoniste qualifiée. Pour l'évaluation, j'utiliserai un test du langage appelé «Évaluation du Langage oral». Les évaluations auront lieu dans les locaux de l'école, dans une salle affectée à cette fin par le directeur. Votre enfant sera invité à répéter des mots et des phrases, décrire et sélectionner les images. L'évaluation durera moins de 30 minutes par enfant. Nous prendrons soins de programmer les évaluations de telle sorte que votre enfant ne manque pas les activités scolaires importantes.

Participation volontaire

Le principal de l'école maternelle de votre enfant a donné son autorisation pour que cette étude soit menée dans son établissement. La participation de votre enfant à cette étude est entièrement volontaire. Vous en tant que parents devez décider si vous souhaitez que votre enfant participe à cette étude. Vous et votre enfant pouvez décider de vous retirer de cette étude à tout moment sans pénalité. Mon assistant et moi seront attentif à tout comportement indiquant que votre enfant ne veut plus participer à l'étude comme le refus de coopérer ou pleurer. Si votre enfant

montre un tel comportement, l'évaluation sera arrêtée et selon la situation, l'évaluation se poursuivra à un autre moment ou un autre enfant sera choisi en remplacement.

Confidentialité

Votre nom et le nom de votre enfant seront gardés confidentiels dans un classeur verrouillé accessible uniquement au chercheur et au directeur de recherche. Des codes seront utilisés pour se référer à vous et votre enfant, et tous les dossiers contenant des informations sur votre enfant seront supprimés une fois l'étude terminée.

Bénéfices aux participants

Il n'y a pas de bénéfice direct à participer à cette étude. Vous et votre enfant ne recevrez aucun paiement pour participer à cette étude. Cependant, si votre enfant se trouve à avoir un trouble du langage, je vais vous envoyer une lettre de référence dans lequel je vais vous décrire la nature du problème et indiquer quel professionnel de la santé de consulter. Tous les parents des enfants qui participent à cette étude recevront une brochure qui contient des informations sur la façon dont la parole et le langage se développe, certains signes avant-coureurs des troubles du langage et de la parole, ainsi que quelques conseils qui pourraient être utiles pour améliorer le langage de votre enfant. Vous pourrez communiquer avec le directeur de l'école maternelle de votre enfant et poser des questions sur les résultats de l'étude, une fois la recherche terminée.

Risques liés à la participation

Il n'y a pas de risques connus pour la participation à la présente étude. L'Université de Cape Town dispose d'une assurance pour les participants qui souffriraient d'une blessure liée à une recherche initié par eux.

Je demande votre permission pour évaluer la parole et le langage de votre enfant. Si vous acceptez que votre enfant participe à cette étude, s'il vous plaît compléter le formulaire de consentement et le questionnaire ci-joint. Nous vous prions de renvoyer tous les documents à l'enseignant(e) de votre enfant au plus tard le -- -- 2014. Si vous avez des questions ou des préoccupations concernant les droits ou le bien-être de votre enfant à participer à cette étude, vous pouvez contacter le Professeur Marc Blockman Tél : +27 21 406 6492, Email : marc.blockman @uct.ac.za qui est le président du comité d'éthique de la Faculté des sciences de la santé humaine de l'Université de Cape Town. Si vous avez besoin de plus amples informations ou si vous avez des questions s'il vous plaît n'hésitez pas à me contacter ou à contacter mon superviseur (détails ci-dessous).

Cordialement,
Lilly Tchoungui Oyono

The Researcher:

Lilly Tchoungui Oyono
E-mail: lillyto@hotmail.com
Tel: 00237 99 30 92 39 (Cameroon)
/00277 789228112 (South Africa).
University of Cape Town.

The supervisor:

Professor Shajila Singh
University of Cape Town
shajila.singh@uct.ac.za

**Sub-divisional inspectorate
of the Cameroonian Ministry
of Basic Education**
Tel: 00237 22229189

CONSENTEMENT ECLAIRE

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

J'ai lu et compris la lettre d'information sur l'étude. J'ai eu l'occasion de poser des questions et j'ai obtenu des réponses. Je comprends que ma participation et la participation de mon enfant est volontaire et que nous pouvons nous retirer de l'étude à tout moment sans pénalité. Je comprends que la confidentialité sera maintenue tout au long de l'étude et que mon nom, celui de mon enfant ou toute autre information nous concernant ne seront pas rendus publics. Je comprends que j'ai accès aux résultats de l'étude par le Directeur de l'école si je veux les avoir.

Je suis d'accord Pas d'accord de participer à cette étude,

Je suis d'accord pas d'accord que mon fils (ma fille)

nommé(e).....
participe à cette étude.

.....
Nom des parents signature date

.....
Téléphone des parents Nom de l'école

.....
Nom du Chercheur signature date

Appendix I

Biographical information sheet

Thank you for allowing your child to participate in this study. Please complete this information sheet which should take five minutes of your time. Please submit it along with the consent form to the class teacher by -- -- 2014.

A. Biographical information

Please answer the following questions

- a. Child's name:
- b. Child's class:
- c. Child's date of birth:
- d. Child's Gender:
- Male ¹
 - Female ²
- e. Child's home languages:
- f. How long your child has been living in Yaoundé?
- 0 to 2 years ¹
 - 3 years and more ²
- g. What is the highest level of education the father have completed?
- University or college or equivalent ¹
 - Technical training ²
 - Secondary school ³
 - Primary school ⁴
 - No schooling completed ⁵
- h. What is the highest level of education the mother have completed?
- University or college or equivalent ¹
 - Technical training ²
 - Secondary school ³
 - Primary school ⁴
 - No schooling completed ⁵

B. Health information

Please circle the appropriate response.

- a. Does your child have any problems with vision? YES/NO

- b. Does your child have any hearing problems? YES/NO
- c. Is your child's speaking ability similar to that of other children his/her age? YES/NO
If No please specify.....
- d. Does our child have any medical / physical and /or health problems? YES/NO
If yes please specify.....

Thank you for completing the questions. Please note all the information will be treated in a strictly confidential manner.

Appendix J Biographical Data in French

QUESTIONNAIRE D'INFORMATION SUR VOTRE ENFANT

Je vous remercie d'avoir permis que votre enfant participe à cette étude. Veuillez remplir ce questionnaire qui vous prendra cinq minutes de votre temps et renvoyer le ainsi que le formulaire de consentement éclairé à son enseignant(e) avant le -- -- 2014.

A. INFORMATIONS GENERALES

Nom de l'enfant :

Classe de l'enfant : Ecole :

Date de naissance de l'enfant :

Sexe: Garçon Fille

Langues parlées par l'enfant ?

- 1^{ere} langue/dialecte.....2^{eme} langue/dialecte
.....
- 3^{eme} langue/dialecteAutre langues
.....

Depuis combien de temps votre enfant vit-il à Yaoundé ?

- 0 to 2 ans ¹
- 3 ans et plus ²

Quel est le plus haut niveau d'éducation de son père?

- Université/ Ecole Supérieure ¹
- Formation technique ²
- Ecole secondaire (lycée) ³
- Ecole primaire ⁴
- N'a pas été scolarisé ⁵

Quel est le plus haut niveau d'éducation de sa mère?

- Université/ Ecole Supérieure ¹
- Formation technique ²
- Ecole secondaire (lycée) ³
- Ecole primaire ⁴
- N'a pas été scolarisée ⁵

B. INFORMATION SUR LA SANTE

(Veuillez entourer la réponse appropriée).

Est-ce que votre enfant a des problèmes de vision ? OUI / NON

Est-ce que votre enfant a des problèmes d'audition ? OUI / NON

Est-ce que votre enfant a des difficultés de parole ou de langage? OUI / NON

Si Oui veuillez préciser

Est-ce que votre enfant a des problèmes physiques et / ou de santé ? OUI / NON

Si Oui veuillez préciser.....

Nous vous remercions d'avoir répondu aux questions. Soyez assurés que toutes les informations que vous nous avez communiquées seront traitées de manière strictement confidentielle.

Appendix K

Sample of the recording sheet

Nom : Date de N. Age.....

Sexe : Classe..... Ecole : Date de l'examen :

4. Compréhension (C1)

Ensemble : Montre-moi l'image ou il y a ...
Deuxième présentation : Ecoute bien ce que j'ai dit et montre-moi l'image ou il y a ce que je dis.

- | | | |
|-----|------------------|-----|
| Q1. | Le garçon mange. | (1) |
| Q2. | Le chat joue. | (1) |

- | | | |
|-----|---|---|
| PSM | 1. Le garçon dort. | 0 |
| | 2. La fille est cachée. | 1 |
| | 3. Les enfants cartonnent à l'école. | 1 |
| | 4. Les oiseaux volent. | 1 |
| | 5. La voiture est sur le bit. | 1 |
| | 6. La maison s'appelle Catherine. | 1 |
| | 7. Le camion pousse la voiture. | 1 |
| | 8. Le vin que tu manges est glacé. | 1 |
| | 9. Il regarde l'école du côté. | 1 |
| | 10. La chat est derrière l'arbre. | 1 |
| | 11. Le camion est à côté ? | 1 |
| | 12. Le chien est sous le meuble. | 1 |
| | 13. Quelques personnes ont des cheveux. | 1 |
| | 14. Le vin est contre le mur. | 1 |
| | 15. Le paquet de bombes qu'on m'a donné est vide. | 1 |
| | 16. La fille est moins grande que le garçon. | 1 |
| | 17. La voiture est entre les maisons. | 1 |
| | 18. Je mange les cornes qui restent du gâteau. | 1 |
| | 19. Le garçon court. | 1 |
| | 20. Le chat n'est pas caché. | 1 |

4. Compréhension (C2)

- | | | |
|-----|--------------------------|---|
| Q1. | Le garçon court. | 1 |
| Q2. | Le chat n'est pas caché. | 1 |

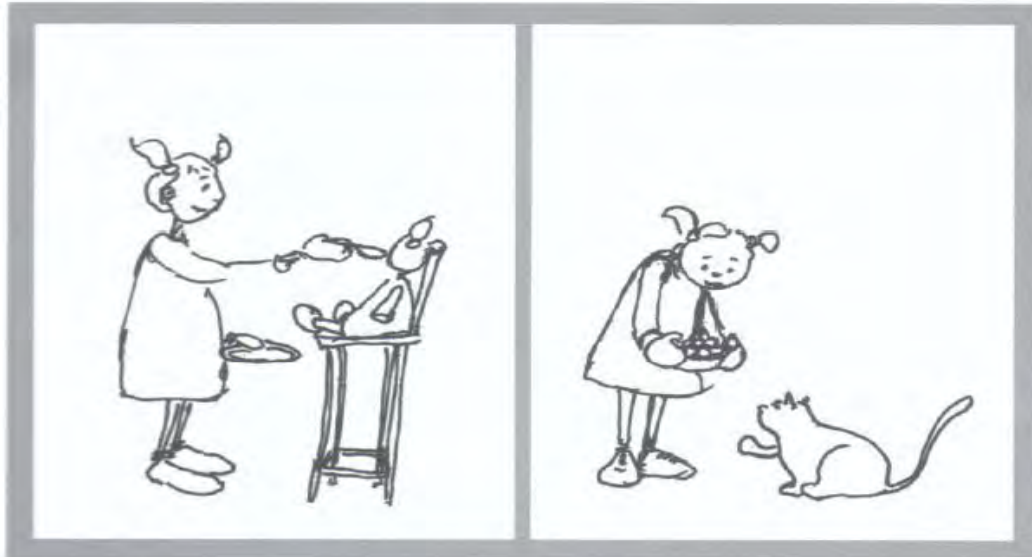
- | | | |
|-----|--|---|
| C2M | 1. Les enfants marchent leurs chaussures. | 1 |
| | 2. La petite fille le regarde. | 1 |
| | 3. Le monsieur va partir. | 1 |
| | 4. La petite fille est devant le garçon. | 1 |
| | 5. Qui est cette fille ? | 1 |
| | 6. L'oiseau a fait son nid. | 1 |
| | 7. L'enfant joue. | 1 |
| | 8. La voiture est poussée par le camion. | 1 |
| | 9. C'est un chat. | 1 |
| | 10. La ballade qui est dans le port à des voiles. | 1 |
| | 11. Mais qui est le poisson que j'aimais pour son côté à l'air ? | 1 |
| | 12. Le chat dort j'ai tiré la queue m'a griffé. | 1 |
| | 13. Pépette et la maman ont fait leurs courses. | 1 |
| | 14. La petite fille lui propose les cheveux. | 1 |
| | 15. Je mange les cornes qui restent du gâteau. | 1 |
| | 16. Le camion est suivi par la voiture. | 1 |
| | 17. L'animal bien à l'air dehors ? | 1 |
| | 18. La petite fille est plus grande ? | 1 |
| | 19. Philippe avait un chat. | 1 |
| | 20. Maman a dit que je mette ma veste. | 1 |
| | 21. Pourquoi es-tu cassé le jouet de la voiture ? | 1 |

Total

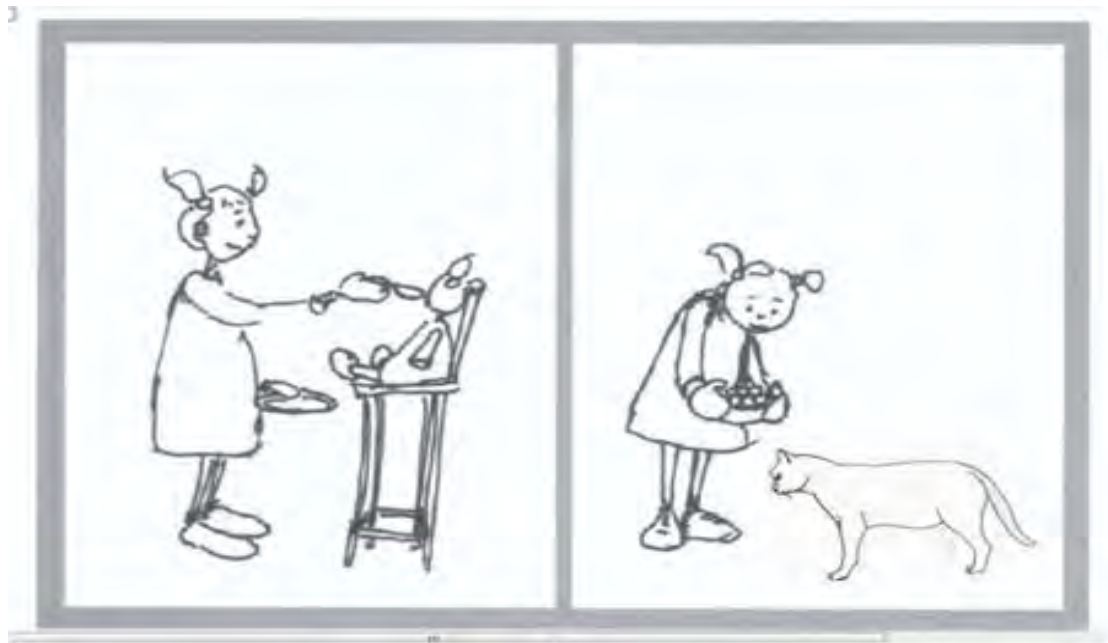
<p>Bégaiement Répétition ou prolongation des sons, des syllabes et / ou des mots : Oui Non Présence de blocages de la parole et tensions musculaires : Oui Non Les troubles de la fluence sont présents dans plus de 10% des productions : Oui Non</p> <p>Trouble de la voix Voix rauque ou enrouée/ périodes de perte de la voix : Oui Non Voix nasale : Oui Non</p>	<p>Bégaiement : Oui Non Trouble de la voix : Oui Non</p>
---	---

Appendix L
Linguistic Production subtest's modified picture

ORIGINAL PICTURE



PICTURE MODIFIED



Appendix M
Referral letter

Dear Ms/Mr

Re: Referral to a health professional

Title of the study: The norming of the ‘Evaluation du Langage Oral’ and the prevalence of speech and language disorders in preschool aged children from Yaoundé (Cameroon).

Thank you for having granted permission for your child to participate in this study. Your son/ daughter has had a speech and language assessment by the researcher who is a qualified speech -language therapist. This assessment revealed that your child could have:

.....
.....

The speech-language therapist recommend you consult a:

.....

If you have any questions or concerns regarding your or this child’s rights or welfare as research participants. You may contact the University of Cape Town Faculty of Health Sciences Human Research Ethics Committee (HREC) at: Professor Marc Blockman. Chair: Faculty of Health Sciences. Human Research Ethics Committee. Tel: +27 21 406 6492. Email: marc.blockman@uct.ac.za. If you require further information or if you have any questions please feel free to contact me or my supervisor (details below).

Yours Faithfully,

Lilly Tchoungui Oyono

Appendix N
Referral letter in French

Objet: Reference chez un professionnel de la sante

Monsieur/Madame

Titre de l'étude: Etalonnage du test 'Evaluation du Langage Oral' et prévalence des troubles de la parole et du langage chez les enfants de l'école maternelle à Yaoundé (Cameroun).

Merci d'avoir accordé la permission à votre enfant de participer à cette étude. Votre enfant a été évalué par le chercheur qui est une orthophoniste qualifiée. Cette evaluation a revele que votre enfant pourrait avoir :

.....
.....

L'orthophoniste recommande que vous consultiez un:

.....

Si vous avez des questions ou des préoccupations concernant les droits ou le bien-être de votre enfant à participer à cette étude, vous pouvez contacter le Professeur Marc Blockman Tél : +27 21 406 6492, Email : marc.blockman @uct.ac.za qui est le président du comité d'éthique de la Faculté des sciences de la santé humaine de l'Université de Cape Town. Si vous avez besoin de plus amples informations ou si vous avez des questions s'il vous plaît n'hésitez pas à me contacter ou à contacter mon superviseur (détails ci-dessous).

Cordialement,
Lilly Tchoungui Oyono

Appendix O Speech and language brochure

School Age Speech & Language Development

FACT SHEET



Give your child a strong foundation. Parents are a child's best role model for speech and language development. All children need a home environment where they are encouraged to communicate. By the time a child is four and a half they will have a vocabulary of approximately 2000 words, they will be able to listen well, and 90 to 100 percent of their speech will be understood. Most children will have mastered all English speech sounds by the age of seven or eight. By school age, a child should be able to speak in complete sentences with minor grammatical errors. A child's language skills continue to develop through the school years. From about age 9 to 19 most language growth occurs in the area of written language. If you are concerned about your child's speech and language development, talk to a speech-language pathologist.

Create an environment which encourages communication!

- ✓ Be a model for correct pronunciation but don't make your child repeat after you when he/she has said something wrong.
- ✓ Read with your child and talk about what you read. Connect what you read to your child's or family's own experiences.
- ✓ Talk about things as they happen.
- ✓ Listen carefully and give your child enough time to speak.
- ✓ Don't interrupt.
- ✓ Use a slow, natural rate of speech yourself when speaking to your child.
- ✓ Give your child the opportunity to make verbal choices, such as "do you want an apple or an orange?"
- ✓ Play guessing games like "I spy" and other word games.
- ✓ Play rhyming word games and read books written in rhyme to your child.
- ✓ Read alphabet books together. Talk about the first sound as well as the first letter of each word.
- ✓ Imaginative play using dolls or action figures can help your child model social interactions. Include greetings, comments, questions or small talk.
- ✓ Use open-ended questions like "What should we buy at the store?"

Warning signs for problems in speech or language development:

- ✓ Speaks using incomplete sentences
- ✓ Seems unable to follow oral directions
- ✓ Avoids, stumbles, or gets stuck on certain words and sounds
- ✓ Has difficulty playing or communicating with friends
- ✓ Struggles with reading and writing despite good oral language skills.
- ✓ Has problems swallowing or chewing
- ✓ Has frequent or long-term hoarseness
- ✓ Is unable to control the volume of his/her speech appropriately
- ✓ Has a history of chronic ear infections



Early detection is vital! If you suspect a problem consult your yellow pages or visit our website to find a speech-language pathologist or audiologist near you.

www.caslpa.ca

Appendix P Speech and language brochure in French

Développement de la parole et du langage chez l'enfant d'âge scolaire

FICHE DE RENSEIGNEMENTS



Donnez de bonnes bases à votre enfant. Comme parent vous êtes le meilleur modèle de développement de la parole et du langage de votre enfant. Chaque enfant a besoin d'un environnement familial qui l'encourage à communiquer. Vers l'âge de quatre ans et demi, l'enfant aura un vocabulaire de quelque 2 000 mots, pourra écouter attentivement et sera intelligible de 90 à 100 %. La plupart des enfants maîtrisent tous leurs sons dès l'âge de sept ou huit ans. Dès l'âge scolaire, l'enfant doit pouvoir s'exprimer par phrases complètes en ne commettant que des erreurs grammaticales mineures. Si le développement de la parole ou du langage de votre enfant vous inquiète, consultez un orthophoniste.

Créez un environnement propice à la communication!

- ✓ Lisez avec l'enfant.
- ✓ Montrez à l'enfant la bonne prononciation, mais ne lui faites pas répéter.
- ✓ Parlez de choses alors qu'elles se produisent.
- ✓ Écoutez attentivement ce que dit l'enfant et laissez-lui le temps de compléter sa pensée.
- ✓ Ne l'interrompez pas.
- ✓ Utilisez vous-même un débit lent et naturel lorsque vous lui parlez.
- ✓ Permettez-lui de faire des choix verbaux (p. ex. « Veux-tu une pomme ou une orange? »).
- ✓ Faites des jeux de devinettes et de mots.
- ✓ Le jeu imaginaire avec des poupées ou des figurines vous offre l'occasion de présenter des situations de communication sociale et conversationnelles. Employez des salutations, faites des commentaires, posez des questions et faites de la conversation légère.
- ✓ Employez des questions à réponse libre telles « Que devrions-nous acheter au magasin? »

Signes avertisseurs de troubles de développement de la parole ou du langage

- ✓ Il s'exprime avec des phrases incomplètes
- ✓ Il semble éprouver des difficultés à suivre des directions verbales
- ✓ Il évite certains mots ou sons, ou hésite ou bégaye lorsqu'il utilise ces mots ou sons
- ✓ Il a de la difficulté à jouer ou à communiquer avec ses amis
- ✓ Il a de la difficulté à avaler ou à mastiquer
- ✓ Il présente une voix qui est fréquemment enrouée ou enrouée pour des périodes prolongées
- ✓ Il a de la difficulté à contrôler le volume de sa voix
- ✓ Il présente une histoire d'otites à répétition



Le dépistage précoce est primordial! Si vous présentez un problème, consultez les pages jaunes ou visitez notre site Web pour trouver un orthophoniste ou un audiologiste.

www.casipa.ca

Appendix Q

Co-occurrence of speech and language disorders

Age group	Area of difficulty	Fluency -2 SD n (%)	Fluency -1.25 SD n (%)	Voice -2 SD n (%)	Voice -1.25 SD n (%)	Expressive language -2 SD n (%)	Expressive language -1.25 SD n (%)	Receptive language -2 SD n (%)	Receptive language -1.25 SD n (%)
3 year olds n = 118	Articulation	0 (0)	0 (0)	1(0.8)	1(0.8)	0 (0)	9(7.6)	1 (0.8)	5(4.2)
	Receptive	0 (0)	0 (0)	1(0.8)	1(0.8)	0 (0)	7(5.9)	NA	NA
	Expressive	0 (0)	1(0.8)	0 (0)	1(0.8)	NA	NA	*	*
	Voice	0 (0)	0 (0)	NA	NA	*	*	*	*
4 year olds n = 188	Articulation	2(1.1)	5(2.7)	1(0.5)	3(1.6)	0 (0)	9(4.8)	2(1.1)	9(4.8)
	Receptive	2(1.1)	7(3.7)	0(0)	3(1.6)	0 (0)	13(6.9)	NA	NA
	Expressive	0 (0)	5 (2.7)	0 (0)	2(1.1)	NA	NA	*	*
	Voice	1(0.5)	1(0.5)	NA	NA	*	*	*	*
5 year olds n = 154	Articulation	0 (0)	0 (0)	0(0)	2(1.3)	1 (0.6)	3 (1.9)	1(0.6)	4(2.6)
	Receptive	0 (0)	1 (0.6)	2(1.3)	3(1.9)	0 (0)	8(5.2)	NA	NA
	Expressive	0 (0)	0 (0)	1 (0.6)	3(1.9)	NA	NA	*	*
	Voice	0 (0)	0 (0)	NA	NA	*	*	*	*

* Already displayed in this table