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Investigating the impact of linguistic impairments on individuals with neurodevelopmental disorders Case of Cerebral Palsy

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF A MASTERS DEGREE IN LINGUISTICS

BY

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DEDICATION

To

My Mother

Mrs. Mefah Comfort

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ABSTRACT

This research endeavours to identify linguistic impairments among individuals with Cerebral Palsy (CP) and explore their impact on affected individuals. Additionally, the study aims to propose therapeutic strategies to enhance their language abilities. To achieve these objectives, a qualitative approach was adopted, utilizing various research instruments such as observation checklists, guided interviews, and language tests. Participant observation and semi-structured interviews were employed to gather insightful data on the subject matter. The sample comprised 7 male and female participants, aged 8 to 16 years, selected through purposive, non-probability sampling from the national handicap centre, Etougebe. The research drew on Levelt's (1989) model of speech production as a theoretical foundation to facilitate data analysis. The study's findings unveiled that individual with CP encounter expressive language disorders encompassing phonological, articulation, and muscle speech difficulties, as well as receptive language disorders affecting comprehension. The linguistic impairments were found to significantly impact communication, reading, writing, academic performance, career prospects, and social interactions in individuals with CP. Moreover, the research revealed the existence of notable therapeutic measures implemented in inclusive schools to address these learning challenges. Among the therapeutic interventions employed by teachers were articulation therapy, ergo therapy, and psychomotor therapy, which showed potential for ameliorating speech abilities in affected individuals. Based on the findings, this study emphasizes the importance of early intervention by parents and society to improve the speech capabilities of children with disabilities. Furthermore, the research advocates for the creation of inclusive environments that cater to the unique needs of children with CP. By implementing these recommendations, it is possible to provide a supportive framework that fosters language development and communication skills in individuals with Cerebral Palsy, thereby enhancing their overall quality of life.

RESUME

Cette recherche vise à identifier les altérations linguistiques chez les personnes atteintes d'Infirmité Motrice Cérébrale (IMC) et à explorer leur impact sur les personnes concernées. De plus, l'étude vise à proposer des stratégies thérapeutiques pour améliorer leurs capacités linguistiques. Pour atteindre ces objectifs, une approche qualitative a été adoptée, utilisant divers instruments de recherche tels que des listes de contrôle d'observation, des entretiens guidés et des tests de langage. L'observation des participants et des entretiens semi-structurés ont été utilisés pour recueillir des données instructives sur le sujet. L'échantillon comprenait 7 participants masculins et féminins, âgés de 8 à 16 ans, sélectionnés par échantillonnage initie par choix raisonné, non-probabiliste, au Centre National des Handicapés d'Etougebe. La recherche s'est appuyée sur le modèle de production de discours de Levelt (1989) en tant que fondement théorique pour faciliter l'analyse des données. Les résultats de l'étude ont révélé que les personnes atteintes de IMC rencontrent des troubles du langage expressif, comprenant des difficultés phonologiques, d'articulation et de trouble moteur de la parole, ainsi que des troubles du langage réceptif affectant la compréhension. Les altérations linguistiques ont été constatées comme ayant un impact significatif sur la communication, la lecture, l'écriture, les performances scolaires, les perspectives professionnelles et les interactions sociales des personnes atteintes d'infirmité motrice cérébrale. De plus, la recherche a révélé l'existence de mesures thérapeutiques pertinent mises en œuvre dans les établissements d'enseignement pour répondre à ces difficultés d'apprentissage. Parmi les interventions thérapeutiques utilisées par les enseignants figuraient la thérapie d'articulation, l'ergothérapie et la thérapie psychomotrice, qui ont montré leur potentiel pour améliorer les capacités de parole chez les personnes concernées. Sur la base des résultats, cette étude souligne l'importance d'une intervention précoce par les parents et la société pour améliorer les capacités de parole des enfants en situation de handicap. En outre, la recherche préconise la création d'environnements inclusifs répondant aux besoins spécifiques des enfants atteints d'IMC. En mettant en œuvre ces recommandations, il est possible de fournir un cadre de soutien qui favorise le développement du langage et des compétences de communication chez les personnes atteintes d'IMC, améliorant ainsi leur qualité de vie globale.

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LIST OF ABBREVIATIONS

AAC: Alternative and Augmentative Communication

ADHD: Attention Deficit Hyperactivity Disorder

APHC: Association of Parents with Handicapped Children.

ASD: Autism Spectrum Disorders

ASHA: American Speech- Language- Hearing Association.

C: Consonant.

CNRH: Centre Nationale de Rehabilitation des Handicapes

CP: Cerebral Palsy

CSBSDPCQ : Communication and Symbolic Behaviour Scales Caregiver Questionnaire

CV: Consonant Vowel

DSM-5: Diagnostic and Statistical Manual of Mental Disorders.

ELD: Expressive Language Disorders

ICD-10: International Book of Diseases

IFG: Inferior Frontal Gyrus

MRI: Magnetic Resonance Imaging

NDDs: Neurodevelopmental disorders

NRCPD: National Rehabilitation Centre for Persons with Disabilities

PLS-4: Preschool Language Scale, 4th edition.

RLD: Receptive Language Disorders

SLI: Specific Language Impairment.

SMA: Supplementary Motor Area

SVANTE: Swedish Articulation and Nasality Test

TOT: tip-of-the-tongue

V: Vowel

LIST OF SYMBOLS

→: Deviation

//: Phonological Transcription

[]: Phonetic Transcription

/: Environment of occurrence

#: Word boundary

∅: Deletion

GENERAL INTRODUCTION

This chapter lays foundational background. In order to understand the focus of the study, it spells out the components necessary in the study including the background to the study, the problem statement, the research questions, the research hypothesis, the significance of the study, the motivations, the scope of the study, the outline of the study and ends with a brief chapter conclusion.

1.1 Background of the Study

This section elaborates on the background of the study from multiple perspectives namely from a historical perspective, a conceptual perspective and a contextual perspective.

1.1.1 Historical Background

In order to gain understanding on the concept of Cerebral Palsy (from here on referred to as CP) as it is understood today, it is important to examine it through the history of neurodevelopmental disorders.

The symptoms of neurodevelopmental disorders were studied in the early 20th century long before the development of the classification (Rosendahl 2020). Neurodevelopmental disorders such as Intellectual Disability, Autism Spectrum Disorder, and attention deficit hyperactivity disorders were first described by physicians in the 18th and 20th centuries such as Weikard, Down, Asperger and Kanner (Rosendahl 2020, pp.67-68). Initially these concepts were regarded as distinct disorders but over the past decades evidence has indicated that childhood disorders such as Intellectual Disability, Autism spectrum disorder and Attention deficit hyper activity disorder shared specific genetic risk factors as well as comorbidities (Rosendahl, ibid). This led researchers to propose that conditions that onset early in life and involve impairments in the developing nervous system, belong to a neurodevelopmental continuum. This led to the classification of these disorders under the term “Developmental Disorders” when DSM III (Diagnostic and statistical manual of mental disorders 3rd edition) was introduced in the 1980s (Rosendahl 2020). This classification was later changed to “Disorders First Diagnosed in Infancy, Childhood or Adolescence” in DSM-IV introduced in 1994 (Rosendahl 2020). It added a new category called “Motor Skills Disorder” which signalled the entry of Cerebral Palsy under this classification. The term “Neurodevelopmental Disorders” was officially introduced in the DSM-5 as the new umbrella classification for all disorders with onset in childhood and marked the inclusion of CP as a motor disorder under

this category. This was based on its having an onset in childhood and given its origin in abnormal brain development.

The origin and discovery of Cerebral Palsy is centred on the contributions and genius of great minds determined to improve the lives of those suffering from it. CP is a disorder that has affected people for nearly a millennium and although there is no historical record, there is no doubt that it has existed as long as women have been giving birth.

We have it on record that, research on CP was pioneered by William Little in the 1830s and 50s who suffering from clubfoot used his disability as a driving force to research on improving the lives of others with disabilities. Little described this phenomenon in one of a series of lectures of 1843 titled "Deformities of the human frame" which he presented to the Obstetrical Society of London. He explained that children with CP have an injured nervous system that results in spasticity. Little theorized that CP was caused by birth complications and lack of oxygen which damaged sensitive brain tissues. In his best known work published in 1862, Little grouped cases of CP into different categories; hemiplegia (rigidity which affects one side), Paraplegia (affects both legs more than arms), Generalized rigidity (Rosenbaum et al 2006). This grouping of his served as a foundation for later classification systems for CP developed by subsequent researchers. It is important to note that even though Little pioneered research on CP, he did not coin the term 'Cerebral Palsy" and for a while the condition was known as "Little's Disease".

The term "Cerebral Palsy" was coined by Sir William Osler who in his 1889 book titled "

The Cerebral Palsies of Children" described his research of a case series of 151 patients and used a classification system similar to Little's in a bid to "adhere to customs for the sake of clarity and convenience" (Osler 1889). This term replaced the earlier name of Little's disease.

As more researchers became interested in CP, a difference in opinion ensued, notably from Sigmund Freud the Austrian neurologist and founder of psychoanalysis. Freud published papers describing his beliefs about the aetiology of CP. He observed during his studies that children affected with CP had other problems not associated with movement disorders some of the problems include; vision impairment, mental deficiencies and seizures. This led him to theorize about the possibility of the disorder beginning as the brain developed in the womb. Even though Freud accepted Little's assertion of birth complications being a cause of CP, he argued that the birth difficulties were spurred by earlier developmental problems of the foetus. His assertions were later proven correct but were not accepted until the 1980s.

In the early 1920s Winthrop Phelps an orthopaedic surgeon pioneered a modern approach to the physical management of children with CP and advocated for; physical therapy, orthoses and nerve blocks. Phelps in a later article identified four treatment goals namely; locomotion, self-help, speech and general appearance (Phelps 1941). Phelps also developed his own system of classification for CP and went on to found the American Academy for CP in 1947 with him as its first president.

In the 1960s and 70s, researchers began investigating the relationship between CP and language. One of the earliest studies on this aspect was conducted by Brown and Bellugi (1964) examining language development in children with various neurological conditions including CP. The study revealed that children with CP often exhibited delays and impairments in language development when compared to their typically developing peers. Lamberts and Grieve (1979) conducted a comprehensive review on language disorders in individuals with CP, this review synthesized existing literature to provide insights into the prevalence and characteristics and associated factors of language impairment in individuals with CP. Hardy (1983, cited in Friel 1997) posited that children with CP exhibited a high prevalence of speech and language disorders compared to typically developing children. Friel (1997) investigated the acquisition of first language and gestures in children with CP both speaking and non-speaking. These researches revealed that CP was not just a disorder that affects the motor sensory aspects of people but also a disorder of language and this led subsequent studies in the 1980s to be focused on alternative communication methods and measuring the receptive capabilities of individuals with CP (Adler 1975, Lloyd and Karlan 1983, Hardy 1983, Beringer and Gans 1986).

As a result of this high prevalence of language impairments in individuals with CP, researchers focused efforts in the 1990s towards determining the aetiology and towards early intervention. In the 1980s a government funded study combined information about 35,000 CP births and it was discovered that relatively few cases of CP were accompanied by trauma at birth and this discovery sparked a wave of research on CP from researchers in diverse fields. The 1990s therefore brought new advances in the early diagnosis of CP in infants. It was determined that early identification of the disorder prevents permanent contracture of limbs.

In Cameroon, early research on CP began in the 1990s. In 1992, Motchie and Mbonda (1992) conducted a research on CP focusing on etiological and therapeutic aspects. This research examined 147 case studies of CP at the Yaoundé Central Hospital. It focused on the etiological and clinical aspects of the phenomenon as well as some therapeutic options. This

research was the very first research on CP in the context of Cameroon and set the trend for subsequent research on CP.

Since 1992, research on CP has been evolving especially in the clinical domain where several researches have been conducted over the years including; Bediang (2008) who conducted a study looking at the clinical, etiological and scannographic aspects of CP, Mbonda et al. (2011) Nguefack et al. (2013), Mangamba et al. (2021). The research trend on CP thus far has been clinically inclined with each research building on the previous to further understanding of one clinical aspect of CP or the other.

1.1.2 Conceptual Background

Since its discovery in the 1800s by William Little, CP was for a long time referred to by the scientific community as Little's Disease until sir William Osler coined the term "Cerebral Palsy". However the coining of a term did not much address the problem faced by researchers in the domain of CP at the time which was the fact that no two cases of CP were the same and as a result coming up with a general all-inclusive definition capable of catering to the varying forms of CP proved rather challenging and as such a classification system with the various CP types was also another challenge faced by the research community with researchers in different fields employing diverse classification systems.

In 1861 William Little attempted the first definition of Cerebral Palsy in a paper he presented at the Obstetrical Society of London wherein he stated that children with the condition have an injured nervous system that results in spastic rigidity. This definition of his is the first attempt at defining what is known today as spastic CP and was so ground-breaking for later iterative definitions. Several prominent researchers attempted a definition of CP as well as a classification system over the ensuing years (Evans 1948, Asher and Schonell 1950, Wyllie 1951, Ingram 1955). The above authors each went about diverse ways in implementing a classification for CP. Keith and Polani (1957) convened a meeting of a club called the Littles group wherein they sought to come up with a definition of CP and they published their definition of CP as " a permanent but not unchanging disorder of movement and posture appearing in the early years of life and due to a non-progressive disorder of the brain , the result of interference during its development" (Mac Keith and Polani 1959). Bax (1964) defined CP as " a disorder of movement and posture due to a defect or lesion of the immature brain" he went on to further exclude from CP disorders that are temporal, due to a progressive disease, or due solely to mental deficiency. This definition however did not cover the various

impairments associated with CP such as; sensory, cognitive, communicative and behavioural impairments. The multiplicity of disorders covered by CP led Mutch and colleagues to modify the definition of CP in 1992 into "an umbrella term covering a group of non-progressive but often changing motor impairment syndromes secondary to lesions or anomalies of the brain arising in the early stages of development". These definitions focused on the motor impairments aspects of CP but did not cover other manifestations of the condition.

Due to the unsatisfactory nature and inadequacy of the aforementioned definitions and attempts at classifying CP, an international workshop on the definition and classification of CP was convened in USA on July 2004 led by prominent researchers in the domain of CP. The goal of the committee was to establish a definition for CP that accounted for the wide range of impairments associated with CP, to address the fact that CP is not an etiologic diagnosis but a clinical descriptive term, to develop a multidimensional terminology reflective of various disciplines and can be used internationally. This led Rosenbaum et al. (2007) to the following definition of CP:

> Cerebral Palsy (CP) describes a group of permanent disorders of the development of movement and posture, causing activity limitation that are attributed to non- progressive disturbances that occurred in the developing foetal or infant brain. The motor disorders of Cerebral Palsy are often accompanied by disturbances of sensation, perception, cognition, communication, and behaviour, by epilepsy, and by secondary musculoskeletal problems. (p.9).

The above definition attempts to cover various loopholes and makes it easier for scientists in multidisciplinary domains to communicate and take into account the various impairments associated with CP especially communication impairments which is of interest to us in this study.

1.1.3 Contextual Background

In order to get a better understanding of the research problem, it is essential to take a look at the background of CP in the context of Africa in general and Cameroon in particular which is the context of the research study. In the African context, several researches have been conducted on CP mostly with a clinical orientation. Majority of these studies are hospital based clinical descriptions of CP and they include;

Djibo (2007) who for his doctoral thesis conducted a study on children with CP from 0 to 14 years at a re-education Centre in Bamako. His study examined the clinical characteristics of CP as well as the socio-demographic traits of the individuals. Similar studies were later conducted by; Mwesige et al. (2017), who conducted a population based study in Uganda, Ekanem et al. (2020) in Ethiopia, Tsige et al. (2021) in Ethiopia, and Mwesige (2016) who investigated the clinical features of CP.

In Cameroon, research on CP is still in its early stages with the majority of studies conducted so far being clinically focused. Motchie and Mbonda (1992) who conducted the very first study on CP in Cameroon is an example of such investigations. Their study focused on the causes, clinical features and treatment options for CP. This signaled the beginning of a wave of clinical research studies on CP such as; Wylfred (2008) who executed a similar study with scannographic elements included. Furthermore, Nguefack et al. (2015) published an article on CP that was similar to the prior studies. In a similar vein, Moifo et al (2013) undertook a comparable study on CP that looked into the findings and description of Neuro-imaging scans. This study used Computed tomography scans to determine common brain lesions of CP. Mangamba et al. (2022) also pursued a study on CP focusing on determining clinical, treatment and epidemiological characteristics.

In another light, Mbonda et al. (2011) explored CP with a focus on one of its associated disorders which is epilepsy. Here the researchers looked at the prevalence of epilepsy across various forms of CP noting that epilepsy was present in 41.5% of patients (Mbonda et al. 2011, p.2). In addition Kana et al. (2022) conducted another clinical research on CP in order to identify the comorbidities in children with CP. During this study they conducted a study on 88 children with CP and found that intellectual disability, microcephaly, epilepsy amongst others were the most salient comorbidities. (Kana et al. 2022, p.2).

From the studies above, CP has been copiously investigated from a medical perspective, however its associated impairments such as language impairments have not been investigated especially from a non-clinical perspective. The above research indicate that there is more to be done on CP in Cameroon as there is a gap to be filled from different views other than the medical.

1.2 Problem Statement

According to Kana et al. (2022) the prevalence rate of Cerebral Palsy in Cameroon is 18.5%. Cerebral Palsy has a high prevalence of comorbidities and linguistic impairments is one

of the most prominent comorbidities associated with CP, accounting for 74.2% of the comorbidities identified. (Mangamba et. al.2022). Despite this high prevalence of linguistic impairments in CP cases, the trend of research on CP in Cameroon thus far has been clinically centred and mostly focused on aspects such as the clinical characteristics, aetiology ,and epidemiology to name a few.

This is evident in the works of researchers such as; Motchie and Mbonda (1992), Wylfred (2008), Moifo et al. (2013), Nguefack et al. (2015), Kana et al. (2022), and Mangamba et al.(2022). The above studies are a clear indication that other aspects of CP have been overlooked with little to no attention given to its associated impairments. This is evident in the fact that although linguistic impairments have a high occurrence rate in CP, little to no study be it linguistic or clinical has been conducted investigating them or their impact. This leaves a gap to be filled in the research on CP and hence the current study.

1.3 Research Objectives

This study targets a main objective and three specific objectives.

1.3.1 Main Objective

To identify the linguistic manifestations in Cerebral Palsy, the resultant consequences and to propose possible therapeutic strategies.

1.3.2 Specific Objectives

1) To identify linguistic manifestations in individuals with CP
2) To examine the consequences of linguistic impairments on individuals with CP.
3) To propose possible therapeutic strategies.

1.4 Research Questions

This study will be guided by the following research questions which are divided into a main research question and a series of specific research questions.

1.4.1 Main Research Question

What are the linguistic manifestations present in individuals with CP, their impact and possible therapeutic strategies available?

1.4.2 Specific Research Questions

1) What are the linguistic manifestations present in individuals with CP?

2) What is the impact of linguistic manifestations on individuals with CP?
3) To suggest possible therapeutic strategies geared towards improving the communicative capabilities of individuals with CP.

1.5 Research Hypothesis

The investigation in this research is guided by the following hypothesis in a bid to answer the research questions. It is divided into a main and specific hypothesis.

1.5.3 Main Hypothesis

Individuals with CP exhibit linguistic manifestations that impact their communication abilities.

1.5.4 Specific Hypothesis

1) Individuals with CP suffer a number of linguistic manifestations
2) CP has very negative consequences on the communication abilities of individuals suffering from it.
3) Speech language therapies can ameliorate the linguistic abilities of individuals with CP.

1.6 Significance of the study

Although several studies have been conducted on CP, the current research holds significance to various stakeholders such as the scientific community, the clinical domain, parents of individuals with CP, handicap centres, educational institutions and the society at large.

To the scientific community, this study fills a gap in knowledge and contributes to the overall body of research on CP especially in the domain of psycholinguistics. By investigating the specific challenges faced by individuals with Cerebral Palsy in language development, this research contributes to the broader understanding of neurodevelopmental disorders. It adds to the existing body of knowledge on language impairments, providing valuable insights into the unique linguistic needs of this population. The findings of this study can serve as a basis for further research, promoting a deeper understanding of the underlying mechanisms of language impairments and informing the development of effective intervention strategies.

Within the medical domain, this study holds great significance. Understanding the intricacies of the language impairments in individuals with Cerebral Palsy can aid healthcare professionals in accurately diagnosing and assessing the needs of these individuals. The

linguistic input complements the clinical data already available and enables the above stakeholders better interact and understand the best strategies and health policies to employ. In addition, the findings may contribute to the development of specialized screening tools and assessment protocols tailored to the unique challenges faced by this population. Furthermore, the research outcomes can guide the design and implementation of targeted intervention programs, enhancing the quality of care and therapeutic approaches provided to individuals with Cerebral Palsy and language impairments.

For parents of individuals with Cerebral Palsy, this study provides valuable information about the specific language difficulties faced by their children. It provides a deeper understanding of the factors that contribute to language impairments and the challenges their child may encounter. This knowledge empowers parents by equipping them with information about potential intervention strategies, communication techniques, and support networks. The study's findings may help parents navigate the often complex landscape of language impairments in Cerebral Palsy, enabling them to make more informed decisions regarding their child's education, therapy, and overall well-being.

In addition, this study serves as a sensitizing campaign and wake up call to the parents of individuals with CP and the society in general. The results from the study serves as a deterrent to current societal misconceptions regarding CP and other disorders. The findings enable the parents and society in general to understand that, CP in general and the resulting impairments do not have spiritual origins nor is it due to a curse. Therefore there are available strategies that can aid their understanding and interaction with these individuals but also greatly contribute towards alleviating the impairments that they suffer from. The society and the parents armed with such knowledge will pay closer attention to the needs of these individuals and even take pre-emptive measures to tackle CP in its early stages in order to avoid the linguistic implications.

Handicap centres and rehabilitation services play a pivotal role in supporting individuals with Cerebral Palsy. The significance of this study for these stakeholders lies in its potential to enhance the efficacy of their services. By shedding light on the specific language needs of individuals with Cerebral Palsy, this research can guide the development of tailored intervention programs within these settings. It can assist professionals working in these centres to refine their therapeutic techniques, incorporate evidence-based approaches, and adapt their support to better address language impairments. Ultimately, the findings of this study can

contribute to improving the outcomes and overall quality of life for individuals with Cerebral Palsy accessing these services.

Educational institutions are vital stakeholders in the lives of individuals with Cerebral Palsy and language impairments. This study's significance lies in its potential to inform and shape educational practices for students with these challenges. By identifying the linguistic difficulties faced by individuals with Cerebral Palsy, educators can develop inclusive teaching strategies, specialized interventions, and appropriate accommodations. The study's findings can contribute to the design of individualized education plans and provide educators with valuable insights into optimizing the learning environment to foster language development in this specific population.

In sum this study adds to the bulk of literature on CP and is significant as it helps to draw the attention of the government on the need for intervention centres and also on the need to fast-track the education and autonomy and or normalization of individuals suffering from CP.

1.7 Scope of the study

In terms of Neurodevelopmental disorders, this study is mainly concerned with CP, specifically linguistic impairments and their consequences. Geographically, the study is limited to Yaoundé in general and the National Handicap Centre at Etougebe in particular. In terms of population, it is limited to individuals with CP at the Handicap Centre aged 6 to 16 years exhibiting language difficulties. It does not cover other neurodevelopmental disorders observed at the Centre or elsewhere.

1.8 Outline of the study

This work is subdivided into the general introduction, chapters one, two, three and four. The general introduction provides an entry point into the study and contains preliminary information relevant to the study and provides a background to the study.

The first chapter handles the theoretical framework and the literature review. It gives a comprehensive summation and analysis of research in the domain of CP thus far and how it interrelates with the current study and provides a theoretical framework that will not only guide the study but also ensure the study attains authentic conclusions.

The second chapter provides detailed information on the methodology employed in carrying out the study.

The third chapter involves a detailed presentation of the investigation, treatment and analysis of data collected.

The fourth chapter presents the results obtained from the analysis and provides the general conclusion to the research as well as some suggestions for further study.

1.9 Conclusion

This chapter laid the groundwork for the study by tackling key fundamental aspects and giving a background to the phenomenon under study. The study from hereon will be focused on obtaining evidence to back up the questions asked and to confirm or debunk the hypothesis as well as present the resulting findings.

CHAPTER ONE THEORETICAL FRAMEWORK AND LITERATURE REVIEW

This chapter dives into details on the theoretical framework best suited for this research as well as a review of related literature surrounding the study area. This enables the researcher to understand what has been covered so far within this field of study, spot gaps and situate the relevance of the current research in the domain of studies on CP. In addition, some operational terms that are relevant to the study are defined in this chapter in order to clarify any ambiguity or confusion. Hence this chapter is an essential piece of the puzzle in this study as it sets the stage for subsequent chapters. It is segmented into three sections mainly the theoretical framework, literature review and definition of operational terms.

1.1 Theoretical Framework

The speech sounds generated by a speaker are the physical manifestations of language converted into sound. This assertion is echoed by Smith (1992a, p. 233) who posits that "the sound generated by a speaker is the product of coordinated multilevel motor processes…" This description of language as a multilevel process points to the fact that language is not a random occurrence but a system. Given this assertion and the fact that the current study is concerned with language, this research makes use of Levelts' (1989) model of speech production. This study specifically makes use of Levelts' (1989) model that is elaborated in Blanken et al. (1993, pp.1-3). This model describes the intricate neural processes involved in the conception and formulation of language, right down to its physical realization as overt speech and subsequent comprehension by the listener.

1.1.1 Levelts' (1989) model of speech production

The exercise of expressing language through speech takes place in minutes but involves complex multi-step processes and these processes are concisely captured or structured in Levelts (1989) model detailed in Blanken et al. (1993). In this model, the speaker is viewed as "a highly complex information processor who can, in some rather mysterious way, transform intentions, thoughts, and feelings into fluently articulated speech" (Blanken et al. 1993, p.1). The transformation of thoughts to speech is done through a linearization process made up of independent components that function together. These processing components include; the conceptualizer, formulator, articulator, acoustic-phonetic analysis, parser and discourse processing. This unique architectural representation of the speaking and listening process provides deep insight into the mechanism of language and how its production and comprehension is achieved. This model is relevant to this study as it provides insight into

understanding what aspect of language is affected in individuals with CP and at what stage. The following lines elaborate further on these processes and their functions.

1.1.2 Levelts' components of Speech production

Levelts (ibid) model consist of components and these components or stages do not occur randomly, there is a hierarchical order of levels with one serving as an input to the next level. In order to understand their relation to each other and to the current study, the following lines provide insights into each component. The following diagram illustrates these components in full detail

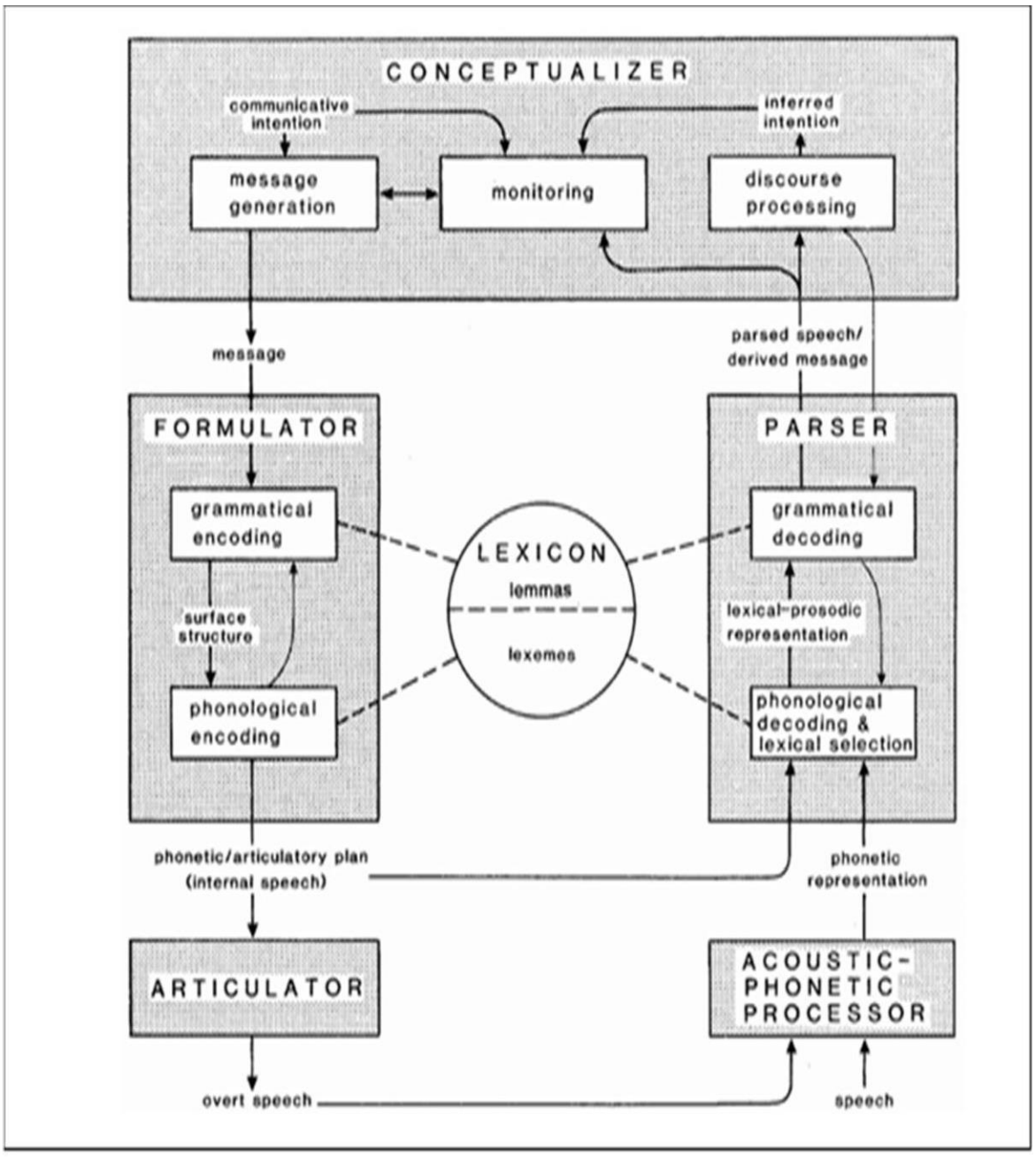

Figure 1. Levelts' (1989) Model (Blanken et al. 1993).

1.1.2.1 The Conceptualizer

This is the level wherein the speaker conceives an idea, "selects and orders information whose expression may realize that intention" and the speaker "also formulates that information i.e. gives it linguistic shape" (Blanken et al. 1993, p.1). The speaker at this level retrieves the appropriate words from memory in a process known as lexical access. He/she assigns them their proper grammatical and syntactic roles and positions respectively. This entire process of planning what to say and assembling the necessary information as well as the linearization of that information is called "macro-planning" (Levelt 1989, p.123). In addition to "macro-

planning", the conceptualizer also incorporates a "micro-planning" element that determines how the speaker will present the message and the choice of words as well as word order. (Blanken 1993, p.3). The elements of the conceptualizer not only give insight into the micro-processes that goes into speech production in "normal" speakers, but provides a means of interpreting and analysing the utterances of people with impairments such as CP. The end product of this stage is called the preverbal message which serves as the input for the formulator, the next processing component in the speech production chain. Thus, communication can fail at this initial level as individuals with CP may suffer neurological breakdowns that are likely to hinder proper conceptualization and consideration of the micro-level.

1.1.2.2 The Formulator

The formulator translates a conceptual structure into a linguistic structure through grammatical and phonological encoding. According to Blanken et al. (1993, p.4) "The formulator maps messages into linguistic forms. It performs two relatively independent operations: grammatical encoding and phonological encoding."

Grammatical encoding takes a message as input and delivers a surface structure as output (Blanken et al. ibid). The surface structure is made up of lemma which are lexical elements that do not have phonological form. The surface structure carries within it a configuration underlying the syntactic relation of these lemmas in terms of function such as "'head of phrase', 'subject of', direct object of'" (Blanken et al. 1993, p.2). These lemmas have a semantic specification describing the conditions under which the lemma can be used. The lemma at this stage is made up of syntactic information regarding their grammatical category and their place in a sentence. The output of grammatical encoding is the surface structure which is hierarchical in nature and made up of lemmas.

Phonological encoding entails retrieving or building a phonetic articulatory plan for each word and for the utterance as a whole. Here the phonological specification for each lemma is retrieved from the mental lexicon and they are called lexemes. It is important to note that "when the retrieval of a lemmas lexeme is blocked the speaker is in a 'tip-of-the-tongue' (TOT) state" (Blanken et al. 1993) highlighting the importance of this processor to speech production. When the lexemes are retrieved, they are subjected to a phase of "slot-filling" wherein the lexemes are fitted into metrical frames. Metrical frames enable the speaker arrange the sounds into "a string of syllable specifications" (Blanken et al. 1993, p.3) which in turn enables the

speaker determine the correct pronunciation of the word. Given the precise and intricate processes going on at this level, it is very essential to the successive realization of the final speech output and should anything affect this component, or any of its subsections, it will ultimately alter the intended message. This makes it relevant to the current study as it provides explanation to common phonological disorders such as syllable deletion, substitutions that are likely affecting the speech of individuals with CP. In addition any damage to the nerves responsible for this component can also affect the movement of articulators and the speech rate which in turn makes speech slow and laborious as seen in some cases of CP. The output of this processor is a phonetic or articulatory plan which serves as the input to the next processing component, the Articulator.

1.1.2.3 The Articulator

This level deals with the articulatory plan which is essentially "a program for articulation" (Levelt, 1989, p.12). It is the internal representation of how the utterances should be articulated and Levelt referred to it as "internal speech" and it is executed by a three-fold motor system made up of the respiratory, laryngeal and supra-laryngeal systems (Blanken et al. p.7) The respiratory system "...Provides the acoustic energy for speech by providing the steady outflow of air" as such any damage or hindrance to this system affects the sound quality and pitch. The laryngeal system is responsible for "voicing and loudness" (Blanken, ibid). This means that the voicing of vowels, voiced and voiceless consonants is determined by this system and so if it is affected, it could lead to sounds being mispronounced or distorted. The supra-laryngeal system determines whether a sounds comes out as a vowel or a consonant. This is because "it can be constricted in different places (dental, alveolar, palatal, velar, uvular, and glottal), and there are different manners in which these constrictions can be released (plosive, fricative, affricative, lateral, etc.)." (Blanken et al. p.7). This plays a great role in determining not only the linguistic articulatory shape of sounds but also the pace at which it is articulated. The pace at which the phonetic plan is generated is asynchronous to the pace of articulation and thus, the resulting phonetic plan is temporarily stored in a device known as an "articulatory buffer" until they are ready to be executed. During execution sets of muscles are used in a coordinated way in order to achieve overt speech and according to Levelts (ibid) the articulatory plan is independent of context whereas the execution adapts to various circumstances and context to achieve the articulatory goal. Given the intricate mechanisms involved here, any malfunction due to muscle impairment can not only hinder the articulation of sounds fluently

but make it difficult to produce clear distinguishable sounds which can make speech indecipherable.

This is a likely outcome in extreme cases of CP where patients are unable to manipulate the vocal folds and have swallowing difficulties. In addition this stage can affect individuals with CP in that due to poor motor control they may have difficulties generating a steady airflow needed for speech sounds or poor control of the tongue can hinder the steady flow of air causing sounds to be misarticulated. It can also affect the pitch and rhythm and fluency of their articulation. It is also important to note that the output of the articulator is overt speech which is subsequently analysed as input by the acoustic phonetic component.

1.1.2.4 Acoustic-Phonetic Analysis

This component exists at the level of the listener and consists of a "front-end processor" that receives the acoustic signals from the articulator for processing (Blanken et al. p.8). It processes the acoustic input and delivers "representations of the speakers intended articulatory gestures" (Blanken et al. ibid). These representation are called "phonetic representations" and they contain information about the phonetic properties of the sounds such as voicing, coronality, nasality etc. (Blanken et al. ibid). This component is central to the communication process because it provides the input needed for subsequent stages of interpretation and so if damaged, the listener will not be able to deliver the right phonetic representation meaning the speaker's intentions have been altered. In addition any damage can affect comprehension in the listener ultimately causing receptive language issues which is not uncommon in individuals with CP. This may cause the listener to give a wrong feedback due to inappropriate processing at this stage. Phonetic representations serve as input to the parser.

1.1.2.5 The Parser

This component is responsible for decoding the phonetic representations and assigning the resulting segments to matching words in the mental lexicon. It consists of two key phases the phonological decoding phase and grammatical decoding phase.

The phonological decoding phase is concerned with lexical selection whereby the phonetic features of a word "activates all lexical items whose word-initial phonological specification matches the input." (Blanken et al. p. 9). Through this method, lexical selection is made. Phonological decoding is also concerned with prosodic decoding wherein the listener "will have to recognize the metrical groupings of the words recognized." to facilitate the listeners understanding of the speakers tone, stress and also facilitate syntactic decoding. Without this key component, the listeners comprehension of the message will be skewed or incomplete leading to faulty feedback. The output of phonological decoding is lexical or prosodic representation which is passed on to the grammatical decoding phase.

Grammatical decoding is centred on interpreting the lexical representations syntactically. To achieve this, several key processes take place during grammatical decoding and they are incrementality, minimal attachment, semantic anomaly, and global syntactic parsing. (Blanken et al. 1993, p.10). The above processes enable the listener make sense of the sentence structure as well as its grammaticality. In addition, global syntactic parsing performs "syntactically based semantic interpretation" takes into account grammatical aspects such as subject, direct and indirect object to ensure not only a grammatically correct but semantically appropriate message. Any disturbance in this crucial area may likely affect an individual's ability to comprehend and interpret what is said and may also impact their ability construct long responses. This is likely the case in individuals with CP. The output here is termed the derived message.

1.1.2.6 Discourse Processing

This is the last stage in the comprehension of the speaker's message. At this level, the focus is on identifying referents. In order to fully understand a speaker's message, the listener must engage in discourse processing. This involves identifying which entities the speaker is referring to and building a mental model of the situation being discussed. (Blanken at al.1993, pp.11-12). The listener's interpretation can be influenced by previous assumptions about the speaker's knowledge and the listener's own experiences.

When interpreting discourse, the listener may choose the most relevant entity or the last mentioned entity. In addition, understanding the speaker's intentions requires analysing all aspects of the situation, from the physical environment to the listener's relationship with the speaker. Given the complex processes involved, any failure in an individual's ability to perform discourse processing probably due to attention or cognitive problems can have disastrous consequences on their interpretation of the speaker's message. This is the case with the issue under study as CP affects the nervous system of the brain thereby making it difficult for them to understand complex sentences, limit their responses, difficulties constructing long sentences, challenges discussing or processing abstract concepts, difficulties inferring meaning from context, difficulties understanding metaphoric meanings.

1.1.2.7 Relevance of Levelts Model in the study

Although several models describing the language process have been proposed, Levelts (1989) model adapted in Blanken et al. (1993) is best suited for the current study. This is because the model covers the full spectrum of processes involved in the production and comprehension of language. Although it is a model depicting speech production in "normal" speakers, when adapted to the current study provides the researcher with a theoretical microscope for identifying the language impairments in people with CP. This makes it possible for the researcher to account for speech production problems and comprehension problems as well. In addition, it enables the researcher determine which components are affected, and the precise location in the production chain where the pathology occurs.

Furthermore, the model provides a detailed depiction of the various micro-processes that takes place giving the researcher insight into how the organs of speech function and how they can be affected in the event of a pathology. It also permits the researcher to determine the various language impairments that can arise in the event of any malfunction in relation to CP. In addition, the seven components presented in this model are highly relevant to the research objectives of this study allowing the researcher to ascertain the impact of any malfunctions on the individuals with CP.

Lastly, the researcher makes use of this model because it is very versatile and cross-disciplinary and compared to other models is recent and subject to updates and refinements such as in Blanken et al. (1993). In addition, this model is very popular amongst researchers and has been used in a variety of studies making it well grounded in research. This goes to further provide some modicum of validity and reliability to the current research.

1.2 Literature Review

The literature review for this study is done conceptually, contextually and ends with an empirical review which is done following the objectives of the study. It covers the body of research and literature surrounding Cerebral Palsy and its associated impairments with emphasis on linguistic impairments.

1.2.1 Conceptual review

The following paragraphs cover literature regarding the development and evolution of some key concepts relevant to the study such as; neurodevelopmental disorders, Cerebral Palsy, and language/linguistic impairment (for the purpose of this study the preferred term adopted and used throughout is “linguistic impairments”).

1.2.1.1 Neurodevelopmental disorders (NDDS)

Falissad (2021) provides valuable insights into the early conceptualization of neurodevelopmental disorders (NDD) and its relevance to the present study. The term NDD originated in the 1970s as a way to distinguish disabilities affecting the body from those impacting cognition and behaviour (Falissad 2021, p.179). This differentiation aimed to move away from the term "mental disorders." Initially, NDD was mainly associated with Autism Spectrum Disorders (ASD) and Attention Deficit Hyperactivity Disorder (ADHD). However, it was not until the publication of "Rutter's child and adolescent psychiatry" in 2008 that the term NDD gained wider recognition and a broader scope (Falissad, ibid).

This historical context is significant for the current study because it shows that in its early stages, NDDs were not associated with communication disorders or conditions like CP. By exploring the evolution of the NDD concept, our study aims to contribute to the understanding of language impairments within the framework of CP as an NDD, filling gaps in the historical understanding of NDD's association with communication disorders.

In addition, operating on a similar vein about the conceptual aspects of neurodevelopmental disorders (NDDs), Rutter et al. (2008) examined the historical attempts at classifying these disorders and the evolution of the term itself. The authors highlight previous classifications, such as "functional" and "organic" disorders, as well as the concept of "minimal brain dysfunction" (MBD) that was popular in the 1960s and 1970s. (Rutter et al. 2008, p.32) These earlier attempts failed to provide a comprehensive framework. As a result, the term neurodevelopmental disorders emerged and was defined in the ICD-10 as disorders of

psychological development marked by early onset and impairment related to the central nervous system's maturation. (Rutter et al. ibid).

However, researchers like Tager-Flusberg (1999 cited in Rutter et al. 2008) and Harris (1995 cited in Rutter et al. 2008) expanded the usage of NDD to include single-gene disorders and disorders resulting from brain lesions or toxins. This inclusive approach allows for the classification of Cerebral Palsy (CP) as an NDD due to its early onset and impairments related to the brain. The significance of this classification is two-fold for the current study: it provides a framework to identify language impairments in individuals with CP and sheds light on the co-occurrence of other impairments, such as specific reading disability, specific language impairment, ADHD, and autism, which can provide insights into linguistic impairments in people with CP. Overall, Rutter et al.'s discussion helps contextualize the language impairments within the broader field of neurodevelopmental disorders and offers a foundation for the researcher’s objectives.

On their part, Thapar et al. (2016) proposed a conceptual approach to the classification of neurodevelopmental disorders (NDDs) based on the DSM-5 system. They advocate for grouping disorders such as ADHD, Autism Spectrum Disorder (ASD), Communication Disorders, and Motor Disorders together under the term "Neurodevelopmental Disorders." This classification aims to distinguish NDDs from other mental disorders and recognizes their shared characteristics, including childhood onset, stable course, multifactorial origins, and overlapping symptoms. The authors argued that this grouping facilitates interdisciplinary assessment and treatment, involving professionals from diverse fields to provide comprehensive care for children with NDDs. By pooling expertise and resources, it creates a neurodevelopmental base of expertise, enabling more effective treatment and therapies for these disorders.

The classification proposed by Thapar et al. (2016) aligns with the focus of the current study on language impairments in individuals with neurodevelopmental disorders, particularly Cerebral Palsy. Their classification includes Communication Disorders, which encompass linguistic impairments, as well as Motor Disorders that encompass CP. This underscores the co-occurrence of these phenomena within the broader framework of NDDs. However, it is worth noting that while the work addresses the interdisciplinary nature of NDDs, it primarily approaches the concept from a clinical perspective. This highlights the importance of considering NDDs from various angles, including linguistic perspectives, which further emphasizes the significance of the current research.

1.2.1.2 Cerebral Palsy (CP)

The first known person to conduct studies on CP was Dr William Little. His pioneering work in the 19th century laid the foundation for understanding Cerebral Palsy (CP). His works and lectures provided crucial insights into the condition. Little's observations led him to define spastic Cerebral Palsy as a result of an injured nervous system, specifically characterized by spasticity. This definition, initially known as "Little's Disease," became the first recorded description of spastic CP (Little, 1843; Little, 1853). In his 1861 paper presented at the Obstetrical Society of London, Little further proposed that CP is caused by oxygen deprivation during labour and delivery, resulting in brain damage and subsequent spastic rigidity and paralysis. He also identified a correlation between the severity of physical impairment and the degree of mental retardation, making him one of the earliest researchers to investigate what is now recognized as Cerebral Palsy (Little, 1861).

While Dr Little's work was ground-breaking for its time, it had limitations that are relevant to the current study. His focus on oxygen deprivation during birth as the sole cause of CP could not account for other potential causes, and his definition only encompassed one form of the disorder. Subsequent research has since expanded our understanding of the diverse manifestations and aetiologies of Cerebral Palsy, highlighting the need for a broader perspective to encompass the various factors contributing to the condition. The study seeks to expand upon these early findings and explore the language impairments associated with Cerebral Palsy within the context of neurodevelopmental disorders.

This gap however was filled by sir William Osler who first coined the term “Cerebral Palsy” in relation to Dr Little’s research. He then went on to publish a book called “The Cerebral Palsies of Children” (1889) wherein he talked about different forms of the impairment and their resultant manifestations based on the area of the brain affected. Osler (1889) summarizes his lectures on numerous case studies and highlights the various causes of impairments for the various forms of Cerebral Palsy as seen when he mentions that

> Certain general features define sharply from each other palsies of the upper and lower portion of the motor path. When the latter is affected, as in the common infantile spinal palsy, poliomyelitis anterior, we have the combination of paralysis with rapid wasting, early loss of reflexes, absence of rigidity and marked changes in electrical reactions. On the other hand in involvement of the upper segment, when the lesion is

> cortico-spinal, anywhere from the motor cells of the cerebrum to the grey matter of the cord, there is paralysis with spasm or disordered movements, exaggerated reflexes, neither rapid nor extreme wasting normal electrical reactions. (p.1)

The above descriptions are characteristic of spastic and dyskinetic Cerebral Palsy. Osler in his book also provided insights on treatment and therapies to help manage the disorder. Osler (1889) and Little (1861) believed that early intervention was pivotal to the treatment of children suffering from Cerebral Palsy. Though his research further provided information on the different types of CP, it did not provide any adequate explanations as to the cause of the impairment other than what Little had explained in his work.

This oversight was addressed by Freud (1897) the Austrian neurologist who challenged Little's assertion that Cerebral Palsy was acquired during birth by theorizing that Cerebral Palsy might be caused by abnormal development before birth and established a connection between Cerebral Palsy and other conditions such as Intellectual disability, seizures, and issues with vision. Freud's work marked a significant advancement in the study of Cerebral Palsy especially as he developed a classification system for Cerebral Palsy which was used by researchers (Ingram, 1966). Despite these advancements in the understanding of Cerebral Palsy, there was still no general standard definition of Cerebral Palsy and impairments associated with this.

Most research during the 19th century right up to the early 2000s were focused on developing a standardized definition and classification system for Cerebral Palsy (Ingram and Balf 1955, Mac and Keith 1959, Bax 1964, Rosenbaum et al. 2006). Ingram and Balf (1955) executed a study wherein they proposed a standardized and simplified definition of Cerebral Palsy as well as a classification system. They saw the need for "a standard terminology and for a classification which can be employed successfully by all those engaged in the treatment of affected children" (Ingram and Balf 1955, p.163). The classification system they proposed was an improved version based on Freud's earlier classification model wherein they defined and characterized different forms of Cerebral Palsy. Mac Keith and Polani (1959) conducted a research wherein they advocated for unified classification and terminology for Cerebral Palsy that can be used by both neurologists and paediatricians as well as anybody in the domain, and to that effect they went on to identify and classify the various types of cerebral palsies. Bax (1964) published a research study on terminology and classification of Cerebral Palsy wherein he gave the classic definition of Cerebral Palsy as "a disorder of movement and posture due to

a defect or lesion of the immature brain" (Bax 1964, p. 295). His work is one of the first to shed light on the resulting disabilities of CP and mentioned speech impairments as one of these disabilities. This definition was used as the classic definition for Cerebral Palsy.

In 2005, Bax, Rosenbaum and other prominent researchers in the field came up with a report that took into account the various attempts at classification throughout the history of CP by researchers, neurologists, paediatricians and investigators on CP. They analysed the various approaches to classification and came up with a harmonized definition of CP spearheaded by prominent researchers in the domain. Rosenbaum et al.(2006) defined Cerebral Palsy as;

> A group of permanent disorders of the development of movement and posture causing activity limitation that are attributed to non-progressive disturbances that occurred in the developing foetal or infant brain. The motor disorders of Cerebral Palsy are often accompanied by disturbances of sensation, perception, cognition, communication, and behaviour by epilepsy and by secondary musculoskeletal problems (P. 9)

A key aspect of this report is that they developed a classification for CP based on neurological, behavioural, clinical, epidemiological perspective thereby highlighting the need for a multidisciplinary approach to this disorder however no classification or analysis was made from a neurolinguistic or psycholinguistic perspective given that linguistic impairments are one of the associated disturbances of this disorder.

Freeman (2005) authored a book on CP wherein he discussed the diagnosis, types, causes, epidemiology, treatments and therapies related to Cerebral Palsy. His book was aimed as a guide to help health practitioners manage and deal with the various facets and disabilities of Cerebral Palsy. Furthermore, Freeman elaborated on the various methods for diagnosing an individual with Cerebral Palsy as well as recent methods and theories in the management and care of the disorder. His work also highlighted supportive techniques for parents with children that have Cerebral Palsy.

Dorothy and Leonard (eds.) (2000) in their work elaborate on the various forms of speech and language impairments and give a detailed overview of the causes, the characteristics, intervention procedures and outcome of these disorders. They also examined new theories and approaches to speech and language impairments such as the extended optional

infinitive theory which can be used to give predictions about the kinds of grammatical constructions that these children find difficult. Furthermore, they also contrasted language impairment and acquisition in different languages thereby introducing a multilingual approach to the study of language impairments. The outcome of their study provided insights into the impact of language impairments on children such as reading impairment. The authors even proceed to cite poverty as factor of language impairment in children from poor homes. They noted that, "as a group, their profile of language skills is typically closer to that of children with mild mental retardation than to that of middle class children". This means that lack of early intervention and proper education can contribute to language impairments in children from humble backgrounds or limit their usage of it. This is relevant in this study as it indicates that the environmental background of the participants is a relevant factor towards properly understanding the linguistic manifestations they present. However their work does not explore in detail the intrinsic aspects of language affected hence the need for us to carry out this study.

Miller et al. (2006) in their book titled "Cerebral Palsy: A complete guide for caregiving" sought to combat the sparse information about CP by presenting parents and stakeholders concerned with CP , a concise and pertinent overview of the disorder, its types and all it entails as well as helpful insights on taking care of individuals with this disorder. Through this work, they aimed at enabling teachers, physicians or parents engaged in the care of CP individuals to better understand their needs and how to attain them. Miller et al. (2006) posit that contrary to what was believed in the 1880s about the primary cause of CP being lack of oxygen, this is only the case for a small minority. They argue that the primary cause of CP in most cases is due to brain damage when the foetus is still developing in the womb and based on evidence from advances in modern brain imaging techniques, some CP cases are observed to be as a result of stroke during the late stages of foetal development while in others it is due to abnormal brain development in the early stages of foetal development. They went further to cite factors that can cause brain damage that evolves to CP and they are;

- Idiopathic brain damage which means the root cause is unknown
- Due to a viral infection during pregnancy such as cytomegalovirus
- Due to Hydrocephalus before or after birth
- Blood clot in the foetus' brain causing stroke.
- Bleeding into the brain (could be due to a bleeding disorder)

- Prolonged period of asphyxia (lack of oxygen) for instance due to a tearing away of the placenta from the walls of the uterus during labour thereby cutting off the baby's blood supply.
- Bacterial meningitis after birth
- Head trauma from child abuse during the first year of life.
- Lead poisoning

However, the authors highlighted the fact that the above factors do not always result in brain damage and when they do the brain damage does not always result in CP. With regards to CP that is due to unknown causes, the authors cited a recent theory that attempts an explanation of what happens. This theory posits that "…something (possibly an infection in the amniotic fluid that surrounds the foetus in the womb) sets off an inflammatory reaction in the brain of the foetus, and this inflammation causes the brain damage resulting in CP" (Miller et al. 2006, p.5).As interesting and plausible as this theory is, it is still relatively new and although it is backed by some experiments, it still has a loopholes to fill for instance the "something" which causes the inflammation as well as the conditions during which it happens are not exactly detailed and so such an explanation is still hypothetical.

Given the varying nature of CP cases, making generalizations about children with CP is challenging because each child has a different combination of motor and coordination problems. Thus, the authors posited a subgroup classification of CP to mitigate this situation. Through this subgroup, CP is classified based on two variables; the type of movement problem involved (spastic, athetoid, hypotonic, or mixed) and the body parts affected (legs only, one arm and one leg, or all four limbs). This classification style is in line with previous classifications (Ingram and Balf 1955, Keith and Polani 1959, Bax 1964) and the terms associated with the above variables are elaborated below. The elaboration is based on Miller et al. (2006, p.5) and the terms include:

a. Spasticity: This refers to the inability of a muscle to relax or too much muscle tone.
b. Athetosis: This is the inability to control muscle movement (no muscle control)
c. Ataxia: This on the other hand, refers to balance and coordination problems

To better understand the above types of movement, it is important to describe the parts of the body affected and they are;

a. Hemiplegia: when CP affects one arm and one leg on the same side of the body.

b. Diplegia: when CP affects all four limbs with the arms affected to a lesser degree

c. Quadriplegia: when CP affects all four extremities equally as well as trunk and neck muscles (a child with this is unable to walk independently)

The above criteria is used to describe CP cases whereby the word for the dominant type of movement problem is combined with the component that is most affected. For example, a child with stiff muscle problems that mainly affect his legs is said to have spastic diplegia. In terms of circumstances that can cause CP to occur during the birth process and in children aged 2-3 years, the authors posited a variety of factors. Despite the fact that the exact cause of CP is unknown, they hypothesized that in birth, CP is often the result of inherent problems that lead to brain damage contrary to Little's assertion and popular belief that it is due to asphyxia. This stance was based on evidence from a number of studies which indicated that only about 9% of children had CP exclusively due to asphyxia whereas approximately "..91% of the babies had other inherent causes that led to brain damage, unrelated to their birth experience" (Miller et. al.2006, p.10). For children aged 2 to 3years, the authors highlighted the main causes of CP to be; asphyxia (due to poisoning, near-drowning and choking), a blow to the head (accident, child abuse), severe infections such as meningitis or encephalitis.

The insights highlighted by the authors is relevant to the current study as it not only provides background knowledge on CP but also on its associated impairments such as communication impairment which is central to the current study. In addition the classification system employed in describing CP cases is adopted in the current study in describing CP cases because it provides an avenue to describe just about any case of CP. However, the authors mainly approached the subject from a medical perspective which is similar to other researchers thereby highlighting the need for a research from a linguistic perspective tackling the language aspects of CP.

Furthermore, from the above literature, it is evident that CP has associated linguistic impairments and learning disabilities however, in most of the studies above, these impairments are cited without proper insights into them and even when they are given proper attention, the approach employed is mostly medical. Given that CP affects the brain and nervous system resulting in a cascade of impairments, it is evident that CP like other neurodevelopmental disorders requires attention from experts and personnel across multiple disciplines.

Jacobson et al. (2007) discussed the epidemiology, classification, diagnosis and intervention of several developmental disabilities including CP. For CP they posited a similar classification to Miller et al (2006) affirming that the "classification system for CP serves to highlight consistent differences in the types of CP" (Jacobson et al. 2007, p.63). This is an affirmation of the fact that each CP case is unique with slightly different affectations depending on what cognitive functions are impacted. The researchers also focused on the method of diagnosis for CP and elaborated on the strategies employed. They argued that CP diagnosis includes specific findings from neurologic exams that are present in the developing child and "a history that confirms the motor delay or deviance is not deteriorating". In other words one of the fundamental conditions to look out for in a CP case is that it should be non-progressive with the level of damage staying the same over the years. Some of the neurologic findings mentioned by the researchers include; Abnormality of muscular tone, Abnormalities of posture/movement, Persistence of primitive reflexes.

Another metric of diagnosis is walking which occurs in most children within the range of 12 to 16 months. (Jacobson et al. 2007, p.66). In this light CP diagnosis requires that the examiner observes movement and postural control, head lag, ability to bear weight on legs, poor sitting balance which are things that could be missed in a neurologic exam. (Jacobson et al. ibid). In addition, a neurodevelopmental exam of the gross and fine motor systems should be added. It is important to note that these diagnostic strategies are essential for the early detection of CP in children from 7 months upwards. Brain imaging is an additional component that supports CP diagnosis but is not a diagnostic method in itself. Magnetic Resonance Imaging (MRI) is the most used imaging tool in CP and it is seen in the studies of Wylfred (2008), Moifo et al. (2013), Mangamba et al. (2022). The results from this study is relevant to the current research as it provides key metrics to look out for in order to identify or diagnosis CP. This is especially important in this study, given that during fieldwork there are several different cases of developmental disorders with similar symptoms. And due to the diagnostic strategies outlined here, it is possible to single out cases of CP by observation. The researcher can combine observation and their medical records to identify CP cases.

1.2.1.3 Linguistic/Language Impairments

In order to properly execute the current study, it is necessary to gain an understanding of the concept of linguistic impairments and what other researchers had/have to say about the concept.

In the domain of linguistic impairments, several studies have been conducted regarding its classification and these include; the classification of linguistic impairments within the Diagnostic and Statistical Manual of Mental Disorders 5th edition (DSM-5). The DSM-5 (American Psychiatric Association, 2013, p.42), categorized linguistic impairments as persistent difficulties in language acquisition and use, affecting comprehension and production across modalities. Expressive language impairments involve deficits in verbal and written expression, while receptive language impairments relate to comprehension difficulties. The DSM-5 emphasizes that linguistic impairments significantly deviate from age-expected language abilities, impacting communication, social participation, academic achievement, and occupational performance. This classification is relevant to the study on language impairments in individuals with Cerebral Palsy, as it provides a framework for understanding the nature and impact of linguistic impairments in this population. In addition, dividing linguistic impairments into expressive and receptive impairments further provide the researcher with foundational knowledge.

In addition, Cohen (2001) takes this further by emphasizing the importance of understanding the components of language skills in order to comprehend language impairments. She integrates linguistics and language acquisition, highlighting the role of the phonological system in speech sound combination and meaning comprehension (Cohen 2001, p. 7). Phonological awareness is identified as a crucial predictor of reading ability, and children with language impairments often struggle with vocabulary development due to difficulties in phonological awareness. She asserts this stating that children with language impairments "…have impoverished expressive and receptive vocabularies and difficulty learning new words" due in part to "…problems in phonological awareness". (Cohen 2001, p. 9). Cohen also addresses challenges in understanding complex sentences, which involve syntax, auditory verbal processing, and pragmatics. Her research focuses on the link between language impairments and psychopathology in children, noting that behavioral problems and poor social interactions can be attributed to language impairments, which are often overlooked when assessing emotional disturbances. However, her study does not consider neurodevelopmental disorders like Cerebral Palsy, which is associated with linguistic impairments.

This literature is relevant to the present study as it provides insights into the complex processes of language and the impact of language impairments. Cohen's perspective from linguistics contributes to understanding the linguistic aspects affected in individuals with Cerebral Palsy. Additionally, her work highlights the subtle nature of language impairments

and the need for proper assessment. However, her study does not specifically address the linguistic impairments associated with Cerebral Palsy, underscoring the importance of empirical data to confirm and gain further insights into this area of study.

In a bid to describe the nature and characteristics of children with linguistic impairments, Layton et al. (2000) compiled a book titled "Handbook of early language impairment in children: Nature". Here the authors addressed language impairment with a focus on children with language delay and an emphasis on specific language impairment (SLI). The authors note that one of the main indicators of some language deviation or developmental delay in children is when they exhibit signs of delay in expressive language. In most cases, this delay is often a secondary consequence to a primary cause as noted by Tallal (1988) and Whitehurst and Fischel (1994). The primary cause in some children with expressive delay include; hearing loss, seizure condition and brain lesion. While in some others it could be pervasive developmental disorder, or in some cases the delay is as a result of environmental deprivation, extreme neglect or abuse (Layton et al. 2000, p.1). They posit that in a situation where "language delay is found in the absence of any other condition presumed to be primary (i.e., when all of the primary conditions can be excluded), the diagnostic term of choice in current practice is specific language impairment (SLI)." (Layton et al. 2000, p.2). This distinction is important as it clearly illustrates that linguistic impairment refers to a damage, weakening or deviation of the language capabilities of a child as a secondary consequence to a primary factor such as those listed above. Whereas a SLI is when said signs of such deviations are evident without any primary causatives.

The authors further break down the three subtypes of SLI which are expressive (delay in language production), receptive (delay in comprehension) and mixed (both). The authors approached the concept of language impairment with a narrowed down focus on SLI and language delay which are just a facet or aspect in linguistic impairment, and also approached it from a documentary overview perspective. Hence the need for the current study on linguistic impairment from a linguistic perspective. The authors also looked at communication disorders in relation to psychiatric disorders and posited that communication disorders co-occur alongside psychiatric disorders as well as mental and developmental disorders. This is in line with the findings of Cohen (2001) and with the current study.

In the domain of neurodevelopmental disorders, the America's Children and the Environment institute (2015) regards neurodevelopmental disorders as "disabilities associated primarily with the functioning of the neurological system and brain". This means that these

disorders mainly affect the integrity and function of the brain in general and the nervous system in particular and as a result affecting motor skills, speech, language, memory, learning, behaviour and other neurological functions. They also highlighted common examples of neurodevelopmental disorders which includes; Attention-deficit/hyperactivity disorder (ADHD), autism, learning disabilities, intellectual disability, Cerebral Palsy, and impairments in vision and hearing. (America's Children and the Environment 2015, p.1). Furthermore, they posited that in most cases individuals have more than one neurodevelopmental disorder. In terms of causes or aetiology, they argued that most neurodevelopmental disorders do not have a specific cause but rather have a combination of causes which can range from genetics, biological, psychosocial and environmental risk factors. The authors however focused mostly on the environmental risk factors of neurodevelopmental disorder which entails drugs, alcohol tobacco, low socio-economic status, physical environment, environmental contaminants. They cited contaminants such as lead and methylmercury, which are associated with adverse effects on a child's brain and nervous system which in turn impacts their cognitive function, lower intelligence quotient and reduced academic achievement (America's Children and the Environment, 2015, p.1). Methylmercury in particular according to studies the researchers cited, causes neurotoxic and developmental effects in humans. This was evident in cases of people who were "prenatally exposed to two high-dose mercury poisoning events in Japan and Iraq , who experienced severe adverse health effects such as Cerebral Palsy, mental retardation, deafness and blindness" (America's Children and the Environment, 2015, p.2). This not only shows that neurodevelopmental disorders have diverse causes but the impact of these disorders on the lives of children especially as they tend to co-occur which can lead to varying impacts. Even though the study does not look at each disorder in detail or their resultant consequences, their examples of neurodevelopmental disorders is pertinent to the current work. It included Cerebral Palsy which is the neurodevelopmental disorder that this study is concerned with. In addition the authors also cited the resultant consequences on functions such as speech, language and memory. This impact on speech and language is pertinent to the current research because it ties to one of the research questions. This is because mentioning Cerebral Palsy and also mentioning communication impairments as consequences of neurodevelopmental disorders establishes and associative link between the two phenomena. Thus highlighting the need for the current study.

Within the scope of Cerebral Palsy, the concept of CP as it is understood today is the product of years of research and effort put in, in order to get an understanding of the phenomenon. It therefore has been an evolutional process with each research contributing to

the understanding of the concept. The multiple questions surrounding CP as well its associated impairments such as linguistic impairments, necessitated the conduction of empirical based studies to further insights into the phenomenon. These empirical studies and their results are examined in the next section following the objectives of the study.

1.2.2 Empirical review

The following paragraphs present empirical research on linguistic manifestations in individuals with CP.

To begin with, Friel (1997) carried out a research study on language and gesture development in children with Cerebral Palsy making use of a parent questionnaire. Her research sought to gather descriptive data on the vocabulary and gesture development of 2 to 6 years old children with CP who are speaking and non-speaking as well as to find out if there is a difference in phrase and word comprehension as well as gesture production between speaking and non-speaking children with CP. Her study indicated that non-speaking children with CP scored lower than their typical developing counterparts while children with Cerebral Palsy that are speaking had a higher speech, gesture production and language reception score indicating that non-speaking CP children may have a much severe form of CP as compared to their speaking counterparts. Despite the findings, her research did not address in detail the language and articulatory defects faced by these children.

Schuele (2004) assessed the consequences of speech language impairments on the reading and writing abilities of children. She divided the children into three categories; those suffering from speech production impairments, oral language impairments, speech production and oral language impairments. The assessment indicated that children with speech impairments alone have limited risk of literacy difficulties however they have difficulties spelling while children with language difficulties display reading difficulties in comprehension and word decoding. This research gave insights into the consequences of speech language impairments but it did not dive into the causes nor did it examine the specific disorders responsible for this. This leaves a gap as to what specific types of disorders may have an influence on their literacy outcomes as well.

Catts (1993) identified a group of children with speech language impairment in kindergarten and administered a speech language test as well as measures of phonological awareness and rapid automatized naming. This was done through reading comprehension and written word recognition. The children with speech impairments performed lower on reading

tests and their overall language ability was lower compared to their typical developing age mates. On the other hand, measures of phonological awareness and rapid automatizing indicated that these children are able to recognize words. The results of the study was a confirmation of previous studies asserting the fact that children with speech language impairments are susceptible to reading disabilities. These results proved insightful to the current study as it enabled us see beforehand the possible linguistic consequences of speech language impairment in our area of study. However, it does not examine the factors responsible for these impairments hence highlighting the significance of our study to the body of research.

Weir (1979) conducted a study on CP with the aim of determining the role that computer-based activity can effect in improving their expressive capabilities especially in writing. It also aimed at enabling these individuals develop spatial awareness. Their sample population constituted 9 children with CP with an age range of 7 to 17 years. The instrument of evaluation involved a computer program called LOGO which was used to provide the participants with special tasks that required fine motor skills as well as cognitive processing. This program provided an environment for the participants to move objects and type, and solve problems. The children were tested by presenting them with this program and having them perform tasks such as moving virtual sticks from one end of the screen to another as well as typing information. When they moved the sticks on the computer, they will later do the same with physical sticks.

The researchers noted that all the subjects had difficulties with the task, however, those around the ages of 17 performed relatively better than those within the age range of 11 years. The younger children performed the tasks at very slow rate. The researcher observed that in terms of writing, although the LOGO program provided CP individuals with a platform for written expression, their writing had "…systematic errors" with texts looking like "…written down "spoken English" rather than "written English".

From the perspective of the current study, this literature is of importance as it highlights one of the linguistic challenges observed in participants with CP which is difficulty in writing. Also, the researcher's focus on developing their visual spatial skills touches on cognitive processing which in turn is associated with language performance. The use of computers to improve the expressive abilities of CP individuals represents a novel approach to ameliorating the impairments in these individuals. However, the study mainly focused on developing spatial abilities in these individuals and as such did not deep-dive into the written capabilities of the

research participants. This study is an indicator of the need to study the linguistic capabilities of these individuals.

Following up on this, Pirila et al. (2006) conducted a research study on language and motor skills. The focus of this research was to investigate if children with an intelligence level above 70 had just speech problems and whether those with an intelligence level below 70 had verbal expressive and comprehension problems in addition to speech problems. Moreover, the study explored the interrelation between the degree of motor limitation, cognitive difficulties, language and motor problems in children with CP. In addition, the study also aimed at determining the extent to which aspects such as motor skills, intelligence level, and motor speech abilities of a new born baby can be predicted by a neonatal cranial ultrasound. The population for this research constituted 36 premature born children ranging from 1 year 10 months to 9 years, all afflicted with CP caused by periventricular leukomalacia. The study population was limited to children in Finland. Majority of the children had Spastic diplegia (22) while 5 of them had hemiplegia and 9 developed quadriplegia (Pirila et al. 2006, p.118).

To carry out the study, the researchers employed a language test in order to assess the expressive and comprehension skills of the participants. To this end, Reynell Developmental Language Scale (revised) was used to measure their receptive skills while expressive language skills were measured using the Speech Test tool and Verbal Language Development Scale. These tests measures both passive and active vocabulary, grammatical structures and naming. Test for motor speech abilities was rated as normal (age-appropriate oral motor patterns), immature (minor one to two difficulties) or deviant (difficulties in at least three aspects of oral motor functioning).

In terms of phonological assessment, the researchers rated it under three categories; normal (age-appropriate intelligible speech), immature (speech is intelligible but contains a few deviations that are not age-appropriate) or deviant (speech is less intelligible or unintelligible without contextual cues, not age-appropriate deviations) (Pirila et al. 2006, p.121). The speech and language tests were administered, assessed and scored by speech- language pathologists.

The researchers observed that some percentage of children with intelligence above 70 were primarily impaired in the motor speech domain while children with intelligence below 70 had impairments in language and motor speech skills. In addition, articulation and phonology skills posed a challenge to many children with an intelligence below 70. They also used

augmentative and alternative communication means and went for speech therapy more often. The researchers also observed that neonatal ultrasound could not predict the development of higher brain functions such as speech and language.

The classification used to denote the severity of motor and phonological abilities is relevant to the current study as it will be used as a reference to measure the performance of participants. In addition, the results obtained from this study warrants research in a different geographical location and context to determine if similar results can be obtained through an empirical study. However, the researchers approached the subject from a quantitative perspective with a broad overview of the subject and this is consistent with other literature covered thus far. There is glaring need for a more granular approach to the linguistic impairments in children with CP and especially in the Cameroon context no less.

In addition, Norberg et al. (2014) conducted research to study the speech characteristics and speech impairments of school-aged CP children in Sweden. Their accessible population constituted 19 children with spastic, ataxic and dyskinetic CP who also have speech impairment. The study aimed at evaluating consonant production across CP types such as spastic, ataxic and dyskinetic CP, hypernasality, and the differences in the degree of severity across CP types. The researchers in order to attain this, had a sample population of 9 girls and 10 boys diagnosed with CP. The inclusion criteria for the research participants was speech impairment "documented in the medical and speech language records". (Nordberg et al. 2014, p.388). The test instrument used by the researchers for data collection was the standardized Swedish Articulation and Nasality Test (SVANTE) made up of 74 pictures aimed at eliciting one and two syllable words (Nordberg et al. 2014, p.388). The tests and data were collected by two seasoned speech-language pathologists. The data recorded was later used by the speech-language therapists to assess the speech capabilities of the participants as well as perform a phonetic transcription of speech material from each participant.

The researchers after analysing the data, observed that in terms of errors in consonants, nasality, and voicing, there were variations in the degree based on the CP type. For instance, the most common errors for Spastic CP participants were voicing, substitution and omission. Children with dyskinetic CP had few errors while participants with ataxic CP, mostly presented substitution and voicing consonant errors. In this aspect, the researchers noted, the 4 participants who had ataxic CP, "displayed more severe problems with the production of consonants than the children with spastic and dyskinetic CP" (Nordberg et al. 2014, p.393). They theorized that this difference in performance resulting in a high frequency of substitution

maybe due to the nature of the motor problems affecting ataxic CP. This can result in difficulties articulating consonants such as fricatives. The researchers also highlighted the necessity of having standardized tools for assessing speech ability in individuals with CP.

This study is relevant because it not only made use of speech-language pathologists, but regarded the speech difficulties of children with a special attention to consonants. This ties with the current research under study which aims to assess the linguistic impairments in children with CP. However, the researchers narrowed their focus towards assessing just the speech production difficulties with a focus on consonant articulation. They did not take into consideration other aspects of language, nor did the study dive into details about each feature, rather it broadly covered their existence. In addition, the researchers highlighted the need to "…conduct comprehensive assessment that includes cognitive and linguistic functioning, not just assessment of speech sound production". This study comes as a response to that call.

Mei et al. (2016) conducted research on the "Language outcomes of children with Cerebral Palsy aged 5 years and 6 years". The focus of the study was to describe the language abilities of children with CP specifically the frequency, range and features of language impairment (Mei et al. 2016, p.3). The sample population for the study consisted of 84 participants recruited via the Victorian Cerebral Palsy Register which contains information about individuals with CP in Victoria, Australia since 1970. (Mei et al.2016, p.3). The inclusion criteria for the study involved children born from 25th August 2005 and 24th August 2007. A quantitative approach was employed in the study. The researchers in order to identify language impairments, employed the Preschool Language Scale (PLS-4) used to test both receptive and expressive language abilities. With this test, participants are said to have impairments in a language sub-domain if they are unable to or fail one or more age-appropriate tasks. For participants who were unable to speak or are nonverbal, the Communication and Symbolic Behaviour Scales Caregiver Questionnaire (CSBSDPCQ) was used. It assesses pre-linguistic skills and was completed by parents. The researchers noted that from the data, receptive and expressive language impairment was present in 61% of participants (Mei et al. 2016, p.6).

The researchers after analysing the data posited that verbal participants faced challenges in semantics, language structure, social communication, integrative language skills and phonological awareness. The researchers also noted that the language challenges the participants faced is typical of language impairment associated with a disability. This rules out the possibility of CP children having specific language impairment. In addition, the research results indicated that cognition is associated with language impairment. Results from the test

in non-verbal participants indicated that they are able to communicate comprehension through emotion, eye gaze and gestures (Mei et al. 2016, p.8). Mei et al. (2016, p.8) also raised a concern about the need "…to pinpoint the specific cognitive deficits that contribute most to language to assist in developing targeted interventions." Since the level of cognition from their findings has an impact on the severity of linguistic impairment.

This research is relevant to the study because it takes a look at sub-language functions such as phonology, morphology, syntax and semantics through a standardized test the PLS-4. However, despite its standardization, the tests employed to assess the individuals did not probe deeply and this assertion is supported by the researchers who posit that "Whilst the PLS-4 is a comprehensive assessment, it does not measure in-depth each sub-domain" (Mei et al. 2016, p.8). In addition, the quantitative approach in this study while it can be used to make generalizations about the larger CP population, does not dive into the particularities regarding language impairments. From the above empirical literature, it is evident that a myriad of research has been done on CP and its associated language impairments however majority of the studies either approach the subject from a quantitative approach or from a clinical perspective. There is need for a strictly linguistic narrative to the phenomena of CP and linguistic impairments that dives in-depth in order to not only gain further insights, but also ascertain the factors responsible. This study comes in as a response not only to this worry but also to complement the previous literature by collecting empirical data to confirm the results that have been recorded in the above studies and by so doing indicating whether or not time has had an effect on the results.

In addition to studies on linguistic manifestations, research was also conducted relating to the impact of linguistic manifestations on individuals with CP.

Fluss and Lidzba (2020) conducted a narrative review focusing on the cognitive and academic skills typically affected in individuals with CP. They asserted that the current motor-oriented classification of CP often ignores non-motor comorbidities affecting CP patients. The non-motor disabilities often account for a significant part of the functional limitation and hindrance faced by individuals with CP. (Fluss and Lidzba 2020, p.447). Therefore, the authors proposed a mechanistic model based on Fritz and Morton's "causal modelling" of NDDs theory (Fluss and Lidzba 2020, p.448). The authors implemented this model with the aim of explaining the mechanisms by which the biological abnormalities in CP lead to observable cognitive deficits and further translates into difficulties with academic skills and participation. In the course of their literature review, the authors noted that speech and language problems

were prevalent across all forms of CP which seriously hinders their academic and social participation to varying extents. However, they also commented on the fact that, in most CP cases, receptive language abilities are better preserved compared to expressive language abilities which are often heavily affected. They posited that this difference is "likely related to distinct affected cerebral structures" (Fluss and Lidzba 2020, p.450). According to the researchers, receptive language is associated with cognitive abilities while oro-motor, speech and expressive language abilities are correlated with gross motor functioning which further reinforces the premise that receptive and expressive deficits in individuals with CP are the result of different areas of the brain being affected. The results of the study indicated that most children with CP exhibited deficits in linguistic, visuospatial functions, attention, working memory and executive functions.

This in turn affected their academic performance and social participation resulting in learning disabilities in reading, writing, and mathematics. The researchers emphasized the need for early motor intervention as well as a speech and communication intervention due to the high prevalence of language impairments in the CP population. They also recommended a school readiness assessment in order to enable early identification and measure academic capabilities. The findings highlighted in this study are relevant to the current research as it not only provides insights into the most common impairments in CP but also details the impact of these impairments on individuals with CP giving the researcher fundamental elements to look out for in the course of the study. However, their research was from a purely clinical perspective and mainly reviewed past research done by others.

Gillies et al. (2018) conducted a population-based cohort study using linked hospital and educational data on individuals with CP. They used this data to examine participation and achievement in standardized educational testing among children with Cerebral Palsy in New South Wales Australia. Using a hospital codes, the authors identified a cohort of 3,944 children with CP and compared their educational outcomes to a cohort of over 750,000 children without CP (Gillies et al. 2018, p.2). The results of the study indicated that 46% of the CP cohort could not participate in the reading assessment and only about 30% achieved scores in the normal range, which was less than the non-CP cohort. Furthermore, children with tetraplegia were less likely to participate and achieve normal range scores.

The authors concluded that despite inclusive education policies, significant disability still prevents participation for many children with CP. The results of the study is relevant as it provides evidence of the academic achievement gaps experienced by children with CP, it

quantifies the impact of CP and its impairments on the lives of individuals suffering from it. Their findings highlight the need for greater accommodation in mainstream schooling to facilitate learning and participation for children with CP. However, the study mainly quantified the impact on CP and did not elaborate on the nature of the impact and why some participants could not take part in the assessments.

Sanberg (2006) conducted a longitudinal study for 6 years examining the development reading and spelling abilities in 6 children aged 6 to 12 years with severe speech and physical impairments. Adopting a cognitive psychology perspective, the researcher evaluated the children's literacy skills, phonological awareness, short-term memory, and intellectual abilities at three time points during childhood (Sanberg 2006, p.630). The results indicated that although initial IQ and phonological skills predicted typical literacy acquisition, the children demonstrated persistent difficulties acquiring age-appropriate reading and spelling skills over time. The study highlights a dissociation between phonological awareness and actual literacy achievement in children with severe speech motor impairments due to Cerebral Palsy. The findings suggest that impaired phonological processing and verbal short-term memory paired with lack of speech articulation may impede literacy development in this population.

The study outcome indicates that specialized literacy instruction is required for children with severe CP even when intellectual abilities are less impaired. The correlation of phonological processing deficit to literacy challenges is significant to the current study as it displays the underlying impact of linguistic impairments on the education of individuals with CP. And it also highlighted the need for further research to clarify the precise contribution of phonological awareness and working memory on literacy. Despite the researchers varying results, previous study conducted by Vandervelden and Siegel (1999) found impaired phonological processing and spelling in children with severe speech and physical impairment. Smith (2001 cited in Sanberg 2006, ibid) on the other hand posited that speech impairment might have a negative influence on skills needed for literacy to develop such as phonological skills. These findings all point to the impact of linguistic impairments on academic capabilities of individuals with CP highlighting the need for more research hence the current study.

The following lines presents literature relating to therapeutic strategies employed in the treatment of CP.

Korkalainen et al. (2022) conducted a review study evaluating the effectiveness of motor speech interventions in improving speech intelligibility. The researchers operated on a

theoretical premise that adherence to the principles of motor learning (PML) can improve motor intervention outcomes. In order to achieve this, eight databases were searched for studies on speech intervention published from 2000 to 2021 and these studies were reviewed and summarized (Korkailainen et al. p.112). After screening 1036 initial articles, 21 studies representing 8 interventions and 131 participants were included. Some of the interventions include Beatalk, Intensive dysarthria therapy (IDT), Lee Silverman Voice Treatment (LSVT LOUD), and Speech Intelligibility Treatment (SIT) just to name a few. They evaluated the interventions ranging from low to moderate strength. The researchers noted that all interventions targeted speech accuracy at the body functions level and some also improved intelligibility and participation. However, adherence to principles of motor learning was inconsistent across studies. The authors concluded that while preliminary evidence for motor speech intervention in CP is promising, more rigorous research adhering to motor learning principles is needed. This is especially true in high-quality trials that examine effectiveness for intelligibility and participation outcomes. This study highlights the need for further research on optimized motor speech interventions for children with CP. Hence the current study.

Pennington et al. (2016) through a systematic review, investigated studies of speech therapy for children with dysarthria in order to examine the effectiveness of different types of treatments. The researchers noticed that despite the availability of augmentative and alternative communication (AAC) systems for children with dysarthria, many children still opt to communicate by speech. Therefore, the authors wanted to investigate if the use of therapy can provide better improvements in the intelligibility of their speech as opposed to AAC systems. They focused on children who acquired dysarthria below three years (Pennington et al. 2016, p.4). In order to achieve their objective, the researchers combed through multiple databases such as the Cochrane Central Register of Controlled Trials, MEDLINE, ERIC, and Linguistics and Language Behaviour Abstracts just to name a few. They searched randomized controlled trials or quasi-experimental studies on speech therapy for early childhood dysarthria published between 1980 and July 2015 (Pennington et al. 2016, p.5). The researchers found no studies meeting their inclusion criteria. Their review highlights the lack of rigorous evidence on the efficacy of common speech therapy practices for this population.

While no studies met the inclusion criteria, the authors summarized findings from excluded observation studies which suggested potential benefits of motor-learning based interventions on intelligibility and voice quality in children with moderate to severe dysarthria (Pennington et al. 2016, pp.7). The results of their study highlighted a significant gap in high-

quality evidence on the impact of speech therapy for early childhood dysarthria. The study is significant as their findings can inform the methodology and outcomes examined in future studies.

Due to the scientific nature of this research, there is bound to be a handful of relevant jargon pertinent to the study and as such it is necessary to define these terms especially those strictly tied to the topic itself so as to paint a clearer picture.

1.3 Definition of operational terms

This section presents some operational terms relevant to the study and their definitions. Some of the terms of defined include:

1.3.1 Linguistic Impairment

Linguistic impairment (which also means language disorders or language impairments) according to the American Speech-Language-Hearing Association (ASHA), refers to "…. A significant impairment in the acquisition and use of language across modalities due to deficits in comprehension and / or production across any of the five language domains (i.e., phonology, morphology, syntax, semantics, pragmatics)." (American Speech-language-Hearing Association 2022). This definition is adequate for the purposes of this research and as such is adopted. This is because it covers key aspects that are relevant to the study namely the sub-language domains which is concerned with the study. In addition, it brings in the notion of consequence as a result of these deficits which has an impact on the individuals across modalities such as learning, writing, processing and manipulating language which are underlying factors that the current study is centred on.

1.3.2 Neurodevelopmental Disorders

According to Mullin et al. (2014), Neurodevelopmental disorders "…are multifaceted conditions characterized by impairments in cognition, communication, behaviour and / or motor skills resulting from abnormal brain development." In another vein, Parenti et al. (2020) defined Neurodevelopmental disorders as "…a class of disorders affecting brain development and function and are characterized by wide genetic and clinical variability." The first definition by Mullin et al. (2014) is most suitable for the current study because in their definition, they outline the associated impairments often co-occurring alongside neurodevelopmental disorders especially communication impairments which is key concept in the current study.

1.3.3 Cerebral Palsy

Miller et al. (2006, p.3) define Cerebral Palsy as "…. a collection of motor disorders resulting from damage to the brain that occurs before, during, or after birth. The damage to the child's brain affects the motor system, and as a result the child has poor coordination, poor balance or abnormal movement patterns or a combination of these characteristics". Also, Bax (1964) defines CP as "a disorder of posture and movement due to a defect or lesion in the immature brain." Even though Bax' definition is the most frequently cited of the two, it does not give sufficient detail relevant to the present study like the first definition which specifies the period during which the lesion may have occurred and also highlights the resulting consequences. For the purposes of the current study, therefore, the definition given by Miller et al (2006) is adopted.

1.3.4 Dysarthria

According to Duffy (2013, p.4), Dysarthria which is often associated with Cerebral Palsy "…refers to a group of neurogenic speech disorders characterized by abnormalities in the strength, speed, range, steadiness, tone, or accuracy of movements required for breathing, phonatory, resonatory, articulatory or prosodic aspects of speech production".

Perotta (2020) defines Dysarthria as "…a motor language disorder that derives from a neurological injury involving the motor component of language and is characterized by a poor articulation capacity of the phonemes; in practice, dysarthria is a condition in which problems are inherent in the muscles responsible for producing language, often to the point of making words extremely difficult. Any type of language subsystem (breathing, phonation, resonance, prosody and articulation) can be involved and lead to impairments in the intelligibility, audibility, naturalness, and effectiveness of voice communication". Given the detailed description of the speech characteristics in dysarthria that is present in Perotta's definition, the current study adopted his definition for its profound description of the features characterising such speech.

1.3.5 Expressive Language Disorder

Paul (2007) defines expressive language disorder as, "…difficulty with expressing needs, ideas, or information through speech and includes limited vocabulary, grammar errors, and difficulty formulating sentences". The authors definition highlights the characteristics present in expressive language disorder whereas Reed (2014) describes expressive language disorders as "Children with expressive language disorder, demonstrate a significant limitation

in their ability to use spoken language to convey thoughts, ideas, and feelings. Expressive language development lags behind receptive language skills". While the first definition targeted the nature of the impairment, the second definition does not go into details on its characteristics as such the first definition is employed in the current study.

1.3.6 Receptive Language Disorder

According to Moyle and Long (2021) receptive language disorders refer to "…impairments in the ability to understand or comprehend language. Deficits may be observed in the comprehension of oral, written, gestural, and / or symbolic language systems. All levels of language maybe affected, including at the word, sentence, and discourse levels." On the other hand, Scheiner and Ball (2015) describe receptive language disorders as "difficulty following directions, understanding words/sentences, answering questions". Although both definitions capture the essence of receptive language disorders, Moyle and Long's (ibid) definition offers a more comprehensive perspective on the phenomenon therefore for the purposes of this study, their definition is preferred over that of Scheiner of Ball (ibid).

1.3.7 Phonological Disorders

The Encyclopaedia of Child Behaviour and Development (2011) describes phonological disorders as "…disorders where individuals fail to use appropriate speech sounds for their age and dialect". On the other hand, American Speech-Language Hearing Association (ASHA) describes phonological disorders as disorders that "focus on predictable rule-based errors (e.g., fronting, stopping and final consonant deletion) that affect more than one sound" thus indicating clearly that phonological disorders deal with difficulty in mastering the sound patterns in a language or incomplete mastery of the sound patterns resulting in deviations reducing the intelligibility of the speaker's utterance. Hence the second definition is adopted for the current study as it provides more details on types of phonological disorders which are in line with the research objectives.

1.3.8 Articulation Disorders

Feldman and Messick (2009) refer to articulation disorders as "the inability to produce sounds correctly in speech" and that "children with articulation disorders typically exhibit errors on a small subset of sounds". This definition provides a rudimentary conceptualisation of articulation disorders but provides no details on its manifestations. Cuffaro (2011) on the other hand, refers to articulation disorders as "…difficulties with the way sounds are formed and strung together, usually characterized by substituting one sound for another (wabbit for

rabbit), omitting a sound (han for hand), or distorting a sound (ship for sip).” This definition indicates that articulation disorders represent difficulties pronouncing or producing specific sounds which results in its deviation. Cuffaro (ibid) definition ties in line with the research objectives and as such is the definition of choice for the current research.

1.4 Conclusion

This chapter took a dive into the literature surrounding the study in order to better situate it and explore the gaps. It also elaborated on the theoretical framework guiding the study and defined some operational terms employed in the research.

CHAPTER TWO METHODOLOGY

This chapter presents the methodology that the researcher followed in order to achieve the research goals and objectives. It opens with the research design, the area of study, the research population, and sampling and sampling technique, research procedure and data collection, proceeds to method of data presentation and analysis, ethical considerations and ends with a chapter conclusion.

2.1 Research Design

The problem raised by this study requires empirical research and as such it needs primary data to be collected and the research philosophy adopted towards collecting the necessary data is Interpretivism. Interpretivism holds that reality or society is shaped by the perception of individuals. According to Biggam (2021):

> Interpretative researchers believe that there are many, equally valid interpretations of reality and that further, these interpretations are dependent on when they are made and the context in which they are made: they are time and context- dependent (p.144).

This definition aligns with the current study because, interpretivism necessitates the utilization of a qualitative methodology in data collection, which in turn demands a comprehensive examination. In order to facilitate a nuanced and intricate exploration of the subject matter, a qualitative approach was employed, aligning harmoniously with the research philosophy guiding this study. Creswell (1994) defines a qualitative approach as a process of inquiry that seeks to comprehend social or human problems by constructing a multifaceted, holistic representation through the use of language. It involves the meticulous documentation of detailed perspectives shared by informants, within a natural setting (Creswell, 1994, pp. 1-2). This approach proves particularly suitable for the present study, as it encompasses key aspects that are deeply intertwined with the research. Firstly, the qualitative approach aligns with the essence of the study, which centres around linguistic impairments in individuals with Cerebral Palsy (CP). Given that language is a social construct and impairments stemming from disorders impede social interaction, this approach serves as an ideal means to collect and analyse empirical data.

Consequently, there is need for the researcher to closely observe the participants, thereby fostering a deeper comprehension of their experiences within their natural

environments. This approach goes hand in hand with the study's philosophy of interpretivism which holds that researchers play an active role in describing and comprehending the world around them. Such a philosophy aligns harmoniously with the objectives of this research, recognizing the possibility of distinct features or behaviours among individuals with Cerebral Palsy (CP). In essence, it embraces the idiosyncrasies inherent in each CP case, accommodating the constraints of time and context, thereby necessitating in-depth observations. Moreover, one of the keys aims of our research is to identify the linguistic impairments manifested in individuals with CP, demanding a comprehensive examination and interpretation of the phenomenon within each individual, taking into account their distinctive characteristics.

2.2 Area of the study

The following paragraphs present a brief rundown of the administrative structure of the city where the study is conducted, further situating the location of the specific institution where fieldwork was done. The data for the study was obtained at the National Rehabilitation Centre for Persons with Disabilities. As such it is limited to this specific centre. It also highlights the reason for selecting this particular handicap centre amongst several others.

2.2.1 Brief history of the study area

Yaoundé, the capital city of Cameroon, is located in the Centre Region which is made up of several administrative divisions and subdivisions which plays a crucial role in the governance and organization of the region. The region is divided into 10 administrative divisions, namely Mfoundi, Haute-Sanaga, Mbam-et-Kim, Nyong-et-Kéllé, Mefou-et-Afamba, Mbam-et-Inoubou, Nyong-et-Mfoumou,Nyong-et-So'o, Méfou-et-Akono, and Lekié (Aaron 1999).Each division is further subdivided into numerous subdivisions, adding a granular level of administrative control and management. However, our focus is on the Mfoundi administrative division which encompasses all of Yaoundé. (Aaron ibid). Within the Mfoundi division are several subdivisions namely; Yaoundé 1 (Nlongkak),Yaoundé 2 (Tsinga), Yaoundé 3 (Efoulan), Yaoundé 4 (Kondengui.), Yaoundé 5 (Nkolmesseng.), Yaoundé 6 (Biyem-Assi.), Yaoundé 7 (Nkolbisson.).

Amongst these subdivisions, the study focuses on the Yaounde 6 subdivision with its headquarters at Biyem-Assi. The reason for this choice is due to the presence of the National Rehabilitation Centre for Persons with Disabilities (NRCPD) in Etougebe, which falls under the jurisdiction of Yaoundé 6 subdivision. Established in 1971 by Cardinal Paul Emil Leger, the NRCPD's mission was to rehabilitate children suffering from poliomyelitis. On January

15th, 1972, it was transformed into a private social institute named Rehabilitation Center of Yaoundé (RCY) by His Excellency Ahmadou Ahidjo, the President of the Federal Republic of Cameroon (NRCPD, n.d.). In 1978, Cardinal Paul Emil Leger sold the institute to the Cameroonian state, and it was subsequently renamed the National Centre for Persons with Disabilities (NCPD) or "Centre Nationale de Rehabilitation des Handicapes (CNRH)." It became a specialized institute under the Ministry of Social Affairs. In 2009, through Decree No. 2009/096 dated March 16th, the center was elevated to a public administrative establishment, expanding its mission to encompass comprehensive care for all types of disabled individuals.

The centre was established with the following objectives in mind:

- Rehabilitation of individuals with motor disabilities.
- Provision of special education for disabled children.
- Professional training and social integration.
- Orthopaedic surgery.

To achieve these goals, the centre provides three primary services:

- Medical and paramedical treatments (including General Medicine consultations, Neurology consultations, Traumatic consultations, etc.).
- Support for disabled individuals through psychological follow-ups and social workers.
- Special Education (comprising a special and inclusive primary section) and Professional Training (consisting of seven workshops).

It is important to note that while the data collection site is the National Rehabilitation Centre in general, this research specifically focuses on the special education sector, represented by a special primary school within the centre known as "La Colombe." To better understand why this school was chosen for data collection, it is necessary to examine its historical background, which provides a comprehensive understanding of the school's objectives.

In 1973, a special school named “La Colombe” was created by the Cardinal under the initiative of the Association of Parents with Handicapped Children (APHC) which later became the Association of Parents and Friends of Special Children in Cameroon (APFSCC). This

institute was inaugurated on the 29th of September 1973 by the First Lady Mrs. Germaine Ahidjo and it is a medical pedagogical day school. (NRCPD, ibid).

The purpose of the school was the rehabilitation, educational and pedagogical supervision of young children with mental deficiencies. In order to achieve this objective, the school is engaged in several activities such as;

- The detection of deficiencies suffered by handicapped children
- Identification of recovery methods and the development of skills that will enable the children to lead independent lives.

The school's educational section comprises a special and an inclusive section, as well as a professional training section, with classes categorized into the special cycle, the inclusive cycle, and the training centres consisting of seven workshops. In alignment with this structure, the nursery class serves as the starting point for children, where they engage in activities such as learning rhymes and songs to enhance their vocal abilities. These lessons primarily employ visual aids like charts and toys to ensure their attention remains focused. Children who exhibit progress in their learning are advanced to Initiation 1, where they are introduced to fundamental elements such as vowels, basic counting (from 1 to 10), basic shapes (squares, circles, triangles), colours, body parts, as well as fruits and animals. Upon demonstrating mastery of these concepts, they are promoted to Initiation 2.

In the initiation 2 class, children are taught the complete alphabet and counting up to 20, along with basic arithmetic operations. They also learn to identify various fruits, body parts, and objects commonly found in school. Writing exercises are regularly assigned to reinforce their knowledge of letter formation and numeral writing. Additionally, the curriculum includes practical activities like using beads to create diverse objects such as bracelets or chains. It is important to note that children in this class are categorized into three groups: "teachable," "trainable," and "unteachable/untrainable." Those who display a strong aptitude for foundational skills such as mastering the alphabet and achieving a certain level of numeracy are classified as "teachable" and are placed in the inclusive section. On the other hand, those who exhibit talent and interest in skills like bead making or painting are considered "trainable" and are assigned to the professional section. Children who struggle in both learning and skill development are categorized as "unteachable/untrainable" and are directed to the special cycle class. Furthermore, it should be noted that some children may spend up to four years in a single class, depending on their specific disabilities and learning capabilities.

At the special class, the children are taught basic life skills such as how to take care of themselves (bathing, brushing of teeth, washing of hands etc.). While at the inclusive section, the children with disabilities are taught alongside “normal” children and the teacher takes into account the disabilities each student has and teaches accordingly.

It is also worth noting that although the data for the current research is gotten from the school, the study is not an exhaustive coverage of all the disabilities present at the school. This is due to the fact not all cases met the inclusion criteria. Thus, the data collected here is obtained from individuals with CP who are the target population of this research. In addition, this data was obtained from specific classes within the school and not all the classes.

2.3 Population of the study

This section looks at the target and accessible population as well as the sample population.

2.3.1 Target Population

The target population for this study consists of children within the city of Yaoundé suffering from Cerebral Palsy. The hospital-based study conducted by Mangamba et al. (2022) indicated that the hospital prevalence of CP within the city of Yaoundé is 4.86% highlighting the availability of this population with the city of Yaoundé. The target population includes male and female children ranging from 8years old to 16 years old. This age range was chosen because, at this stage of development, children are expected to have acquired proper communication skills. Any deviations or impairments in their communication abilities would be more noticeable and likely related to linguistic impairments. Including children below this age range would have made it difficult to distinguish between impairments caused by CP and associated conditions versus those associated with normal developmental milestones.

2.3.2 Accessible Population

The accessible population for this study consists of children with Cerebral Palsy and linguistic impairments attending the "La Colombe" Special Education School, which is located at the National Center for Rehabilitation of Persons with Disabilities (NRCPD). The accessible population includes children who were at the school at the time of research and who were available for assessments during the study.

2.3.3 Sample Population

The sample population for the study was obtained based on whether they met the inclusion criteria for the study. In order to be certain the sample population possessed the characteristics of the target population, the researcher had to make sure that they actually had CP to begin with. In addition to being diagnosed with CP, the sample had to also exhibit evidence of language impairments. In order to diagnose if the children suffer from CP, the researcher made use of observation to look for certain criteria that are fundamental to the diagnosis of CP. These criteria include; signs of abnormal movements and postural control (such as stiff jerky movements), abnormal infantile reflexes (such as a toe-walking gait, fisting), involuntary movements (such as tremors, spasms or writhing movements of the face, arms or legs), speech and feeding (such as slurred speech, drooling). This observation strategy is based on Jacobson et al. (2007) who posited that "diagnosis of CP requires the examiner to observe movements and postural control that are not typically noted in a neurologic exam" (Jacobson et al. 2007, p.7). To test their communicative abilities for linguistic impairments the researcher made use of a language test to check expressive and receptive language abilities. The test consisted of pointing at fruits and objects on the blackboard and asking each participant to pronounce, asking each participant to pronounce letters of the alphabet, and asking them to pronounce some words. For comprehension the researcher gave basic instructions to each participant to test their understanding. Basic tracing of letters and numbers was used to assess writing. In addition to the sample population, the researcher also consulted specialized inclusive teachers in charge of the various classes where the research participants were obtained making them a small subset of the population sample. This is because the researcher also conducted interviews with them regarding the performance and general abilities of the children with CP.

The researcher with the permission of the parents and school administrative obtained the medical records of the children which was combined with observation to confirm the presence of CP. The medical records contained information about each participants CP diagnostics, the type of CP diagnosed, when it was detected, information on their family situation and birth history. The following table illustrates details from these medical records. Variables on the table such as prenatal problems refer to complications that occurred during pregnancy, while natal problems refer to issues that arose during birth and postnatal refers to complications that developed after birth. Neonatal problems on the other hand refer to complications encountered shortly after birth. On the table, "Yes" indicates the presence of

something and “No” the absence of something. These variables help illustrate the underlying factors that could have contributed to the development of CP. The table also contains information about the age, gender, and the language of each participant. The environmental data for CP001 indicates that she was diagnosed with CP of the type spastic hemiplegia (meaning it affects one side of the body), and it was detected in her at age 3. There were no complications during pregnancy or birth, but she developed complications shortly after birth. The data also indicated that she lives with her parents and is a 14 year old female. It also indicates she is the first child. More examples are seen on the table below.

Table 1. Environmental Data.

CP Cases / Env. data	CP001	CP002	CP003	CP004	CP005	CP006	CP007
Diagnosis	CP	CP	CP	CP	CP	CP	CP
Type of CP	Spastic Hemiplegia	Spastic Diplegia	Spastic Diplegia	Spastic Hemiplegia	Spastic Diplegia	Spastic Hemiplegia	Spastic Athetosis
Age detected	3	2	3	7 months	1	2	1
Prenatal Problems	No	No	No	No	No	No	No
Natal Problems	No	No	No	No	No	No	yes
Neonatal Problems	Yes	Yes	No	No	yes	No	no
Postnatal Problems	No	No	Yes	Yes	No	Yes	Yes
Family situation	First child	3rd child	Lone child	3rd child	2nd child	2nd child	Last child
Language	English	French	French	French	French	French	English
Gender	Female	Male	Male	Female	Male	Male	Female
Age	14	12	8	16	11	14	11

2.4 Sampling Technique and sample size

This section elaborates on the sampling technique and sample size of the study.

2.4.1 Sampling technique

A non-probability sampling technique was employed in the study. Nonprobability sampling involves selecting units, such as groups of people or research participants, from a population using a non-random criteria. Consequently, not all members of the population have an equal chance of being included. The non-random criteria involved being diagnosed with CP and exhibiting symptoms of language impairment as well as belonging to an age range of 8 to 16 years. These traits were relevant to the research objective of investigating the effects of linguistic impairments on individuals with Cerebral Palsy. The researcher opted for this sampling method based on theoretical and practical considerations. For the teacher population, the inclusion criteria entailed being special inclusive teachers who are in charge of the various classes where the research participants came from. Secondly, they needed at least 2 years of experience teaching them.

The choice of non-probability sampling aligns with the qualitative approach adopted in the study. By employing this method, the researcher was able to thoroughly observe and study the selected participants with Cerebral Palsy, as well as their unique traits, in a comprehensive manner. The specific type of non-probability sampling used in this study was Purposive sampling. This method involved selecting research participants that meet pre-set criteria relevant to the research questions. It was chosen based on the purpose of the study and the characteristics of the population being studied. For this the researcher used a screening diagnosis such as observation, medical records and language test to ensure the sample met the study requirements. It aligned with the qualitative nature of the research, which aimed to capture in-depth descriptions of the selected units

2.4.2 Sample size

As mentioned earlier, the researcher employed a purposive sampling method to select a sample size of seven research participants from various classes, each exhibiting different levels of linguistic impairment. The selection criteria involved identifying participants with both Cerebral Palsy (CP) and linguistic impairments, aligning with the research objectives of the study. To identify individuals with CP, the researcher consulted their medical records. Some cases of CP were severe to the extent that the participants could not articulate, so they were excluded from the study. To ensure anonymity and confidentiality, the actual names of the

participants were not used, instead, each participant was assigned a code beginning with "CP" followed by a numeric value. The table below presents the sample size obtained for the study:

Table 2: List of Research Participants

Participants	Age	Gender	Type of CP	Description
CP001	14	Female	Spastic Hemiplegia	Too much muscle tone affecting one arm or leg on the same side of the body
CP002	12	Male	Spastic diplegia	Too much muscle tone affecting all four limbs with the arms affected to a lesser degree
CP003	8	Male	Spastic diplegia	Too much muscle tone affecting all four limbs with the arms affected to a lesser degree
CP004	16	Female	Spastic hemiplegia	Too much muscle tone affecting one arm or leg on the same side of the body
CP005	11	Male	Spastic diplegia	Too much muscle tone affecting all four limbs with the arms affected to a lesser degree
CP006	14	Male	Spastic hemiplegia	Too much muscle tone affecting one arm or leg on the same side of the body
CP007	12	Female	Athetoid Diplegia	No muscle control affecting all four limbs with the arms affected to a lesser degree

2.5 Research Procedure

The data for this study was obtained through the use of semi-structured interviews, a wordlist and observation of participants. Guided interviews supported by a wordlist ranging from 10 to 20 minutes were conducted with the research participants in an empty classroom in school during lunch breaks. This was done with permission and consent from the school administrators. This ensured confidentiality and avoided noise and distractions. For the teachers, interviews ranging from 30 to 40 minutes were conducted in their respective classes.

The researcher in order to gain familiarity with the children, established a rapport with them by singing school rhymes with them, dancing, and being present during class lessons.

At the start of the field work, the researcher mostly observed the children and took field notes. After having confirmed the participants had CP and exhibited linguistic impairments, the researcher followed an interview guide that was pilot tested with some of the children fitting the study criteria. When this was done, the researcher proceeded to hold guided interviews with participants. At the start of each interview, the researcher greeted the student and introduced himself, and informed the student that he or she will be pronouncing some words. All interviews were audio recorded with permission from teachers and the school administrative. In addition, the participants were aware that they were being recorded. The participants sat facing the interviewer with the recorder placed unobtrusively between them. The researcher maintained a warm, open posture and tone. Field notes were taken during and after each interview and during classes regarding factors such as interpersonal skills, language abilities, friendliness etc. These observations supplemented the guided interview data. The interviews with the teachers coupled with the researcher's observations provided information on the impact of linguistic impairments on the research participants. The duration of the field work was four months.

2.6. Data Collection

This section provides details on the method of data collection and the instruments used to obtain the data.

2.6.1 Methods of Data Collection

This study made use of in-depth, one-on-one interviews, and observation. The researcher employed these methods to gather detailed and comprehensive data, recognizing that each method has its own strengths and limitations. By using both observation and interviews, the researcher aimed to ensure reliability and compensate for any gaps in data collection. The subsections that follow provide a detailed exploration of each method and how they were applied in the study.

2.6.1.1. Participant Observation

The researcher utilized participant observation as a key method during the fieldwork phase of this study. In order to maintain objectivity, the researcher adopted a moderate participation role, engaging with participants when necessary while also observing from a

bystander position. Upon arriving at the research site, the researcher recognized the importance of establishing a rapport with the participants. By interacting with them in a friendly and familiar manner, the researcher aimed to alleviate any anxiety or fear that might hinder participants' natural behaviour. This step aligned with one of the four stages of observation outlined by Howell (1972), which emphasizes on the importance of building rapport and getting to know the people involved.

During the observation process, the researcher took meticulous field notes to ensure that no important details were overlooked. These field notes served as a comprehensive record of the observations made, capturing specific behaviours, linguistic patterns, and any other relevant information. In addition to observing the participants, the researcher paid attention to the teachers and their interactions with the children. The researcher also occasionally initiated discussions to facilitate further understanding of the participants' language abilities.

To systematize the observation process and assess the participants' language prowess, the researcher employed an observation checklist. This checklist utilized a Likert rating of 1 to 3, representing the level of linguistic impairment exhibited by the participants. The observation checklist was formatted as a table with the participant codes listed horizontally on the right axis. The left vertical axis consisted of a comprehensive set of expressive and receptive language modalities used to assess their skills. A 3-point Likert rating scale was used to score each modality where; 1 signified “Never/rarely observed”, 2 signified “Sometimes observed” and 3 signified “Frequently/always observed”. On the expressive language side, modalities such as speech intelligibility (aspects such as slurring of words, distortion), uses simple short phrases, topic maintenance, and gestures are included. These permitted the researcher to observe the child’s expressive language abilities. Receptive language skills rated include following directions, inferencing/abstraction (ability to comprehend abstract or non-concrete concepts), and comprehension of long sentences. Observing these modalities assessed how well the participants processed verbal input. By employing participant observation, taking field notes, and utilizing audio recordings, the researcher ensured a comprehensive and accurate collection of data. These methods facilitated a deeper understanding of the participants' experiences and language-related challenges, aligning with the objectives of the study.

2.6.1.2. Interviews

In this study, the primary method of data collection used was interviews. Interviews made it possible to capture detailed personal perspectives and meanings of individuals who

have experienced a particular phenomenon (Creswell 2013). Hence this method was selected to gain rich, first-hand insights from the children and teachers. In this light, the researcher used a guided interviews along with a wordlist for the study subjects with CP and semi-structured interviews for their teachers. The use of semi-structured interviews for teachers was to engage the teachers in open-ended discussions, allowing for a deeper exploration of their experiences with the research participants and their insights into their language impairments and limitations faced by the participants in academic and social aspects. The teachers were encouraged to provide elaborate answers, which facilitated a more comprehensive understanding of the research participants and their experiences.

2.6.2 Instruments of Data Collection

The main instruments used to obtain data during fieldwork were one-on-one semi-structured interviews along with a wordlist, and participant observation. The main instruments were used in combination with other instruments such as a wordlist which was used along with a guided interview for participants with CP as well a digital audio recorder. For participant observation, it was complemented with an observation checklist while field notes were used during interviews and observations. This section describes in detail the instruments used.

2.6.2.1 Semi-structured interviews

A key instrument developed for the collection of linguistic data for the study subjects with CP was a guided interview wordlist. The language assessment wordlist was made up concrete and abstract nouns, numerals, some common verbs and a mix of simple short questions and sentences, as well as some long abstract sentences and questions. The mix of word classes provided diversity in speech sound production contexts while the use of questions elicited connected speech and sentence-level construction and comprehension abilities. The researcher developed both French and English versions of the wordlist and each was administered to participants who spoke the language primarily. The specific words in the English and French lists differed in terms of vocabulary but while the vocabulary differed, both lists sampled similar phonetic context (such as multisyllabic words, words with initial and final consonants) and similar elicitation categories (repeating words and phrases). In addition, the data in both lists were similar in terms of syllable number, complexity, speech sound composition, word length and word class distribution. Thus, while the lists vary in terms of specific words, they target comparable speech parameters, contexts, and similar sounds such that the data obtained is functionally equivalent for analysis even though the surface features differ. The wordlist was

first pilot tested with two individuals with CP at the school before being administered to the sample population. Each guided interview lasted 10 to 20 minutes.

Semi-structured interviews were conducted with the teachers in charge of participants with CP to gain insights into the students' language skills and impairments. The interview guide contained open-ended questions in four key areas

- Observed language impairments
- Effects of language impairments on academics (teachers discussed how impairments affected reading, writing, learning, verbal comprehension and participation)
- Impact on social interaction
- Therapies and interventions (teachers provided information on speech, language, and communication therapies students were receiving).

These topics served as a starting point for in-depth discussions. The researcher used follow-up probes and requests for examples to encourage detailed responses. All teachers were asked the same core questions with flexibility to expand.

The researcher used a digital audio recorder app to take audio recordings during the language assessment interviews and interviews with teachers. The audios were transcribed and treated for data presentation and analysis. In addition, the researcher took field notes during the guided interviews jotting down areas where the participants have difficulties with, articulatory characteristics and general tone and response. For the semi-structured interviews, the researcher jotted down some of the areas where the students are affected and tasks that they were limited in. These provided a complementary and rich data set.

2.6.2.2 Participant Observation

The researcher also obtained data via participant observation. The researcher engaged in an unobtrusive observation of the research participants during class hours observing their interactions with peers, communication, participation in class activities, execution of exercises and lessons. In addition, these interactions also enabled the researcher observe fundamental characteristics indicating whether or not they had CP or that helped the researcher identify those with CP. A structured checklist was used alongside the participant observation to document the language skills of the children. A 3-point Likert scale was used to rate each language area per child with lower scores indicating greater impairment. The researcher while

observing each child also took field notes. The observation data provided complimentary information to other instruments by capturing spontaneous communication in a natural context.

2.7 Reliability and Validity

This section takes a look at the steps taken by the researcher to ensure the reliability and validity of the study by way of minimizing the threats to validity and reliability.

2.7.1 Reliability

According to Brink (1991, p.1), reliability refers to the ability of a research method to consistently yield the same results over repeated testing periods. To ensure the reliability of the instruments used in this study, the researcher conducted a pilot test as a form of test-retest. The researcher visited the special education school and conducted a preliminary observation and interaction with the research participants. During this process, the researcher observed the participants and engaged them in questions related to their expressive and receptive language capabilities. The results from this pilot test showed consistency between the characteristics noticed through observation and those identified during the interviews. This provided evidence of reliability in the data collection instruments.

Moreover, in qualitative research, reliability is measured through "dependability" and "conformability" as suggested by Guba and Lincoln (Kumar, 2011, p.186). Dependability focuses on whether the same results would be obtained if the research were conducted again under the same conditions. In this study, the researcher conducted multiple observations and interviews over the four-month fieldwork period, consistently obtaining similar outcomes. This demonstrated dependability and added to the reliability of the study.

Conformability, on the other hand, refers to the degree to which the results can be confirmed or corroborated by others. By adhering to established research methods, including research philosophy, sampling, data collection, and analysis methods, the researcher ensured that the results of this study can be replicated by other researchers who systematically apply the same methods.

By addressing reliability through the pilot test and considering both dependability and conformability, the researcher took measures to enhance the trustworthiness and replicability of the study's findings. These steps contribute to the overall rigor and credibility of the research.

2.7.2 Validity

Validity refers to the ability of an instrument to measure what it is designed to measure (Kumar, 2011, p.179). In this study, the researcher focused on assessing the impact of linguistic impairments in individuals with CP. To ensure validity, the researcher employed observation as a primary method of data collection. Through observation, the researcher aimed to identify observable linguistic impairments in the research participants. During interviews and interactions, the researcher designed questions that specifically targeted the expressive and receptive language capabilities of the participants, as well as their cognitive abilities. The researcher took care to avoid using complex questions that could confuse the participants. This use of language-focused questions aligns with the principles of construct and content validity, ensuring that the questions are appropriate for measuring the phenomenon of interest. Additionally, the researcher employed Levelt's (1989) model of speech production as the theoretical framework to analyse the observed impairments. This choice aligns with content validity, as the model encompasses the various stages involved in language conceptualization, expression, and decoding. It serves as a relevant tool to measure impairments and explore their possible causes.

In qualitative research, validity is often represented by "credibility" (Kumar, 2011). Credibility involves establishing that the results of qualitative research are believable from the perspective of the research participants (Trochim and Donnelly, 2007, cited by Kumar, 2011, p.185). In this study, the research participants are children with CP, and the findings obtained from data collection were consistent with the observations and experiences reported by their teachers. This alignment between the research findings and the perspectives of the participants enhances the credibility of the study.

2.8 Method of Presentation and Data analysis

The data for this study was presented using tables, charts and prose format. Tables were used to present the data on linguistic impairments in individuals with CP while a prose format was adopted in presenting interview data collected from teachers on the impact of these impairments and on therapeutic strategies. The study also made use of pie charts that were generated using Microsoft Excel to present the findings of the study.

In terms of method of data analysis, this study made use of a qualitative method of data analysis, considering the nature of the collected data. Thematic analysis was employed to identify and extract relevant themes that align with the research questions and objectives. The

researcher made use of thematic analysis because it offered a systematic approach to classifying and analysing qualitative data. By using coding to organize the data, important elements and concepts relevant to the research could be easily identified and comprehensively examined. This method allowed for the identification of patterns and connections within the data, leading to a deeper understanding of the research topic.

Moreover, thematic analysis facilitated the categorization of various codes under broader themes. This categorization helped prevent data cluttering, ensuring that the information is presented in a clear and interpretable manner. By adopting this method, the researcher was able to efficiently analyse and interpret the data, enabling a robust exploration of the research questions and objectives. Overall, the utilization of thematic analysis and coding contributed to a rigorous analysis process, enhancing the reliability and validity of the study's findings.

2.9 Ethical Considerations

In terms of the ethical considerations, the researcher obtained a research permit document from the head of department which was presented at the handicap centre along with an application to carry out research at the school. The researcher obtained permission from the school to collect data from the students as well as to record audio. The guardians of the research participants elected for anonymity of each child and the researcher complied to that as well to ensuring the data obtained is only used for the purposes of the study and is not broadcasted or shared to other people. The researcher also sought the permission of each teacher before entering their class for observation and subsequently explained to the teachers the objective of the study and so had their support.

2.10 Conclusion

This chapter x-rayed the research methodology used in the study. The research adopted a qualitative methodology and it looked at the research design, area of the study, population and sample size as well as the method of data collection. It also took a dive into the method of data analysis that will be subsequently employed and also discussed some ethical consideration taken into account.

CHAPTER THREE DATA PRESENTATION AND ANALYSIS

This chapter plays a crucial role in presenting and analysing the data collected during the fieldwork. To ensure a well-organized approach, the chapter is divided several key sections. This chapter focuses on the three research questions of the study and begins by identifying linguistic impairments in individuals with CP. It also looks at the impact of these impairment on the CP cases and goes on to discuss available therapeutic strategies to ameliorate these impairments.

3.1 Linguistic impairments in individuals with CP

This section handles the presentation and analysis of data related to linguistic impairments in individuals with Cerebral Palsy.

3.1.1 Data presentation on linguistic impairments in individuals with CP.

This section presents the speech and language data obtained from the CP cases.

3.1.1.1 Speech data

In order to better understand the data and the research questions, it is essential to get a brief glance of the speech data of the research subjects presented in table 3. It presents their degree of interpersonal skills during interaction. A scale of 0, 1, 2, and 3 was used to check and indicate the degree of the presence or absence of a trait in the interpersonal skills of the participants. Here, “0” stood for never present, “1” stood for somehow present, “2” present and “3” for very present. Hence one finds that participant CP001 was friendly (2), somehow cooperative (1) somehow attentive, never makes gestures in speaking (0), violent (2) and she somehow witnesses short and long pauses (1) in between speech. Whereas participants CP002 is friendly, cooperative, and attentive (2). He however, never uses gestures (0), is not violent (0) and does not experience short and long pauses between speeches. Just like CP002, CP003 is also friendly, cooperative and attentive (2), he never uses gestures (0), is not violent (0) and does not experience short or long pauses in his speech (0). Participants CP004 and CP005 are similar to the previous cases in terms of friendliness, cooperation and attentiveness and. On the other hand, they differ in that case CP004 has short pauses in his speech (2), does not use gestures (0) whereas CP005 has it very present in his conversation patterns (3). While CP004 only has short pauses, and never long pauses (0) case CP005 has short and long pauses very present in his speech (3). Case CP006 is somehow friendly, cooperative and attentive. He never uses gestures (0), was violent (2), and witnesses short pauses (2) and somehow long pauses (1).

In the case of CP007, she was very friendly, very attentive and cooperative (3), short and long pauses are very present in their speech (3) and was never violent (0) and never using gestures (0).

Table 3. Speech data.

subjects / Traits	CP001	CP002	CP003	CP004	CP005	CP006	CP007
Friendliness	2	2	2	2	2	1	3
Cooperation	1	2	2	2	2	1	2
Attentiveness	1	2	2	2	2	1	3
Gestures	0	0	0	0	3	0	0
Violence	2	0	0	0	0	2	0
Short pauses	1	0	0	2	3	2	3
Long pauses	1	0	0	0	3	1	3

3.1.1.2 Language Impairments in Individuals with Cerebral Palsy

This section presents the language data of participants with CP in order to identify the diverse language impairments experienced by individuals with Cerebral Palsy (CP). The data revealed the presence of expressive (such as phonological, articulation and muscle speech disorders) and receptive (such as comprehension) language disorders. The following subheadings elaborate on each language impairment.

3.1.1.2.1 Expressive Language Disorder

Regarding expressive language disorders, the researcher observed several deviations, including phonological disorders, articulation disorders, and muscle speech disorder, which is a speech disorder affecting the muscles involved in speech production. The following lines present the data associated with each disorder and their subtypes.

i. **Phonological Disorders**

Specifically focusing on phonological disorders, the researcher identified various deviations such as voicing, devoicing, deletion of final and initial consonants, syllable deletion, and cluster reduction.

a. Voicing

This disorder is exhibited by two participants CP001, and CP003. The other participants showed no signs of this deviation and as such were exempted. Closer examination of the data obtained from the utterances of these two participants revealed deviations at the level of voicing. These deviations primarily involved the alteration of voiceless consonants such as /p/, /θ/, /t/ /s/, and /f/ into their voiced counterparts in certain environments. For instance, the voiceless fricative /f/ in "fine" undergoes voicing as it is realized as /v/ in [vaɪ]. It is also evident in the word "pomme" where /p/ is altered into /b/ resulting in [bɔm]. It is also seen in the words "two" and "sept" where the voiceless alveolar plosive /t/ and the voiceless fricative /s/ are deviated into the voiced alveolar plosive [d] resulting in [du] and [dɛt] respectively. It is worth noting that although the wordlists for both French English speakers differ in terms of specific vocabulary, they both assess similar language parameters in terms of syllable numbers, sound composition, complexity as well similar contexts. This is evident in both speakers having deviations on the same sound [d]. Furthermore, the use of diverse list was to ensure the elicitation of natural occurring data to avoid any biases. In addition, both lists were pilot tested before implementation to ensure they both assessed the same language metrics. Additional examples are illustrated in the table below which depicts instances of this occurrence.

Table 4: Voicing disorder in CP cases

Ideal speech	CP001	deviation	gloss	Ideal speech	CP002	deviation	gloss
/faɪn/	[vaɪ]	/f/→[v]/#_aɪ	Fine	/sɛʁpje/	[ebɛʁ]	/p/ → [b]/e-ɛ	serpiere
/nʌθɪŋ/	[nɔdɪ]	/θ/→ [d]/ɔ_ɪ	Nothing	/pɔm/	[bɔm]	/p/ → [b]/#-ɔ	pomme
/pɛnsɪl/	[pɛnzɛl]	/s/→ [z]/n__ɛ	Pencil	/sɛt/	[dɛt]	/s/→ [d]/#_ɛ	Sept
/tu:/	[du:]	/t/→ [d]/#__u	Two	/sɛl/	[dɛl]	/s/→ [d]/#_ɛ	Sel
/θɹi:/	[deji]	/t /→ [d]/#_e	Three	/pɛ/ ̃	[vɛ̃]	/p/→ [v]/#_ɛ̃	Pen
/faʊə/	[vɔ]	/f/→ [v]/#_ɔ	Four	/fam/	[vɛm]	/f/→ [v]/#_ɛ	Femme
/faɪf/	[vaɪv]	/f/→ [v]/#__aɪ	Five	/plãtɛ̃/	[bentɛ̃]	/p/→ [b]/#_ɛ	plantain
/sɪks/	[zɪs]	/s/→ [z]/#__ɪ	six				

The table above illustrates that these voicing disorders are consistent amongst fricatives and plosives specifically sounds articulated in the forward parts of the mouth. Note that despite both participants speaking two different languages (French and English) the voicing disorders are consistent across both languages.

b. Devoicing

Another voicing disorder identified in the data is a pattern of altering voiced consonants into voiceless forms. Identified in two participants, (CP002 and CP003), the devoicing deviations observed centre primarily on stops and fricatives. This is evident in examples like the adult realization of "Bonjour" which is realized in the participant's utterance as [pɔju] with /b/ being altered to /p/. Similarly, in the word "Dormir", /d/ is replaced with its voiceless counterpart /t/ in the same context. The data indicates that devoicing takes place in consonant sounds occurring in the anterior and posterior regions of the mouth. This is evident in the words "vert" and "gateau" where the sounds /v/ and /g/ are replaced with their voiceless counterparts [f] and [k] deviating the words to [fɛ] and [kato] respectively. Another instance of this occurrence is the deviation of the words "danger" and "president" where the alveolar plosive /d/ and the voiced alveolar fricative /z/ are devoiced into [t] in [taje]. In the case of /z/ it deviated into the glottal stop [?] and the voiceless alveolar fricative [s] altering the word into [ə?idɑn] and [esidan].The following table illustrates instances of this disorder.

Table 5: Devoicing

Ideal speech	CP002	CP003	Deviation	Gloss
/bɔʒuʁ/	[pɔju]	----	/b/→[p]/#__ɔ	Bonjour
/dɔʁmiʁ/	[tɔmi]	[tɔmɪ]	/d/→[t]/#__ɔ	Dormir
/vɛʁ/	[fɛ]	[fɛ]	/f/→[v]/#__ɛ	Vert
/dɑʒe/	[tɑje]	[tɑje]	/d/→[t]/#__a	Danger
/gato/	[kato]	[kato]	/g/→[k]/#__a	gateau
/pʁezidɑ̃/	[ə?idɑn]	[esidɑn]	/z/→[?]/ə__ɪ /z/→[s]/e__ɪ	President

c. Final Consonant Deletion

Combing through the data sets, revealed a pattern whereby final consonants are deleted. This deviation is apparent in all seven participants and is evident in words like “orange”, where the sound /ʒ/ is deleted for the French word while for the English counterpart, the sound /dʒ/ is omitted as well resulting in the target word being realized as [ojaə̃] and [ojin] respectively. This illustrates that final consonant deletion occurs in both languages for CP cases. Another example of this occurrence is illustrated in the words like “cinq” where /k/ is omitted and in “nine” where /n/ is deleted as well by CP cases resulting in [sɛ] and [naɪ]. The sound types deleted are mainly plosives, fricatives and nasals. Another instance of this is evident in the words “babouche” and “smile” where the final consonants /ʃ/ and /l/ are deleted resulting in [babu] and [mai] respectively. More examples are captured in the following tables. Due to the fact that not all the participants speak the same language, the researcher makes use of two tables to illustrate this phenomenon, one for each language.

Table 6a. Final Consonant deletion (French)

Ideal speech	CP002	CP003	CP004	CP005	CP006	Deviation	Gloss
/oʁɑ̃ʒ/	[oja]	[ojaə̃]	[ojaə̃]	[ojaə̃]	[oja]	/ʒ/→∅/ɑ̃__#	Orange
/bɔʒ̃ uʁ/	[pɔju]	[bɔju]	[bɔju]	[bɔju]	[bɔju]	/ʁ/→∅/u__#	Bonjour
/babuʃ/	[papu]	[babu]	[babu]	[babu]	[babu]	/ʃ/→∅/u__#	Babouche
/pisin/	[pisi]	[pwesi]	[pisi]	[pisi]	[pisi]	/n/→∅/i__#	Piscine
/sɛk/	[sɛ]	[sɛə̃]	[sɛə̃]	[sɛə̃]	[sɛ]	/k/→∅/ɛ__#̃	Cinq
/nɛf/	[nɛ]	[nɛ]	[nɛ]	[nɛ]	[nɛ]	/f/→∅/ɛ__#	Neuf
/falɛz/	[falɛ]	[falɛ]	[falɛ]	[falɛ]	[falɛ]	/z/→∅/ɛ__#	Falaise
/sistɛm/	[sitɛ]	[sitɛ]	[sitɛ]	[itɛ]	[sitɛ]	/m/→∅/ɛ__#	Système
/aʁiv/	[aji]	[aji]	[aji]	[aji]	[aji]	/v/→∅/i__#	Arrive
/epok/	[ɛpo]	[ɛpo]	[ɛpo]	[ɛ-ɛɛpo]	[ɛpo]	/k/→∅/o__#	Epoque

The above table illustrates final consonant deletion in French participants. On the other hand, the table below illustrates final consonant deletion in English participants (CP001 and CP007).

Table 6b. Final consonant deletion (English)

Ideal speech	CP001	CP007	Deviation	Gloss
/eɪt/	[eɪ]	[eɪ]	/t/→∅/eɪ__#	Eight
/naɪn/	[naɪ]	[naɪ]	/n/→∅/aɪ__#	nine
/nʌθɪŋ/	[nɔdɪ]	[nɔdɪ]	/ŋ/→∅/ɪ__#	Nothing
/faɪn/	[vaɪ]	[vaɪ]	/n/→∅/aɪ__#	Fine
/paɪnæpəl/	[pɑ:pə]	[pɑ:pə]	/l/→∅/ə__#	Pineapple
/ɒrɪndʒ/	[ojɪn]	[ojɪn]	/dʒ/→∅/n__#	Orange
/pɪn/	[pɪ]	[pɪ]	/n/ →∅/ɪ__#	Spin
/smaɪ/	[maɪ]	[maɪ]	/l/ →∅/aɪ__#	Smile
/jæm/	[jɑ:]	[jɑ:]	/m/ →∅/ ɑ__#	Yam

d. Initial Consonant deletion

Aside from deleting final consonants, all participants also exhibited deletion of initial consonants in some contexts. These deviations impact different types of sounds, including plosives, nasals and fricatives, and for both French and English participants with an instance of vowels being affected. Instances of initial consonant deletion can be seen in words like “merci” where /m/ is deleted resulting in alterations like [ɛsɪ], [a:sɪ] and in words like “zero” where /z/ is omitted resulting in [ɛjo]. It is also seen in words like “huit” and “honey” where the initial voiceless glottal fricative /h/ is omitted leading to the deviated utterances such as [it] and [ɔnɪ] illustrating that both the English and French speakers deviate similar sound segments irrespective of language. Further examples are illustrated in the following two tables for both languages.

Table 7a. Initial Consonant Deletion (French)

Ideal speech	CP002	CP003	CP004	CP005	CP006	Deviation	Gloss
/mɜʁsi/	[ɑ:si]	[ɛsi]	[ɛsi]	[ɛsi]	[ɛsi]	/m/→∅/#__ɛ	merci
/zɛʁo/	[ɛro]	[ɛjo]	[ɛjo]	[ɛjo]	[ɛjo]	/z/→∅/#__ɛ	zero
/nuʁityʁ/	[utiti]	[ujitu]	[uti]	[uti]	[uti]	/n/→∅/#__u	nourriture
/wit/	[it]	[it]	[it]	[it]	[it]	/w/→∅/#__i	huit
/mɛ:tʁɛs/	[ɛtɛs]	[ɛtjɛs]	[ɛtjɛs]	----	[ɛ..ɛtɛs]	/m/→∅/#__ɛ	maitresse
/ʒənu/	[ənu]	[ənu]	-	[ə..ə.ənu]	-	/ʒ/→∅/#__ə	genou

The above table illustrates that the sounds frequently affected in this group of participants are, /m/, /z/, /n/, /w/, /ʒ/. On the other hand, the table below shows the distribution of occurrence for English participants indicating that the sounds (consonants) affected are mainly plosives such as /h/ and /s/.

Table 7b. Initial Consonant Deletion (English)

Ideal speech	CP001	CP007	Deviation	Gloss
/hʌni/	[ɔnɪ]	[ɔnɪ]	/h/→ ∅/#__ʌ	Honey
/hɔ:s/	[ɔs]	[ɔs]	/h/→∅/#__ɔ:	Horse
/haʊs/	[as]	[aʊs]	/h/→∅/#__a	House
/spu:n/	[pun]	[p.p..pun]	/s/→∅/#__p	Spoon
/skɜ :t/	[kət]	[k..k..kət]	/s/→∅/ #__k	Skirt
/skɪp/	[kɪp]	[k.kɪ..kɪp]	/s/→∅/ #__k	Skip

e. Syllable Deletion

The data reveals several instances of syllable deletion in the utterances of all CP cases under study. This deletion is witnessed in both languages and is evident in examples like “voyager” where the final syllable /ʒe/ is deleted altering the word to [vaja] and [vwaja] respectively. Similarly in “tomato”, the initial syllable /to/ is deleted resulting in [mɑ:tə]. Other

instances are visible in words like “apple” and “lapin” where the initial syllables /æ/ and /la/ are deleted altering the words to [pə] and [pɛ]. The data also indicated that syllable deletion in English CP cases is mostly initial and medial while in French CP cases it occurs initially, medially and finally as illustrated by the French words “travailler” and “arreter”. In the former, the final syllable /je/ is deleted deviating it to [tʁava] while in the latter, the medial syllable /ʁɛ/ is deleted resulting in [ate]. For English the word “elephant” is deviated whereby the medial syllable /lə/ is deleted leading to [ɛfa]. The subsequent tables illustrate these instances

Table 8a. Syllable deletion (French)

Ideal speech	CP002	CP003	CP004	CP005	CP006	Deviation	Gloss
/vwajaʒe/	[vaja]	[vaja]	[vwaja]	[vwaja]	[vwaja]	/ʒe/→∅	voyager
/ɑ̃vwaje/	[ɑvwa]	[ɑvwa]	[ɑvwa]	[ɑvwa]	[ɑvwa]	/je/→∅	envoyer
/tʁebyʃe/	[buʃe]	[buʃe]	[buʃe]	[buʃe]	-	/tʁɛ/→∅	trébucher
/tʁavaje/	[tʁava]	[tʁava]	[tʁava]	[tʁava]	[tʁava]	/je/→∅	travailler
/lapɛ̃/	[pɛ]	[pɛ]	[pɛ]	[pɛ]	[pɛ]	/la/→∅	lapin
/mɛ:tʁ/	[ɛ]	[ɛ]	[ɛ]	[ɛ]	[ɛ]	/tʁ/→∅	maitre
/paʁtaʒe/	[taje]	[taje]	[taje]	[taje]	[taje]	/paʁ/→∅	Partager
/ananɑ/	[njanja]	[nana]	[nana]	[a.na]	------	/na/→∅ /a/→∅	ananas
/aʁɛ:te/	[ate]	[ate]	[ate]	[ate]	-----	/ʁɛ/→∅	arreter
/tapjoka/	[poka]	[poka]	[poka]	[poka]	[poka]	/ta/→∅	tapioca

The table above reveals that the pattern of syllable deletion takes place at initial, medial and final positions with the majority of instances occurring at final position. On the other hand, the table below illustrates the occurrence in English participants (CP001 and CP007).

Table 8b. Syllable deletion (English)

Ideal speech	CP001	CP007	Deviation	Gloss
/təmɑ:toʊ/	[mɑ:tə]	[ma..m..mato]	/to/→∅	Tomato
/paɪnæpəl/	[pɑ:pə]	[p.p..pɑ:pə]	/næ/→∅	pineapple
/æpəl/	[pə]	[p.pə]	/æ/→∅	Apple
/ɔfɪs/	[vɪs]	[v.v.vis]	/ɔ/ →∅	Office
/ɛləfən/	[ɛfa]	[ɛfa]	/lə/→∅	Elephant

The above table illustrates a deletion pattern of initial and medial final position. Based on the distribution observed in the two tables, the following table illustrates the syllable structures identified.

Table 8c. Syllable structure

Syllable structure	Examples
V	/a/, /ɔ/
CV	/ʒe//to/
CVC	/paʁ/
CCV	/tʁɛ/

f. Cluster reduction

This phenomenon is exhibited by two CP cases under study namely CP001 and CP007 whereby, consonant clusters are deleted or reduced. In the data, several instances of cluster reduction are observed such as in the words “skip” and “sting” where the clusters /sk/ and /st/ are reduced to /k/ and /t/ and the word deviated to [kɪp] and [tɪŋ] respectively. The table below provides further examples of these occurrences.

Table 9. Cluster reduction

Ideal speech	CP001	CP007	Deviation	Gloss
/skɪp/	[kɪp]	[k.kɪ..kɪp]	/s/→∅/ #__k	skip
/slɪp/	[sɪp]	[s.s.s.sɪp]	/l/→∅/ #__ɪ	slip
/slæp/	[sap]	[s.sa.sa...sap]	/l/ → ∅/ s_æ	slap
/stɪŋ/	[tɪŋ]	[t.tɪŋ]	/s/ → ∅/#__ɪ	sting
/stʌmbəl/	[tɔmbə]	[tɔ.mbə]	/s/→ ∅/#__ɔ	stumble
/spun/	[pun]	[p.p..pun]	/s/→ ∅/#_p	spoon

The above table shows that the cluster reduction takes place primarily at the word initial position.

ii. Articulation Disorders

In terms of articulation disorders, the data revealed several types such as substitution, addition and distortion which are presented subsequently.

a. Substitution

The researcher noticed several instances of substitution common in the utterances of all study participants with CP. They exhibit instances of replacing sounds with others as evidenced in words like “haricot” and “zoo” where /r/ and /z/ are replaced by the glide /j/ resulting in [ejɪko] and [jo] respectively. Other examples can be seen in the tables below. The first table shows the occurrence in the French speaking CP cases and the second table illustrates the occurrence in English speaking CP cases participants.

Table 10a. Substitution (French)

Ideal speech	CP002	CP003	CP004	CP005	CP006	Deviation	Gloss
/bɔʒ̃ uʁ/	[pɔju]	[bɔju]	[bɔju]	[bɔju]	[bɔju]	/ʒ/→[j]/ɔ__u	bonjour
/mɑ̃ʒe/	[mɑje]	[mɑje]	[mɑje]	[mɑje]	[mɑje]	/ʒ/→[j]/a__e	manger
/sis/	[ʃiʃ]	[ʃiʃ]	[ʃiʃ]	[ʃiʃ]	[ʃiʃ]	/s/→[ʃ]/#__i /i__#	Six
/zo/	[jɔ]	[jɔ]	[jɔ]	[jɔʔɔ̃]	[jɔ]	/z/→[j]/#___ɔ	zoo
/ʁi/	[ji]	[ji]	[ji]	[ji]	[ji]	/ʁ/→[j]/#__i	riz
/aʁiko/	[əjiko]	[əjiko]	----	[ə..əko]	-----	/a/ →[ə]/#	Haricot
/avoka/	[əfoka]	[əfoka]	[foka]	[a.a.foka]	-------	/v/ →[f]/a_o /v/ →[f]/ə_o	avocat

The table above illustrates that substitution occurs across vowels and consonants. In the same way, the table below presents substitution in English speaking CP cases.

Table 10b. Substitution (English)

Ideal speech	CP001	CP007	Deviation	Gloss
/ɒrɪndʒ/	[ojɪn]	[ojɪn]	/r/→[j]/ o__i	orange
/zɛro/	[ɛjo]	[ɛjo]	/r/→[j]/ ɛ__o	zero
/fɪʃ/	[vɪs]	[v.vɪ..vɪʃ]	/f/ → [v] /#__ɪ	fish
/jɛləʊ/	[jɛjo]	[j.jɛjo]	/l/ →[j] / ɛ_o	yellow
/raɪt/	[lɑ:t]	[w.wɑ..wɑ:t]	/r/ →[l]/#__ɑ /r/ →[w]/# __ɑ	write
/rɔŋ	[jɔŋ]	[wɔŋ]	/r/ →[j]/#_ɔ	wrong

b. Addition

Another articulation phenomenon observed is the insertion of sounds in certain contexts. This was detected in participants CP001 and CP007 and to a lesser degree in CP003. Examples of this deviation is evident in “snake” and “three” where consonant clusters/sn/ and /tr/ are separated by the insertion of /ɪ/ and /j/ resulting in [tsɪneɪk] and [deji]. The following table shows more examples of this deviation. Manifested by these CP cases.

Table 11. Addition (English)

Ideal speech	CP001	CP007	Deviation	Gloss
/tri: /	[deji]	[d..de.deji]	∅→[j]/ d__ɪ	three
/lɪp/	[bɪzɪp]	[b..bɪzɪp]	∅→[bɪ]/ #__z	lip
/sneɪk/	[tsɪneɪk]	[ts.ts.. tsɪneɪk]	∅→[ɪ] / ts_n	snake
/laɪən/	[laɪjɔn]	[lajɔn]	∅ →/j/ /aɪ__ɔ	Lion
/wɛnzdeɪ/	[wɛndɛsdeɪ]	[wɛndɛsdeɪ]	∅→[dɛs] /n__d	wednesday

The table above shows the distribution of addition among the two participants.

c. Distortion

In the course of going through the data, the researcher noticed that some participants exhibited a consistent process of distortion. This is evident especially in CP002 and CP003 and to a lesser extent in CP004, CP005 and CP006. Instances of this distortion can be seen in words like “merci” and “oeuf” wherein the sounds /m/ and /ʁ/ are deleted, the vowel /ɜ/ is replaced with /ɑ/ and /ɛ/ resulting in distortions like [a:si], [ɛsi] while /v/ and /j/ are added to “oeuf” resulting in alterations such as [vjoeuf] and [jeouf]. The following table illustrates more examples of this phenomenon.

Table 12. Distortion

Ideal speech	CP002	CP003	CP004	CP005	CP006	Deviation	Gloss
/pastɛk/	[tɛtɛ]	[tɛtɛ]	[pɛtɛ]	-----	------		Pasteque
/oef/	[vjoefs]	[joefs]	------	------	------		Oef
/wazo/	[oto]	[oso]	------	------	------		Oiseau
/ʃɔsyʁ/	[ɪsu]	-----	[tɛsu]	-----	------		Chaussure
/mɜʁsi/	[ɑ:si]	[ɛsi]	[ɛsi]	[ɛsi]	[ɛsi]		Merci
/salɔ̃/	[ezɔ̃]	[ezɔ̃]	-------	-------	-------		salon
/katʁ/	[tate]	[tate]	----	----	-------		Quartre
/deʒœne/	----	-----	------	-------	[adedi]		Dejeuner
/gʁã/	[jand]	[jand]	-------	-----	[nand]		Grand
/famij/		[emi]	-----	------	[mimi]		famille
/maʃe/	------	----	[mase]	[a..ase]	[mase]		marcher

The above indicates that distortion is exhibited across consonants and vowels and that participants CP002 and CP003 have more instances of distortion than participants CP004, CP005 and CP006 suggesting individual variability in the expression of language.

iii. Muscle Speech Disorder

Here the data revealed the presence of muscle speech disorders in the form of dysarthria which was marked by slurring. This disorder is exhibited by two participants namely; CP002 and CP003.

a. Dysarthria

The data revealed the presence of slurred speech in the utterances of some participants which is an indicator that dysarthria is present. The following paragraphs elaborate further the manifestation of slurring speech.

Slurring

In terms of slurred speech, the data showed that participants CP005 and CP007 had tendencies to emit utterances marked by long and short pauses, slow rate of articulation and elongated pronunciation of sounds. This is evident in instances like "ardoise," where CP005 exhibits the deletion of the sounds /ʁ/, /w/, /a/, and /z/, resulting in a prolonged and slow pronunciation of the remaining sounds. Similarly, in "write," CP007 experiences difficulty pronouncing the initial sound, causing a belaboured speech with prolonged pauses. More examples can be seen in the table below.

Table 13. Slurring

Ideal speech	CP005	deviation	gloss	Ideal speech	CP007	deviation	gloss
/aʁdwaz/	[a.a.a.ado]	/ʁ/, /w/, /a/,/z/ are deleted and the speech is drawn out and slow	ardoise	/raɪt/	[waɪ..waɪt]	Belaboured speech and difficulty pronouncing the first syllable	write
/anana/	[a.a.aana]	Speech is slurred and the /a/ sound is dragged	ananas	/du/	[d..d.dj..dju]	/j/ is inserted and her speech is laboured	do
/avoka/	[a.a.foka]	The speech is dragged out with pauses	avocat	/pleɪ/	[p..p.peɪ..]	Speech is slow	play
/sovaʒ/	[s-s-s-su-ɛj̃]	Utterance is marked by short pauses and slow speech	sauvage	[twɛntɪ tu]	[tʃu.. twɛn..tɪ……. tʃu]	Her speech is slow marked by pauses and difficulty pronouncing stressed syllables	twenty
/epok/	[ɛ-ɛ-ɛpo]	/k/ is omitted and the rest of the sounds are dragged	epoch	/baɪsikəl]	[ba..ba..sɪke]	The speech is slow marked by pauses	bicycle

/stilo/	[ti…jo]	Marked by a long drawn out pause	stylo		[bɔ…ða]	Long pause after /bɔ/ and drawn out pronuciation	
/kʁejɔ̃	[ke…..kejɔ̃]	Speech is slow marked by long pause			[tu. tu. .tumɔ..wo]	Slow speech that is drawn out	

The table above shows that the participants have difficulties pronouncing certain sounds sometimes taking long pauses before continuing with their articulation. These pauses are marked by dots with each dot indicating a pause before the next sound is articulated. In addition to other sounds, participants with CP have a lot of difficulty articulating plosive and fricative sounds.

3.1.1.2.1 Receptive language disorders

Aside from expressive disorders, findings from the study also revealed that data also indicated the presence of receptive language disorders in participants although to a lesser extent relative to expressive language disorders. This disorder is manifested primarily in the form of comprehension problems.

i. Comprehension disorder

In terms of comprehension disorder, several instances are observed in the communications of participants CP004 and CP006 wherein they give inappropriate responses to the questions asked. This can be seen in participant CP004's response to the question "Qu'elle est ta nourriture préférée?" (What is your favourite food?), the participant provides an inappropriate response unrelated to the question in an attempt to reply she said "j'ai cinq ans" (I am five years old). Similarly, CP006 gives an unexpected response when asked "Tu faisais quoi dans la cuisine?" (What were you doing in the kitchen?), the participant does not provide a response. This indicates an inability to understand and process the question accurately. The two tables below represent the utterances of both participants showing more instances of this comprehension disorder.

Table 14a. Comprehension disorder (CP004)

Researcher's question	CP004 response	Deviation
Qu'elle est ta nourriture préférer	"j'ai cinq ans"	Inappropriate response to the question
Non, qu'elle est ta nourriture préférer		Difficulty comprehending complex/abstract questions
Ok, tu as mangé quoi aujourd'hui	'J'ai mangé à la maison'	Inappropriate response to the question
Quand tu finis avec les habits tu fais quoi ?	'avec le savon'	Inappropriate response to the question
Tu peux me dit les jours de la semaine ?	No response	unable to understand complex questions
Aujourd'hui cest mardi, dit mardi	'mardi'	
Hier c'était quoi ?	No response	Participant seems unable to answer abstract questions that requires thinking
Connais-tu les mois de l'année	Connais-tu les mois de l'année	unable to understand and respond to complex questions
Travailler	'je travaille'	Making a sentence instead of pronouncing the word

Table 14b. Comprehension disorder (CP006)

Researcher's question	CP006 Response	Deviation
Tu travail ?	'En haut.Je suis partir avec la voiture'	Inappropriate response to question
Tu faisais quoi dans la cuisine	No response	unable to understand and respond to complex questions
Tu été à la cuisine n'est pas ?	'J'ai partir puiser l'eau	Inappropriate response
Ou as-tu puisé l'eau ?	'on va laver les assiettes avec'	Inappropriate responses to the question
C'est quoi ta nourriture préférer ?	'le maitre va donner la nourriture'	Inappropriate response to the question
Ok le maitre vas donner qu'elle jar de nourriture ?	'je mange tout'	Inappropriate response to the question
Tu cherches quoi ?	'on vas preparer le riz avec le poisson'	Inappropriate response to the question
Aimes-tu le travail ?	'pour charger la nourriture'	Inappropriate response to the question
Tu es allé au marché ?	'la nourriture'	Inappropriate response to the question
Il y a la nourriture dans ton sac ?	Il y a la nourriture dans ton sac ?	'et le poisson cinq cents'
Le quoi ?	Le quoi ?	'le poisson preparer'

Non je demande ce que tu faisais derrière	'je suis partir verser'	The response does not match the question
Tu as versé quoi ?	No response	Participant does response shows he does not understand the question

Looking at the two tables, the researcher observes that not only do both participants show difficulties understanding questions especially abstract ones, they also exhibit difficulties understanding long sentences. In addition, their responses are short and are hardly complete sentences.

This section presented the data for all the language impairments identified in the research subjects using tables. The analysis of this data is handled in the subsequent section

3.1.2 Data Analysis of language impairments in CP.

The data presented above is analysed in this section in order to gain insights into the underlying processes involved in language impairments in people suffering from CP. Hence in this section, the speech and language data are analysed.

3.1.2.1 Analysis of speech data.

The data presented on speech data revealed the presence of several behavioral traits during the speech of each participant. All seven participants exhibit a variety of characteristics present during their interaction with the researcher and others. The following lines elaborate further on the traits observed.

3.1.2.1.1 Friendliness

In terms of friendliness the data revealed that all seven participants exhibited varying degrees of friendliness during their interaction. Participants CP001, CP002, CP003, CP004, CP005 and CP007 displayed a disposition of being open towards people, especially CP007 who seemed friendlier than the others. CP006 however was less friendly and very agitated, and does not follow directions and instructions well. This less than friendly nature can be attributed to cognitive impairments affecting his ability to understand the instructions or respond appropriately causing him to avoid interacting with people. This lack of interaction limits the

chances of communication with others which in turn limits the development of language abilities.

3.1.2.1.2 Violence

The data indicated that two participants namely CP001 and CP006 demonstrated violent tendencies. They manifested this trait by being aggressive to their classmates and being stubborn to their teacher at times. This behavior made it difficult for teachers to work with them and made even their classmates to avoid interacting with them. This is noticed especially when they attempt to communicate or interact and are not successful and as such the outbursts is a reflection of their frustration at not being able to interact normally. However, the other participants do not exhibit these tendencies indicating that this is not very common in the population and also that although they may have CP, they have varying levels of impairment and different responses to these challenges.

3.1.2.1.3 Pauses

Another prominent behavioural pattern observed in the study participants with CP is the presence of pauses in the utterances of some participants. This was observed in CP001, CP004, CP005, CP006, and CP007 in varying degrees while CP002 and CP003 did not exhibit any such traits. Short pauses were exhibited in various degrees by all five participants and this indicates impaired access to the mental lexicon and difficulty planning and sequencing sounds in words. This is captured in Levelts (1989) model whereby the speaker is said to be in a "tip-of-the tongue state" in searching for the right words. On the other hand, long pauses were very present in CP007, CP005 and somehow present in CP001 and CP006. Drawing on Levelts (ibid) model, these long pauses can be attributed to not just word retrieval difficulties, but also impaired planning and execution of message formulation, lexical access, phonological encoding and articulation. The pauses also indicate weak muscle precision and ability to sustain long conversations which explains why participants compensate for this by taking pauses to relax the articulatory muscles. This inability to communicate smoothly ultimately affects their ability to have meaningful interactions and opportunity to develop their linguistic prowess. These pauses therefore reflect impairment in semantic memory and language production.

3.1.2.1.4 Gestures

This behavioral tendency was only noticed in one participant CP005 while for the rest it was not present. This was manifested in CP005 through the use of his hands to explain things where verbal expressions failed him. Whenever he tried to express something and was unable

to articulate it, he then resorted to gestures to compensate for this communication deficit. This compensation can be attributed to impairments in motor coordination and movement of the articulatory muscles and also a reflection of dysarthria rendering it difficult to articulate certain expressions. Thus the participant uses gestures as a compliment for verbal communication.

3.1.2.1.5 Cooperation

All seven participants demonstrated cooperativeness except for CP001 and CP006 who were not as cooperative as the rest. The two participants often displayed this by not engaging in turn-taking during interactions, not maintaining eye contact and at times refusing to respond to questions or follow instructions. This lack of cooperation and inability to fully engage and participate in social interactions with other can be attributed to expressive and receptive language difficulties as well as difficulty navigating social situations. This makes it hard for them to interpret questions and follow conversations properly or stay-on topic and as a result it further hinders their language development.

3.1.2.1.6 Attention

In terms of attentiveness, participants CP002, CP003, CP004, CP005 exhibit good attentiveness while CP007 is very attentive. On the other hand, CP001 and CP006 are not as attentive. They are unable to focus and concentrate on a single task especially language related ones. This difficulty in commanding attention signifies a deficit in their ability to formulate and successfully express a thought which requires attention and focus. It can also be attributed to impairments in the prefrontal context and parietal lobes responsible for selective attention and processing sensory input. Impairments in these regions can also cause language processing difficulties in individuals.

The above analysis provides a clear insight into the verbal behaviours of CP cases and the underlying factors responsible for such behaviours. This therefore supplies additional information towards describing and understanding the language impairments in these individuals.

3.1.2.2 Analysis of Language data

. The language data presented above indicated the presence of varying linguistic impairments in individuals with CP that fall under expressive and receptive language categories. This section analyses the data presented and the analysis is done placing each deviation based on whether they fall under expressive or receptive language impairments.

3.1.2.2.1 Expressive language disorders.

One of the main themes identified in the data, is expressive language disorders which is manifested by all seven participants in one aspect or the other. They exhibited this disorder in the form of phonological, articulation and muscle speech disorders. In order to execute proper analysis of this manifestation, each subtype is analysed so as to gain insights on their unique manifestations.

i. Phonological Processing Disorder

Within the realm of expressive language disorders, the data analysis unveiled the presence of phonological impairments in the language of individuals diagnosed with Cerebral Palsy (CP). Upon scrutinizing the data, the researcher noted that the participants displayed a tendency to alter the sounds within words, resulting in voicing disorders, consonant deletion, syllable deletion, and cluster reduction. This inclination bears resemblance to the phonological processes employed by young children during the early stages of language acquisition, which aim to simplify and facilitate speech production. Bowen (2015) supports this assertion, regarding phonological processes as "patterns used by young children to simplify the adult target forms of words, making them easier to pronounce and remember." Typically, children outgrow these processes by the age of five (Bowen ibid). Looking at the ages of cases under study such as CP001, CP002, CP003, CP004, CP005, CP006 and CP007, it is clearly evident that these CP cases have grown past the ages of language acquisition.

Consequently, Bowen (2021) categorizes this phenomenon in children older than this age group as "a speech sound production disorder, characterized by significant deviations from the adult target forms, resulting in speech that is difficult to comprehend". Bowen's (2021) description accurately encapsulates the observed phenomenon among the participants of this study. To conduct a thorough analysis of phonological processing disorders in the participants, the subsequent paragraphs provide detailed explanations of each manifestation.

a. Voicing

Upon examining the data, a consistent pattern of voiceless sounds being substituted by their voiced counterparts was identified, resulting in alterations to the target words. Participants CP001 and CP002 displayed numerous instances of voicing disorders, as evidenced by examples like "pencil" (/pɛnsɪl/), "sel" (/sɛl/) where /s/→[z], [d], and "pomme" (/pɔm/) where /p/→[b]. In these cases, the voiceless alveolar fricative /s/ was changed to the voiced alveolar fricative /z/ and the voiced alveolar plosive [d], resulting in [pɛnzɛl] and [dɛl]. Whereas the voiceless bilabial plosive /p/ was replaced by a voiced bilabial plosive [b], transforming the target word to [bɔm]. Further examination of additional examples (Table 5) reveals a clear trend of voiceless fricatives and stops being replaced by their voiced counterparts across different phonetic contexts. These deviations predominantly occur before specific vowel sounds such as /aɪ/, /ɛ/, /ɛ/, and /ɪ/. This pattern suggests that voicing deviations in individuals with Cerebral Palsy͂ are influenced by the surrounding vowel sounds. As the affected sounds are all consonants, this can be attributed to the manner and place of articulation of the voiceless sounds in question. Consonants are intricate sounds, and among them, fricatives and plosives are particularly complex. Consequently, the production of fricatives and plosives requires a high level of fine motor skills and articulatory coordination, which are compromised in both participants due to the impact of Cerebral Palsy on their neural motor nervous system.

This observation regarding the complexity of consonant articulation is echoed by Nordberg (2015), who suggests that "children with Cerebral Palsy and speech impairments, with a developing speech sound system, may face even more challenges than adults with consonants of high phonetic complexity..." (Nordberg, 2015, p.8). Nordberg further explains that "high-complexity consonants, such as fricatives, which require refined speech motor control, are more commonly misarticulated than speech sounds with lower complexity" (Nordberg, ibid). Her assertion aligns precisely with the findings observed in the participants of this study. Similarly, the findings in Kim et al. (2010) fall in line with the results of the current study. They observed that individuals with Cerebral Palsy and low speech intelligibility also encountered difficulties in producing complex consonant sounds. The phonetic complexity of sounds within words affecting individuals with Cerebral Palsy, leading to errors such as voicing substitutions, serves as a clear illustration of the interconnectedness between language and the brain.

To shed light on the underlying processes, Levelt's (1989) model is employed as a theoretical microscope. In this context, it can be hypothesized that the observed misarticulations in the speech of individuals with Cerebral Palsy likely arise during the phonological encoding stage, where the intended phonological representation is transformed into a phonetic plan. According to Levelt, phonological encoding involves the selection and ordering of phonological units to construct words. In the case of individuals with Cerebral Palsy, the observed deviations suggest that impaired motor control, associated with the condition, affects the precise execution of the motor movements required for articulating specific phonemes, thereby resulting in deviations such as voicing substitutions.

These misarticulations in voiceless consonants align with the researcher's observations during fieldwork, where interactions with the aforementioned participants were closely monitored. The table below presents voiceless sounds and the corresponding voiced counterparts that replace them.

Table 15. Sound voicing in CP cases

Voiceless sounds	Voiced sounds
/f/	/v/
/θ/	/d/
/s/	/z/ /d/
/t/	/d/
/p/	/b/

Based on the table above, the following phonological rule is derived which depicts this phenomenon. The rule can be stated as: Voiceless fricatives and voiceless stops, are realized as their voiced counterparts before specific vowel contexts, such as /aɪ/, /ɛ/, /ɛ/,/u/ and /ɪ/, in the speech of individuals with CP. Thus, the above rule depicts the exact environments where voicing occurs in these consonants, hinting that in different environments, it may not be the case. This rule highlights one key aspect of phonological disorders which is the fact that people with CP can articulate a particular sound differently in certain phonological environments.

b. Devoicing

Another disorder observed in the data obtained from study participants with CP, is a pattern whereby voiced consonants are deviated into a voiceless sound in certain environments. This devoicing pattern is noticed in the utterances of two participants namely CP002 and CP003. This pattern is evident in words such as “danger” and “gateau” where the voiced alveolar plosive /d/ and voiced velar plosive /g/ are replaced by voiceless alveolar plosive [t] and voiceless velar [k] resulting in articulations such as [taje] and [kato] respectively. It is also evident in “vert” where a voiced labiodental fricative /v/ is altered to a voiceless labiodental fricative [f] deviating the word to [fɛ]. The deviations observed here suggest that plosives and fricatives at the bilabial, labiodental, alveolar and to lesser extent velar places of articulation are commonly affected by devoicing in individuals with CP. The analysis of the data is further supported by similar observations made by the researcher in the course of interacting with the participants and watching their communication engagements with other individuals.

Given that articulating voiced consonants require skilful manipulation of the vocal cords along with the active articulators such as the tongue, it is no surprise that the participants end up misarticulating them especially since CP greatly affects motor coordination. Similar situations have been observed by Kim et al. (2010), Platt et al. (1980). Levelts (1989) model makes it possible to account for this misarticulation of voiced sounds which is due to difficulties at the phonological encoding stage suggesting that the voicing features of the sounds are not properly encoded resulting in the misarticulations present in their speech. In addition, based on Levelts model, it is apparent that the appropriate phonological properties of the sound such as its supra-segmental features such as voiceness, pitch, and timbre were not properly encoded resulting in devoicing.

The following table summarizes the distribution of these sounds and the sound changes from voiced to their voiceless counterparts

Table 16. Sounds devoicing in CP cases.

Voiced sounds	Voiceless sounds
/b/	[p]
/d/	[t]
/v/	[f]
/d/	[t]
/g/	[k]
/z/	[s]

The data from the above table serves as a basis for the derivation of the following phonological rule: In the speech of individuals with CP, voiced plosives and fricatives undergo devoicing when they are in a pre-vocalic context before a vowel with a low tongue height such as /a/, /ɛ/, /ɔ/, /e/ and /ɪ/. This can be represented in phonological notation as in the rule below

[+voiced,+obstruent] → [-voiced] / __ [+low V]

Thereby capturing the specific environment of the deviation.

c. Initial Consonant/Final Consonant Deletion

Like other forms of deviations, sound deletion is also present in the speech of the learners with CP as reflected in the transcriptions obtained from the guided wordlist. The researcher noticed a consistent pattern of consonant deletion, specifically at word-initial and word-final positions. This is common with all the research participants. While this phenomenon is common in the early stages of language development in children aged five and below, in this case, it is an abnormality; it is indicative of a disorder. Participants here range from the ages of 8 to 16 which is largely above acquisition age according to Fromkin et al. (2003), Lenneberg, (1968), Steinberg and Sciarini (2006). Regarding word-initial consonant deletion, instances of this phenomenon are observed in words like "huit," where the sound /w/ was omitted at the beginning of the word by participants CP002, CP003, CP004, CP005, and CP006. This resulted in the alterations of the words orthography to [ɪt]. Similarly, in the word "honey," participants CP001 and CP007 both omitted the voiceless glottal fricative sound /h/, resulting in [ɔnɪ]. The many examples (seen in tables 6 and 7), are also illustrations of these linguistic manifestations

in CP. From these examples, it is apparent that final consonant deletion predominantly occurs in the presence of vowels, whereas initial consonant deletion is more flexible, occurring across both vowels and consonants. The deletion of consonants at both word-initial and word-final positions indicates that individuals with Cerebral Palsy struggle to effectively coordinate their articulatory organs to transition between consonants and vowels in certain phonological environments. The inherent articulatory complexity involved in producing fricatives and plosives, particularly at word boundaries, poses a challenge for individuals with Cerebral Palsy, leading to the omission of final consonants. Conversely, the omission of initial consonants, regardless of their voicing, highlights the difficulty in effectively coordinating the articulators to articulate these complex fricative and plosive sounds at the beginning of word segments.

Furthermore, these difficulties support the assertions of Kim et al. (2010), Platt et al. (1980b), and Kent (1992), who posit that highly complex sounds like fricatives and plosives are more susceptible to errors due to their realization and the impact of Cerebral Palsy on motor coordination. Consequently, they are prone to omission during articulation. Utilizing Levelt's Model reveals the underlying process behind this deviation. Levelts model, indicates that it occurs during the formulation and articulation stages.

At the formulation stage, participants with Cerebral Palsy, due to difficulties in motor planning and control, struggle to select and organize the sounds in the correct order of articulation. Consequently, the final phonetic plan that is realized and passed on to the articulators for production may contain errors. At the articulation stage, the phonetic plan, which serves as a blueprint for the intended speech sounds, is translated into actual movements of the articulators, such as the lips, tongue, and jaw. This process involves activating the appropriate muscles and coordinating their movements to produce the desired speech sounds. However, due to the impact of Cerebral Palsy on the brain, particularly in areas associated with motor planning and coordination, individuals with Cerebral Palsy experience reduced activation, flexibility and accuracy in these processes. As a result, initial or final consonants may be omitted during articulation, even if the individual managed to select and organize the correct sequence of sounds during the encoding stage.

Furthermore, this argument ties with Pennington et al. (2003) and Guenther et al. (2004) who argued that individuals with Cerebral Palsy exhibit reduced activation in the Inferior Frontal Gyrus (IFG) and Supplementary Motor Area (SMA), which are areas of the brain associated with motor planning and coordination. This insight coupled with the occurrences of

the sounds enables the generation of the two phonological rules, as described in the table below and as captured in the rules formulated.

Table 17. Phonological rule for initial and final consonant deletion.

Phonological Rule	Description	Representation.
Initial Consonant Deletion	Voiced or voiceless consonant becomes deleted in word initial position	C → ∅ / #---
Final Consonant Deletion	The final consonant C is deleted at word boundary regardless of its specific place or manner of articulation.	C → ∅ / ---#

d. Syllable Deletion

The linguistic data from individuals with Cerebral Palsy (CP) reveals a distinct pattern of syllable deletion. While examining the data collected through the guided wordlist, the researcher noticed that all seven participants exhibited patterns of syllable deletion in particular contexts of their words. This is evident in words like “voyager” where the final syllable /ʒe/ is deleted deviating the word to [vwaja] and in “elephant” wherein the medial syllable /lə/ is deleted altering the word to [ɛfa]. Examples of many such cases are found in table 8 (p.68). The internal structure of these syllables reveals a consonant vowel structure and further analysis of these syllables show that they all share a common similarity where syllables made up of short vowels preceded or followed by consonants are deleted. In addition, the target words in the data had complex syllable structures such as CCVCVCV, VCCVCV and CCVCVCV. Given that the syllable structure of the deleted syllables is a CV structure (evident in words like “tomato” and “lapin” where /tə/ and /la/ are deleted) suggests that individuals with CP have difficulties articulating multi-syllabic words with complex syllable structures. Given that a word is often made up of a combination of stressed and unstressed syllables or in cases like /tʁe/ which is made up of consonant clusters, it is possible that the participants omit such sounds due to difficulties pronouncing all the syllables in a word or as a means of simplifying the words facilitating articulation.

This deviation can be understood through the lens of metrical framing in the phonological encoding stage of language production (Blanken et al. 1993, p.5). In metrical framing, syllables within words are organized into strong and weak positions based on prosodic rules. During metrical framing, the phonological encoder applies metrical templates or rules to construct the rhythmic patterns of words. These templates consider factors such as syllable weight and position within the word. However, individuals with CP may experience challenges in executing the motor movements necessary for producing certain sounds and syllables, leading to syllable reduction. This is illustrated in words like "elephant" and "arreter" where the syllables /lə/ and /ʁɛ/ are omitted resulting in [ɛfa] and [ate] respectively. The reduced syllables are typically those in weak or less prominent positions within the word. In metrical terms, they may be more likely to be omitted because they carry less stress or require more complex motor coordination. The simplification of syllable structures helps individuals with CP streamline their speech production process, making it easier to generate words and communicate their intended message.

These findings lead to the generation of the following phonological rule: In words with a complex syllable structure (such as CCVCVCV or VCCVCV), the CV syllable is deleted in individuals with Cerebral Palsy (CP).

e. Cluster reduction

The researcher observed that some participants exhibited instances of reducing consonant clusters to simplify articulation. Participants CP001 and CP007 both demonstrated this deviation in instances such as "spoon" and "slap" whereby the clusters /sp/ and /sl/ are reduced to /p/ and /s/ deviating the words into [pun] and [sap]. A closer observation revealed an underlying pattern wherein glides and fricatives are susceptible to cluster reduction. This is because the participants consistently omit the glide /j/ in a situation whereby it is followed by a vowel and is preceded by a fricative while /s/ is deleted when it precedes a plosive (see more examples in table 9). Given that glides are similar in articulation to vowels, it indicates that in an environment where a fricative and a vowel occur without any intervening segments, the participants have difficulty transitioning from one phoneme to another and as such the glide is deemed redundant since the word already has a vowel in it, the glide is deleted leaving the fricative. On the other hand, in a situation where a fricative and plosive are paired with no intervening vowel, the complexity of the fricative sound renders articulation challenging hence they are omitted in favour of the plosive. These misarticulations are due to imprecise

coordination and poor motor skills in individuals with CP making it difficult for them to realize such sound clusters. This assertion is also echoed by Mei et al. (2020, p.1377) wherein 28% of their research participants exhibited cluster reduction among other phonological deviations.

In addition, Levelts (ibid) model provides further insights into the phenomenon. Individuals with CP are able to conceptualize words with consonant clusters which are transmitted to the articulation stage. The articulation stage requires the precise coordination and execution of the speech articulators and in the case of individuals with CP, deficits in motor planning and coordination impacts the precision, strength and coordination involved in elocution. This makes it demanding for individuals with CP to execute the precise coordination of multiple articulators and smooth transitions involved in the realization of consonant clusters. In addition, limitations at the level of the self-monitoring component makes it difficult to notice errors in clusters. In order to compensate for these deficits, individuals with CP simplify the consonant clusters by reducing or omitting some of the consonants in the final realization of the word. The observed deviations can be summarized in the following phonological rule: individuals with CP tend to simplify or delete complex consonant clusters, specifically targeting plosive-fricative and glide-fricative clusters. This captures the phenomenon observed in this study.

ii. Articulation Disorders

Along with phonological problems, articulation disorders are another expressive language disorder that is detected in the guided interview data. According to Crosbie et al. (2002), articulation disorder is defined as "an impairment of speech sounds of production in which the individual is unable to produce certain speech sounds or produces them incorrectly, making it difficult for listeners to understand what is being said". This definition ties right in with what is observed with the study population in the current research through the guided interview data. The utterances of participants with CP exhibit this disorder in several instances. According to the American Speech-Language-Hearing Association (ASHA), articulation disorders are often characterized by symptoms such as substitutions, distortions, omissions and additions. (www.asha.org 2023). All the above symptoms are present in the speech of the CP cases in this study except omissions. All 7 respondents demonstrated one manifestation of articulation disorder or the other and as such the researcher has analysed the occurrence of this disorder by grouping participants under the different symptoms (substitutions, additions and distortion).

a. Substitution

The data presented (table 10) in the study indicates that participants with CP showed instances of replacing one sound with another. This deviation is present in all the research participants and the substitution observed cuts across consonants and vowels. The researcher noticed that the most prominent form of substitution present in all the participants is a consistent pattern of gliding especially where fricative sounds occur, the sound is often replaced with the glide /j/. The following illustrates this pattern of sound substitution observed in the participants.

Table 18. Substitution sounds

Target sound	Replacement sound
/r/	/j/ /l/, /w/
/ʒ/	/j/
/z/	/j/
/v/	/f/
/l/	/j/
/a/	/ə/ /e/
/s/	/ʃ/

Although gliding is one of the major substitution patterns observed, in terms of vowels there is an instance of vowel backing where the front vowel /a/ sound is substituted for the mid-central vowel /ə/ across 5 participants (French). Another pattern observed is a fricative-to-fricative substitution such as /s/ to /ʃ/, /v/ to /f/. This tendency indicates that when participants are faced with complex sounds such as fricatives, they substitute these sounds with a less demanding sound such as glides that are similar in articulation to vowels requiring little manipulation. As Pennington (2012) articulates, "movement for speech are rapid and demand considerable coordination and control" which may prove challenging for individuals with CP who do not possess fine motor control of jaw movements and the articulators and vocal folds necessary for articulation. This ties with Levelts Model whereby motor impairments associated with CP affect the articulatory planning and execution stages of speech production.

At the phonological encoding stage, individuals with CP encounter challenges in accurately selecting and organizing the appropriate articulatory gestures for specific sounds. The substitutions observed in this analysis can be attributed to the simplification of articulatory gestures, allowing individuals with CP to produce sounds more efficiently. The substitution patterns observed in the data are similar to substitution patterns observed by Kim et al. (2010) wherein they recorded substitution error patterns in terms of sound complexity, voicing, place and manner of articulation. Thus the current study further proves the existence of a set pattern in the substitution errors common in individuals with CP. As evident in words like "haricot" and "zoo" where /r/ and /z/ are replaced by the glide /j/ resulting in [ejɪko] and [jo] respectively.

b. Addition

Another pattern observed in the speech of individuals with CP is the use of addition to modify the phonetic properties of some sounds thereby rendering them easier to articulate. This is exhibited by participants CP001 and CP007 in several instances. One prominent pattern observed is the addition of the glide /j/ in words like "three" and "lion." In the word "three," the /j/ sound is consistently inserted after the initial consonant, resulting in the deviation [d..de.deji]. Similarly, in the word "lion," the /j/ sound is inserted between the vowel sounds, leading to the deviation [lajɔn]. These findings suggest a pattern of glide addition in individuals with CP. In some instances, the data revealed patterns of entire syllables being added such as /bɪ/ and /dɛs/ in “zip” and “Wednesday” resulting in [bɪzɪp] and [wɛndɛsdeɪ](11). Looking at the data, one notices these syllables occur before complex consonant or consonant clusters hence the participants employ this addition as a compensatory strategy to enable them pronounce the words. In addition, the fact that the syllable structures of the additions are open ended reveal an underlying issue. That the participants introduce a CV syllable before a consonant or before two consonants to facilitate the transition in articulation from consonant to vowel. This shows that individuals with CP have difficulties pronouncing sounds with complex structures requiring rapid transition of the articulators from one phoneme to the other. This is the case with “lion” wherein the participants insert a glide /j/ in between two vowels to enable them easily articulate.

In this case, using Levelts model indicates that this deviation occurs at the phonological and articulation stages. At the phonological encoding stage, the challenges in selecting and organizing appropriate articulatory gestures may result in the addition of sounds to facilitate smoother transitions between phonemes. The observed glide and fricative additions can be attributed to compensatory strategies employed by individuals with CP to enhance articulatory precision.

c. Distortion

The data from the wordlist guided interview indicated the presence of distortion in the speech of the research participants with CP. This deviation is present in the study subjects although in varying degrees for instance it is more noticeable in CP002 and CP003 than in CP004, CP005, and CP006. The data reveals consistent distortion patterns in individuals with CP, where certain phonemes are replaced or modified in their production of ideal speech sounds. One notable pattern observed is the distortion of the consonant /p/ in words like

"pasteque" and "dejeuner." CP cases replace /p/ with the sound [t] in the word "pasteque," resulting in the deviation [tɛtɛ]. This deviation indicates an underlying phonological process of consonant harmony whereby the medial consonant /t/ influences the initial consonant /p/ to assimilate its properties like place of articulation. This type of assimilation spreads from right-to-left and is known as regressive assimilation. (Jensen 2004). The resulting assimilation causes the consonants to harmonize thereby facilitating articulation. A similar situation is observed in the word "dejeuner," whereby the target sound is completely distorted save for the initial syllable /de/. A case of consonant harmony also occurs here whereby the /ʒ/ is assimilated in a left-to-right progressive assimilation leading to an easier pronunciation. This is evident in words like “merci” and “oeuf” wherein the sounds /m/ and /ʁ/ are deleted, the vowel /ɜ/ is replaced with /ɑ/ and /ɛ/ resulting in distortions like [a:si], [ɛsi] while /v/ and /j/ are added to “oeuf” resulting in alterations such as [vjoeuf] and [jeouf] see table 12 above.

Additionally, the data demonstrates the distortion of the vowel /ɔ/ in the word "chaussure."̃ Participants produce various deviations such as [ɪsu], [tɛsu], or [ɛsu], instead of the ideal /ʃɔsyʁ/. These distortions indicate difficulties in accurately articulating the vowel /ɔ/. Furthermore, the data reveals patterns of consonant and vowel distortion. This consistent distortion pattern may be due to motor impairments in individuals with CP which affect both the articulatory planning and execution stages. At the articulatory planning stage, difficulties in precisely coordinating and executing the necessary articulatory gestures can result in distorted phoneme production. The observed plosive, nasal vowel, and fricative distortions can be attributed to imprecise control of articulatory movements, leading to altered speech sounds. These distortion errors are consistent with observations made by the researcher during fieldwork. In addition, it is similar to claims made by Lofqvist et al. (2015) in their study of children with CP. Using electromagnetic articulography (EMA) to investigate the articulatory control of children with CP suggested that the children had difficulty coordinating movements of the tongue and lips during speech production (Lofqvist et al. ibid).

iii. Muscle speech disorders.

In terms of muscle speech disorders, participants CP005 and CP007 exhibited it in the form of dysarthria which was marked by slurring. This deviation observed in the data is similar to the observations made by the researcher when participating in their class activities during fieldwork.

The following lines elaborate further on this.

a. **Dysarthria**

The data illustrates that individuals with CP suffer from dysarthria which is manifested through slurring. Dysarthria is one of the most closely associated disorders with CP since it is primarily a motor speech disorder caused by damage to the central or peripheral nervous system. The observed articulatory deviations in CP05 and CP007 relate to Duffy's (2013) articulation of dysarthria as "a collective term for a group of speech disorders resulting from disturbances in muscular control over the speech mechanism due to damage of the central or peripheral nervous system". As such, "children with Cerebral Palsy often have dysarthria" (Hodge and Bochner 2016).

This is evident in the utterances of CP005 and CP007 where their speech is punctuated with slurring and breathing difficulties. For instance, in the word "ardoise" CP005 struggles to articulate it with each attempt being marked by long pauses and his difficulty in manipulating his tongue and muscles causing the output to be slurred and unintelligible. Similarly, CP007 also has a hard time articulating "write" and ends up deviating to [waɪ..waɪt] the examples in table 13 all point to this. The researcher also noted that the participant's speech is sluggish and that when producing complex sounds such as fricatives and plosives, their articulation became even slower and they start counting syllables. That is when they produce a syllable, a long pause ensues before the subsequent syllable is produced. These pauses and general sluggishness could be attributed to breathing problems and the fact their articulatory muscles and jaw muscles easily gets fatigued due to CP impairment. As such the pause is a compensatory break giving the muscles time to relax before attempting the next pronunciation. Pennington (2012) succinctly intimates that "Dysarthria in children with CP often affects all processes respiration, phonation, resonance, articulation and prosody" and as a result, "Children may have difficulties, controlling their breathing for speech. They may have shallow breathing and may speak on short bursts of air, which might make their voices quiet, especially in longer utterances". (Pennington 2012, p.171).

In addition, the long pauses and sluggishness exhibited the two participants in the study is also linked with the author's findings. She posits that individuals with CP that have dysarthria, may exhale and then start to speak when a significant proportion of their breath has been exhaled. This causes them to run out of breath and speak on residual air. Furthermore, in terms of speech rate, "the vibration of their vocal folds may be slow or irregular, which can create low pitched, monotone and voices" (Pennington 2012 ibid). The above arguments are

significant as they capture the deviations observed by the researcher in participants CP005 and CP007. The effects of dysarthria also leads to reduced control of the tongue and lip muscles leading to reduced range of consonants and vowels that can be produced in speech.

These findings are also captured using Levelts Model. When the message is conceived and encoded into a phonetic plan which is then passed unto the articulator for translation, the articulator is unable to properly translate this plan into muscle movements. This is because the weakened muscles and coordination system are unable to execute it with precision resulting in an unclear output.

3.1.2.2.2 Receptive Language disorder

Receptive disorders were very obvious in CP004 and CP006. The main aspect of receptive disorder observed in these participants is comprehension disorder. Data revealed that both participants gave inappropriate responses to rather very simple questions such as when the researcher asks CP006 what his favourite food is ("Quelle est ta nouriture preferer?"), he replies "le maitre va donner la nourriture'' which is not the expected reply. Similarly, when CP004 is asked what her favourite food is , she says "j'ai cinq ans" indicating that she has not understood the semantic meaning of the question. These responses (Tables 14a and b) show that the participants also have difficulties understanding complex sentences. This is evident when the researcher asks one of the participants CP004 to say the days of the week ("Tu peux me dire les jours de la semaine?") she does not respond, and the same thing occurs when she is asked to list the months of the year. In addition to this, they also displayed an inability to construct long sentences, keep their responses short. This outcome is consistent with the observations made by the researcher during fieldwork. When this finding is considered in relation to Levelts (1989) Model, one finds that, the conceptualizer stage incorporates a self-monitoring component which enables them "attend to both the meaning and the form of their utterances" and "monitor anything in their own speech that they can monitor in the speech of others". (Blanken et al. 1993, p.21). It is this component that helps the speaker and listener keep track of what they are saying ensuring they say contextually relevant things.

However, in some individuals with CP, the impact of CP on the nervous system of the brain affects their working memory and consequently affects this self-monitoring component. This may be the case for both participants as their responses suggests that they do not make use of this module to monitor what the interlocutor is saying and what they are saying in response.

In addition, this situates language comprehension error at the level of the conceptualizer where the individual is unable to properly decode the messages being uttered and transmitted.

3.1.2.3 Discussion of Finding

The analysis of the data revealed several underlying factors which when summed up hold significance to the study.

The linguistic impairments identified in the study are broadly categorised under expressive language disorders and receptive language disorders. The findings revealed that expressive language disorders affected individuals with CP more than receptive language disorders. This is because out of the 7 participants, only two participants exhibited receptive language disorders. Furthermore, this few numbers is an indicator that although the expressive capabilities of individuals with CP may be affected to varying degrees, in most cases their comprehension is unaffected. The following table illustrates the distribution of expressive and receptive language disorders observed in the study by participants and subtypes.

Table 19a. Occurrence of Expressive and Receptive language disorders.

Language impairments	Number of participants present
Expressive Language disorder	7
Receptive language disorder	2

The above table shows that expressive language disorder had a far greater number of participants than receptive language disorders. This information is better illustrated in the chart below

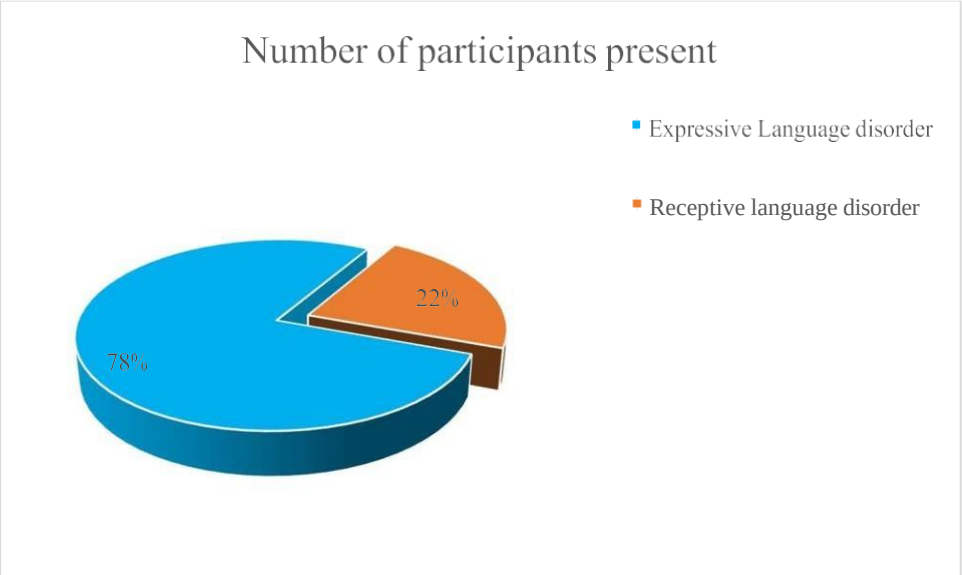

Figure 2 distribution of language impairments in individuals with CP.

Peering deeper into expressive language disorders, the data revealed that phonological disorder is present in the participants with slightly more subtypes as compared to articulatory disorder. This points to the fact that CP has a great impact on the phonological awareness as well as on articulatory coordination and motor skills. It also aligns with the findings using Levelts model which indicated that majority of expressive disorders were centred on phonological encoding and articulation stages of language production. The following table illustrates the distribution of each disorder based on the number of subtypes exhibited by participants.

Table 19b. Distribution of Expressive language disorders.

Expressive language disorder	Number of Subtypes
Phonological disorders	6
Articulation disorders	4

The data in this table is visually illustrated by the chart below.

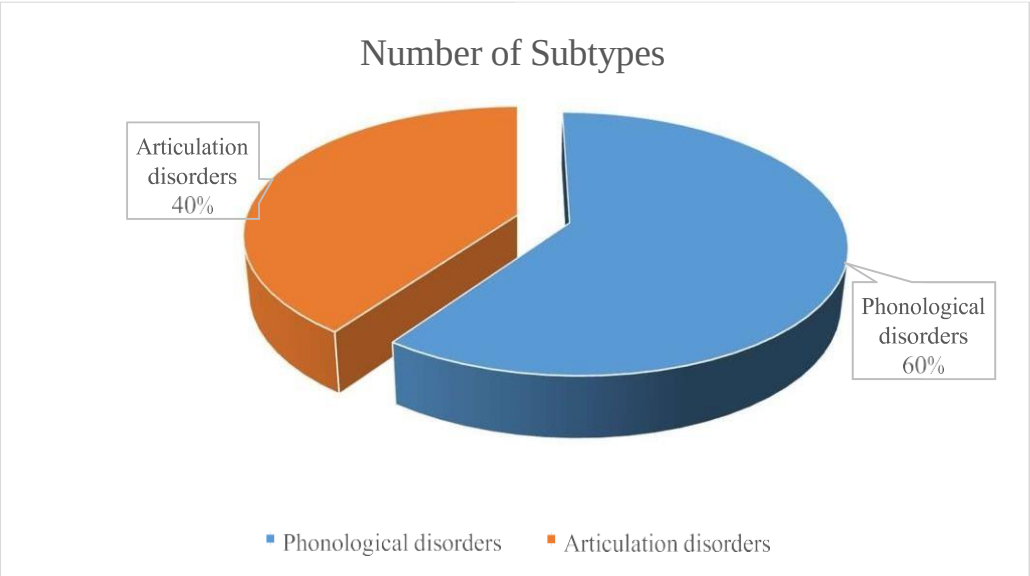

Figure 3 Distribution of expressive language disorders.

In sum, looking at the data in its broadest sense, it quickly becomes apparent that the most prominent language impairments in individuals with CP are expressive language disorders specifically speech sound disorders as these had the highest number of appearances in respondent's speech. And while not as prominent, receptive language disorders are also present and equally have a huge impact on the communication of these individuals. the underlying impairment in the motor nervous system and coordination is the root cause of these language impairments and these language impairment affects not only their phonetic and phonological abilities but translates to other aspects of their life such as their reading, writing, learning ability and their social life as a whole.

3.2 The Impact of Language Impairments on Individuals with CP

In this section, the second research question which looks at the impact of language impairments on individuals with CP is addressed. This impact is looked at in terms of their reading ability, writing, learning ability and social life. In order to assess this, the researcher conducted interview sessions with the teachers of the cases of CP that constituted the sample for this study. The researcher also observed their interactions and reaction in class during lessons. This section is therefore divided into two subsections with the first part presenting the interview data and the second part analysing and interpreting the said data.

3.2.1 Data Presentation on the impact of language impairments on individuals with CP

This section presents the data derived from the teachers' perspective regarding the effect of linguistic impairments on the lived experiences of participants with Cerebral Palsy, specifically in relation to the following aspects:

3.2.1.1 Impact on communication

The teachers during the interviews affirmed the presence of linguistic impairments in the study participants with CP. They also commented that language impairments in children with CP has an impact on their communicative abilities. This is further elaborated on by an interviewee who points out that "the children with CP have speaking and comprehension problems. They need didactic and concrete materials to understand." This assertion is echoed by another interviewee who adds that "…. their speech is low, unclear and some of them stutter." This limited communication ability is equally reiterated by another interviewee who says that "they will not be able to attend a regular school because the teachers will have difficulties understanding them. In addition, most of them cannot take a taxi or bike to school on their own because the bike man or taxi man won't understand what they are saying except specialized teachers and people who are familiar with them." This limitation in communication also hinders their participation and response to questions in class as stated by one of the interviewees. From the responses of the interviewees, it is evident that linguistic impairments hinder the expressive and receptive capabilities of the study participants which in turn hinders their ability to function in other aspects of life.

3.2.1.2 Impact on reading

The responses of the teachers indicated that the reading ability of children with CP is affected due to language impairments. Each teacher's response revealed the presence of some degree of reading disability ranging from mild to severe. This is evident in the response of one teachers regarding participants CP001 and CP002 wherein she says that "they cannot read. They can only identify objects and point". This response is similar to another teacher's assertion of participants CP003, CP004 and CP006 that, "they could not read. However, they could count from 1 to 10". For participants CP007 and CP005, the teachers response indicated that reading disability is present but they are able to read. It is revealed by an interviewee that "For the moment, they cannot read full words but they can attempt reading some words especially short words. However, you will have to be patient as they can only do so letter by letter and slowly." This response not only shows that their reading ability is affected but their

speed of reading if they eventually read is slower than normal. The data shows therefore that the ability of children with CP to learn how to read and read like their typically developing peers is hampered due to linguistic impairments. The data also indicates that the degree of impact varies across study participants with some struggling more than others.

3.2.1.3 Impact on writing

Similar to reading, the data from the interviews indicated that the presence of language impairments in individuals with CP limits their writing ability. This is attested by the teachers who affirm that all study participants with CP are unable to write properly as is expected of their age group and that this is due in part to language impairments. Most of the participants such as participants CP007, CP006 and CP001 are described as "yes, they are unable to write and carve out letters" while participants CP004, CP002, CP003 are said to not be capable of "writing either. But they can colour well, like colour without leaving the circle". These challenges in writing also affect their overall academic performance.

3.2.1.4 Impact on academic performance

The teachers unanimously agreed that language impairments reduce the academic performance of the study participants with CP. They reported that most of them could not actively participate in class exercises nor respond to questions when asked. This is elaborated by one teacher who reveals that for participants CP004, CP001 and CP006 "their language problems have affected their learning performance to the point that some of their teachers are discouraged. They are unable to complete assignments and speak properly". This shows the effect of expressive language impairments on their overall performance in class. In the case of participants CP002, CP003, CP005 and CP007 the teachers reported that the impact on their academics is less severe relative to the other participants with CP. However, one teacher notes that despite this, their performance is still low compared to their typically developing age mates in that "even in class when compared to some of their normal peers in terms of learning, reading, writing, and communication ability, they cannot measure up to them". Thus, the degree of affectation varies amongst the CP cases but is still low overall compared to what they should be normally capable of at their age.

3.2.1.5 Impact on career outlook and social interaction

The interviewees reported that linguistic impairments have a negative impact on the children's ability to form new social connection and gain meaningful employment. They explained that the difficulties the children face expressing themselves often alienates them from

forming new connections with people who are not familiar with their impairments. One teacher even notes that, “they can only interact with children who understand them and even in their neighbourhood, only those closer to them can interact. When they try to make friends with other people, they run away from them due to the language barriers.” In addition to this, the teachers also explained that new interns at the centre not familiar with the language of the children often do not understand when the children have needs. This is emphasized by one of the teachers who remarked that “yes they exhibit frustration when they express themselves and you do not understand them. For instance, when they are in class with new interns, they may be indicating to the intern that they want to urinate and the intern may have difficulties getting them and so when they end up urinating on themselves they feel inferior”. This impairment further affects their chances of having gainful employment. The above responses from the teachers demonstrate that language impairments have an impact on individuals with CP. The following section analyses and interprets these responses.

3.2.2 Data analysis and Interpretation

This section handles the analysis of the data presented above. The data from the teachers reveal that language impairments have profound impacts that exceeds limitations in communication to impact on academic performance and even career prospects. This assertion is similar to the findings posited by (Jarl and Schmidt 2020) in their research study on the school outcomes of adolescents with CP. The researchers report that “Children with CP have substantially lower school achievement compared with a general population sample” and they observed further that the underlying cause for this low performance was due to “... the inability to communicate effectively that hindered adolescents with CP to progress in their educational endeavours.” (Jarl & Schmidt 2021, p.4). This argument is mirrored by one of the teachers who emphasized that, “the consequences of language problems on the academic performance of individuals with CP is that they are not understood by teachers who are not teachers of special needs children”. The confirmation of this assertion highlights the need to dig down and find out what academic aspects are affected. From the presentation, the following aspects emerged as most affected and they include; impact on reading, writing, academic performance, career outlook and social interaction. Each aspect is analysed and interpreted in the following lines.

3.2.2.1 Impact on communication

The data presented reveals significant communication barriers that adversely impact the ability of children with CP to narrate and construct sentences. During fieldwork, it was observed that these children faced difficulties in answering questions appropriately in class and expressing their needs effectively. Furthermore, linguistic impairments hindered their comprehension of complex and abstract concepts and their ability to infer meaning from context. This was exemplified by a teacher's report, stating that when asked questions like "Que-est-ce que tu as mangé ce matin?", the children responded with hesitation and provided fragmented answers like "le pain" or "haricot" without constructing complete sentences like " j'ai mange le pain et l'haricot". Additionally, during observation, it was noted that language impairments affected the individuals' capacity to communicate their lived experiences and construct coherent sentences. For instance, participant CP005 remained silent when asked about his holiday activities, and though he acknowledged visiting the zoo and seeing a snake, he struggled to narrate or describe these experiences verbally. Instead, he used gestures to convey information, indicating an intact vocabulary but an inability to fully translate conceptual messages into linguistic form. These findings align with Levelt's (1989) model, suggesting impairments in the conceptualization and formulator stages. Individuals with CP face challenges in conceptualizing their intended messages and mapping them to linguistic forms, as well as assigning appropriate syntactic and grammatical properties. This limitation affects their ability to actively participate in conversations with peers and other people thereby alienating them.

3.2.2.2 Impact on Reading

The data from the interviews indicated significant reading deficits in all 7 participants. This reading disability is also evident in the researcher's observation of the students. For instance, the researcher while in class observed that most of the participants with CP such as participants CP001, CP004, and CP006 could only recite letters of the alphabet and pronounce words after the teacher. But when given simple short words and asked to read, they were unable to read them. This disability in reading is indicative of impairments in decoding visual print letters or graphemes into phonological and semantic representations. This gap in ascribing written letters to their phonological equivalents makes them unable to determine the individual phonetic and phonological characteristics of the sounds in a word and how they are to be pronounced when interacting with other sounds. This shows a deficit in phonological

awareness where the children due to language impairments are not aware of the individual phonemes in a word.

Applying this to Levelts (1989) model indicates a deficit at the phonological and grammatical decoding stages where lack of one-to-one mapping of the lexical representations in the mental lexicon to the letters in a word can lead to decoding errors. It is also due to error in grammatical decoding stage where lack of information on the phonological qualities of the sounds hampers the assignment of the grammatical and syntactic properties ultimately leading to morphological processing errors. This finding is consistent with the observations made by Critten et al. (2019) who argued that children with CP risk reading and spelling delays when they have poor phonological processing. Peeters et al. (2008) on their part, argue that expressive language in children with CP is vital for the development of reading skills. They explained further by positing that "the extent to which a child is able to articulate influences his or her phonological awareness development" indicating that the more children can use overt speech the better their phonological awareness skill. Therefore, children with low or poor expressive abilities have low chances in the development of phonological awareness which is vital for the development of reading. These deficits in phonological awareness can lead to reading difficulties, such as slow reading speed, poor comprehension, counting words, and difficulty decoding words as evident in participants such as CP005 and CP007 who although having some level of reading ability, are still relatively lower than their typical developing peers. In addition to this, their reading is slow, slurred and laborious and this has an impact on their educational progress as they cannot advance to higher classes appropriate for their age group. As such they are unable to take part in reading exercises in class or even enjoy great literature. These findings, highlight the severe impact of linguistic impairments on the reading abilities of individuals with CP.

3.2.2.3 Impact on Writing

Another area that is greatly affected by language impairments is the writing ability. Due to the motor and cognitive impairments present in individuals with CP, their ability to hold a pen or pencil to form and write letters legibly is affected. It has also impacted their ability to organize their thoughts, plan what they want to write and spell words correctly. This corresponds to what the researcher observed in the field. While observing the participants as they took their lessons, the researcher noted that all of them had a hard time holding a pencil and shaping letters talk less of spelling. In addition to this observation, the interview data from teachers revealed difficulties with writing across participants as illustrated by a teacher who

reveals that “they all have difficulties writing and in some cases some of them are unable to even carve out letters of the alphabet”. This is consistent with what the researcher observed in most of the study participants such as CP001, CP002, CP003, CP004, CP006 and CP007 who had a hard time making discernible letters with chalk or any writing material. This indicates how severely hindered they are. Even participant CP005 who is slightly better than the rest is still limited in his abilities compared to his peers and classmates. As Sturm (2012) puts it, "Writing impairment is a common and significant challenge for children with CP. It can interfere with their academic success, social interactions, and overall quality of life”. This assertion holds true as it makes it difficult for them to take down lesson notes, write tests and complete simple exercises in class, or completing assignments at home. Writing is one of the most prominent ways in which information is spread amongst people and not being able to write heavily limits their communication and productive potential. However, the evidence of CP005 being able to write is a sign that the gravity is case specific can improve with time and therapy.

3.2.2.4 Impact on academic performance

The presence of language impairments in individuals with CP affects them in many ways as language is indirectly connected with intelligence, memory and learning ability. As such, an impairment in language abilities spells difficulties in other areas in a human being’s life. This is the case in the research participants of this study whereby the impact of language impairments on their reading and writing abilities translates to a delay or impairment in their learning. This finding is reflected in Smith (2001 cited in Sanberg 2006, p.629) who posits that speech deficits may have a negative impact on literacy skills needed to develop. It is worth noting that, impairment in learning for students with CP is not uniform across the board as each individual has different levels of impairment and different levels of manifestations. This is emphasized by a teacher who remarks that “some of them are teachable while others are unteachable due to the nature of their handicap.” This is evident in the case of participants such as CP001, CP006 and CP004 who are the most affected in terms of learning impairment. This is so severe that their teachers categorize them as uneducable and thus, only suited for the learning of life skills. On the other hand, participants such as CP002, CP003, CP005 and CP007 are not heavily affected in terms of learning as they all exhibit potential to assimilate lessons and perform tasks although with much difficulties and serious teacher guidance.

3.2.2.5 Impact on Career Outlook and Social Interaction

As Aristotle so articulately puts it, “Man is a social being” prone to interact and socialize with one another. One of the key tenets of social interaction is the exchange of values and ideas through a medium of communication; “Language”. Language plays a major role in socializing, fostering new relationships and indeed advancing further in one’s career and productivity is greatly aided by one’s ability to communicate effectively. The data presented illustrates considerable career and social limitations for individuals with CP. Broader language deficits undermine vocational skills that are dependent on communication, reading, writing and complex cognitive processes as well as discourse processing. Their deficits in these areas greatly reduce the chances of gainful employment thereby rendering their career and future uncertain. This challenge in terms of career prospects is affirmed by a teacher who notes that, “Due to the nature of their handicap, the job opportunities for them is challenging. They are still in training so we are working closely with them and their parents to find where they can fit. Some of them like sports but due to being hemiplegic or diplegic cannot take it as a career”. Another teacher reports that “even when they have the skills, they may still face difficulties from prejudices and institutions not wanting to employ them because of their handicap”. This indicates that career prospects are not only hindered by linguistic impairments but also by societal stereotypes. This limits their employment opportunities to low paying jobs.

In addition, challenges in communication in the research subjects heavily limits their ability to expand their social circle and make new friends. As remarked by a teacher, communication barriers often push people away from them causing inferiority complexes and frustrations in them. And this has a huge impact on their self-image and self-esteem causing them to feel unwanted and inhuman. This is the case with participants CP001, CP004 and CP006. However, this is not the case for every CP participant with language impairment as respondents such as CP002, CP003, CP005, CP007 have high chances of gainful employment and creating new relationships. This is because despite their language troubles, they are more interested in skills titled towards that direction. Thus, the impact of linguistic impairments on this population is profound and varies.

3.3 Some therapeutic strategies to ameliorate linguistic impairments.

This section explores the third research question on the possible therapeutic strategies available for the amelioration of linguistic impairments in individuals with CP. It elaborates on some of the therapeutic strategies obtained through interviews with teachers and via the researcher’s observation. In this light, the main language therapy mentioned by the teachers

and administered at the centre to students with CP is articulation therapy. Other therapies also administered to the students include; ergotherapy, psychomotor therapy and occupational therapy.

3.3.1 Articulation Therapy

Regular articulation therapy at the centre focuses on individual speech sounds and oral motor control to improve the children's overall speech clarity and intelligibility. In terms of articulation therapy, the interviewees detailed that for articulation therapy, the speech therapist conducts it twice a week while the teachers do rudimentary drills every morning during lessons. The speech therapist works one-on-one with the students on pronouncing sounds accurately using various approaches. According to the teachers, a common technique used was sound drills where the therapist had students repeat words and phrases emphasizing target sounds. According to the teachers, the speech therapist makes "the children pronounce individual sounds especially consonant sounds such /m/ /f/, /t/ which requires movement of the lips and tongue. You know that some of the children with CP have difficulties controlling their mouth organs and lips, so this helps with that". This helps them position the lips, tongue and jaw. A similar task observed by the researcher was the teachers using an approach called vocal conditioning. With this approach, the teacher breaks up a into syllables and repeats specific sounds over and over. For instance, if the word is "ananas" it is broken into "ana" + "nas". The drills the students to repeat each syllable several times and sometimes it is repeated upto 15 times. The teacher then puts the word together and makes the children repeat it over and over thereby reinforcing pronunciation. In addition, the children also practice pronouncing a sound in different syllables, words and phrases. For instance, pronouncing the sound /b/ in different syllables like "ba-bo-be" then proceeding to connect these syllables to words such as "ba" for "bag", "bo" for "boy" and "be" for "bed". These exercises strengthen speech sound discrimination abilities and allows for focused clear pronunciation.

Additional oral motor exercise used to improve mouth positioning in the form of candle blowing exercises. Children practiced blowing candles which required focused breathing and lip closure. According to the teachers, this "assisted in the articulation of certain sounds such as /ʃ/, /p/ and /b/ which requires the quick release of air". It also helps with strengthening lip and facial muscles needed for speech clarity. The students also looked at themselves pronouncing sounds in mirrors to get visual feedback about tongue and mouth placement. The therapist places a mirror in front of the student and pronounces a word making sure to have the child focus on her lips. The child then attempts to pronounce the same word while trying to

imitate the movements of the therapist's mouth. While pronouncing the child compares if he or she is doing the same thing the therapist did. This strategy helps increase the children's awareness of mouth positioning for intelligible speech.

In terms of efficiency most of the articulation therapy strategies go a long way in improving the expressive abilities of the children. This assertion is echoed by the testimony of one of the interviewees who affirmed that "the therapies really work for most of the children". She elaborated on this with the story of two students at the centre called Karen and Owen. The interviewee highlighted that these two children could neither articulate any discernible speech sound nor write before. But after "after some time at the centre following therapies, they can not only talk, they can write and socialize whereas they could not do so before." The researcher during fieldwork did notice improvement in some participants who after therapy improved slightly in articulation such as participant CP007. However, the researcher also noticed that in some severe cases of CP the therapies did not improve their capabilities as they could neither articulate nor use gestures. The success of this articulatory therapy with some CP cases at the centre makes it a viable therapeutic strategy that can go a long way in improving the linguistic abilities of individuals with CP especially if interventions take place at an early age.

3.3.2 Ergotherapy

Based on the interviews, ergotherapy uses targeted physical exercises and activities to improve motor control and coordination which supports speech and language function. According to the teachers, for children with CP, ergotherapy is geared towards enhancing oral motor control, strength, and planning which facilitates clearer speech production. According to the interviewees, "it is physical therapy that involves massages, machines used to make their body flexible". The children with CP depending on their area of affectation are trained with machines targeted at the areas that are spastic, dyskinetic or athetoid such as the limbs and facial muscles. One of the activities observed the researcher involved the use of block-shaped objects to train their fine motor skills.

The task involved selecting objects from a bin and matching it to similar shaped objects to form a new shape such as a square or circle. This required precision and focus ultimately training the muscles in their hands and fingers which is necessary for writing. Upon receiving consistent ergotherapy massages, participant CP005 improved muscle control of his hand and fingers such that he could hold a pencil or chalk and trace shapes on a book. Although the tracing was still a far cry from what he is normally supposed to do at his age, it was a significant

improvement. This indicates that ergotherapy has a good chance of improving their literacy abilities and as such should be employed in most CP cases.

3.3.3 Psychomotor Therapy

This strategy involves the combination of cognitive and physical exercises to encourage the connection of the language and motor areas of the brain. For individuals with CP, the tasks assigned to them at involves pronouncing words while gesturing to objects on a board or naming picture cards while bouncing a ball. This task is also aimed enhancing their ability to stay focused and not easily get distracted which is necessary for the development of literacy skills.

3.4 Conclusion

In a nutshell, Language impairments are a common challenge for people with CP. These impairments can affect a person's ability to communicate, learn, and participate in social activities. Early intervention and support services can help people with CP to overcome these challenges and live full and productive lives.

GENERAL CONCLUSION

This chapter which serves as the concluding chapter is made up of five subsections and serves to synthesize the findings of the study in the summary of findings, present major problems encountered in the course of the research, suggest recommendations to major stakeholders, suggestions for further study and a general conclusion to the work.

4.1 Summary of Findings

4.1.1 Linguistic impairments in individuals with CP

The findings revealed that all seven participants exhibit linguistic impairments in the form of expressive and receptive language disorders. All CP cases exhibited expressive language impairments such as phonological disorders, articulation disorders and muscle disorder which was observed in only go research participant. In terms of phonological disorders, all participants exhibited initial and final consonant deletion of complex sounds such as plosives and fricatives likely due to neural impairments as a result of CP affecting the articulatory muscles. Voicing disorders were present in only a small subset of participants notably three whereby they altered the vocal qualities of sounds leading to low intelligibility. Syllable deletion was also prominent across all participants where they deleted some syllable to simplify words and facilitate articulation. Phonological disorders were most prominent amongst CP cases indicating that they had difficulties assimilating and mastering the sound patterns their language which prevents them from expressing themselves accurately.

In terms of consonant deletion, the study revealed that CP cases deleted complex sounds in various environments to facilitate pronunciation, example include

- The deletion of plosives such as /t,k/, nasals /m,n,ŋ/, fricatives /f, z, v,ʃ,ʒ,ʁ/, liquid /l/ and approximant /dʒ/ at word final positions preceded by vowels such as /ɑ,u,i,ɛ,ə,o,aɪ, eɪ/ and by a nasal /n/. For example, this in words like /eɪt/→[eɪ] “eight”, /sɛk/→[sɛ] “cinq”, /oʁɑʒ/→[oja] “orange”, /babuʃ/→[babu].
- The deletion of fricatives such as /z/, /ʒ/, /s/,/h/ nasals /m/, /n/ and glide /w/ at word initial position before vowels such as /a,ɔ,ʌ,ɛ,u,I,ə/ and before consonants such as /p,k/. This is seen in instances such as /hʌni/→[ɔnɪ], “honey”, /zɛʁo/→ [ɛʁo/ “zero” and /ʒənu/→[ənu].

Voicing disorders on the other hand did not occur across all CP cases however the following instances were spotted

- The findings indicate that CP cases alter voiceless fricatives such as /f, θ, s/, and voiceless plosives such as /p, t/ with their voiced counterparts /v,d,z,b/ before specific vowel context such as /aɪ, ɛ, u, ɪ/. This is seen in examples such as /pɛnsɪl/→[pɛnzɛl] “pencil”, /sɛl/→[dɛl].
- The findings indicate the presence of a phonological rule whereby voiceless fricatives and stops are realized as their voiced counterparts before specific vowel environments
- The replacement of voiced fricatives such as /v, z/ and plosives/b,d,g/ with their voiceless counterparts [p,t,f,k,s] before vowels with low tongue height such as /a, ɛ, ɔ, e/
- These findings indicate an underlying phonological rule whereby voiced plosives and fricatives undergo devoicing when in a pre-vocalic context before vowels with low tongue height.

In terms of syllable deletion, the findings reveal that French speaking CP cases delete syllables word initially, medially and finally while English speaking CP cases delete syllables word initially and medially.

- This is seen in examples such as /paʁtaʒe/→[taje] “partager”, /aʁɛ:te/→ [ate] “arreter”, /təmɑ:toʊ/→[mɑ:tə] “tomato”, /ɛləfən/→[ɛfa] “Elephant”

For Cluster reduction, it only occurs in two participants namely CP001 and CP007 whereby clusters such as /sk, sl, st, sp, sm/ are reduced clearly indicating difficulties executing the complex articulatory precision required to produce such sounds. Examples include /skɪp/→ [kɪp] “skip”, /stɪŋ/→ [tɪŋ].

Apart from phonological disorders, articulation disorders were also present across all research participants with CP although the specific manifestations varied. Substitution was detected amongst all research participants. Addition on the other hand was only observed in two participants. On the other five research participants suffered from distortion. These articulatory difficulties faced by the participants indicates that they have underlying difficulties with the sound segments they are unable to articulate. This difficulty results from impairments to the central nervous system affecting the articulatory muscles, strength, and precision.

- Findings reveal that substitution cuts across consonants and vowels in individuals with CP. The most prominent form of substitution observed is gliding especially where

fricative sounds occur and are replaced by /j/. this is seen in examples such as /mɑ̃ʒe/ →[mɑje] “manger”, /zo/ →[jɔ] “zoo”

- Another pattern observed in substitution is vowel backing where front vowel sound /a/ is substituted for the mid-central vowel /ə/ across five French participants. This is seen in examples like /avoka/ →[əfoka] “avocet”, /aʁiko/ →[əjiko] “haricot”.
- CP cases also exhibited fricative to fricative substitution such as /s/ to /ʃ/, seen in instances like /sis/ →[ʃiʃ]
- For addition, CP001 and CP007 demonstrated a pattern of inserting segments such as glide /j/ and syllables /bɪ/, /dɛs/, / in instances like /tri: / →[deji] “three”, /lɪp/ →[bɪzɪp].
- The findings revealed the presence of distortion in five participants with CP (CP002, CP003, CP004, CP005 and CP006) whereby certain consonants are are replaced or modified as seen in examples such as /pastɛk/→ [tɛtɛ] “pasteque”, /wazo/→ [oto].
- The study revealed the presence of muscle speech disorders such as dysarthria in individuals with CP. This was evident in CP005 and CP007 It was marked by slurred speech, slow speech rate and breathiness of voice.

Aside from expressive language disorders, the study revealed the presence of receptive language disorders in some CP cases. This was mainly observed in two participants: CP001 and CP007. The findings revealed that participants have comprehension disorder whereby they gave inappropriate responses to questions asked.

In sum, the findings from the study indicate although individuals with CP exhibit language impairments in similar areas, there are slight variations in terms of severity. In addition, the results of the study validate the research hypothesis that individuals with CP suffer from linguistic impairments. These impairments include expressive language disorders such as phonological process disorders, articulation and muscle speech disorders and receptive disorders. The first research objective which sought to identify linguistic impairments in individuals with CP was attained. These findings can contribute to the development of speech therapy interventions. The variability across participants highlight the need for a targeted support strategy to address the unique needs of each CP case.

4.1.2 Impact of Linguistic impairments on individuals with CP

The study identified five main impacts of language impairments on CP cases namely; communication difficulties, reading difficulties, writing difficulties, low academic performance, low career and social prospects as elaborated below.

4.1.2.1 Communication difficulties

The data obtained from interviews with teachers' highlights that the participants with CP face serious communication difficulties which aligns with what the researcher observed. This deficit hinders them from being able to communicate or express their needs to a wider group of people outside of their family members and those familiar with their disability. It is so severe that they are unable to function independently or go to different places on their own.

4.1.2.2 Reading difficulties

The teachers reported that the children faced difficulties which affected their ability to learn. The deficits they have in phonological awareness renders it difficult for them to make one-to-one associations between printed letters and the corresponding sounds in their mental lexicon thereby making it difficult for them to read. However, the degree of challenges vary according to participants as some are unable to read completely while some show signs of eventually being able to read. This limitation severely impacts their learning and ability to participate in class.

4.1.2.3 Writing difficulties

Similar to reading, the teachers affirmed that CP cases were unable to write. This limitation arises due to poor motor control and stiffness they experience due to impairments on the brain and also as a result of difficulties translating conceptual sounds to written form.

4.1.2.4 Low academic performance

Findings from teacher responses show that learners with CP due to limitations in language abilities, hinders their academic progress. Linguistic impairments limit their ability to develop literacy skills needed to fully function and perform actively in class. This limitation is so severe that some CP cases are considered uneducable and sent to a special class to learn life skills. It also discourages their teachers from interacting with them.

4.1.2.5 Low career and social prospects

The responses from interviews with teachers show that individuals with CP have very limited chances of gainful employment and forming new social connections with people. Their communication deficits cause people to shy away from the because of the barriers in comprehension and intelligibility. These difficulties coupled with societal stereotypes severely limit the ability of these individuals to live and autonomous and vibrant social life.

In sum these findings effectively confirmed the second hypothesis on the impact of language impairments on individuals with CP and realizes the second objective of the research to determine the impact of language impairments on individuals with CP.

4.1.3 Therapeutic strategies to ameliorate language impairments in CP.

The study revealed three main therapeutic strategies employed to ameliorate language abilities of CP Cases and they are; articulation, psychomotor and ergotherapy.

The findings revealed that articulation therapy was employed to enable children learn sound pronunciation and control of the articulators which resulted in improved language abilities. Therefore, this therapy is an effective strategy towards building the language abilities in CP children as illustrated by the positive comments given by teachers.

A second therapeutic strategy psychomotor therapy is targeted at facilitating the development and association of the cognitive and motor areas of the brain. This facilitates the development of flexibility and multitasking abilities necessary in communication.

Ergotherapy is employed to facilitate the development of flexibility in the limbs and facilitate fine motor skills. This method is effective as it enables participants improve in their ability to hold writing tools.

These findings indicate the availability of effective therapeutic strategies which can be used to improve the overall language abilities of CP cases. It also validates the third research hypothesis and attains the third objective of possible therapeutic strategies. The employment of the above strategies at an early age can go a long way to giving CP cases full communicative abilities.

4.2 Problems Encountered

Every worthwhile endeavour is often riddled with ups and downs and this study proved no different. Throughout the course of the study, the researcher encountered several challenges.

- One significant difficulty was accessing a representative sample of individuals with CP due to the relatively small population size and diverse characteristics of the condition.
- The lack of access to special tools such as MRI scanners to scan the brains of the research participants for lesion and also to check their musculature to ensure it is CP acted as stumbling block to getting more insights into the neural mechanisms that are impaired. Hence the researcher had to rely on the medical history of the prescribed CP cases to confirm their exact situation.
- Difficulty in obtaining standardized language tests.

4.3 Recommendations to Stakeholders

The following paragraphs presents recommendations to stakeholders directly or indirectly connected to the study.

To parents and caregivers: looking after them, it is recommended that they actively seek information and resources related to the linguistic impairments associated with CP. This can be through attending seminars on handicaps and mental disorders so as to better familiarize themselves with the disorder. They should collaborate with healthcare professionals, educators, and speech-language therapeutics to gain a comprehensive understanding of the child's specific needs and the available interventions. Additionally, parents should advocate and encourage their child's access to appropriate speech and language therapy services and assistive technologies that can enhance communication abilities.

Recommendations to the academic community: The academic community has a responsibility to create inclusive educational environments that address the linguistic needs of students with CP. Schools and government institutions can partner to sponsor teachers through special training programs to get them acquainted with the linguistic impairments associated with CP and other neurodevelopmental disorders. Collaboration between teachers and speech language therapists is encouraged.

Recommendations to clinical personnel: It is recommended that clinical personnel such as speech-language pathologists and healthcare providers receive special training in assessing and treating communication difficulties in this population.

4.4 Suggestions for further study

Although this work is a psycholinguistic study of the language impairments in CP, it is not exhaustive and as such there are several avenues for further research such as;

- A longitudinal study tracking the progression of linguistic impairments in individuals with CP over time.
- An experimental study examining the use of innovative tools such as large language model artificial intelligence to ameliorate the communication in individuals with CP
- A study investigating the effectiveness of different intervention and therapeutic strategies targeting linguistic impairments in CP.
- A study exploring the influence of socio-cultural factors on the linguistic development of individuals with CP.

- Comparative study examining the linguistic profiles of individuals with different types and severities of CP.

4.5 Conclusion

In sum, this study investigated and identified the language impairments in individuals with CP and its impact on their communication, education, career and relationships. Language is a feat of the human species and is responsible for all the advancements mankind has experienced, individuals with CP have a right to be able to use this natural ability and as such this study serves as a clarion call for their right to a language that is impairment free.

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ANNEXES

Annex I:Language Test

French	English	French	English	French	English
serpiere	Fine	Orange	Honey	voyager	skip
pomme	Nothing	Bonjour	Horse	envoyer	slip
Sept	Pencil	Babouche	House	trébucher	slap
Sel	Two	Piscine	Spoon	travailler	sting
Pen	Three	Cinq	Skirt	lapin	stumble
Femme	Four	Neuf	Skip	maitre	spoon
plantain	Five	Falaise	Tomato	Partager	
Bonjour	six	Système	pineapple	ananas	
Dormir	Eight	Arrive	Apple	arreter	
Vert	nine	Epoque	Office	tapioca	
Danger	Nothing	merci	Elephant	bonjour	
gateau	Fine	zero	zero	manger	
President	Pineapple	nourriture	fish	six	
Pasteque	Orange	huit	yellow		
Oef	Spin	maitresse	write		
Oiseau	Smile	genou	wrong		
Chaussure	Yam	famille	write		
Merci	three	marcher	do		
salon	lip	zoo	play		
Quartre	snake	riz	twenty		
Dejeuner	Lion	Haricot	bicycle		
Grand	wednesday	avocat	orange		

Annex II: Observation Checklists

Language

Speech data.

subjects / Traits	CP001	CP002	CP003	CP004	CP005	CP006	CP007
Friendliness	2	2	2	2	2	1	3
Cooperation	1	2	2	2	2	1	2
Attentiveness	1	2	2	2	2	1	3
Gestures	0	0	0	0	3	0	0
Violence	2	0	0	0	0	2	0
Short pauses	1	0	0	2	3	2	3
Long pauses	1	0	0	0	3	1	3

Environmental Data

CP Cases / Env. data	CP001	CP002	CP003	CP004	CP005	CP006	CP007
Diagnosis							
Type of CP							
Age detected							
Prenatal Problems							
Natal Problems							
Neonatal Problems							
Postnatal Problems							
Family situation							
Language							
Gender							
Age							

List of Research Participants

Participants	Age	Gender	Type of CP	Description
CP001				
CP002				
CP003				
CP004				
CP005				
CP006				
CP007				

Annex III: Interview Questions

- Have been teaching the children for a long time?
- Do the children have communication problems?
- What are some of language impairments or difficulties that the children face?
- What are the effects of these impairments on them in terms of
- Their ability to read?
- Their abilty to write?
- Their ability to communicate?
- Their academic performance
- And their chances at meaningful employment?
- How is the children's performance in school?
- How do the children socialize with others?
- What are the methods you use to help the children talk better?