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# THE EVOLVING FIELD OF CLINICAL LINGUISTICS, PHONETICS AND PHONOLOGY

Review paper
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The aim of this paper is to provide an overview by looking at the scope of the field of clinical linguistics, phonetics and phonology, followed by the historical context to show how the field has evolved over time, capturing recent developments and providing a vision for potential future developments and directions.

**Keywords**: clinical linguistics, clinical phonetics, clinical phonology

## THE SCOPE OF CLINICAL LINGUISTICS, PHONETICS AND PHONOLOGY

Clinical linguistics is a subfield of the broader field of linguistics and it refers to the study of how linguistic terminology and linguistic theoretical accounts can be used to analyse and explain language data coming from individuals with language and communication difficulties (Stojanovik et al., 2023). David Crystal was first to start using the term clinical linguistics in title for his book which was part of a book series entitled *Disorders of Human Communication*. Crystal defines it as the use of linguistics to describe, analyse, assess, diagnose and treat communication disorders (e.g. Crystal, 1981). When we talk about linguistics, we usually refer to morphology, syntax, semantics and pragmatics, with phonology sometimes being considered as

part of linguistics and sometimes being studied separately. Cummings, for example, defines clinical linguistics to include "disorders which result from disruption to the wider processes of language transmission and reception and disorders of the vegetative functions that are an evolutionary precursor to language" (Cummings, 2008: 1). This definition considers clinical linguistics as creating a synergetic relationship between linguistics as an academic discipline and clinical practice which covers different types of conditions often seen in clinical speech and language therapy contexts. Clinical linguistics covers a wide range of conditions including developmental language disorder, language differences due to genetic conditions such as Williams syndrome or Down syndrome, acquired disorders of language and communication due to brain trauma or injury (e.g. different types of aphasia), characteristics of language and communication of autistic individuals or those affected by sensory impairments such as vision or hearing impairment. Although Crystal (1981) states that he did not see much point in having clinical phonetics as a separate subfield, he acknowledges that when it comes to the analysis of clinical data, there are very good reasons for a systematic distinction to be made between disorders of speech and those of language. Over the past few decades, the field of clinical phonetics has been emerging in its own right and strengthening its identity.

Clinical phonetics is a subfield of the broader field of phonetics and it refers to the application of phonetic science to the analysis of speech sounds produced by individuals with speech difficulties and interpretation of the speech errors often encountered in clinical contexts. Compared with clinical phonetics, which according to Eldridge (1967) may have its origins in ancient times, clinical phonology emerged in the 20$^{th}$ century, at the time when linguistic approaches were beginning to be applied to communication impairments. In particular, there was a shift from phoneme and feature-based accounts of atypical sound systems to the application of natural phonological process analysis to atypical speech production, especially regarding developmental speech difficulties. In this context, the theoretical framework of natural phonology (Stampe, 1969, 1973) and the work of David Ingram (1976) in the USA, and Pamela Grunwell (1981) in the UK had a significant impact on how phonological analysis was approached in the clinical context, and this is still relevant currently (see for example, Asad et al., 2018; Dodd et al., 2002; Mayr et al., 2021). Current clinical phonological approaches are drawn from different theoretical perspectives including optimality theory (Gierut & Morrisette, 2005), non-linear approaches (Bernhardt & Stemberger, 1998), gestural phonology (Hodson & Jardine, 2009) and cognitive/usage-based phonology (Sosa & Bybee, 2008), with accompanying debate about the status

of phonological accounts of atypical speech data: are they merely extremely useful descriptive devices, or do they reflect actual psycholinguistic processes? Phonological accounts of speech impairment have shown, crucially, that they are not necessarily the product of articulatory constraints but reflect difficulties with the organisation and use of sound segments in words.

Clinical linguistics, phonetics and phonology provide a bridge between theoretical accounts and developments in linguistics, phonetics and phonology and how these accounts and developments can be applied to description and analyses of a wide range of speech, language and communication impairments, with a view to these analyses leading to potential remediation/intervention. Clinical phonetics covers a broad range of conditions which affect speech production and perception including hearing loss/deafness, craniofacial conditions which includes for example cleft lip and palate, voice disorders which can result from problems with the vocal folds or structures associated with the larynx, or developmental disorders of speech which affect the phonological organisation or phonetic realisations, or fluency disorders such as stuttering and cluttering.

It should be noted that, although many communication disorders may be manifested linguistically, and/or phonetically, and/or /phonologically, this does not necessarily mean that they will always have a specifically linguistic cause. Therefore in order to provide a comprehensive explanation of speech, language and communication difficulties, we may need to delve deeper and dig beyond linguistics, phonetics and phonology to other domains such as physiology, neurology, general cognitive abilities and social interaction. Thus, a better definition of clinical linguistics may be 'the study of communication disorders, with specific emphasis on their linguistic aspects while not forgetting how these interact with other domains' (Stojanovik et al., 2023).

## HISTORICAL CONTEXT

People have been interested in speech, language and communication difficulties for millennia. For example, in the Bible, Moses describes himself as: "I am not eloquent, neither heretofore, nor since Thou hast spoken unto Thy servant; but I am slow of speech, and of a slow tongue" (Exodus, 4: 10–12), describing his speech and language abilities as perceived by himself. The earliest known example of a scientific study of child language impairment can be traced back to 1835, when Franz Gall (Austrian physician) mentions language impairment in a textbook on neurological diseases (Nettelbladt, 2001). Significant advancements in the late 19$^{th}$ century strongly influenced the study of speech and language impairments. For example, speech instituti-

ons and speech clinics started to get established. The national Speech institute 'Taleinstitutet' was founded in Copenhagen, Denmark in 1898. The foundation of the International Phonetic Association in 1886 played a significant role in offering tools for describing speech and language impairment (Nettelbladt, 2001). But it was not until the 20th century that the fields clinical linguistics, phonetics and phonology started to develop as scientific fields of study in their own right. The publication of Roman Jakobson's *Kindersprache, Aphasie und Allgemeine Lautgesetze* (Jakobson, 1941) (later published in English as *Child Language, Aphasia and Phonological Universals* (Jakobson, 1968)) played a fundamental role in positioning the field of study of communication disorders as a scientific discipline. This publication emphasised the importance of looking for and studying systematic patterns in clinical speech and language data, and the importance of relating these patterns to relevant theoretical accounts. This method to use a systematic approach, treat human language as a rule-driven system and looking for it in speech and language data is still very much the fundamental principle of study in this field (Stojanovik et al., 2023). Early studies such as the creation of the Wug Test by Jean Berko-Gleason (Berko-Gleason, 1958) to assess how children acquire the rules that govern their language's morphology, demonstrated the applicability of linguistic principles on assessing language development in children. This research paved the way for the design of assessment batteries for children with language impairments, such as, for example, the Test of Early Grammatical Impairment (TEGI) by Rice and Wexler (2001).

In the United Kingdom, from the mid-1970s new bachelor's degrees in speech and language therapy programmes were established at a number of universities, and this resulted in the training of generations of speech and language therapists who were linguistically well trained and knowledgeable, and also able to benefit from the development of new linguistic toolkits for assessment, diagnosis and remediation. The linguists and phoneticians/ phonologists who taught on the speech and language therapy programmes became more informed about communication impairments, which often had a decisive role in the direction of the research they engaged in. The main driving force behind these developments in the 1970s and 1980s was David Crystal, who together with colleagues such as Paul Fletcher, Michael Garman, Pamela Grunwell worked on and produced a range of analytical procedures for 'profiling' the phonological, grammatical, semantic and prosodic characteristics of speech, language and communication disorders (Crystal et al., 1976; Crystal, 1982; Grunwell, 1985). Versions of one of the perhaps most widely used procedures called Language Assessment, Remediation and Screening Procedure (LASRP) has most recently been available in many different languages (Ball et. al., 2012, 2019).

Another significant development was the establishing of a specialist journal Clinical Linguistics & Phonetics in 1987 by Martin Ball which invited paper submissions "either applying linguistic/phonetic analytic techniques to clinical problems, or showing how clinical data contribute to theoretical issues in linguistics/phonetics" (Ball & Kent, 1987: 2). This clearly showed the intrinsic and reciprocal relationship between speech and language therapy/pathology and linguistic, phonetic, and phonological theory. As more work was being done in the field of speech disorders it became obvious that the International Phonetic Alphabet (IPA) was not able to capture a whole range of articulatory distinctions which were encountered in impaired speech. This led to the development of a supplementary set of phonetic symbols which were specifically dedicated to the description of impaired speech called the extended IPA (extIPA) (Duckworth et al., 1990). The extIPA was officially recognised by the International Phonetic Association and incorporated in the Handbook of the International Phonetic Association (1999). The ExtIPA is regularly being revised and updated, the latest updates being done in 2018 (Ball et al., 2018). The International Clinical Phonetics and Linguistics Association (ICPLA) (www.icpla.info) was founded in 1990 and the journal Clinical Linguistics & Phonetics became the official journal of ICPLA. All of these developments have raised the global profile of clinical linguistics, phonetics and phonology.

## RECENT DEVELOPMENTS IN CLINICAL LINGUISTICS, PHONETICS AND PHONOLOGY

It is possible to capture the phonetic characteristics of atypical speech using speech instrumentation. For example, Electropalatography, Electro-Magnetic Articulography (EMA) and ultrasound have been used to explore how different articulators such as the tongue, lip and jaw move in various speech disorders (Cleland et. al., 2015; Lee et. al., 2019). Laryngography and video fluoroscopy are also widely used as techniques which allow for the investigation of the activity of the vocal folds (Abberton & Fourcin, 1997) and spectrography has been used to elucidate various aspects of atypical speech production from an acoustic point of view (Kent, 2004; Lunderborg et al., 2015).

Clinical phonetic transcription has traditionally been used to capture both typical and atypical speech production. There are many challenges and pitfalls for anyone attempting to make a phonetic transcription of radically atypical speech production (Howard & Heselwood, 2002), with its validity and reliability often being challenged. Recently, attempts have been made to use computerised tools to compare phonetic transcriptions and some of these

are freely available to use (e.g. Bailey et al., 2021; https://aptct.auburn.edu). This allows objective scoring of transcriptions which would be harder to achieve if one were to rely on traditional transcriptions methods only.

Within clinical phonology, there has been an increasing body of work drawn from specific theoretical perspectives, such as for example, non-linear approaches (Bernhardt & Stemberger, 1998, 2022). A special issue in the journal Clinical Linguistics & Phonetics was dedicated to the profiling of protracted phonological development of children acquiring 16 different languages using a constraint-based nonlinear phonological framework (Bernhardt & Stemberger, 2022). This collection of papers shows how we can profile and explain protracted phonological development in children using a specific theoretical approach and how detailed phonological analysis can be useful in planning relevant interventions.

The last couple of decades have also seen a significant increase in research on phonological profiles in typically and atypically developing children speaking different languages. For example, Putonghua (a standard spoken form of modern Mandarin Chinese) (Wu et al., 2020), Vietnamese (Le et al., 2021), Farsi (Shooshtaryzadeh & Stemberger, 2022), Akan (Amoako et al., 2020) showing slow but steady diversification in the field so that the needs of speakers of different languages can be met. Furthermore, clinical interventions usually focus on the individual and their needs and there has been a call for the use of precision medicine as a new way of approaching speech and language intervention with a view to improving outcomes (Peter et al., 2023).

Other recent research developments include the creation of speech corpora of individuals with speech/language/communication disorders, which are invaluable resources for education and research. The DisorderedSpeechBank is a venture initiated by Nicole Müller and Martin Ball in 2015. The project was later renamed DELAD, (Database Enterprise for Language And speech Disorders),and it is in progress with researchers currently working on a number of languages including Catalan, Croatian, Dutch, English, Finnish, French, German, Irish, Norwegian, Polish, Spanish, Swedish, and Welsh (Lee et al., 2022).

## THE FUTURE OF CLINICAL LINGUSTICS PHONETICS AND PHONOLOGY

Clinical linguistics, phonetics and phonology have grown significantly over the past few decades and are part of a multidisciplinary framework demonstrating how we can deepen our understanding of speech and language

structure by looking at how it can go wrong. The future of clinical linguistics holds great promise as the field continues to evolve and expand. Clinical linguistics, phonetics and phonology as scientific fields are multidisciplinary and clinical linguists often work alongside speech and language therapists enabling a systematic analysis of speech and language data and affording clinicians to tailor interventions to the specific speech and language needs of the clients they serve.

Several key trends and directions can be anticipated:

1. Technological advancements: As technology continues to advance, clinical linguistics, phonetics and phonology will benefit from more sophisticated tools for speech and language analysis. Artificial intelligence and machine learning can help automate assessment processes and improve the accuracy of diagnoses. Furthermore, technological advances in research methods such as neuroimaging (e.g., Friederici, 2017) allow for the investigation of underlying anatomical, physiological and neurological 'causes' of speech, language and communication disorders and these type of analyses are likely to become more accurate, more accessible and more widely used.
2. Individualised interventions: Future developments in clinical linguistics, phonetics and phonology will likely focus on tailoring interventions even more precisely to the needs of individual clients. Personalised intervention plans that consider linguistic and phonetic profiles, cognitive factors, and cultural backgrounds will hopefully become increasingly common.
3. Interdisciplinary collaboration: Collaboration between clinical linguists and clinical phoneticians, speech and language therapists, neurologists, ear, nose and throat specialists, audiologists and other healthcare professionals should deepen, leading to a more holistic approach to communication disorders. Insights from neuroscience and genetics may provide a more comprehensive understanding of speech, language and communication difficulties. Multidisciplinary team working in health settings is becoming more common though perhaps is not universal. It needs to be admitted that these interdisciplinary collaborations are not always there nor always easy to establish, and set ups may vary from country to country (or even within countries) but this is something that the field should aspire to achieve.
4. Global impact: Clinical linguistics, phonetics and phonology will continue to address the needs of diverse populations, including those with multilingual and multicultural backgrounds and culturally sensitive

assessment and intervention approaches will be essential. There is already an acknowledgement in the field for the advantages of interdisciplinary team working in promoting culturally responsive practices (for example Stanley et al., 2020). It has also been acknowledged that there needs to be a rethink of how speech and language assessments may be culturally biased (for example, Nair et al., 2023) and how this can be addressed in future.

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