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Speech and Grammar
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Ebook ISBN: 9781984665195

Published by:
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Chapter 1

Grammar

In linguistics, the **grammar** of a natural language is its set of structural constraints on speakers' or writers' composition of clauses, phrases, and words. The term can also refer to the study of such constraints, a field that includes domains such as phonology, morphology, and syntax, often complemented by phonetics, semantics, and pragmatics. There are currently two different approaches to the study of grammar, traditional grammar and theoretical grammar.

Fluent speakers of a language variety or *lect* have effectively internalized these constraints, the vast majority of which – at least in the case of one's native language(s) – are acquired not by conscious study or instruction but by hearing other speakers. Much of this internalization occurs during early childhood; learning a language later in life usually involves more explicit instruction. In this view, grammar is understood as the cognitive information underlying a specific instance of language production.

The term "grammar" can also describe the linguistic behavior of groups of speakers and writers, rather than individuals. Differences in scales are important to this sense of the word: for example, the term "English grammar" could refer to the whole of English grammar (that is, to the grammars of all the speakers of the language), in which case the term encompasses a great deal of variation. At a smaller scale, it may refer only to what is shared among the grammars of all or most English speakers (such as subject–verb–object word order in simple

declarative sentences). At the smallest scale, this sense of "grammar" can describe the conventions of just one relatively well-defined form of English (such as standard English for a region).

A description, study, or analysis of such rules may also be referred to as a grammar. A reference book describing the grammar of a language is called a "reference grammar" or simply "a grammar" (see History of English grammars). A fully explicit grammar which exhaustively describes the grammatical constructions of a particular speech variety is called a descriptive grammar. This kind of linguistic description contrasts with linguistic prescription, an attempt to actively discourage or suppress some grammatical constructions, while codifying and promoting others, either in an absolute sense or about a standard variety. For example, some prescriptivists maintain that sentences in English should not end with prepositions, a prohibition that has been traced to John Dryden (13 April 1668 – January 1688) whose unexplained objection to the practice perhaps led other English speakers to avoid the construction and discourage its use. Yet preposition stranding has a long history in Germanic languages like English, where it is so widespread as to be a standard usage.

Outside linguistics, the term *grammar*is often used in a rather different sense. It may be used more broadly to include conventions of spelling and punctuation, which linguists would not typically consider as part of grammar but rather as part of orthography, the conventions used for writing a language. It may also be used more narrowly to refer to a set of prescriptive norms only, excluding those aspects of a language's grammar which are not subject to variation or debate on their normative

acceptability. Jeremy Butterfield claimed that, for non-linguists, "Grammar is often a generic way of referring to any aspect of English that people object to."

Etymology

The word *grammar* is derived from Greekγραμματικγτέχνη (*grammatik téchnē*), which means "art of letters", from γράμμα (*grámma*), "letter", itself from γράφειν (*gráphein*), "to draw, to write". The same Greek root also appears in graphics, grapheme, and photograph.

History

Linguistics is the scientific study of language. It involves an analysis of language form, language meaning, and language in context.

Linguistics began to be studied systematically by the Indian scholar Pānini in the 6th century BCE. Beginning around the 4th century BCE, Warring States period China also developed its own grammatical traditions. Aristotle laid the foundation of Western linguistics as part of the study of rhetoric in his *Poetics* ca. 335 BC. Traditions of Arabic grammar and Hebrew grammar developed during the Middle Ages in a religious context like Pānini's Sanskrit grammar.

Modern approaches began to develop in the 18th century when the classical discipline of rhetoric was gradually removed. During the 19th century, linguistics came to be regarded as belonging to either psychology or biology, and such views

remain the foundation of today's mainstream Anglo-American linguistics. They were however contested in the early 20th century by Ferdinand de Saussure who established linguistics as an autonomous discipline within social sciences. Following Saussure's concept, general linguistics consists of the study of language as a semioticsystem which includes the subfields of phonology, morphology, syntax, and semantics. The linguist's approach to these can be synchronic or diachronic.

Today, linguistics is considered as relating to a large number of scientific approaches and is further split into several subfields including applied linguistics, psycholinguistics, sociolinguistics, computational linguistics, and so on.

Antiquity

Across cultures, the early history of linguistics is associated with a need to disambiguate discourse, especially for ritual texts or arguments. This often led to explorations of sound-meaning mappings, and the debate over conventional versus naturalistic origins for these symbols. Finally, this led to the processes by which larger structures are formed from units.

Babylonia

The earliest linguistic texts – written in cuneiform on clay tablets – date almost four thousand years before the present. In the early centuries of the second millennium BCE, in southern Mesopotamia, there arose a grammatical tradition that lasted more than 2,500 years. The linguistic texts from the earliest parts of the tradition were lists of nouns in Sumerian (a language isolate, that is, a language with no

known genetic relatives), the language of religious and legal texts at the time. Sumerian was being replaced in everyday speech by a very different (and unrelated) language, Akkadian; it remained however as a language of prestige and continued to be used in religious and legal contexts. It therefore had to be taught as a foreign language, and to facilitate this, information about Sumerian was recorded in writing by Akkadian-speaking scribes.

Over the centuries, the lists became standardised, and the Sumerian words were provided with Akkadian translations. Ultimately texts emerged that gave Akkadian equivalents for not just single words, but for entire paradigms of varying forms for words: one text, for instance, has 227 different forms of the verb *ĝar* “to place”.

India

Linguistics in ancient India derives its impetus from the need to correctly recite and interpret the Vedic texts. Already in the oldest Indian text, the Rigveda, *vāk* ("speech") is deified. By 1200 BCE, the oral performance of these texts becomes standardized, and treatises on ritual recitation suggest splitting up the Sanskrit compounds into words, stems, and phonetic units, providing an impetus for morphology and phonetics.

Some of the earliest activities in the description of language have been attributed to the Indian grammarian Pāγini (6th century BCE), who wrote a rule-based description of the Sanskrit language in his *A□□ādhyāyī*.

Over the next few centuries, clarity was reached in the organization of sound units, and the stop consonants were organized in a 5x5 square (c. 800 BCE, Pratisakhyas), eventually leading to a systematic alphabet, Brāhmī, by the 3rd century BCE.

In semantics, the early Sanskrit grammarian Śākaɣāyana (before c. 500 BCE) proposes that verbs represent ontologically prior categories, and that all nouns are etymologically derived from actions. The etymologistYāska (c. 5th century BCE) posits that meaning inheres in the sentence, and that word meanings are derived based on sentential usage. He also provides four categories of words—nouns, verbs, pre-verbs, and particles/invariants—and a test for nouns both concrete and abstract: words which can be indicated by the pronoun *that*.

Pāɣini (c. 6th century BCE) opposes the Yāska view that sentences are primary, and proposes a grammar for composing semantics from morphemic roots. Transcending the ritual text to consider living language, Pāɣini specifies a comprehensive set of about 4,000 aphoristic rules (*sutras*) that:

- Map the semantics of verb argument structures into thematic roles
- Provide morphosyntactic rules for creating verb forms and nominal forms whose seven cases are called *karaka* (similar to case) that generate the morphology
- Take these morphological structures and consider phonological processes (e.g., root or stem modification) by which the final phonological form is obtained

In addition, the Pāγinian school also provides a list of 2000 verb roots which form the objects on which these rules are applied, a list of sounds (the so-called *Shiva-sutras*), and a list of 260 words not derivable by the rules.

The extremely succinct specification of these rules and their complex interactions led to considerable commentary and extrapolation over the following centuries. The phonological structure includes defining a notion of sound universals similar to the modern phoneme, the systematization of consonants based on oral cavity constriction, and vowels based on height and duration. However, it is the ambition of mapping these from morpheme to semantics that is truly remarkable in modern terms.

Grammarians following Pāγini include Kātyāyana (c. 3rd century BCE), who wrote aphorisms on Pāγini (the *Varttika*) and advanced mathematics; Patañjali (2nd century BCE), known for his commentary on selected topics in Pāγini's grammar (the *Mahabhasya*) and on Kātyāyana'saphorisms, as well as, according to some, the author of the *Yoga Sutras*, and *Pingala*, with his mathematical approach to prosody. Several debates ranged over centuries, for example, on whether word-meaning mappings were conventional (*Vaisheshika-Nyaya*) or eternal (*Kātyāyana-Patañjali-Mīmā□sā*).

The *Nyaya Sutras* specified three types of meaning: the individual (*this cow*), the type universal (*cowhood*), and the image (*draw the cow*). That the sound of a word also forms a class (sound-universal) was observed by Bhartγhari (c. 500 CE), who also posits that language-universals are the units of thought, close to the nominalist or even the linguistic

determinism position. Bhartγhari also considers the sentence to be ontologically primary (word meanings are learned given their sentential use).

Of the six canonical texts or *Vedangas* that formed the core syllabus in Brahminic education from the 1st century CE until the 18th century, four dealt with language:

- *Shiksha* (*śikṣā*): phonetics and phonology (sandhi), Gārgeya and commentators
- *Chandas* (*chandas*): prosody or meter, Pingala and commentators
- *Vyakarana* (*vyākaraṇa*): grammar, Pāγini and commentators
- *Nirukta* (*nirukta*): etymology, Yāska and commentators

Bhartrihari around 500 CE introduced a philosophy of meaning with his *sphoṭa* doctrine.

Unfortunately, Pāγini's rule-based method of linguistic analysis and description has remained relatively unknown to Western linguistics until more recently. Franz Bopp used Pāγini's work as a linguistic source for his 1807 Sanskrit grammar but disregarded his methodology. Pāγini's system also differs from modern formal linguistics in that, since Sanskrit is a free word-order language, it did not provide syntactic rules. Formal linguistics, as first proposed by Louis Hjelmslev in 1943, is nonetheless based on the same concept that the expression of meaning is organised on different layers of linguistic form (including phonology and morphology).

The Pali Grammar of Kacchayana, dated to the early centuries CE, describes the language of the Buddhist canon.

Greece

The Greeks developed an alphabet using symbols from the Phoenicians, adding signs for vowels and for extra consonants appropriate to their idiom (see Robins, 1997). In the Phoenicians and in earlier Greek writing systems, such as Linear B, graphemes indicated syllables, that is sound combinations of a consonant and a vowel. The addition of vowels by the Greeks was a major breakthrough as it facilitated the writing of Greek by representing both vowels and consonants with distinct graphemes. As a result of the introduction of writing, poetry such as the Homeric poems became written and several editions were created and commented on, forming the basis of philology and criticism.

Along with written speech, the Greeks commenced studying grammatical and philosophical issues. A philosophical discussion about the nature and origins of language can be found as early as the works of Plato. A subject of concern was whether language was man-made, a social artifact, or supernatural in origin. Plato in his *Cratylus* presents the naturalisticview, that word meanings emerge from a natural process, independent of the language user. His arguments are partly based on examples of compounding, where the meaning of the whole is usually related to the constituents, although by the end he admits a small role for convention. The sophists and Socrates introduced dialectics as a new text genre. The Platonic dialogs contain definitions of the meters of the poems

and tragedy, the form and the structure of those texts (see the *Republic* and *Phaidros*, *Ion*, etc.).

Aristotle supports the conventional origins of meaning. He defined the logic of speech and of the argument. Furthermore, Aristotle's works on rhetoricand poetics became of the utmost importance for the understanding of tragedy, poetry, public discussions etc. as text genres. Aristotle's work on logic interrelates with his special interest in language, and his work on this area was fundamentally important for the development of the study of language (*logos* in Greek means both "language" and "logic reasoning"). In *Categories*, Aristotle defines what is meant by "synonymous" or univocal words, what is meant by "homonymous" or equivocal words, and what is meant by "paronymous" or denominative words. He divides forms of speech as being:

- Either simple, without composition or structure, such as "man,""horse," "fights," etc.
- Or having composition and structure, such as "a man fights," "the horse runs," etc.

Next, he distinguishes between a subject of predication, namely that of which anything is affirmed or denied, and a subject of inhesion. A thing is said to be inherent in a subject, when, though it is not a part of the subject, it cannot possibly exist without the subject, e.g., shape in a thing having a shape. The categories are not abstract platonic entities but are found in speech, these are substance, quantity, quality, relation, place, time, position, state, action and affection. In *de Interpretatione*, Aristotle analyzes categoric propositions, and draws a series of basic conclusions on the routine issues of

classifying and defining basic linguistic forms, such as simple terms and propositions, nouns and verbs, negation, the quantity of simple propositions (primitive roots of the quantifiers in modern symbolic logic), investigations on the excluded middle (which to Aristotle isn't applicable to future tense propositions — the Problem of future contingents), and on modal propositions.

The Stoics made linguistics an important part of their system of the cosmos and the human. They played an important role in defining the linguistic sign-terms adopted later on by Ferdinand de Saussure like "significant" and "signifié". The Stoics studied phonetics, grammar and etymology as separate levels of study. In phonetics and phonology the articulators were defined. The syllable became an important structure for the understanding of speech organization. One of the most important contributions of the Stoics in language study was the gradual definition of the terminology and theory echoed in modern linguistics.

Alexandrian grammarians also studied speech sounds and prosody; they defined parts of speech with notions such as "noun", "verb", etc. There was also a discussion about the role of analogy in language, in this discussion the grammatici in Alexandria supported the view that language and especially morphology is based on analogy or paradigm, whereas the grammatic in schools in Asia Minor consider that language is not based on analogical bases but rather on exceptions.

Alexandrians, like their predecessors, were very interested in meter and its role in poetry. The metrical "feet" in the Greek was based on the length of time taken to pronounce each

syllable, with syllables categorized according to their weight as either "long" syllables or "short" syllables (also known as "heavy" and "light" syllables, respectively, to distinguish them from long and short vowels). The foot is often compared to a musical measure and the long and short syllables to whole notes and half notes. The basic unit in Greek and Latin prosody is a mora, which is defined as a single short syllable. A long syllable is equivalent to two moras. A long syllable contains either a long vowel, a diphthong, or a short vowel followed by two or more consonants.

Various rules of elision sometimes prevent a grammatical syllable from making a full syllable, and certain other lengthening and shortening rules (such as correption) can create long or short syllables in contexts where one would expect the opposite.

The most important Classical meter as defined by the Alexandrian grammarians was the dactylic hexameter, the meter of Homeric poetry. This form uses verses of six feet. The first four feet are normally dactyls, but can be spondees. The fifth foot is almost always a dactyl. The sixth foot is either a spondee or a trochee. The initial syllable of either foot is called the ictus, the basic "beat" of the verse. There is usually a caesura after the ictus of the third foot.

The text *Tékhnēgrammatiké* (c. 100 BCE, Gk. *gramma* meant letter, and this title means "Art of letters"), possibly written by Dionysius Thrax (170 – 90 BCE), is considered the earliest grammar book in the Greek tradition. It lists eight parts of speech and lays out the broad details of Greek morphology including the case structures. This text was intended as a

pedagogic guide (as was Panini), and also covers punctuation and some aspects of prosody. Other grammars by Charisius (mainly a compilation of Thrax, as well as lost texts by RemmiusPalaemon and others) and Diomedes (focusing more on prosody) were popular in Rome as pedagogic material for teaching Greek to native Latin-speakers.

One of the most prominent scholars of Alexandria and of the antiquity was Apollonius Dyscolus. Apollonius wrote more than thirty treatises on questions of syntax, semantics, morphology, prosody, orthography, dialectology, and more. Happily, four of these are preserved—we still have a *Syntax* in four books, and three one-book monographs on pronouns, adverbs, and connectives, respectively.

Lexicography become an important domain of study as many grammarians compiled dictionaries, thesauri and lists of special words "λέξεις" that were old, or dialectical or special (such as medical words or botanic words) at that period. In the early medieval times we find more categories of dictionaries like the dictionary of Suida (considered the first encyclopedic dictionary), etymological dictionaries etc.

At that period, the Greek language functioned as a *lingua franca*, a language spoken throughout the known world (for the Greeks and Romans) of that time and, as a result, modern linguistics struggles to overcome this. With the Greeks a tradition commenced in the study of language. The Romans and the medieval world followed, and their laborious work is considered today as a part of our everyday language. Think, for example, of notions such as the word, the syllable, the verb, the subject etc.

Rome

In the 4th century, AeliusDonatus compiled the Latin grammar *ArsGrammatica* that was to be the defining school text through the Middle Ages. A smaller version, *Ars Minor*, covered only the eight parts of speech; eventually when books came to be printed in the 15th century, this was one of the first books to be printed. Schoolboys subjected to all this education gave us the current meaning of "grammar" (attested in English since 1176).

China

Similar to the Indian tradition, Chinese philology, *Xiaoxue* (小學 "elementary studies"), began as an aid to understanding classics in the Han dynasty (c. 3rd century BCE). *Xiaoxue* came to be divided into three branches: *Xungu* (訓詁 "exegesis"), *Wenzi* (文字 "script [analysis]") and *Yinyun* (音韻 "[study of] sounds") and reached its golden age in the 17th century CE (Qing Dynasty). The glossary *Erya* (c. 3rd century BCE), comparable to the Indian *Nighantu*, is regarded as the first linguistic work in China. *ShuowenJiezi* (c. 2nd century BCE), the first Chinese dictionary, classifies Chinese characters by radicals, a practice that would be followed by most subsequent lexicographers. Two more pioneering works produced during the Han Dynasty are *Fangyan*, the first Chinese work concerning dialects, and *Shiming*, devoted to etymology.

As in ancient Greece, early Chinese thinkers were concerned with the relationship between names and reality. Confucius (6th century BCE) famously emphasized the moral commitment implicit in a name, (*zhengming*) stating that the moral collapse

of the pre-Qin was a result of the failure to rectify behaviour to meet the moral commitment inherent in names: "Good government consists in the ruler being a ruler, the minister being a minister, the father being a father, and the son being a son... If names be not correct, language is not in accordance with the truth of things." (*Analects* 12.11,13.3).

However, what is the reality implied by a name? The later Mohists or the group known as School of Names (mingjia, 479-221 BCE), consider that *ming* (名 "name") may refer to three kinds of *shi* (實 "actuality"): type universals (horse), individual (John), and unrestricted (thing). They adopt a realist position on the name-reality connection - universals arise because "the world itself fixes the patterns of similarity and difference by which things should be divided into kinds". The philosophical tradition is well known for conundra resembling the sophists, e.g. when GongsunLongzi (4th century BCE) questions if in copula statements (*X is Y*), are *X* and *Y* identical or is *X* a subclass of *Y*. This is the famous paradox "a white horse is not a horse".

XunZi (3rd century BCE) revisits the principle of *zhengming*, but instead of rectifying behaviour to suit the names, his emphasis is on rectifying language to correctly reflect reality. This is consistent with a more "conventional" view of word origins (*yuedingsucheng*約定俗成).

The study of phonology in China began late, and was influenced by the Indian tradition, after Buddhism had become popular in China. The rime dictionary is a type of dictionary arranged by tone and rime, in which the pronunciations of

characters are indicated by *fanqie* spellings. Rime tableswere later produced to aid the understanding of *fanqie*.

Philological studies flourished during the Qing Dynasty, with DuanYucai and Wang Niansun as the towering figures. The last great philologist of the era was Zhang Binglin, who also helped lay the foundation of modern Chinese linguistics. The Western comparative methodwas brought into China by Bernard Karlgren, the first scholar to reconstruct Middle Chinese and Old Chinese with Latin alphabet (not IPA). Important modern Chinese linguists include Y. R. Chao, Luo Changpei, Li Fanggui and Wang Li.

The ancient commentators on the classics paid much attention to syntax and the use of particles. But the first Chinese grammar, in the modern sense of the word, was produced by Ma Jianzhong (late 19th century). His grammar was based on the Latin (prescriptive) model.

Middle Ages

Arabic grammar

Owing to the rapid expansion of Islam in the 8th century, many people learned Arabic as a lingua franca. For this reason, the earliest grammatical treatises on Arabic are often written by non-native speakers.

The earliest grammarian who is known to us is *ʿAbdAllāh ibn AbīIs□āq al-□a□ramī* (died 735-736 CE, 117 AH). The efforts of three generations of grammarians culminated in the book of the Persian linguist *Sibāwayhi* (c. 760–793).

Sibawayh made a detailed and professional description of Arabic in 760 in his monumental work, *Al-kitab fi al-nahw* (الكتابفيالنحو, *The Book on Grammar*). In his book he distinguished phonetics from phonology.

European vernaculars

The Irish *SanasCormaic* 'Cormac's Glossary' is Europe's first etymological and encyclopedic dictionary in any non-Classical language.

The Modistae or "speculative grammarians" in the 13th century introduced the notion of universal grammar.

In *De vulgarieloquentia* ("On the Eloquence of Vernacular"), Dante expanded the scope of linguistic enquiry from Latin/Greek to include the languages of the day. Other linguistic works of the same period concerning the vernaculars include the First Grammatical Treatise (Icelandic) or the Auraiceptna n-Éces (Irish).

The Renaissance and Baroque period saw an intensified interest in linguistics, notably for the purpose of Bible translations by the Jesuits, and also related to philosophical speculation on philosophical languages and the origin of language.

Founding Fathers In the 1600s, JoannesGoropiusBecanus was the oldest representative of Dutch linguistics. He was the first person to publish a fragment of Gothic, mainly The lord's prayer. FranciscusJuniuns, Lambert ten Kate from Amsterdam and George Hickes from England are considered to be the founding fathers of German linguistics.

Modern linguistics

Modern linguistics did not begin until the late 18th century, and the Romantic or animist theses of Johann Gottfried Herder and Johann Christoph Adelung remained influential well into the 19th century.

In the history of American linguistics, there were hundreds of Indigenous languages that were never recorded. Many of the languages were spoken and so they are now inaccessible. Under these circumstances, linguistics such as Franz Boas tried to prescribed sound methodical principles for the analysis of unfamiliar languages. Boas was an influential linguist and was followed by Edward Sapir and Leonard Bloomfield.

Historical linguistics

During the 18th century conjectural history, based on a mix of linguistics and anthropology, on the topic of both the origin and progress of language and society was fashionable. These thinkers contributed to the construction of academic paradigms in which some languages were labelled "primitive" relative to the English language. Within this paradigm a primitive people could be discerned by their primitive language, as in the case of Hugh Blair who argued that Native Americans gesticulated wildly to compensate for poor lexicon of their primitive language. Around the same time, James Burnett authored a 6 volume treatise that delved more deeply into the matter of "savage languages". Other writers theorized that Native American languages were "nothing but the natural and instinctive cries of the animal" without grammatical structure.

The thinkers within this paradigm connected themselves with the Greeks and Romans, viewed as the only civilized persons of the ancient world, a view articulated by Thomas Sheridan who compiled an important 18th century pronunciation dictionary: "It was to the care taken in the cultivation of their languages, that Greece and Rome, owed that splendor, which eclipsed all the other nations of the world".

In the 18th century James Burnett, Lord Monboddo analyzed numerous languages and deduced logical elements of the evolution of human languages. His thinking was interleaved with his precursive concepts of biological evolution. Some of his early concepts have been validated and are considered correct today.

In his *The Sanscrit Language* (1786), Sir William Jones proposed that Sanskrit and Persian had resemblances to Classical Greek, Latin, Gothic, and Celtic languages. From this idea sprung the field of comparative linguistics and historical linguistics. Through the 19th century, European linguistics centered on the comparative history of the Indo-European languages, with a concern for finding their common roots and tracing their development.

In 1786, it was discovered that there is a regular sound that corresponded in the languages spoken in Europe, India, and Persia. This led to the conclusion that all of the languages can from a common ancestor and during the 19th-century linguistics were devoted to figuring out the nuances of the parent language. It was discovered that this parent language started approximately 6000 years ago and has also developed in English, Russian, and Hindi.

In the 1820s, Wilhelm von Humboldt observed that human language was a rule-governed system, anticipating a theme that was to become central in the formal work on syntax and semantics of language in the 20th century. Of this observation he said that it allowed language to make "infinite use of finite means" (*Über den Dualis*, 1827). Humboldt's work is associated with the movement of **Romantic linguistics**, which was inspired by *Naturphilosophie* and Romantic science. Other notable representatives of the movement include Friedrich Schlegel and Franz Bopp.

It was only in the late 19th century that the Neogrammarian approach of Karl Brugmann and others introduced a rigid notion of sound law.

Historical linguistics also led to the emergence of the semantics and some forms of pragmatics (Nerlich, 1992; Nerlich and Clarke, 1996).

Historical linguistics continues today and linguistics have succeeded in grouping approximately 5000 languages of the world into a number of common ancestors.

Structuralism

In Europe there was a development of structural linguistics, initiated by Ferdinand de Saussure, a Swiss professor of Indo-European and general linguistics, whose lectures on general linguistics, published posthumously by his students, set the direction of European linguistic analysis from the 1920s on; his approach has been widely adopted in other fields under the broad term "Structuralism".

By the 20th century, the attention shifted from language change to the structure, which is governed by rules and principles. This structure turned more into grammar and by the 1920s structural linguistic, was developing into sophisticated methods of grammatical analysis.

Descriptive linguistics

During the second World War, North American linguists Leonard Bloomfield, William Mandeville Austin and several of his students and colleagues developed teaching materials for a variety of languages whose knowledge was needed for the war effort. This work led to an increasing prominence of the field of linguistics, which became a recognized discipline in most American universities only after the war.

In 1965, William Stokoe, a linguist from Gallaudet University published an analysis [1] which proved that American Sign Language fits the criteria for a natural language.

Other subfields

From roughly 1980 onwards, pragmatic, functional, and cognitive approaches have steadily gained ground, both in the United States and in Europe.

Theoretical frameworks

- Frameworks of grammar which seek to give a precise scientific theory of the syntactic rules of grammar and their function have been developed in theoretical linguistics.

- Functional grammar (structural–functional analysis):
- Danish Functionalism
- Functional Discourse Grammar
- Systemic functional grammar
- Role and reference grammar
- Dependency grammar: dependency relation (Lucien Tesnière 1959)
- Link grammar
- Montague grammar

Other frameworks are based on an innate "universal grammar", an idea developed by Noam Chomsky. In such models, the object is placed into the verb phrase. The most prominent biologically-oriented theories are:

- Generative grammar:
- Transformational grammar (1960s)
- Generative semantics (1970s)
- Semantic Syntax (1990s)
- Generalised phrase structure grammar (late 1970s)
- Head-driven phrase structure grammar (1985)
- Principles and parameters grammar (Government and binding theory) (1980s)
- Lexical functional grammar
- Categorial grammar (lambda calculus)
- Minimalist program-based grammar (1993)
- Cognitive grammar / Cognitive linguistics
- Construction grammar
- Fluid Construction Grammar
- Word grammar
- Stochastic grammar: probabilistic
- Operator grammar

Parse trees are commonly used by such frameworks to depict their rules. There are various alternative schemes for some grammars:

- Constraint grammar
- Tree-adjoining grammar
- Affix grammar over a finite lattice
- Lambda calculus
- X-bar theory
- Backus–Naur form

Development of grammars

Grammars evolve through usage. Historically, with the advent of written representations, formal rules about language usage tend to appear also, although such rules tend to describe writing conventions more accurately than conventions of speech. Formal grammars are codifications of usage which are developed by repeated documentation and observation over time. As rules are established and developed, the prescriptive concept of grammatical correctness can arise. This often produces a discrepancy between contemporary usage and that which has been accepted, over time, as being standard or "correct". Linguists tend to view prescriptive grammars as having little justification beyond their authors' aesthetic tastes, although style guides may give useful advice about *standard language employment*, based on descriptions of usage in contemporary writings of the same language. Linguistic prescriptions also form part of the explanation for variation in speech, particularly variation in the speech of an individual speaker (for example, why some speakers say "I didn't do

nothing", some say "I didn't do anything", and some say one or the other depending on social context).

The formal study of grammar is an important part of children's schooling from a young age through advanced learning, though the rules taught in schools are not a "grammar" in the sense that most linguists use, particularly as they are prescriptive in intent rather than descriptive.

Constructed languages (also called *planned languages* or *conlangs*) are more common in the modern-day, although still extremely uncommon compared to natural languages. Many have been designed to aid human communication (for example, naturalistic Interlingua, schematic Esperanto, and the highly logic-compatible artificial languageLojban). Each of these languages has its own grammar.

Syntax refers to the linguistic structure above the word level (for example, how sentences are formed) – though without taking into account intonation, which is the domain of phonology.

Morphology, by contrast, refers to the structure at and below the word level (for example, how compound words are formed), but above the level of individual sounds, which, like intonation, are in the domain of phonology. However, no clear line can be drawn between syntax and morphology. Analytic languages use syntax to convey information which is encoded by inflection in synthetic languages. In other words, word order is not significant and morphology is highly significant in a purely synthetic language, whereas morphology is not significant and syntax is highly significant in an analytic language. For example, Chinese and Afrikaans are highly

analytic, thus meaning is very context-dependent. (Both have some inflections, and both have had more in the past; thus, they are becoming even less synthetic and more "purely" analytic over time.) Latin, which is highly synthetic, uses affixes and inflections to convey the same information that Chinese does with syntax. Because Latin words are quite (though not totally) self-contained, an intelligible Latin sentence can be made from elements that are arranged almost arbitrarily. Latin has a complex affixation and simple syntax, whereas Chinese has the opposite.

Education

Prescriptive grammar is taught in primary and secondary school. The term "grammar school" historically referred to a school (attached to a cathedral or monastery) that teaches Latin grammar to future priests and monks. It originally referred to a school that taught students how to read, scan, interpret, and declaim Greek and Latin poets (including Homer, Virgil, Euripides, and others). These should not be mistaken for the related, albeit distinct, modern British grammar schools.

A standard language is the dialect which is promoted above other dialects in writing, education and, broadly speaking, in the public sphere; it contrasts with vernacular dialects, which may be the objects of study in academic, descriptive linguistics but which are rarely taught prescriptively. The standardized "first language" taught in primary education may be subject to political controversy, because it may sometimes establish a standard defining nationality or ethnicity.

Recently, efforts have begun to update grammar instruction in primary and secondary education. The main focus has been to prevent the use of outdated prescriptive rules in favor of setting norms based on earlier descriptive research and to change perceptions about relative "correctness" of prescribed standard forms in comparison to non-standard dialects.

The preeminence of Parisian French has reigned largely unchallenged throughout the history of modern French literature. Standard Italian is based on the speech of Florence rather than the capital because of its influence on early literature. Likewise, standard Spanish is not based on the speech of Madrid, but on that of educated speakers from more northern areas such as Castile and León (see *Gramática de la lenguacastellana*). In Argentina and Uruguay the Spanish standard is based on the local dialects of Buenos Aires and Montevideo (Rioplatense Spanish). Portuguese has, for now, two official standards, respectively Brazilian Portuguese and European Portuguese.

The Serbian variant of Serbo-Croatianis likewise divided; Serbia and the RepublikaSrpska of Bosnia and Herzegovina use their own distinct normative subvarieties, with differences in yat reflexes. The existence and codification of a distinct Montenegrin standard is a matter of controversy, some treat Montenegrin as a separate standard lect and some think that it should be considered another form of Serbian.

Norwegian has two standards, *Bokmål* and *Nynorsk*, the choice between which is subject to controversy: Each Norwegian municipality can either declare one as its official language or it can remain "language neutral". Nynorsk is backed by 27

percent of municipalities. The main language used in primary schools, chosen by referendum within the local school district, normally follows the official language of its municipality. Standard German emerged from the standardized chancellery use of High German in the 16th and 17th centuries. Until about 1800, it was almost exclusively a written language, but now it is so widely spoken that most of the former German dialects are nearly extinct.

Standard Chinese has official status as the standard spoken form of the Chinese language in the People's Republic of China (PRC), the Republic of China (ROC) and the Republic of Singapore. Pronunciation of Standard Chinese is based on the local accent of Mandarin Chinese from Luanping, Chengde in Hebei Province near Beijing, while grammar and syntax are based on modern vernacular written Chinese.

Modern Standard Arabicis directly based on Classical Arabic, the language of the Qur'an. The Hindustani language has two standards, Hindi and Urdu. In the United States, the Society for the Promotion of Good Grammar designated March 4 as National Grammar Day in 2008.

Chapter 2

Speech

Speech is human vocal communication using language. Each language uses phonetic combinations of vowel and consonant sounds that form the sound of its words (that is, all English words sound different from all French words, even if they are the same word, e.g., "role" or "hotel"), and using those words in their semantic character as words in the lexicon of a language according to the syntactic constraints that govern lexical words' function in a sentence. In speaking, speakers perform many different intentional speech acts, e.g., informing, declaring, asking, persuading, directing, and can use enunciation, intonation, degrees of loudness, tempo, and other non-representational or paralinguistic aspects of vocalization to convey meaning. In their speech speakers also unintentionally communicate many aspects of their social position such as sex, age, place of origin (through accent), physical states (alertness and sleepiness, vigor or weakness, health or illness), psychic states (emotions or moods), physico-psychic states (sobriety or drunkenness, normal consciousness and trance states), education or experience, and the like.

Although people ordinarily use speech in dealing with other persons (or animals), when people swear they do not always mean to communicate anything to anyone, and sometimes in expressing urgent emotions or desires they use speech as a quasi-magical cause, as when they encourage a player in a game to do or warn them not to do something. There are also many situations in which people engage in solitary speech. People talk to themselves sometimes in acts that are a

development of what some psychologists (e.g., Lev Vygotsky) have maintained is the use of silent speech in an interior monologue to vivify and organize cognition, sometimes in the momentary adoption of a dual persona as self addressingself as though addressing another person. Solo speech can be usedto memorize or to test one's memorization of things, and in prayer or in meditation (e.g., the use of a mantra).

Researchers study many different aspects of speech: speech production and speech perception of the sounds used in a language, speech repetition, speech errors, the ability to map heard spoken words onto the vocalizations needed to recreate them, which plays a key role in children's enlargement of their vocabulary, and what different areas of the human brain, such as Broca's area and Wernicke's area, underlie speech. Speech is the subject of study for linguistics, cognitive science, communication studies, psychology, computer science, speech pathology, otolaryngology, and acoustics. Speech compares with written language, which may differ in its vocabulary, syntax, and phonetics from the spoken language, a situation called diglossia. The evolutionary origins of speech are unknown and subject to much debate and speculation. While animals also communicate using vocalizations, and trained apes such as Washoe and Kanzi can use simple sign language, no animals' vocalizations are articulated phonemically and syntactically, and do not constitute speech.

Production

Speech production is a multi-step process by which thoughts are generated into spoken utterances. Production involves the selection of appropriate words and the appropriate form of

those words from the lexicon and morphology, and the organization of those words through the syntax. Then, the phonetic properties of the words are retrieved and the sentence is articulated through the articulations associated with those phonetic properties.

In linguistics (articulatory phonetics), articulation refers to how the tongue, lips, jaw, vocal cords, and other speech organs used to produce sounds are used to make sounds. Speech sounds are categorized by manner of articulation and place of articulation.

Place of articulation refers to where the airstream in the mouth is constricted. Manner of articulation refers to the manner in which the speech organs interact, such as how closely the air is restricted, what form of airstream is used (e.g. pulmonic, implosive, ejectives, and clicks), whether or not the vocal cords are vibrating, and whether the nasal cavity is opened to the airstream. The concept is primarily used for the production of consonants, but can be used for vowels in qualities such as voicing and nasalization. For any place of articulation, there may be several manners of articulation, and therefore several homorganic consonants.

Normal human speech is pulmonic, produced with pressure from the lungs, which creates phonation in the glottis in the larynx, which is then modified by the vocal tract and mouth into different vowels and consonants. However humans can pronounce words without the use of the lungs and glottis in alaryngeal speech, of which there are three types: esophageal speech, pharyngeal speech and buccal speech (better known as Donald Duck talk).

Errors

Speech production is a complex activity, and as a consequence errors are common, especially in children. Speech errors come in many forms and are used to provide evidence to support hypotheses about the nature of speech. As a result, speech errors are often used in the construction of models for language production and child language acquisition. For example, the fact that children often make the error of over-regularizing the -ed past tense suffix in English (e.g. saying 'singed' instead of 'sang') shows that the regular forms are acquired earlier. Speech errors associated with certain kinds of aphasia have been used to map certain components of speech onto the brain and see the relation between different aspects of production: for example, the difficulty of expressive aphasia patients in producing regular past-tense verbs, but not irregulars like 'sing-sang' has been used to demonstrate that regular inflected forms of a word are not individually stored in the lexicon, but produced from affixation of the base form.

Perception

Speech perception refers to the processes by which humans can interpret and understand the sounds used in language. The study of speech perception is closely linked to the fields of phonetics and phonology in linguistics and cognitive psychology and perception in psychology. Research in speech perception seeks to understand how listeners recognize speech sounds and use this information to understand spoken language. Research into speech perception also has applications in building computer systems that can recognize

speech, as well as improving speech recognition for hearing- and language-impaired listeners.

Speech perception is categorical, in that people put the sounds they hear into categories rather than perceiving them as a spectrum. People are more likely to be able to hear differences in sounds across categorical boundaries than within them. A good example of this is voice onset time (VOT). For example, Hebrew speakers, who distinguish voiced /b/ from voiceless /p/, will more easily detect a change in VOT from -10 (perceived as /b/) to 0 (perceived as /p/) than a change in VOT from +10 to +20, or -10 to -20, despite this being an equally large change on the VOT spectrum.

Repetition

In speech repetition, speech being heard is quickly turned from sensory input into motor instructions needed for its immediate or delayed vocal imitation (in phonological memory). This type of mapping plays a key role in enabling children to expand their spoken vocabulary. Masur (1995) found that how often children repeat novel words versus those they already have in their lexicon is related to the size of their lexicon later on, with young children who repeat more novel words having a larger lexicon later in development. Speech repetition could help facilitate the acquisition of this larger lexicon.

Problems

There are several organic and psychological factors that can affect speech. Among these are:

- Diseases and disorders of the lungs or the vocal cords, including paralysis, respiratory infections (bronchitis), vocal fold nodules and cancers of the lungs and throat.
- Diseases and disorders of the brain, including alogia, aphasias, dysarthria, dystonia and speech processing disorders, where impaired motor planning, nerve transmission, phonological processing or perception of the message (as opposed to the actual sound) leads to poor speech production.
- Hearing problems, such as otitis media with effusion, and listening problems, auditory processing disorders, can lead to phonological problems.
- Articulatory problems, such as slurred speech, stuttering, lisping, cleft palate, ataxia, or nerve damage leading to problems in articulation. Tourette syndrome and tics can also affect speech. Various congenital and acquired tongue diseases can affect speech as can motor neuron disease.
- In addition to dysphasia, anomia and auditory processing disorder can impede the quality of auditory perception, and therefore, expression. Those who are Hard of Hearing or deaf may be considered to fall into this category.
- Psychiatric disorders have been shown to change speech acoustic features, where for instance, fundamental frequency of voice (perceived as pitch) tends to be significantly lower in major depressive disorder than in healthy controls. Therefore, speech is being investigated as a potential biomarker for mental health disorders.

Brain physiology

Classical model

The classical or Wernicke-Geschwind model of the language system in the brain focuses on Broca's area in the inferior prefrontal cortex, and Wernicke's area in the posterior superior temporal gyrus on the dominant hemisphere of the brain (typically the left hemisphere for language). In this model, a linguistic auditory signal is first sent from the auditory cortex to Wernicke's area. The lexiconis accessed in Wernicke's area, and these words are sent via the arcuate fasciculus to Broca's area, where morphology, syntax, and instructions for articulation are generated. This is then sent from Broca's area to the motor cortex for articulation.

Paul Broca identified an approximate region of the brain in 1861 which, when damaged in two of his patients, caused severe deficits in speech production, where his patients were unable to speak beyond a few monosyllabic words. This deficit, known as Broca's or expressive aphasia, is characterized by difficulty in speech production where speech is slow and labored, function words are absent, and syntax is severely impaired, as in telegraphic speech. In expressive aphasia, speech comprehension is generally less affected except in the comprehension of grammatically complex sentences. Wernicke's area is named after Carl Wernicke, who in 1874 proposed a connection between damage to the posterior area of the left superior temporal gyrus and aphasia, as he noted that not all aphasic patients had suffered damage to the prefrontal cortex. Damage to Wernicke's area produces Wernicke's or

receptive aphasia, which is characterized by relatively normal syntax and prosody but severe impairment in lexical access, resulting in poor comprehension and nonsensical or jargon speech.

Modern research

Modern models of the neurological systems behind linguistic comprehension and production recognize the importance of Broca's and Wernicke's areas, but are not limited to them nor solely to the left hemisphere. Instead, multiple streams are involved in speech production and comprehension. Damage to the left lateral sulcushas been connected with difficulty in processing and producing morphology and syntax, while lexical access and comprehension of irregular forms (e.g. eat-ate) remain unaffected. Moreover, the circuits involved in human speech comprehension dynamically adapt with learning, for example, by becoming more efficient in terms of processing time when listening to familiar messages such as learned verses.

Auditory feedback

Auditory feedback (**AF**) is an aid used by humans to control speech production and singing by helping the individual verify whether the current production of speech or singing is in accordance with his acoustic-auditory intention. This process is possible through what is known as the auditory feedback loop, a three-part cycle that allows individuals to first speak, then listen to what they have said, and lastly, correct it when necessary. From the viewpoint of movement sciences and

neurosciences, the acoustic-auditory speech signalcan be interpreted as the result of movements (skilled actions) of speech articulators (the lower jaw, lips, tongue, etc.). Auditory feedback can hence be inferred as a feedback mechanism controlling skilled actions in the same way that visual feedback controls limb movements (e.g. reaching movements).

Speech

Auditory feedback allows one to monitor their speech and rectify production errors quickly when they identify one, making it an important component of fluent speech productions. The role of auditory feedback on speech motor control is often investigated by exposing participants to frequency-altered feedback. Inducing brief and unpredictable changes in the frequency of their auditory feedback has consistently been shown to induce a "pitch-shift reflex", which suggests that this reflex aids in stabilizing voice frequency around the desired target.

However, due to the fact that auditory feedback needs more than 100 milliseconds before a correction occurs at the production level, it is a slow correction mechanism in comparison with the duration (or production time) of speech sounds (vowels or consonants). Thus, auditory feedback is too slow to correct the production of a speech sound in real-time. Nonetheless, it has been shown that auditory feedback is capable of changing speech-sound production over a series of trials (i.e. adaptation by relearning; see e.g. perturbation experiments done with the DIVA model: neurocomputational speech processing). 10 minutes is typically sufficient for a nearly-full adaptation. Research has also shown that auditory

linguistic prompts resulted in greater correction to acoustic perturbations than non-linguistic prompts, reflecting the decrease in accepted variance for intended speech when external linguistic templates are available to the speaker.

Speech Acquisition and Development

Auditory feedback is an important aid during speech acquisition by toddlers, by providing the child with information about speech outcomes that are used to pick-up and eventually hone speech motor planning processes. Auditory inputs are typically produced by a communication partner (e.g. caretaker) and heard by the toddler, who subsequently tries to imitate them. Children as young as the age of four have demonstrated the ability to adapt speech motor patterns to perceived changes in vowel auditory feedback, which enables them to maintain the accuracy of their speech output. However, children's speech motor adaption abilities are not fully optimised due to their limited auditory perceptual skills. Thus, improvements in children's ability to perceive relevant acoustic property will usually be followed by an improvement in their speech adaption performance.

Individuals who are born deaf often fail to acquire fluent speech, further reinforcing how auditory feedback plays a crucial role in speech acquisition and development.

Delayed auditory feedback experiments indicate that auditory feedback is important during speech production, even in adults. It has been shown that severe disfluencies in speech occur when the timing of voice feedback is delayed for a normal speaker. Individuals who become deaf post-lingually and are

unable to receive vocal feedback anymore also typically experience a deterioration in speech quality, highlighting the importance of auditory feedback in speech formation throughout one's lifetime.

Impacts on Speech Disorders

Stuttering

Stuttering is said to be due to ineffective monitoring of auditory feedback, mainly caused by a deficit in the cortical auditory system modulation during speech planning When fluent speakers detect a sudden irregularity in a specific acoustic parameter of their auditory feedback, they are able to instantly correct the error in their speech production. Individuals who stutter, on the other hand, are found to have weaker-than-normal abilities to correct such errors. Individuals that stutter hence demonstrate ineffective auditory comparisons of desired speech movements, as compared to fluent speakers.

Delayed Auditory Feedbackhas been found to be an effective treatment for some individuals who stutter, since extending the time between speech and auditory perception allows for more time to process and correct errors.

Apraxia of Speech

It is posited that individuals who suffer from apraxia of speech have weak feedforward programs, which results in the disfluencies of their speech. These individuals hence develop a heavy reliance on auditory feedback to minimize and repair

speech errors even in later stages of their lives, whilst fluent speakers easily transitions from feedback dependent to feedforward-dominant. This is not ideal since heavy reliance on mostly auditory feedback is said to be inefficient for the production of rapid and accurate speech.

Auditory maskinghas been found to decrease disfluency duration and increase vocal intensity as well as syllable rate in some individuals who suffer from apraxia of speech. Since apraxia of speech is said to be due to weak feedforward programs and high dependence on auditory feedback, auditory masking can be reasoned to increase fluency by decreasing the frequency of a speaker attending auditorily to speech errors, and hence reducing the likelihood of disfluency-generating corrections.

Impacts on Visually Impaired individuals

Enhanced auditory processing can be observed in individuals with visual impairment, who partially compensate for their lack of vision with greater sensitivity in their other sensories. Their increased sensitivity to auditory feedback allows them to demonstrate impressive spatial awareness despite their lack of sight.

Desktop Assistance

Studies have shown that when vision is no longer the primary source for obtaining information, focus shifts from vision to hearing in the desktop environment. Currently, there are

assistive technologies such as screen readers, which aids visually impaired individuals in obtaining information on their desktop screens via auditory feedback (Eg. JAWS). The assistance can come in the form of either speech based auditory feedback or non-speech based auditory feedback. Speech based interfaces are based on human speech, whilst non-speech based interfaces are based on environmental sounds such as music or artificial sound effects.

For the visually impaired, sole reliance on speech based auditory feedback imposes a heavier cognitive load which is irritating for users. In contrast, non-speech auditory feedback is pleasant and conveys information more quickly, but lacks detailed information in their conveyance and training is required to understand the cues. Hence, the most ideal interface currently is adaptive auditory feedback, which automatically transitions between speech and non-speech cues based on the user state. Such an interface has been found to be more comfortable and generates higher satisfaction amongst visually impaired users.

Impacts on Other Disorders

Graphomotor learning in writing disorders

A trial was conducted to explore whether auditory feedback had an influence on learning how to write. It was found that in adults, auditory feedback enabled the writer to better discern their writing motions. This resulted in an increased in flow and quickness of writing when using sounds to learn the writing of new characters. Subsequent studies then tested the use of

auditory feedback as an aid for children with dysgraphia to learn how to write. It was found that after multiple sittings of using auditory feedback while writing, children could write more smoothly, rapidly and clearly.

Products based on auditory feedback principles have been invented to aid individuals with such writing disorders. Children with speech disorders can also benefit from such products.

For example, a headphone called Forbrain uses a bone conductor and a series of dynamic filters to correct the perception of one's own voice. This improves concentration, attention, speech, coordination, and other sensory functions. It has been awarded by the BETT Show in 2015 in the category "ICT Special Educational Needs Solutions"

Motor learning in movement disorders

Patients suffering from cerebral palsy have little walking capabilities, due to flaws in their nervous system. Auditory feedback in the form of periodic audio signals were found to have a significant improvement on the gait of patients, with several explanations proposed. One model argues that auditory feedback acts as an additional information channel for the motor systems, thereby decreasing the onset of motor faults and refining the gait of patients.

Another model posits that audio signals influence the gait of patients by directing motion patterns, such as heel strike timings. By wearing a device that provides immediate auditory feedback on the quality of one's gait, children with cerebral

palsy learned to set down their feet in proper ways that avoided the sounds created when negative gaits were detected.

Social interaction and motor coordination learning in behavioural disorders

The use of an auditory feedback-based treatment is found to have improved on the social interaction, mimicking and coordination skills of children with autism spectrum disorder. This is achieved through a software which uses sensors to track the body motions of children. Each gesture made will activate a voice recording articulating pieces of sentences. Children then have to reorder these sentence pieces to form a storyline. Different indicators of coordination such as motion quantity and speed were also recorded to keep track of the child's improvement through these auditory cues.

Impacts on Music Performance

Instrument Performance

Auditory feedback is important in the picking up of a new musical piece. By exposing beginner piano players to irregular auditory feedback, they make more mistakes as compared to those who are given logical and anticipatable auditory feedback. Learning in the presence of auditory feedback also improved one's recollection of the musical piece.

However, multiple studies have shown that even without auditory feedback, there is not much disturbance to the performance of seasoned musicians. In the absence or delay of

auditory feedback, musicians turn to auditory imagery to direct their performance. Other forms of feedback can also be used in compensation instead, such as visual feedback where musicians look at their hands to lead their performance. Major disturbances were only seen in the area of pedaling, where results have shown that pianists were prone to stepping the pedal less often in the absence of auditory feedback.

Singing

The importance of auditory feedback in the case of human singing is reviewed by Howell. In the context of singing, it is important for singers to maintain pitch accuracy, even when they are drowned out by orchestral accompaniment or by fellow singers. Many studies have looked into the effects of both external auditory feedback and proprioception (also known as internal feedback) on pitch control. It has been found that external auditory feedback is crucial in maintaining pitch accuracy, especially for adults without voice training. This is further supported by recent research which revealed how non-professional singers show lower pitch accuracy when they receive lesser auditory feedback. However, the research also highlighted how the pitch of professional singers remains almost unaffected by auditory feedback since they are able to rely on their internal feedback after years of training.

Bird songs

The role of auditory feedback in the learning and production of bird-songhas been studied in several research papers. It has been found that songbirds rely on auditory feedback to compare the sounds that they make with inborn tunes or songs

that they memorize from others. Numerous studies have shown that without the ability to hear themselves, songbirds develop erratic songs or show a deterioration in the songs that they sing after experiencing hearing loss. Several scientific models have been put forward to explain the worsening of birdsongs after the loss of hearing. (E.g. see Brainard and Doupe's (2000) error adjustment channel in the anterior forebrain: auditory feedback in birdsong learning).

However, the decline of birdsong quality can vary greatly between different demographics. For example, other studies have found the songs of older songbirds remained consistent, or had a slower rate of deterioration after going deaf. Some researchers have attributed to songbirds learning how to use other forms of non-auditory feedback such as sensory information to maintain the quality of their songs. This process is calledsensory-motor coupling. Others have argued that older songbirds have a longer access to auditory feedback to learn their songs, which results in more practice and thus more stable production of songs even after deafening.

Developmental Dysfluency

Developmental Dysfluency or "normal dysfluency" is the disruption of the ongoing flow of a child's speech patterns during the ages of about 3 to 4 years old. Dysfluency refers to the broken up nature of outgoing speech and can be characterized by long pauses or the insertion of filler words.

Developmental Dysfluency is considered a normal part of childhood language development that can occur between the toddler and preschool years. About twenty-five percent of

children experience some loss in fluency in their linguistic abilities. Some children between the ages of 2 and 6 encounter some obstacles in the path to fluent speech. Fluency refers to the aspect of speech production that includes continuity, smoothness, rate and effort.

Speech is a complex skill that involves cognitive, linguistic, auditory and sensorimotor processes making it a difficult skill for children to master. Children will develop an in-depth understanding of language and speech and as they grow up their language and vocabulary will grow with them. However, due to the large amount of input. Fluency in a normal child will typically improve around the age of 4. Although many adults display some types of dysfluency it is usually in relation to helping them comprehend or express different materials under stress. Developmental dysfluency is a normal part of the acquisition of language. An individual may not be fluent because they are a stutterer or as a result of neurogenic dysfunction but developmental dysfluency is normal in children as they work to acquire language skills and semantic/syntactic processing.

The origin of stuttering is not yet fully understood but parents/adults can mitigate the risk of developmental dysfluency by reducing the conversational demands on their child. Modeling slow, smooth speech and acknowledging the demanding and complex nature of learning language can help.

Background

Speech is a complicated achievement that involves a series of cognitive, linguistic, sensorimotor and auditory processes that

generate an in-depth understanding of language and speech. As children grow up their language and vocabulary grows with them. However, as this happens it is possible that the child might begin to demonstrate forms of disfluencies in their speech as they struggle to get words out when they are engaged in conversation or speaking in general.

Preschool children usually go through a period of dysfluency as they attempt to learn linguistic and speech skills. About 10% of these children will experience a speech or language delay that is serious enough to benefit from early referral and assessment by a speech language pathologist (SLP). Normal disfluency begins during a child's intensive language learning years and resolves on its own as the child undergoes growth and development. This is considered the normal phase of language development.

Most children will outgrow the period of dysfluency but those who do not will require speech therapy.Therefore, it is necessary that there is a distinction between childhood dysfleuency, that will likely correct itself and other disorders, such as stuttering. The most common form of dysfluency in children younger than 3 years of age is the repetition of one syllable words or parts of words, especially at the beginning of their sentences as they try to form the sentence correctly ("I-I-I want my toy).

Language learning in some children may be more problematic than that of others. As a child grows, their language and vocabulary will grow with them. Due to the large input they are receiving throughout their development it is inevitable that some forms of dysfluencies will be present in their

communication efforts. These occurrences, however, are normal. When attempting to master our complex spoken language, children's fluency will increase as their proficiency in the language increases. In a similar way to if an adult learns a second language, children may go through the same learning patterns as they learn their first language. Research specifically in computational linguistics has shown that there is a correlation that exists between native language and patterns of dysfluencies that can occur beyond developmental stages. If a child is bilingual, meaning they are learning two languages at once, they are more likely to experience prolonged periods of dysfluency as they try to work out the differences between the two language inputs they have been receiving.

The brain and language development

As a child attempts to develop their language acquisition as one of the most fundamental human traits it is the brain that undergoes the developmental changes. During the phases of language acquisition the brain both stores linguistic information and adapts to the grammatical regularities and irregularities of language. Recent advances in Functional neuroimaging (fMRI) have contributed to the system leave analysis of the brain in relation to linguistic processing.

In order for language to be obtained, there needs to be brain stimulation and memory processes at work in order to form the correct brain pathways. When synapses are stimulated repeatedly that pattern of neural connections is then written into the brain and it becomes a more efficient permanent pathway that allows signals to be quickly transmitted. In terms of language, these pathways need to be created in order to

remember and understand the language and communicate with it. During specific periods in a child's development the brain is active in forming connections for different abilities, one of which being language. Infants start out able to distinguish sound and process different auditory stimuli but after six months they are only able to do so in their native language. As infants hear sounds repeated a different cluster of neurons in the auditory cortex of the brain that responds to sound. During preschool years, the development of syntax and grammar takes place. It is during this period that children begin to exhibit symptoms of developmental dysfluency if they have it. At this point, because they are learning language and other motor activities, their brain take in an overload of information and often will backtrack in language development as they try to pair linguistics to sound and syntax.

Symptoms

Symptoms of developmental dysfluency include the repetition of sounds or pauses between words. These symptoms have generally been noted within children from 18 months to 5 years of age. This may persist for weeks or months but eventually disappears due to the maturation of the child's nervous system. Children with a family history of stuttering are more likely to develop the disorder than those without.

ex.: "Mommy, I am, I am, um, I am..."

Usually, this language dysfluency is a transitional stage that most children will leave behind as they master oral communications. At this point, there is little to no need for any therapeutic intervention. The typical occurrence lies between

the ages of 18 months and 7 years as children pass through stages of speech dysfluency as they learn how to talk. Those with these types of dysfluencies will exhibit the afore mentioned repetitions about once every 10 sentences

Mistiming and stuttering are common ways that developmental dysfluency manifests itself. When a child mistimes, they prolong a certain letter/syllable in the word they are saying, thereby taking much longer for their sentence to be said. Pauses or blocking are another side effect relating to developmental dysfluency. This is when one inserts a silent interval within the word. Revision is similar to this but is the halting completely, mid-flow of a sentence and taking the thought in a different direction. There is evidence to show that this may not only be an issue of speech motor areas but also the auditory cortex. In a MEG study by Beal et al. they found that adults with “persistent developmental stuttering” or PDS, had slower cortical timing than those who spoke completely fluent. This shows us something is wrong in their auditory motor integration. As far as the underlying ailments behind stuttering,, It is not well known whether this side effect has to do with “errors in linguistic planning” or issues with “access or retrieval of linguistic elements” and it could very well involve both issues.

On occasion, children will go beyond the normal dysfluency patterns. Instances like the previously mentioned example indicate that the child is learning to use language. In contrast, children with stuttering disorder, will likely repeat sounds or one-syllable words three or more times. They may also prolong sounds for two or more seconds. In comparison, stuttering can be seen as a process where a word appears to become "stuck,"

and the person may grimace, jerk the head or neck as he struggles to overcome the stutter.

Typical dysfluency characteristics:

- Repeating phrases (eg. "he ate-he ate my cookie)
- Use of filler words ("um, uh, like, ah..etc")
- No tension of physical inability and struggle to speak
- Lack of problematic behaviors when speaking
- No negative reaction or frustration
- Appearance of dysfluencies only last less than 6 months

Children with normal dysfluency tend to have stuttering difficulties that come and go. Generally this is during preschool years and the problem normally ceases altogether by the time a child starts school. Everyone experiences periods of dysfluency - normal speech patterns include about 2-4% interruptions in flow or fluency. Revisions, word and phrase repetitions and interjections are all common in children speech (see typical dysfluencies below) whereas; sound and syllable repetition, sound prolongation and broken words are much more atypical.

Indications for referral to a speech language pathologist:

- Doubt as to the nature of the child's speech changes
- Exhibit of reactions of avoidance or escape (pauses, interjections, eye blinks and head nods)
- Three or more stuttering dysfluencies (eg. b-but, a-and, thi-this) per 100 syllables uttered.

Children may feel a demand to start speaking at a higher level and can have difficulties with speech that exhibits the following patterns:

- Fast paced speech rate with few pauses
- The use of several questions in a sentence
- Interruption
- Lack of learning time
- If their teacher/parent does not listen to them

When those around a child speak too quickly or input several questions within one sentence, the child must engage several cortices (as stated above) as well as comprehension skills in order to verbally respond to the person they are talking to. If the child lacks learning time as they develop, they will be unable to process harder words and hit a stalling point in sentence comprehension.

Normal children may be dysfluent at any time butter likely to increase their dysfluencies when they are tired, excited, upset or being rushed to speak.

The dysfluencies may appear in a cycle meaning that they may increase in frequency for several days or weeks and then be hardly noticeable again for weeks or months and could return again following this until the behavior is outgrown.

Usually, children with normal dysfluencies such as these appear to be unaware that they are occurring and show no signs of surprise or frustration. It is evident that the child is not struggling to speak but rather taking more time than necessary to complete a thought or sentence.

Dysfluency disorders

The following disorders can be diagnosed following the years in which speech pattern disruptions could be the result of developmental dysfluency that is common within the age range of 2–6 years old. There are types of dysfluencies that are normal developmental processes and others that are more abnormal and atypical.

Stuttering

Stuttering is the most common dysfluency disorder. it is an interruption in the flow of speaking characterized by repetitions, sound prolongations, and blocks that change the rhythm of sleep. A disturbance in the normal fluency and time patterning of speech that is inappropriate for the age of the person. Stuttering typically has its origins in childhood. Most who stutter will begin to do so around 2.5 years of age. Approximately 95% of children who stutter will start to do so before the age of 5.

Stuttering symptoms may include dysfluencies such as hesitations, word fillers, nonword fillers, silent pauses, and interjections. All very similar to developmental dysfluency symptoms. Less typical stuttering will include sound/syllable repetitions, prolongations, and blocks. Stuttering can also occur with other speech and sound disorders, and intellectual language disabilities.

Stuttering can greatly interfere with school, work or social interactions. Children who stutter may also experience fear or anxiety about social settings or public speaking. Speech

patterns and behaviors that might signal that a child is potentially going to develop a stuttering disorder can include within-word or part0word repetitions prolonged sounds, avoiding speaking situations, looking frustrated or upset and tense appearance in neck muscles.

If stuttering is familial there is likely a genetic mutation that causes the disorder. Unlike the aforementioned typical dysfluencies, stuttering can be a result of genetics. Mutations on the GNPTAB, GNPTG, and NAGPA have been found to disrupt the signal that directs enzymes to target locations in the brain and cause stuttering in vocal and linguistic processes.

Neurophysiological factors

Recent research has suggested both structural and neurological differences in children who stutter. Neuropsychological factors that contribute to stuttering are as follows:

- Gray and White Matter Differences
- Those with persistent stuttering issues have shown through fMRI studios to have deficiencies in left gray matter volume and reduced white matter in the left hemisphere as well.
- Neural Network Connectivity Differences
- Children who stutter seem to have reduced connectivity in areas that support timing of movement control in the brain which can impact speech planning that is necessary for correct fluency.

- Atypical Lateralization of Hemispheric functions
- Differences present in event related brain usages used for language processing. This suggests that there is presence of atypical lateralization in relation to speech and language functions.

Cluttering

Cluttering (Tachyphemia) is a fluency disorder that can co-occur with stuttering but may also occur individually. When someone is experiencing cluttering disorder their conversation segments may be perceived as too fast, too irregular or both. Other symptoms may include stuttering, language or phonological errors, and attention deficits. It may result from disorganized speech planning or being unsure of what to say.

Both cluttering and stuttering are forms of fluency disorders that develop beyond the key years of about ages 2–6. During these ages, dysfluency is mainly just considered to be developmental dysfluency. Cluttering, unlike stuttering, can be distinguished by little to no physical structure, little to no secondary behaviors, decreased awareness of speech problems and the aforementioned typical dysfluencies such as revisions and interjections.

Both stuttering and cluttering both have a genetic component. About 1/3 of those who stutter will also clutter which can prove even more difficult to overcome with Speech therapy. A consequence of cluttering is individuals may not be willing to attempt to repair breakdowns in communication which may result in less effective social integration and interactions that can lead to a sense of isolation, anxiety, and depression.

Ductus (linguistics)

In linguistics, **ductus** is the qualities and characteristics of speaking or writing instantiated in the act of speaking or the flow of writing the text. For instance, in writing, ductus includes the direction, sequencing, and speed with which the strokes making up a character are drawn.

Unlike rhythm, ductus is the performative quality that emerges by actuating the metrically arranged language in voice. It is then the specific style and character of the language as it exists within time. While rhythm is tied to tempo, ductus picks up various features of performative language, such as pitch and tone as well. It is for example possible to recognize people by their ductus.

Elocution

Elocution is the study of formal speaking in pronunciation, grammar, style, and tone as well as the idea and practice of effective speech and its forms. It stems from the idea that while communication is symbolic, sounds are final and compelling.

History

In Western classical rhetoric, elocution was one of the five core disciplines of pronunciation, which was the art of delivering speeches. Orators were trained not only on proper diction, but on the proper use of gestures, stance, and dress. (Another area

of rhetoric, elocutio, was unrelated to *elocution* and, instead, concerned the style of writing proper to discourse.)

Elocution emerged as a formal discipline during the eighteenth century. One of its important figures was Thomas Sheridan, actor and father of Richard Brinsley Sheridan. Thomas Sheridan's lectures on elocution, collected in *Lectures on Elocution* (1762) and his *Lectures on Reading* (1775), provided directions for marking and reading aloud passages from literature. Another actor, John Walker, published his two-volume *Elements of Elocution* in 1781, which provided detailed instruction on voice control, gestures, pronunciation, and emphasis.

With the publication of these works and similar ones, elocution gained wider public interest. While training on proper speaking had been an important part of private education for many centuries, the rise in the nineteenth century of a middle class in Western countries (and the corresponding rise of public education) led to great interest in the teaching of elocution, and it became a staple of the school curriculum. American students of elocution drew selections from what were popularly deemed "Speakers." By the end of the century, several Speaker texts circulated throughout the United States, including McGuffey's *New Juvenile Speaker*, the *Manual of Elocution and Reading*, the *Star Speaker*, and the popular *Delsarte Speaker*. Some of these texts even included pictorial depictions of body movements and gestures to augment written descriptions.

The era of the elocution movement, defined by the likes of Sheridan and Walker, evolved in the early and mid-1800s into what is called the scientific movement of elocution, defined in

the early period by James Rush's *The Philosophy of the Human Voice* (1827) and Richard Whately's*Elements of Rhetoric* (1828), and in the later period by Alexander Melville Bell's *A New Elucidation of Principles of Elocution* (1849) and *Visible Speech* (1867).

In her recent book *The Elocutionists: Women, Music, and the Spoken Word* (University of Illinois Press, 2017), Marian Wilson Kimber addresses the oft-forgotten, female-dominated genre of elocution set to musical accompaniment in the United States.

Sample curriculum

An example of this can be seen in the Table of Contents of McGuffey's *New Sixth Eclectic Reader* of 1857:

- Principles of Elocution
- I. Articulation
- II. Inflections
- III. Accent and Emphasis
- IV. Instructions for Reading Verse
- V. The Voice
- VI. Gesture
- *New Sixth Reader*. Exercises in Articulation
- Exercise I. — The Grotto of Antiparos
- Exercise II. — The Thunder Storm
- Exercise III. — Description of a Storm
- IV. Hymn to the Night-Wind
- V. — The Cataract of Lodore
- On Inflection
- VI. — Industry Necessary for the Orator
- VII. — The Old House Clock [*etc.*]

Modern elocution

Jason Munsell, a communications and speech professor, theorizes that part of elocution is strategic movement and visuals. This is suggested due to a major portion of communication occurring digitally.

Emotional prosody

Emotional prosody or **affective prosody** is the various non-verbal aspects of language that allow people to convey or understand emotion. It includes an individual's tone of voice in speech that is conveyed through changes in pitch, loudness, timbre, speech rate, and pauses. It can be isolated from semantic information, and interacts with verbal content (e.g. sarcasm). Emotional prosody in speech is perceived or decoded slightly worse than facial expressions but accuracy varies with emotions. Anger and sadness are perceived most easily, followed by fear and happiness, with disgust being the most poorly perceived.

Production of vocal emotion

Studies have found that some emotions, such as fear, joy and anger, are portrayed at a higher frequency than emotions such as sadness.

- Anger: Anger can be divided into two types: "anger" and "hot anger". In comparison to neutral speech, anger is produced with a lower pitch, higher

intensity, more energy (500 Hz) across the vocalization, higher first formant (first sound produced) and faster attack times at voice onset (the start of speech). "Hot anger", in contrast, is produced with a higher, more varied pitch, and even greater energy (2000 Hz).

- Disgust: In comparison to neutral speech, disgust is produced with a lower, downward directed pitch, with energy (500 Hz), lower first formant, and fast attack times similar to anger. Less variation and shorter durations are also characteristics of disgust.
- Fear: Fear can be divided into two types: "panic" and "anxiety". In comparison to neutral speech, fearful emotions have a higher pitch, little variation, lower energy, and a faster speech rate with more pauses.
- Sadness: In comparison to neutral speech, sad emotions are produced with a higher pitch, less intensity but more vocal energy (2000 Hz), longer duration with more pauses, and a lower first formant.

Perception of vocal emotion

Decoding emotions in speech includes three (3) stages: determining acoustic features, creating meaningful connections with these features, and processing the acoustic patterns in relation to the connections established. In the processing stage, connections with basic emotional knowledge is stored separately in memory network specific to associations. These associations can be used to form a baseline for emotional expressions encountered in the future. Emotional meanings of

speech are implicitly and automatically registered after the circumstances, importance and other surrounding details of an event have been analyzed.

On average, listeners are able to perceive intended emotions exhibited to them at a rate significantly better than chance (chance=approximately 10%). However, error rates are also high. This is partly due to the observation that listeners are more accurate at emotional inference from particular voices and perceive some emotions better than others. Vocal expressions of anger and sadness are perceived most easily, fear and happiness are only moderately well-perceived, and disgust has low perceptibility.

The brain in vocal emotions

Language can be split into two components: the verbal and vocal channels. The verbal channel is the semantic content made by the speaker's chosen words. In the verbal channel, the semantic content of the speakers words determines the meaning of the sentence. The way a sentence is spokenhowever, can change its meaning which is the vocal channel. This channel of language conveys emotions felt by the speaker and gives us as listeners a better idea of the intended meaning. Nuances in this channel are expressed through intonation, intensity, a rhythm which combined for prosody. Usually these channels convey the same emotion, but sometimes they differ. Sarcasm and irony are two forms of humor based on this incongruent style.

Neurological processes integrating verbal and vocal (prosodic) components are relatively unclear. However, it is assumed that

verbal content and vocal are processed in different hemispheres of the brain. Verbal content composed of syntactic and semantic information is processed the left hemisphere. Syntactic information is processed primarily in the frontal regions and a small part of the temporal lobe of the brain while semantic information is processed primarily in the temporal regions with a smaller part of the frontal lobes incorporated. In contrast, prosody is processed primarily in the same pathway as verbal content, but in the right hemisphere. Neuroimaging studies using functional magnetic resonance imaging (fMRI) machines provide further support for this hemisphere lateralization and temporo-frontal activation. Some studies however show evidence that prosody perception is not exclusively lateralized to the right hemisphere and may be more bilateral. There is some evidence that the basal ganglia may also play an important role in the perception of prosody.

Impairment of emotion recognition

Deficits in expressing and understanding prosody, caused by right hemisphere lesions, are known as aprosodias. These can manifest in different forms and in various mental illnesses or diseases. Aprosodiacan be caused by stroke and alcohol abuse as well. The types of aprosodiainclude: motor (the inability to produce vocal inflection), expressive (when brain limitations and not motor functions are the cause of this inability), and receptive (when a person cannot decipher the emotional speech).

It has been found that it gets increasingly difficult to recognize vocal expressions of emotion with increasing age. Older adults have slightly more difficulty labeling vocal expressions of

emotion, particularly sadness and anger than young adults but have a much greater difficulty integrating vocal emotions and corresponding facial expressions. A possible explanation for this difficulty is that combining two sources of emotion requires greater activation of emotion areas of the brain, in which adults show decreased volume and activity. Another possible explanation is that hearing loss could have led to a mishearing of vocal expressions. High frequency hearing loss is known to begin occurring around the age of 50, particularly in men.

Because the right hemisphere of the brain is associated with prosody, patients with right hemisphere lesions have difficulty varying speech patterns to convey emotion. Their speech may therefore sound monotonous. In addition, people with right-hemisphere damage have been studied to be impaired when it comes to identifying the emotion in intoned sentences.

Difficulty in decoding both syntactic and affective prosody is also found in people with autism spectrum disorder and schizophrenia, where "patients have deficits in a large number of functional domains, including social skills and social cognition. These social impairments consist of difficulties in perceiving, understanding, anticipating and reacting to social cues that are crucial for normal social interaction." This has been determined in multiple studies, such as Hoekert et al.'s 2017 study on emotional prosody in schizophrenia, which illustrated that more research must be done to fully confirm the correlation between the illness and emotional prosody. However, people with schizophrenia have no problem deciphering non-emotional prosody.

Non-linguistic emotional prosody

Emotional states such as happiness, sadness, anger, and disgust can be determined solely based on the acoustic structure of a non-linguistic speech act. These acts can be grunts, sighs, exclamations, etc. There is some research that supports the notion that these non-linguistic acts are universal, eliciting the same assumptions even from speakers of different languages.

In addition, it has been proven that emotion can be expressed in non-linguistic vocalizations differently than in speech. As Lauka et al. state: Speech requires highly precise and coordinated movement of the articulators (e.g., lips, tongue, and larynx) in order to transmit linguistic information, whereas non-linguistic vocalizations are not constrained by linguistic codes and thus do not require such precise articulations. This entails that non-linguistic vocalizations can exhibit larger ranges for many acoustic features than prosodic expressions.

In their study, actors were instructed to vocalize an array of different emotions without words. The study showed that listeners could identify a wide range of positive and negative emotions above chance. However, emotions like guilt and pride were less easily recognized.

In a 2015 study by VerenaKersken, Klaus Zuberbühler and Juan-Carlos Gomez, non-linguistic vocalizations of infants were presented to adults to see if the adults could distinguish from infant vocalizations indicating requests for help, pointing to an object, or indicating an event. Infants show different

prosodic elements in crying, depending on what they are crying for. They also have differing outbursts for positive and negative emotional states. Decipherment ability of this information was determined to be applicable across cultures and independent of the adult's level of experience with infants.

Sex differences

Men and women differ in both how they use language and also how they understand it. It is known that there is a difference in the rate of speech, the range of pitch, and the duration of speech, and pitch slope (Fitzsimmons et al.). For example, "In a study of relationship of spectral and prosodic signs, it was established that the dependence of pitch and duration differed in men and women uttering the sentences in affirmative and inquisitive intonation. Tempo of speech, pitch range, and pitch steepness differ between the genders" (Nesic et al.). One such illustration is how women are more likely to speak faster, elongate the ends of words, and raise their pitch at the end of sentences.

Women and men are also different in how they neurologically process emotional prosody. In an fMRI study, men showed a stronger activation in more cortical areas than female subjects when processing the meaning or manner of an emotional phrase. In the manner task, men had more activation in the bilateral middle temporal gyri. For women, the only area of significance was the right posterior cerebellar lobe. Male subjects in this study showed stronger activation in the prefrontal cortex, and on average needed a longer response time than female subjects. This result was interpreted to mean that men need to make conscious inferences about the acts

and intentions of the speaker, while women may do this sub-consciously. Therefore, men needed to integrate linguistic semantics and emotional intent "at a higher stage than the semantic processing stage."

Considerations

Most research regarding vocal expression of emotion has been studied through the use of synthetic speech or portrayals of emotion by professional actors. Little research has been done with spontaneous, "natural" speech samples.

These artificial speech samples have been considered to be close to natural speech but specifically portrayals by actors may be influenced stereotypes of emotional vocal expression and may exhibit intensified characteristics of speech skewing listeners perceptions.

Another consideration lies in listeners individual perceptions. Studies typically take the average of responses but few examine individual differences in great depth. This may provide a better insight into the vocal expressions of emotions.

Illeism

Illeism/و و li.و zəm/ (from Latin*ille* meaning "he, that") is the act of referring to oneself in the third person instead of first person. It is sometimes used in literature as a stylistic device. In real-life usage, illeism can reflect a number of different stylistic intentions or involuntary circumstances.

In literature

Early literature such as Julius Caesar's *Commentarii de Bello Gallico* or Xenophon's *Anabasis*, both ostensibly non-fictional accounts of wars led by their authors, used illeism to impart an air of objective impartiality, which included justifications of the author's actions. In this way personal bias is presented, albeit dishonestly, as objectivity.

In an essay, theologian Richard B. Hays challenged earlier findings that he disagrees with: "These were the findings of one Richard B. Hays, and the newer essay treats the earlier work and earlier author at arms' length."

Illeism may also be used to show idiocy, as with the character Mongo in *Blazing Saddles*, e.g. "Mongo like candy" and "Mongo only pawn in game of life"; though it may also show innocent simplicity, as it does with Harry Potter's Dobby the Elf ("Dobby has come to protect, even if he does have to shut his ears in the oven door").

In everyday speech

In different contexts, illeism can be used to reinforce self-promotion, as used to sometimes comic effect by Bob Dole throughout his political career ("When the president is ready to deploy, Bob Dole is ready to lead the fight on the Senate Floor", Bob Dole speaking about the Strategic Defense Initiative at the NCPAC convention, 1987). This was particularly made notable during the United States presidential election of 1996 and lampooned broadly in popular media for

years afterwards. Deepanjana Pal of *Firstpost* noted that speaking in the third person "is a classic technique used by generations of Bollywoodscriptwriters to establish a character's aristocracy, power and gravitas".

On the other hand, third person self-referral can be associated with self-irony and not taking oneself too seriously (since the excessive use of pronoun "I" is often seen as a sign of narcissism and egocentrism), as well as with eccentricity in general. Psychological studies show that thinking and speaking of oneself in the third person increases wisdom and has a positive effect on one's mental state because an individual who does so is more intellectually humble, more capable of empathy and understanding the perspectives of others, and is able to distance emotionally from onesown problems. Accordingly, in certain Eastern religions, like Hinduism, illeismis sometimes seen as a sign of enlightenment, since through it, an individual detaches their eternal self (atman) from their bodily form; in particular, Jnana yoga encourages its practitioners to refer to themselves in the third person. Known illeists of that sort include Swami Ramdas, Ma Yoga Laxmi, Anandamayi Ma, and Mata Amritanandamayi.

A number of celebrities, including Marilyn Monroe, Alice Cooper, and Deanna Durbin, referred to themselves in the third person to distance their public persona from their actual self.

Some parents use illeism (refer to themselves as "Daddy" or "Mommy") because very young children may not yet understand that the pronouns "I" and "you" refer to different people based on context.

Notable illeists

Real people

Politics

- Julius Caesar's *Commentarii de Bello Gallico* (58–49 BC) present the author's exploits in the Gallic War in the third person.
- Henry Adams (1838-1918), historian, author and descendant of presidents John Adams and John Quincy Adams, throughout his autobiography *The Education of Henry Adams* (1918)
- General Douglas MacArthur (1880–1964) was known to refer to himself as "MacArthur" in telling stories involving himself
- Charles de Gaulle (1890–1970), president of France
- Richard Nixon (1913–94), 37th president of the United States
- Bob Dole (born 1923), during his United States presidential campaign in 1996
- Mikhail Gorbachev (born 1931), Russian politician, President of USSR
- Paulo Maluf (born 1931), Brazilian politician
- Bernie Sanders (born 1941) used third person in his presidential campaign in 2016.
- Donald Trump (born 1946) used the third person repeatedly during his presidency.
- Silvio Berlusconi (born 1936), Italian politician, Prime minister (1994-1995; 2001-2006; 2008–2011)
- Herman Cain (1945–2020), during his United States presidential campaign in 2012

- Narendra Modi (born 1950), Prime Minister of India
- Anthony Garotinho (born 1960), Brazilian politician
- Roy Kwong Chun-yu (born 1983), District Councilor and legislator of Hong Kong
- Chen Shui-bian, former President of the Republic of China (Taiwan)

Sports

- After pitching Game 5 of the ALDS, Johnny Cueto (b. 1986) gave a post game interview in the third person.
- Gregg Easterbrook (b. 1953), sports journalist, refers to himself as "TMQ" or "your columnist" in his weekly Tuesday Morning Quarterback columns.
- Zlatan Ibrahimović (b. 1981), Swedish footballer
- LeBron Jamesmade several references to himself in the third person during *The Decision* program on ESPN in 2010.
- Rickey Henderson (b. 1958), baseball left fielder, occasionally referred to himself as "Rickey".
- Karl Malone (b. 1963), basketball player
- Diego Maradona (1960–2020), Argentinian footballer
- LotharMatthäus (b. 1961), German football manager and former player, is quoted with the phrase: "A LotharMatthäus does not let himself be beaten by his body. A LotharMatthäus decides on his fate himself."
- Cam Newton (b. 1989), NFL quarterback, referred to himself in third person during his press conference at the NFL Combine in 2011.
- Pelé (b. 1940), Brazilian footballer
- Billy Davies (b. 1964), Scottish footballer and manager

Entertainment

- Alice Cooper
- Flavor Flav
- Dwayne Johnson referenced himself in the third person as The Rock during his pro wrestling career, particularly with the catchphrases "The Rock says" and "Do you smell what The Rock is cookin'?"
- Gina Lollobrigida
- HedyLamarr
- Jean Harlow
- Deanna Durbin
- Marilyn Monroe
- Lila Morillo
- Mister Lobo
- Mr. T
- MF Doom
- Noel Edmonds

Religion and spirituality

- Anandamayi Ma
- Buddha sometimes refers to himself as either, "The Buddha," or "The Tathagata."
- Sathya Sai Baba
- Mata Amritanandamayi
- Swami Ramdas
- Rama Tirtha
- Ma Yoga Laxmi, the secretary of Osho
- Jesus Christ is found referring to Himself as "Jesus" (as well as the "Son of Man"), as in John 17:1–3.

Other

- Salvador Dalí in his interview with Mike Wallace, also known as *The Mike Wallace Interview*, on April 19, 1958.
- Norman Mailer's non-fiction work, *The Fight* (1975), refers to the author in the third person throughout *The Fight*, explaining why he has chosen to do so at the beginning of the book.

Fictional characters

Books

- Major Bagstock, the apoplectic retired Indian army officer from Charles Dickens' *Dombey and Son* (1848) refers to himself solely as Joseph, Old Joe, Joey B, Bagstock, Josh, J.B., Anthony Bagstock, and other variants of his own name.
- Captain Hook in J. M. Barrie's *Peter Pan and Wendy* (1911): "'Better for Hook,' he cried, 'if he had had less ambition!' It was in his darkest hours only that he referred to himself in the third person."
- Winnetou, a Native American character in the eponymous novel by Karl May.
- HerculePoirot, a fictional Belgian detective created by British writer Agatha Christie, usually refers to himself in the third person.
- Gollum from *The Lord of the Rings* (1954–5) spoke in an idiosyncratic manner, often referring to himself in the third person, and frequently talked to himself—"through having no one else to speak to", as Tolkien put it in *The Hobbit*.

- Charlie from the acclaimed novel *Flowers for Algernon* (1959) speaks in third person in the "being outside one's body and watching things happen" manner in his flashbacks to his abusive and troubled childhood suffering from phenylketonuria.
- Boday, a quirky female artist from Jack Chalker's*Changewinds* trilogy (1987–8).
- Y. T., a teenage girl from *Snow Crash* (1992) by Neal Stephenson.
- Bast the Wood Elf from *The Council Wars* series by John Ringo.
- The healer and wisewoman Magda Digby from the *Owen Archer* series (1993–2019) by Candace Robb.
- JaqenH'ghar, an assassin of the Faceless Men in the fantasy suite *A Song of Ice and Fire* (1996–), consistently refers to himself ("a man") and sometimes the person he is addressing (i.e. "a girl") in third person.
- Dobby the Elf in the *Harry Potter* series (1997–2007).
- Ramona, the housekeeper and mentor in Silver Ravenwolf's*Witches Chillers* series (2000–1).
- The old man Nakata from Haruki Murakami's *Kafka on the Shore* (2002).

Comics

- Doctor Doomis known for more often than not referring to himself as "Doom" instead of "me" or "I".
- The Hulk
- Mantisalmost always refers to herself as "Mantis", "she", and "this one"; this has to do with her upbringing at the Temple of the Priests of Pama, an

alien pacifistic sect heavily inspired by real-life Eastern religious movements.

Television

- Elmo from *Sesame Street* (1969–present), whose speech is intended to mimic the speech of preschoolers.
- Brian "Bomber" Busbridge, played by Pat Roach, in *Auf Wiedersehen, Pet* (1983–2004)
- Yoshi in *Super Mario World* (1991)
- Jimmy from the episode "The Jimmy" (1995) of *Seinfeld* (1989–98), whose usage leads to confusion about his identity. The usage rubs off on George Costanza, who exclaims "George is getting upset!"
- Bob, played by Saverio Guerra, in *Becker* (1998–2004)
- Stick-up manOmar Little from *The Wire* (2002–8). Examples include "Omar don't scare" and "Omar listening".
- Eddie Alvarez from *The Unusuals* (2009)
- Kenny Powers, from the television show *Eastbound & Down* (2009–13)
- George Remus, a recurring character played by Glenn Fleshler, in *Boardwalk Empire* (2010–2014)
- Lavon Hayes, the mayor from *Hart of Dixie* (2011–5).
- Ice Bear from the animated series *We Bare Bears* (2015–20).
- Lieutenant Terry Jeffords from *Brooklyn Nine-Nine* (2013–present).

Film

- Mr. Miyagi from *The Karate Kid* (1984) sometimes refers to himself as "Miyagi".
- Magua from *The Last of the Mohicans* (1992)
- Dwight, from *Fast & Furious* (2009)
- Francesco Bernoulli, from *Cars 2* (2011)

Manga and anime

- SayuriKurata from *Kanon* (1999–2000) speaks this way in order to separate herself from her past treatment of her little brother, which she regrets.
- Megumi Noda, aka Nodame, the title character from *Nodame Cantabile* (2001–9)
- Rika Shiguma from *Haganai* (2010–2015)

Video games

- Candice, the seventh Gym Leader in the Sinnoh region in *Pokémon Diamond & Pearl*, often uses illeism in her speech, such as "Candice is on fire!"
- Wiggler in *Paper Mario: Sticker Star*
- Guzma, the leader of Team Skull in *Pokémon Sun & Moon*, speaks like this; notable examples are "It's ya boy Guzma!" and "Guzmaaaaaaaaaaaa! What's wrong with you?!"

Imagined speech

Imagined speech (also called **silent speech**, **covert speech**, **inner speech**, or, in the original Latin terminology used by clinicians, **endophasia**) is thinking in the form of sound – "hearing" one's own voice silently to oneself, without the intentional movement of any extremities such as the lips, tongue, or hands. Logically, imagined speech has been possible since the emergence of language, however, the phenomenon is most associated with its investigation through signal processing and detection within electroencephalograph (EEG) data as well as data obtained using alternative non-invasive, brain–computer interface (BCI)devices.

History

In 2008, the US Defense Advanced Research Projects Agency (DARPA) provided a $4 million grant to the University of California (Irvine), with the intent of providing a foundation for synthetic telepathy. According to DARPA, the project "will allow user-to-user communication on the battlefield without the use of vocalized speech through neural signals analysis. The brain generates word-specific signals prior to sending electrical impulses to the vocal cords. These ***imagined speech*** signals would be analyzed and translated into distinct words allowing covert person-to-person communication." In his "Impossible languages" (2016) Andrea Moro discusses the "sound of thoughts" and the relationship between linguistics units and imagined speech, mainly capitalizing on Magrassi et al. (2015) "Sound representation in higher language areas during language production".

DARPA's program outline has three major goals:

- To attempt to identify EEG patterns unique to individual words
- To ensure these patterns are common to different users to avoid extensive device training
- To construct a prototype that would decode the signals and transmit them over a limited range

Detection methods

The process for analyzing subjects' *silent speech* is composed of recording subjects' brain waves, and then using a computer to process the data and determine the content of the subjects' *covert speech*.

Recording

Subject neural patterns (brain waves) can be recorded using BCI devices; currently, use of non-invasive devices, specifically the EEG, is of greater interest to researchers than invasive and partially invasive types. This is because non-invasive types pose the least risk to subject health; EEG's have attracted the greatest interest because they offer the most user-friendly approach in addition to having far less complex instrumentation than that of functional magnetic resonance imaging (fMRI's), another commonly used non-invasive BCI.

Processing

The first step in processing non-invasive data is to remove artifacts such as eye movement and blinking, as well as other

electromyographic activity. After artifact-removal, a series of algorithmsis used to translate raw data into the ***imagined speech*** content. Processing is also intended to occur in real-time—the information is processed as it is recorded, which allows for near-simultaneous viewing of the content as the subject imagines it.

Decoding

Presumably, “thinking in the form of sound” recruits auditory and language areas whose activation profiles may be extracted from the EEG, given adequate processing. The goal is to relate these signals to a template that represents “what the person is thinking about”.

This template could for instance be the acoustic envelope (energy) timeseries corresponding to sound if it were physically uttered. Such linear mapping from EEG to stimulus is an example of neural decoding.

A major problem however is the many variations that the very same message can have under diverse physical conditions (speaker or noise, for example). Hence one can have the same EEG signal, but it is uncertain, at least in acoustic terms, what stimulus to map it to. This in turn makes it difficult to train the relevant decoder.

This process could instead be approached using higher-order (‘linguistic’) representations of the message. The mappings to such representations are non-linear and can be heavily context-dependent, therefore further research may be necessary. Nevertheless, it is known that an 'acoustic' strategy can still be maintained by pre-setting a “template” by making it

known to the listener exactly what message to think about, even if passively, and in a non-explicit form. In these circumstances it is possible to partially decode the acoustic envelope of speech message from neural timeseries if the listener is induced to think in the form of sound.

Challenges

In detection of other imagined actions, such as imagined physical movements, greater brain activity occurs in one hemisphere over the other.

This presence of asymmetrical activity acts as a major aid in identifying the subject's imagined action. In imagined speech detection, equal levels of activity commonly occur in both the left and right hemispheres simultaneously. This lack of lateralization demonstrates a significant challenge in analyzing neural signals of this type.

Another unique challenge is a relatively low signal-to-noise ratio (SNR) in the recorded data. An SNR represents the amount of meaningful signals found in a data set, compared to the amount of arbitrary or useless signals present in the same set.

Artifacts present in EEG data are just one of many significant sources of noise. To further complicate matters, the relative placement of EEG electrodes will vary amongst subjects. This is because the anatomical details of people's heads will differ; therefore, the signals recorded will vary in each subject, regardless of individuals-specific imagined speech characteristics.

Late talker

A **late talker** is a toddler experiencing late language emergence (LLE). LLE can also be an early or secondary sign of an autism spectrum disorder, or other developmental disorders, such as attention deficit hyperactivity disorder, intellectual disability, learning disability, social communication disorder, or specific language impairment. Late talkers are children who are not intellectually disabled, but do not show signs of normal language development for their age. Lack of language development, comprehension skills and challenges with literacy skills are potential risks as late talkers age. Outlook for late talkers with or without intervention is generally favorable. Toddlers have a high probability of catching up to typical toddlers if early language interventions are put in place. Language interventions include general language stimulation, focused language stimulation and milieu teaching.

Speech pathologists are specialists who work with late talkers and provide individualised support for each child's unique needs.

Language development

Expected language emergence

Toddlers aged 1–2 years begin to use and comprehend different types of words. Initially the most prominent types are nouns and eventually they move on to other word types such as verbs and adjectives. Once a toddler has said his first word, he will begin to acquire new words at a rate of roughly one per week

Words will be related to things in the toddler's environment such as body parts, toys, clothes, etc. They will often use one word to mean many different things; for example, they may call all types of transport 'car'.

Around the 15-month mark toddlers will know six words on average, and begin to notice and wonder about things that are a little outside of their environment. Once they reach 18 months, they refer to themselves by their name and eventually start using the pronoun 'I'. During this stage, they will also repeat parts of sentences they hear. As they get close to 2 years, toddlers start putting two words together. They begin to learn the use of "no" and ask adults to tell them the name of people and new objects. On average, a 2-year-old will know 50 words and will then begin to learn new words at a rate of approximately one per day. From 2 to 3 years of age, their vocabulary grows rapidly. At 30 months old they are expected to know around 200 words and by 3 they will be able to participate in very simple conversations.

Late talker's language emergence

Late language emergence (LLE) occurs when a toddler does not produce or comprehend language at the expected rate for their age. About 13% of two-year-olds experience a delay in language emergence. Late talkers differ from toddlers with language development disorders and disabilities in the sense that their only characteristic is that they experience limited expressive vocabulary for their age, as opposed to, lack of receptive language or cognitive abilities. LLE can be an indicator of other kinds of disorders or disabilities. If a late talker is not catching-up to typical talkers by the age of 4, they could have

specific language impairment. Expressive language screening between the ages of 18-35 months help determine if LLE is "secondary to autism spectrum disorder, intellectual disability, hearing impairment, receptive language delay, or demographic risk".

When compared to typical talkers, 24-month-old late talkers do not seem to struggle with verbs and their formation, which are an important part of one's grammatical development. They struggle with nouns more than a typical talker and have difficulty combining words. Late talkers perform lower than typical talkers in cognitive functioning and receptive language skills.

Signs and symptoms

A toddler is at risk of being a late talker if:

- They produced abnormal babbling from 9 to 21 months of age.
- By 15 months they are not producing six or more words.
- By 18 months they do not appear to comprehend more words than they can produce.
- At 18 months old they're using less than 20 words and lack knowledge of different word-types.
- At 24 months old, they're using less than 50 words and are not combining words from different word classes.
- After producing their first word, they demonstrate a lack of "complex syllable structures, lower

percentage of consonants correct, and smaller consonant and vowel inventories".

- They show a lack of comprehension and insist on communicating using gestures.
- Between 2 and 3 years of age, they're using short sentences with very simple grammar.

Diagnosis

LLE could be a sign of other types of language disorders or intellectual disabilities, so there is a risk of misdiagnosing a child as just being a late talker. This symptom may be secondary to: problems with their vocal tract or hearing, autism, neglect or abuse. In order for toddlers to be diagnosed as late talkers, they need to see a doctor and a speech pathologist.

A doctor will conduct a full medical examination and a speech pathologist will do a full screening and comprehensive assessment. The Language Development Survey (LDS) is a prevalent screening method used on toddlers aged 18-35 months of age. This tests to see if a child's expressive vocabulary and syntax is developing in a standard way. The LDS consists of a parent or carer of the child to report on the child's language development in regards to word combination. This screening takes a total of ten minutes. It also takes risk factors into consideration such as, the child's demographic and history. This test, combined with other forms of assessment, will determine whether a child is a late talker, or if their language delay is associated with another type of language disorder or intellectual disability.

Types of assessment

Assessments are carried out in order to determine the speech and language ability of a child. A speech pathologist works with the parent or carer of the child to decide on the most appropriate assessment.

Ethnographic interviewing

Ethnographic interviewing is a style of assessment that consists of one-on-one interviews between the assessor and assessed. It requires the assessor to ask the child open-ended questions to find information about the child's environment.

Language sampling

Language sampling is utilised to obtain random samples of a child's language during play, conversation or narration. Language sampling must be used with standardized assessments to compare and diagnose a child as a late talker.

Dynamic assessment

Dynamic assessment involves testing, teaching and retesting a child. Firstly, the child's knowledge is tested. Then, the child is taught a word. Finally, the child is retested to see if he has learnt the target language.

This type of assessment is useful in determining whether a child is a late talker or if his language delay is a factor of another kind of disorder.

Standardised assessments

Norm-referenced test

A norm-referenced test consists of comparing and raking a child's scores to others. This allows a child's results to be compared to a statistical standard. A child can be at risk of being a late talker if his test results are on the lower end of the scale compared to other test takers.

Criterion-referenced test

A criterion-referenced test consists of comparing a child's scores to a pre-set standard. A child's scores are taken and analysed to see if they meet the criteria of a typically developing child. This test can be carried out formally or informally.

Observation techniques

Analog tasks

Analog tasks consist of the assessor observing the child participate in play in a staged environment that simulates a real-world situation. The assessor can take note of the child's behaviour and language performance, and use it to diagnose the child.

Naturalistic observation

Naturalistic observation involves observing a child's interaction with others in a trivial social setting. It is often used with criterion-referenced assessments to diagnose a child.

Systematic observation and contextual analysis

Systematic Observation and Contextual Analysis consists of observing the child in a mixture of contexts. The child is observed while doing a task, playing or interacting with others. Conclusions are then drawn of his language function and problems are identified if present.

Culture and assessment

When choosing tests and assessments for a child, culture is taken in to consideration. The assessments carried out on the child needs to be appropriate for the child's cultural setting. Tests cannot be translated as this affects the data and can result in a child being misdiagnosed.

For children who speak more than one language, assessments need to be catered to that. A standardized test is not enough to diagnose a child who is bilingual.

Bilingual children need to be assessed using a combination of ethnographic interviewing, language sampling, dynamic assessment, standardised tests and observation techniques to be accurately diagnosed as a late talker.

Treatment

The earlier interventions are put in place to help a toddler overcome LLE, the better the outcome. Language interventions (with the help of speech pathologists) are needed, so late talkers eventually catch-up. Some common approaches are monitoring, indirect and direct language stimulation. Late

talkers struggle with learning vocabulary and phonological acquisition. Targeting vocabulary and increasing their vocabulary bank, will simultaneously improve their phonological development. When deciding which approach to take in treating a toddler, cultural background needs to be taken into consideration. Some types of intervention may work for some cultures, but may not work nor be appropriate for others.

Language intervention

Late talkers can be treated with a variety of language intervention methods. The earlier a child is diagnosed and treated the better his language skills will develop when growing up.

General language stimulation

General Language Stimulation involves providing the child with an environment that is full of language stimulation. This includes giving the child the opportunity to participate in reading books, playing, cooking and other everyday activities the child is interested in.

The key to this intervention is to follow the late talker's lead. Once a child is interested in a specific object the parent or carer will then take part in parallel talk, that is, talking about the object rather than directly modelling the word.

The parent or carer is then required to repeat the child's utterance, regardless of how incorrect it is, and complement this with semantic and grammatical detail.

Focused language stimulation

Focused language stimulation requires the parent or carer to have a list of goal words for the child to learn and produce. The average number of target words is ten, but this will vary from child to child. The parent or carer will then have to allow the child to be exposed to the target language as much as possible. The adult has to produce the target language in a meaningful and functional context such as, in a sentence or question form. The child is then prompted (not instructed) to repeat the target word. If the target word is produced incorrectly, the parent follows with a recast. Once the child has learnt these words the adult replaces these with new ones and the process is repeated.

Milieu teaching

Milieu Teaching involves changing the child's environment to give him as many opportunities to talk and produce the target language. In this intervention method it is necessary to have a set of language goals for the child to achieve. Incorrect production of target language follows by the adult modelling the word for the child to imitate. Correct production of target language follows by the adult providing a recast.

Culture and treatment

Culture diversity is a considerable factor in choosing the right type of intervention for a child. Speech pathologist are the ones responsible for choosing a treatment that is culturally appropriate for the child and his family. Treatments such as General Language Stimulation, Focused language stimulation

and Milieu Teaching are designed appropriately to meet the needs of the majority in the United States. These methods are adapted to meet the needs of other cultures in the community for the child to have a higher success rate. The nature and context of social interactions is observed when modifying a standard treatment to meet the norms of a child's culture and background. For example, in some cultures it is not common for parents to be so involved in play with their child. The treatment is then adapted for other family members (siblings, cousins, other peers) to deliver the intervention. The location where these treatments are usually provided is the family home. In many cultures this is seen as unacceptable. Treatments for these kinds of situations are modified and options such as, schools are considered as a place to undertake treatment.

Outcomes

Once late talkers enter kindergarten, most begin to catch-up and present language ability within the typical talker range. Late talkers tend to demonstrate poorer language ability and be at the lower end of the normal range than typical talkers. Late talkers exhibit considerably lower scorers on language measures than typical talkers once they reach adolescence. Around 50% to 70% of children who experience LLE reach normal language level by the time they enter school. Their chances of successfully catching up decrease when language delay is still present by the time they are three years old. This is only the case for 5-8% of preschool children.

Chapter 3

Part of Speech

In traditional grammar, a **part of speech** or **part-of-speech** (abbreviated as **POS** or **PoS**) is a category of words (or, more generally, of lexical items) that have similar grammatical properties. Words that are assigned to the same part of speech generally display similar syntactic behavior—they play similar roles within the grammatical structure of sentences—and sometimes similarmorphology in that they undergo inflection for similar properties.

Commonly listed English parts of speech are noun, verb, adjective, adverb, pronoun, preposition, conjunction, interjection, numeral, article, or determiner. Other Indo-European languages also have essentially all these word classes; one exception to this generalization is that Latin, Sanskrit and most Slavic languages do not have articles. Beyond the Indo-European family, such other European languages as Hungarian and Finnish, both of which belong to the Uralic family, completely lack prepositions or have only very few of them; rather, they have postpositions.

Other terms than *part of speech*—particularly in modern linguistic classifications, which often make more precise distinctions than the traditional scheme does—include **word class**, **lexical class**, and **lexical category**. Some authors restrict the term *lexical category* to refer only to a particular type of syntactic category; for them the term excludes those parts of speech that are considered to be functional, such as pronouns. The term **form class**is also used, although this has

various conflicting definitions. Word classes may be classified as open or closed: *open classes* (typically including nouns, verbs and adjectives) acquire new members constantly, while *closed classes* (such as pronouns and conjunctions) acquire new members infrequently, if at all. Almost all languages have the word classes noun and verb, but beyond these two there are significant variations among different languages. For example:

- Japanese has as many as three classes of adjectives, where English has one.
- Chinese, Korean, Japanese and Vietnamese have a class of nominal classifiers.
- Many languages do not distinguish between adjectives and adverbs, or between adjectives and verbs (see stative verb).

Because of such variation in the number of categories and their identifying properties, analysis of parts of speech must be done for each individual language. Nevertheless, the labels for each category are assigned on the basis of universal criteria.

History

The classification of words into lexical categories is found from the earliest moments in the history of linguistics.

India

In the *Nirukta*, written in the 5th or 6th century BCE, the Sanskrit grammarian Yāska defined four main categories of words:

- नाम*nāma* – noun (including adjective)
- आख्यात*ākhyāta* – verb
- उपसर्ग*upasarga* – pre-verb or prefix
- निपात*nipāta* – particle, invariant word (perhaps preposition)

These four were grouped into two larger classes: inflectable (nouns and verbs) and uninflectable (pre-verbs and particles).

The ancient work on the grammar of the Tamil language, *Tolkāppiyam*, argued to have been written around 2,500 years ago, classifies Tamil words as *peyar* (பெயர்; noun), *vinai* (வினை; verb), *idai* (part of speech which modifies the relationships between verbs and nouns), and *uri* (word that further qualifies a noun or verb).

Western tradition

A century or two after the work of Yāska, the Greek scholar Plato wrote in his *Cratylus* dialog, "sentences are, I conceive, a combination of verbs [*rhêma*] and nouns [*ónoma*]". Aristotle added another class, "conjunction" [*sýndesmos*], which included not only the words known today as conjunctions, but also other parts (the interpretations differ; in one interpretation it is pronouns, prepositions, and the article).

By the end of the 2nd century BCE, grammarians had expanded this classification scheme into eight categories, seen in the *Art of Grammar*, attributed to Dionysius Thrax:

- Noun (*ónoma*): a part of speech inflected for case, signifying a concrete or abstract entity

- Verb (*rhêma*): a part of speech without case inflection, but inflected for tense, person and number, signifying an activity or process performed or undergone
- Participle (*metokh*): a part of speech sharing features of the verb and the noun
- Article (*árthron*): a declinable part of speech, taken to include the definite article, but also the basic relative pronoun
- Pronoun (*antōnymíā*): a part of speech substitutable for a noun and marked for a person
- Preposition (*próthesis*): a part of speech placed before other words in composition and in syntax
- Adverb (*epírrhēma*): a part of speech without inflection, in modification of or in addition to a verb, adjective, clause, sentence, or other adverb
- Conjunction (*sýndesmos*): a part of speech binding together the discourse and filling gaps in its interpretation

It can be seen that these parts of speech are defined by morphological, syntactic and semantic criteria.

The Latin grammarian Priscian (fl. 500 CE) modified the above eightfold system, excluding "article" (since the Latin language, unlike Greek, does not have articles) but adding "interjection".

The Latin names for the parts of speech, from which the corresponding modern English terms derive, were *nomen*, *verbum*, *participium*, *pronomen*, *praepositio*, *adverbium*, *conjunctio* and *interjectio*. The category *nomen* included substantives (*nomensubstantivum*, corresponding to what are

today called nouns in English), adjectives*(nomenadjectivum)* and numerals*(nomennumerale)*. This is reflected in the older English terminology *noun substantive*, *noun adjective* and *noun numeral*. Later the adjective became a separate class, as often did the numerals, and the English word *noun* came to be applied to substantives only.

Works of English grammar generally follow the pattern of the European tradition as described above, except that participles are now usually regarded as forms of verbs rather than as a separate part of speech, and numerals are often conflated with other parts of speech: nouns (cardinal numerals, e.g., "one", and collective numerals, e.g., "dozen"), adjectives (ordinal numerals, e.g., "first", and multiplier numerals, e.g., "single") and adverbs (multiplicative numerals, e.g., "once", and distributive numerals, e.g., "singly"). Eight or nine parts of speech are commonly listed:

- noun
- verb
- adjective
- adverb
- pronoun
- preposition
- conjunction
- interjection
- article or (more recently) determiner

Some modern classifications define further classes in addition to these. For discussion see the sections below.

The classification below, or slight expansions of it, is still followed in most dictionaries:

- Noun (names)
- a word or lexical item denoting any abstract (abstract noun: e.g. *home*) or concrete entity (concrete noun: e.g. *house*); a person (*police officer*, *Michael*), place (*coastline*, *London*), thing (*necktie*, *television*), idea (*happiness*), or quality (*bravery*). Nouns can also be classified as count nouns or non-count nouns; some can belong to either category. The most common part of speech; they are called naming words.
- Pronoun (replaces or places again)
- a substitute for a noun or noun phrase (*them, he*). Pronouns make sentences shorter and clearer since they replace nouns.
- Adjective (describes, limits)
- a modifier of a noun or pronoun (*big, brave*). Adjectives make the meaning of another word (noun) more precise.
- Verb (states action or being)
- a word denoting an action (*walk*), occurrence (*happen*), or state of being (*be*). Without a verb a group of words cannot be a clause or sentence.
- Adverb (describes, limits)
- a modifier of an adjective, verb, or another adverb (*very, quite*). Adverbs make language more precise.
- Preposition (relates)
- a word that relates words to each other in a phrase or sentence and aids in syntactic context (*in, of*). Prepositions show the relationship between a noun or a pronoun with another word in the sentence.
- Conjunction (connects)

- a syntactic connector; links words, phrases, or clauses (*and, but*). Conjunctions connect words or group of words
- Interjection (expresses feelings and emotions)
- an emotional greeting or exclamation (*Huzzah, Alas*). Interjections express strong feelings and emotions.
- Article (describes, limits)
- a grammatical marker of definiteness (*the*) or indefiniteness (*a, an*). The article is not always listed among the parts of speech. It is considered by some grammarians to be a type of adjective or sometimes the term 'determiner' (a broader class) is used.

English words are not generally marked as belonging to one part of speech or another; this contrasts with many other European languages, which use inflection more extensively, meaning that a given word form can often be identified as belonging to a particular part of speech and having certain additional grammatical properties. In English, most words are uninflected, while the inflected endings that exist are mostly ambiguous: *-ed* may mark a verbal past tense, a participle or a fully adjectival form; *-s* may mark a plural noun, a possessive noun, or a present-tense verb form; *-ing* may mark a participle, gerund, or pure adjective or noun. Although *-ly* is a frequent adverb marker, some adverbs (e.g. *tomorrow*, *fast*, *very*) do not have that ending, while many adjectives do have it (e.g. *friendly*, *ugly*, *lovely*), as do occasional words in other parts of speech (e.g. *jelly*, *fly*, *rely*).

Many English words can belong to more than one part of speech. Words like *neigh*, *break*, *outlaw*, *laser*, *microwave*, and *telephone* might all be either verbs or nouns. In certain

circumstances, even words with primarily grammatical functions can be used as verbs or nouns, as in, "We must look to the *hows* and not just the *whys*." The process whereby a word comes to be used as a different part of speech is called conversion or zero derivation.

Functional classification

Linguists recognize that the above list of eight or nine word classes is drastically simplified. For example, "adverb" is to some extent a catch-all class that includes words with many different functions. Some have even argued that the most basic of category distinctions, that of nouns and verbs, is unfounded, or not applicable to certain languages. Modern linguists have proposed many different schemes whereby the words of English or other languages are placed into more specific categories and subcategories based on a more precise understanding of their grammatical functions.

Common lexical category set defined by function may include the following (not all of them will necessarily be applicable in a given language):

- Categories that will usually be open classes:
- adjectives
- adverbs
- nouns
- verbs (except auxiliary verbs)
- interjections
- Categories that will usually be closed classes:
- auxiliary verbs
- clitics

- coverbs
- conjunctions
- determiners (articles, quantifiers, demonstrative adjectives, and possessive adjectives)
- particles
- measure words or classifiers
- adpositions (prepositions, postpositions, and circumpositions)
- preverbs
- pronouns
- contractions
- cardinal numbers

Within a given category, subgroups of words may be identified based on more precise grammatical properties. For example, verbs may be specified according to the number and type of objects or other complements which they take. This is calledsubcategorization.

Many modern descriptions of grammar include not only lexical categories or word classes, but also *phrasal categories*, used to classify phrases, in the sense of groups of words that form units having specific grammatical functions. Phrasal categories may include noun phrases (NP), verb phrases (VP) and so on. Lexical and phrasal categories together are calledsyntactic categories.

Open and closed classes

Word classes may be either open or closed. An **open class** is one that commonly accepts the addition of new words, while a **closed class** is one to which new items are very rarely added.

Open classes normally contain large numbers of words, while closed classes are much smaller. Typical open classes found in English and many other languages are nouns, verbs (excluding auxiliary verbs, if these are regarded as a separate class), adjectives, adverbs and interjections. Ideophones are often an open class, though less familiar to English speakers, and are often open to nonce words. Typical closed classes are prepositions (or postpositions), determiners, conjunctions, and pronouns.

The open–closed distinction is related to the distinction between lexical and functional categories, and to that between content words and function words, and some authors consider these identical, but the connection is not strict. Open classes are generally lexical categories in the stricter sense, containing words with greater semantic content, while closed classes are normally functional categories, consisting of words that perform essentially grammatical functions. This is not universal: in many languages verbs and adjectives are closed classes, usually consisting of few members, and in Japanese the formation of new pronouns from existing nouns is relatively common, though to what extent these form a distinct word class is debated.

Words are added to open classes through such processes as compounding, derivation, coining, and borrowing. When a new word is added through some such process, it can subsequently be used grammatically in sentences in the same ways as other words in its class. A closed class may obtain new items through these same processes, but such changes are much rarer and take much more time. A closed class is normally seen as part of the core language and is not expected to change. In

English, for example, new nouns, verbs, etc. are being added to the language constantly (including by the common process of verbing and other types of conversion, where an existing word comes to be used in a different part of speech). However, it is very unusual for a new pronoun, for example, to become accepted in the language, even in cases where there may be felt to be a need for one, as in the case of gender-neutral pronouns.

The open or closed status of word classes varies between languages, even assuming that corresponding word classes exist. Most conspicuously, in many languages verbs and adjectives form closed classes of content words. An extreme example is found in Jingulu, which has only three verbs, while even the modern Indo-European Persian has no more than a few hundred simple verbs, a great deal of which are archaic. (Some twenty Persian verbs are used as light verbs to form compounds; this lack of lexical verbs is shared with other Iranian languages.) Japanese is similar, having few lexical verbs. Basque verbs are also a closed class, with the vast majority of verbal senses instead expressed periphrastically.

In Japanese, verbs and adjectives are closed classes, though these are quite large, with about 700 adjectives, and verbs have opened slightly in recent years. Japanese adjectives are closely related to verbs (they can predicate a sentence, for instance). New verbal meanings are nearly always expressed periphrastically by appending *suru* (する, to do) to a noun, as in *undōsuru* (運動する, to (do) exercise), and new adjectival meanings are nearly always expressed by adjectival nouns, using the suffix *-na* (ーな) when an adjectival noun modifies a noun phrase, as in *hen-naojisan* (変なおじさん, strange man).

The closedness of verbs has weakened in recent years, and in a few cases new verbs are created by appending *-ru* (ーる) to a noun or using it to replace the end of a word. This is mostly in casual speech for borrowed words, with the most well-established example being *sabo-ru* (サボる, cut class; play hooky), from *sabotāju* (サボタージュ, sabotage). This recent innovation aside, the huge contribution of Sino-Japanese vocabularywas almost entirely borrowed as nouns (often verbal nouns or adjectival nouns). Other languages where adjectives are closed class include Swahili, Bemba, and Luganda.

By contrast, Japanese pronouns are an open class and nouns become used as pronouns with some frequency; a recent example is *jibun* (自分, self), now used by some young men as a first-person pronoun. The status of Japanese pronouns as a distinct class is disputed, however, with some considering it only a use of nouns, not a distinct class. The case is similar in languages of Southeast Asia, including Thai and Lao, in which, like Japanese, pronouns and terms of address vary significantly based on relative social standing and respect.

Some word classes are universally closed, however, including demonstratives and interrogative words.

Part-of-speech tagging

In corpus linguistics, **part-of-speech tagging** (**POS tagging** or **PoS tagging** or **POST**), also called **grammatical tagging** is the process of marking up a word in a text (corpus) as corresponding to a particular part of speech, based on both its definition and its context. A simplified form of this is

commonly taught to school-age children, in the identification of words as nouns, verbs, adjectives, adverbs, etc.

Once performed by hand, POS tagging is now done in the context of computational linguistics, using algorithms which associate discrete terms, as well as hidden parts of speech, by a set of descriptive tags. POS-tagging algorithms fall into two distinctive groups: rule-based and stochastic. E. Brill's tagger, one of the first and most widely used English POS-taggers, employs rule-based algorithms.

Principle

Part-of-speech tagging is harder than just having a list of words and their parts of speech, because some words can represent more than one part of speech at different times, and because some parts of speech are complex or unspoken. This is not rare—in natural languages (as opposed to many artificial languages), a large percentage of word-forms are ambiguous. For example, even "dogs", which is usually thought of as just a plural noun, can also be a verb:

- The sailor dogs the hatch.

Correct grammatical tagging will reflect that "dogs" is here used as a verb, not as the more common plural noun. Grammatical context is one way to determine this; semantic analysis can also be used to infer that "sailor" and "hatch" implicate "dogs" as 1) in the nautical context and 2) an action applied to the object "hatch" (in this context, "dogs" is a nautical term meaning "fastens (a watertight door) securely").

Tag sets

Schools commonly teach that there are 9parts of speech in English: noun, verb, article, adjective, preposition, pronoun, adverb, conjunction, and interjection. However, there are clearly many more categories and sub-categories. For nouns, the plural, possessive, and singular forms can be distinguished. In many languages words are also marked for their "case" (role as subject, object, etc.), grammatical gender, and so on; while verbs are marked for tense, aspect, and other things. In some tagging systems, different inflections of the same root word will get different parts of speech, resulting in a large number of tags. For example, NN for singular common nouns, NNS for plural common nouns, NP for singular proper nouns (see the POS tags used in the Brown Corpus). Other tagging systems use a smaller number of tags and ignore fine differences or model them as features somewhat independent from part-of-speech.

In part-of-speech tagging by computer, it is typical to distinguish from 50 to 150 separate parts of speech for English. Work on stochastic methods for tagging Koine Greek (DeRose 1990) has used over 1,000 parts of speech and found that about as many words were ambiguous in that language as in English. A morphosyntactic descriptor in the case of morphologically rich languages is commonly expressed using very short mnemonics, such as *Ncmsan* for Category=Noun, Type = common, Gender = masculine, Number = singular, Case = accusative, Animate = no.

The most popular "tag set" for POS tagging for American English is probably the Penn tag set, developed in the Penn

Treebank project. It is largely similar to the earlier Brown Corpus and LOB Corpus tag sets, though much smaller. In Europe, tag sets from the Eagles Guidelines see wide use and include versions for multiple languages.

POS tagging work has been done in a variety of languages, and the set of POS tags used varies greatly with language. Tags usually are designed to include overt morphological distinctions, although this leads to inconsistencies such as case-marking for pronouns but not nouns in English, and much larger cross-language differences. The tag sets for heavily inflected languages such as Greek and Latin can be very large; tagging *words* in agglutinative languages such as Inuit languages may be virtually impossible. At the other extreme, Petrov et al. have proposed a "universal" tag set, with 12 categories (for example, no subtypes of nouns, verbs, punctuation, etc.; no distinction of "to" as an infinitive marker vs. preposition (hardly a "universal" coincidence), etc.). Whether a very small set of very broad tags or a much larger set of more precise ones is preferable, depends on the purpose at hand. Automatic tagging is easier on smaller tag-sets.

History

The Brown Corpus

Research on part-of-speech tagging has been closely tied to corpus linguistics. The first major corpus of English for computer analysis was the Brown Corpus developed at Brown University by Henry Kučera and W. Nelson Francis, in the mid-1960s. It consists of about 1,000,000 words of running English

prose text, made up of 500 samples from randomly chosen publications. Each sample is 2,000 or more words (ending at the first sentence-end after 2,000 words, so that the corpus contains only complete sentences).

The Brown Corpus was painstakingly "tagged" with part-of-speech markers over many years. A first approximation was done with a program by Greene and Rubin, which consisted of a huge handmade list of what categories could co-occur at all. For example, article then noun can occur, but article then verb (arguably) cannot.

The program got about 70% correct. Its results were repeatedly reviewed and corrected by hand, and later users sent in errata so that by the late 70s the tagging was nearly perfect (allowing for some cases on which even human speakers might not agree).

This corpus has been used for innumerable studies of word-frequency and of part-of-speech and inspired the development of similar "tagged" corpora in many other languages. Statistics derived by analyzing it formed the basis for most later part-of-speech tagging systems, such as CLAWS (linguistics) and VOLSUNGA. However, by this time (2005) it has been superseded by larger corpora such as the 100 million word British National Corpus, even though larger corpora are rarely so thoroughly curated.

For some time, part-of-speech tagging was considered an inseparable part of natural language processing, because there are certain cases where the correct part of speech cannot be decided without understanding the semantics or even the pragmatics of the context. This is extremely expensive,

especially because analyzing the higher levels is much harder when multiple part-of-speech possibilities must be considered for each word.

Use of hidden Markov models

In the mid-1980s, researchers in Europe began to use hidden Markov models (HMMs) to disambiguate parts of speech, when working to tag the Lancaster-Oslo-Bergen Corpus of British English. HMMs involve counting cases (such as from the Brown Corpus) and making a table of the probabilities of certain sequences. For example, once you've seen an article such as 'the', perhaps the next word is a noun 40% of the time, an adjective 40%, and a number 20%. Knowing this, a program can decide that "can" in "the can" is far more likely to be a noun than a verb or a modal. The same method can, of course, be used to benefit from knowledge about the following words.

More advanced ("higher-order") HMMs learn the probabilities not only of pairs but triples or even larger sequences. So, for example, if you've just seen a noun followed by a verb, the next item may be very likely a preposition, article, or noun, but much less likely another verb.

When several ambiguous words occur together, the possibilities multiply. However, it is easy to enumerate every combination and to assign a relative probability to each one, by multiplying together the probabilities of each choice in turn. The combination with the highest probability is then chosen. The European group developed CLAWS, a tagging program that did exactly this and achieved accuracy in the 93–95% range.

It is worth remembering, as Eugene Charniak points out in *Statistical techniques for natural language parsing* (1997), that merely assigning the most common tag to each known word and the tag "proper noun" to all unknowns will approach 90% accuracy because many words are unambiguous, and many others only rarely represent their less-common parts of speech.

CLAWS pioneered the field of HMM-based part of speech tagging but were quite expensive since it enumerated all possibilities.

It sometimes had to resort to backup methods when there were simply too many options (the Brown Corpus contains a case with 17 ambiguous words in a row, and there are words such as "still" that can represent as many as 7 distinct parts of speech (DeRose 1990, p. 82)).

HMMs underlie the functioning of stochastic taggers and are used in various algorithms one of the most widely used being the bi-directional inference algorithm.

Dynamic programming methods

In 1987, Steven DeRose and Ken Church independently developed dynamic programming algorithms to solve the same problem in vastly less time. Their methods were similar to the Viterbi algorithm known for some time in other fields. DeRose used a table of pairs, while Church used a table of triples and a method of estimating the values for triples that were rare or nonexistent in the Brown Corpus (an actual measurement of triple probabilities would require a much larger corpus). Both methods achieved an accuracy of over 95%. DeRose's 1990 dissertation at Brown University included analyses of the

specific error types, probabilities, and other related data, and replicated his work for Greek, where it proved similarly effective.

These findings were surprisingly disruptive to the field of natural language processing. The accuracy reported was higher than the typical accuracy of very sophisticated algorithms that integrated part of speech choice with many higher levels of linguistic analysis: syntax, morphology, semantics, and so on. CLAWS, DeRose's and Church's methods did fail for some of the known cases where semantics is required, but those proved negligibly rare. This convinced many in the field that part-of-speech tagging could usefully be separated from the other levels of processing; this, in turn, simplified the theory and practice of computerized language analysis and encouraged researchers to find ways to separate other pieces as well. Markov Models are now the standard method for the part-of-speech assignment.

Unsupervised taggers

The methods already discussed involve working from a pre-existing corpus to learn tag probabilities. It is, however, also possible to bootstrap using "unsupervised" tagging. Unsupervised tagging techniques use an untagged corpus for their training data and produce the tagset by induction. That is, they observe patterns in word use, and derive part-of-speech categories themselves. For example, statistics readily reveal that "the", "a", and "an" occur in similar contexts, while "eat" occurs in very different ones. With sufficient iteration, similarity classes of words emerge that are remarkably similar to those human linguists would expect; and the differences

themselves sometimes suggest valuable new insights. These two categories can be further subdivided into rule-based, stochastic, and neural approaches.

Other taggers and methods

Some current major algorithms for part-of-speech tagging include the Viterbi algorithm, Brill tagger, Constraint Grammar, and the Baum-Welch algorithm (also known as the forward-backward algorithm). Hidden Markov model and visible Markov model taggers can both be implemented using the Viterbi algorithm. The rule-based Brill tagger is unusual in that it learns a set of rule patterns, and then applies those patterns rather than optimizing a statistical quantity. Unlike the Brill tagger where the rules are ordered sequentially, the POS and morphological tagging toolkit RDRPOSTagger stores rule in the form of a ripple-down rules tree.

Many machine learning methods have also been applied to the problem of POS tagging. Methods such as SVM, maximum entropy classifier, perceptron, and nearest-neighbor have all been tried, and most can achieve accuracy above 95%.

A direct comparison of several methods is reported (with references) at the ACL Wiki. This comparison uses the Penn tag set on some of the Penn Treebank data, so the results are directly comparable. However, many significant taggers are not included (perhaps because of the labor involved in reconfiguring them for this particular dataset). Thus, it should not be assumed that the results reported here are the best that can be achieved with a given approach; nor even the best that *have* been achieved with a given approach.

In 2014, a paper reporting using the structure regularization method for part-of-speech tagging, achieving 97.36% on the standard benchmark dataset.

Issues

While there is broad agreement about basic categories, several edge cases make it difficult to settle on a single "correct" set of tags, even in a particular language such as (say) English. For example, it is hard to say whether "fire" is an adjective or a noun in the big green fire truck

A second important example is the use/mention distinction, as in the following example, where "blue" could be replaced by a word from any POS (the Brown Corpus tag set appends the suffix "-NC" in such cases): the word "blue" has 4 letters.

Words in a language other than that of the "main" text are commonly tagged as "foreign". In the Brown Corpus this tag (-FW) is applied in addition to a tag for the role the foreign word is playing in context; some other corpora merely tag such case as "foreign", which is slightly easier but much less useful for later syntactic analysis.

There are also many cases where POS categories and "words" do not map one to one, for example:

as far as
David's
gonna
don't
vice versa
first-cut
cannot
pre- and post-secondary
look (a word) up

In the last example, "look" and "up" combine to function as a single verbal unit, despite the possibility of other words coming between them.

Some tag sets (such as Penn) break hyphenated words, contractions, and possessives into separate tokens, thus avoiding some but far from all such problems.

Many tag sets treat words such as "be", "have", and "do" as categories in their own right (as in the Brown Corpus), while a few treat them all as simply verbs (for example, the LOB Corpus and the Penn Treebank). Because these particular words have more forms than other English verbs, which occur in quite distinct grammatical contexts, treating them merely as "verbs" means that a POS tagger has much less information to go on.

For example, an HMM-based tagger would only learn the overall probabilities for how "verbs" occur near other parts of speech, rather than learning distinct co-occurrence probabilities for "do", "have", "be", and other verbs.

These English words have quite different distributions: one cannot just substitute other verbs into the same places where they occur. With distinct tags, an HMM can often predict the correct finer-grained tag, rather than being equally content with any "verb" in any slot. Some have argued that this benefit is moot because a program can merely check the spelling: "this 'verb' is a 'do' because of the spelling". However, this fails for erroneous spellings even though they can often be tagged accurately by HMMs.

Function word

In linguistics, **function words** (also called **functors**) are words that have little lexicalmeaning or have ambiguous meaning and express grammatical relationships among other words within a sentence, or specify the attitude or mood of the speaker. They signal the structural relationships that words have to one another and are the glue that holds sentences together. Thus they form important elements in the structures of sentences.

Words that are not function words are called *content words* (or open class words, *lexical words,* or *autosemantic words*) and include nouns, most verbs, adjectives, and most adverbs although some adverbs are function words (like *then* and *why*). Dictionaries define the specific meanings of content words but can describe only the general usages of function words. By contrast, grammars describe the use of function words in detail but treat lexical words only in general terms.

Since it was first proposed in 1952 by C. C. Fries, the distinguishing of function/structure words from content/lexical words has been highly influential in the grammar used in second-language acquisition and English-language teaching.

Overview

Function words might be prepositions, pronouns, auxiliary verbs, conjunctions, grammatical articles or particles, all of which belong to the group of closed-class words. Interjectionsare sometimes considered function words but they

belong to the group of open-class words. Function words might or might not be inflected or might have affixes.

Function words belong to the closed class of words in grammar because it is very uncommon to have new function words created in the course of speech. In the open class of words, i.e., nouns, verbs, adjectives, or adverbs, new wordsmay be added readily, such as slang words, technical terms, and adoptions and adaptations of foreign words.

Each function word either: gives grammatical information about other words in a sentence or clause, and cannot be isolated from other words; or gives information about the speaker's mental model as to what is being said.

Grammatical words, as a class, can have distinct phonological properties from content words. Grammatical words sometimes do not make full use of all the sounds in a language. For example, in some of the Khoisan languages, most content words begin with clicks, but very few function words do. In English, very few words other than function words begin with the voiced *th*[ð]. English function words may have fewer than three letters; e.g., 'I', 'an', 'in', while non-function words usually have three or more (e.g., 'eye', 'Ann', 'inn').

The following is a list of the kind of words considered to be function words with English examples. They are all uninflected in English unless marked otherwise:

- articles — *the* and *a*. In some inflected languages, the articles may take on the case of the declension of the following noun.

- pronouns — *he* :: *him*, *she* :: *her*, etc. — inflected in English
- adpositions — *in*, *under*, *towards*, *before*, *of*, *for*, etc.
- conjunctions — *and*and*but*
- subordinating conjunctions — *if*, *then*, *well*, *however*, *thus*, etc.
- auxiliary verbs — *would*, *could*, *should*, etc. — inflected in English
- particles — *up*, *on*, *down*
- interjections — *oh*, *ah*, *eh*, sometimes called "filled pauses"
- expletives — take the place of sentences, among other functions.
- pro-sentences — *yes*, *no*, *okay*, etc.

Content word

Content words, in linguistics, are words that possess semantic content and contribute to the meaning of the sentence in which they occur. In a traditional approach, nounswere said to name objects and other entities, lexical verbs to indicate actions, adjectives to refer to attributes of entities and adverbs to attributes of actions. They contrast with function words, which have very little substantive meaning and primarily denote grammatical relationships between content words, such as prepositions (in, out, under etc.), pronouns (I, you, he, who etc.) and conjunctions (and, but, till, as etc.).

All words can be classified as either content or function words, but it is not always easy to make the distinction. With only around 150 function words, 99.9% of words in the English

language are content words. Although small in number, function words are used at a disproportionately-higher rate than content and make up about 50% of any English text because of the conventional patterns of usage that binds function words to content words almost every time they are used, which creates an interdependence between the two word groups.

Content words are usually open class words, and new words are easily added to the language. In relation to English phonology, content words generally adhere to the minimal word constraint of being no shorter than two morae long (a minimum length of two light syllables or one heavy syllable), but function words often do not.

Chapter 4

Functional Linguistics

Functional linguistics is an approach to the study of language characterized by taking systematically into account the speaker's and the hearer's side, and the communicative needs of the speaker and of the given language community. Linguistic functionalism spawned in the 1920s to 1930s from Ferdinand de Saussure's systematic structuralist approach to language (1916).

Functionalism sees functionality of language and its elements to be the key to understanding linguistic processes and structures. Functional theories of language propose that since language is fundamentally a tool, it is reasonable to assume that its structures are best analyzed and understood with reference to the functions they carry out. These include the tasks of conveying meaning and contextual information.

Functional theories of grammar belong to structural and humanistic linguistics, considering language as a rational human construction. They take into account the context where linguistic elements are used and study the way they are instrumentally useful or functional in the given environment. This means that pragmaticsis given an explanatory role, along with semantics. The formal relations between linguistic elements are assumed to be functionally-motivated.

Simon Dik characterizes the functional approach as follows:

In the functional paradigm a language is in the first place conceptualized as an instrument of social interaction among

human beings, used with the intention of establishing communicative relationships. Within this paradigm one attempts to reveal the instrumentality of language with respect to what people do and achieve with it in social interaction. A natural language, in other words, is seen as an integrated part of the communicative competence of the natural language user. (2, p. 3)

Since the 1970s, studies by American functional linguists in languages other than English from Asia, Africa, Australia and the Americas (like Mandarin Chinese and Japanese), led to insights about the interaction of form and function, and the discovery of functional motivations for grammatical phenomena, which apply also to the English language.

History

1920s to 1970s: early developments

The establishment of functional linguistics follows from a shift from structural to functional explanation in 1920s sociology. Prague, at the crossroads of western European structuralism and Russian formalism, became an important centre for functional linguistics.

The shift was related to the organic analogy exploited by Émile Durkheim and Ferdinand de Saussure. Saussure had argued in his *Course in General Linguistics* that the 'organism' of language should be studied anatomically, and not in respect with its environment, to avoid the false conclusions made by August Schleicher and other social Darwinists. The post-Saussureanfunctionalist movement sought ways to account for

the 'adaptation' of language to its environment while still remaining strictly anti-Darwinian. Russian émigrés Roman Jakobson and Nikolai Trubetzkoy disseminated insights of Russian grammarians in Prague, but also the evolutionary theory of Lev Berg, arguing for teleology of language change.

As Berg's theory failed to gain popularity outside the Soviet Union, the organic aspect of functionalism was diminished, and Jakobson adopted a standard model of functional explanation from Ernst Nagel's philosophy of science.

It is, then, the same mode of explanation as in biology and social sciences; but it became emphasised that the word 'adaptation' is not to be understood in linguistics in the same meaning as in biology.

Work on functionalist linguistics by the Prague school resumed in the 1950s after a hiatus caused by World War II and Stalinism. In North America, Joseph Greenberg published his 1963 seminal paper on language universals that not only revived the field of linguistic typology, but coined the approach of seeking functional explanations for typological patterns. Greenberg's approach has been highly influential for the movement of North American functionalism that formed from the early 1970s, which has since been characterized by a profound interest in typology.

Greenberg's paper was influenced by the Prague School and in particular it was written in response to Roman Jakobson's call for an 'implicational typology'. While North American functionalism was initially influenced by the functionalism of the Prague school, such influence has been later discontinued.

1980s onward: name controversy

The term 'functionalism' or 'functional linguistics' became controversial in the 1980s with the rise of a new wave of evolutionary linguistics. Johanna Nichols argued that the meaning of 'functionalism' had changed, and the terms formalism and functionalism, respectively, should be taken as referring to generative grammar, and the emergent linguistics of Paul Hopper and Sandra Thompson; and that the term structuralism should be reserved for frameworks derived from the Prague linguistic circle. William Croft argued subsequently that it is a fact to be agreed by all linguists that form does not follow from function. He proposed autonomous linguistics,opposing the idea that language arises functionally from the need to express meaning:

"The notion of autonomy emerges from an undeniable fact of all languages, 'the curious lack of accord ... between form and function'"

Croft explains that, until the 1970s, functionalism related to semantics and pragmatics, or the 'semiotic function'. But around 1980s the notion of function changed from semiotics to "external function". Croft has also explained that he advocates a neo-Darwinian view of language change as based on natural selection. Croft proposes that 'structuralism' and 'formalism' should both be taken as referring to generative grammar; and 'functionalism' to usage-based and cognitive linguistics; while neither André Martinet, Systemic functional linguistics nor Functional discourse grammar properly represents any of the three concepts.

The situation was further complicated by the arrival of evolutionary psychological thinking in linguistics, with Steven Pinker, Ray Jackendoff and others hypothesising that the human language faculty, or universal grammar, could have developed through normal evolutionary processes, thus defending an adaptational explanation of the origin and evolution of the language faculty. This brought about a functionalism versus formalism debate, with Frederick Newmeyer arguing that the evolutionary psychological approach to linguistics should also be considered functionalist.

The terms functionalism and functional linguistics nonetheless continue to be used by the Prague linguistic circle and its derivatives, including SILF, Danish functional school, Systemic functional linguistics and Functional discourse grammar; and the American framework Role and reference grammar which sees itself as the midway between formal and functional linguistics.

Functional analysis

Since the earliest work of the Prague School, language was conceived as a *functional system*, where term *system* references back to De Saussure structuralist approach. The term function seems to have been introduced by VilémMathesius, possibly influenced from works in sociology. Functional analysis is the examination of how linguistic elements function on different layers of linguistic structure, and how the levels interact with each other. Functions exist on all levels of grammar, even in phonology, where the phoneme has the function of distinguishing between lexical material.

- Syntactic functions: (e.g. Subject and Object), defining different perspectives in the presentation of a linguistic expression.
- Semantic functions: (Agent, Patient, Recipient, etc.), describing the role of participants in states of affairs or actions expressed.
- Pragmatic functions: (Theme and Rheme, Topic and Focus, Predicate), defining the informational status of constituents, determined by the pragmatic context of the verbal interaction.

Functional explanation

In the functional mode of explanation, a linguistic structure is explained with an appeal to its function. Functional linguistics takes as its starting point the notion that communication is the primary purpose of language.

Therefore, general phonological, morphosyntactic and semantic phenomena are thought of as being motivated by the needs of people to communicate successfully with each other.

Thus, the perspective is taken that the organisation of language reflects its use value.

Many prominent functionalist approaches, like Role and reference grammar and Functional discourse grammar, are also typologically-oriented, that is they aim their analysis cross-linguistically, rather than only to a single language like English (as it's typical of formalist/generativism approaches).

Economy

The concept of economy is metaphorically transferred from a social or economical context to a linguistic level. It is considered as a regulating force in language maintenance. Controlling the impact of language change or internal and external conflicts of the system, the economy principle means that systemic coherence is maintained without increasing energy cost. This is why all human languages, no matter how different they are, have high functional value as based on a compromise between the competing motivations of speaker-easiness (simplicity or *inertia*) versus hearer-easiness (clarity or *energeia*).

The principle of economy was elaborated by the French structural–functional linguist André Martinet. Martinet's concept is similar to Zipf'sprinciple of least effort; although the idea had been discussed by various linguists in the late 19th and early 20th century. The functionalist concept of economy is not to be confused with economy in generative grammar.

Information structure

Some key adaptations of functional explanation are found in the study of information structure. Based on earlier linguists' work, Prague Circle linguists VilémMathesius, Jan Firbas and others elaborated the concept of theme–rheme relations (topic and comment) to study pragmatic concepts such as sentence focus, and givenness of information, to successfully explain word-order variation. The method has been used widely in linguistics to uncover word-order patterns in the languages of the world. Its importance, however, is limited to within-

language variation, with no apparent explanation of cross-linguistic word order tendencies.

Functional principles

Several principles from pragmatics have been proposed as functional explanations of linguistic structures, often in a typological perspective.

- Theme first: languages prefer placing the theme before the rheme; and the subject typically carries the role of the theme; therefore, most languages have subject before object in their basic word order.
- Animated first: similarly, since subjects are more likely to be animate, they are more likely to precede the object.
- Given before new: old information comes before new information.
- First things first: more important or more urgent information comes before other information.
- Lightness: light (short) constituents are ordered before heavy (long) constituents.
- Uniformity: word order choices are generalised. For example, languages tend to have either prepositions or postpositions; and not both equally.
- Functional load: elements within a linguistic sub-system are made distinct to avoid confusion.

Frameworks

There are several distinct grammatical frameworks that employ a functional approach.

- The structuralist functionalism of the Prague school was the earliest functionalist framework developed in the 1920s.
- André Martinet's Functional Syntax, with two major books, *A functional view of language* (1962) and *Studies in Functional Syntax* (1975). Martinet is one of the most famous French linguists and can be regarded as the father of French functionalism. Founded by Martinet and his colleagues, SILF (*Sociétéinternationale de linguistiquefonctionnelle*) is an international organisation of functional linguistics which operates mainly in French.
- Simon Dik'sFunctional Grammar, originally developed in the 1970s and 80s, has been influential and inspired many other functional theories. It has been developed into Functional Discourse Grammar by the linguist KeesHengeveld.
- Michael Halliday's systemic functional grammar argues that the explanation of how language works "needed to be grounded in a functional analysis, since language had evolved in the process of carrying out certain critical functions as human beings interacted with their ... 'eco-social' environment". Halliday draws on the work of Bühler and Malinowski. The link between Firthian linguistics and Alfred North Whitehead also deserves a mention.
- Role and reference grammar, developed by Robert Van Valin employs functional analytical framework with a somewhat formal mode of description. In RRG, the description of a sentence in a particular language is formulated in terms of its semantic structure and communicative functions, as well as

the grammatical procedures used to express these meanings.

- Danish functional grammar combines Saussurean/Hjelmslevianstructuralism with a focus on pragmatics and discourse.

Danish functional school

The Danish school of functional linguistics was developed in an attempt to combine modern functional grammar and cognitive linguistics with the best ideas and concepts of the earlier structuralist school. Like Hjelmslev and Saussure, the school insist on the basic structural division of communication in planes of content and expression. Like Simon Dik and functionalist grammarians, Danish functionalists also insist that language is fundamentally a means of communication between humans and is best understood and analysed through its communicative function.

When analysing linguistic utterances, the content and expression planes are analysed separately, with the expression plane being analysed through traditional structural methods and the content plane being analysed mostly through methods from semantics and pragmatics. However, it is assumed that structures on the expression plane mirror structures on the content plane. This can be seen in the parallelism between the structure of Danish sentences as described by the structural syntactic model of Paul Diderichsen dividing utterances into three basic fields: a foundation field, a nexus field and a content field; and the pragmatic structure of utterances that often uses the foundation field for discourse pragmatic functions, the nexus field for illocutionary functions and the

content field for the linguistic message. Danish functionalists assume that an utterance is not to be analysed from the minimal units and up, but rather from the maximal units and down, because speakers begin the construction of utterances by choosing what to say in a given situation, then by choosing the words to use and finally by building the sentence by means of sounds.

An example of a two planed analysis is given below in the analysis of the utterance "The book hasn't been read by anyone for a while". The Expression plane consists of "the book" which is a noun phrase with a determiner, a finite verb with a negational adverb "hasn't", and a passive verbal phrase "been read" with an agent "by anyone" and a time adverb "for a while". On the content plane "the book" has the function of topic of the utterance, that which the sentence is about and which links it to the larger discourse, the function of "hasn't" is to state the illocutionary force of the declarative utterance, and the predicate is the message "hasn't been read by anyone for a while" which is intended to be communicated.

Functional discourse grammar

Functional grammar (**FG**) and **functional discourse grammar** (**FDG**) are grammar models and theories motivated by functional theories of grammar. These theories explain how linguistic utterances are shaped, based on the goals and knowledge of natural language users. In doing so, it contrasts with Chomskyantransformational grammar. Functional discourse grammar has been developed as a successor to functional grammar, attempting to be more psychologically and pragmatically adequate than functional grammar.

The top-level unit of analysis in functional discourse grammar is the discourse move, not the sentence or the clause. This is a principle that sets functional discourse grammar apart from many other linguistic theories, including its predecessor functional grammar.

History

Functional grammar (FG) is a model of grammar motivated by functions. The model was originally developed by Simon C. Dik at the University of Amsterdam in the 1970s, and has undergone several revisions since then. The latest standard version under the original name is laid out in the 1997 edition, published shortly after Dik's death. The latest version features the expansion of the model with a pragmatic/interpersonal module by KeesHengeveld and Lachlan Mackenzie. This has led to a renaming of the theory to functional discourse grammar. This type of grammar is quite distinct from systemic functional grammar as developed by Michael Halliday and many other linguists since the 1970s.

The notion of "function" in FG generalizes the standard distinction of grammatical functions such as subject and object. Constituents (parts of speech) of a linguistic utterance are assigned three types or levels of functions:

- Semantic function (Agent, Patient, Recipient, etc.), describing the role of participants in states of affairs or actions expressed
- Syntactic functions (Subject and Object), defining different perspectives in the presentation of a linguistic expression

- Pragmatic functions (Theme and Tail, Topic and Focus), defining the informational status of constituents, determined by the pragmatic context of the verbal interaction

Principles of functional discourse grammar

There are a number of principles that guide the analysis of natural language utterances according to functional discourse grammar.

Functional discourse grammar explains the phonology, morphosyntax, pragmatics and semantics in one linguistic theory. According to functional discourse grammar, linguistic utterances are built top-down in this order by deciding upon:

- The pragmatic aspects of the utterance
- The semantic aspects of the utterance
- The morphosyntactic aspects of the utterance
- The phonological aspects of the utterance

According to functional discourse grammar, four components are involved in building up an utterance:

- The conceptual component, which is where the communicative intention that drives the utterance construction arises
- The grammatical component, where the utterance is formulated and encoded according to the communicative intention

- The contextual component, which contains all elements that can be referred to in the history of the discourse or in the environment
- The output component, which realizes the utterance as sound, writing, or signing

The grammatical component consists of four levels:

- The interpersonal level, which accounts for the pragmatics
- The representational level, which accounts for the semantics
- The morphosyntactic level, which accounts for the syntax and morphology
- The phonological level, which accounts for the phonology of the utterance

Example

This example analyzes the utterance "I can't find the red pan. It is not in its usual place." according to functional discourse grammar at the interpersonal level.

At the interpersonal level, this utterance is one discourse move, which consists of two discourse acts, one corresponding to "I can't find the red pan." and another corresponding to "It is not in its usual place."

- The first discourse act consists of:
- A declarativeillocutionary force
- A speaker, denoted by the word "I"
- An addressee

- A communicated content, which consists of:
- A referential subact corresponding to "I"
- An ascriptivesubact corresponding to "find", which has the function Focus
- A referential subact corresponding to "the red pan", which contains two ascriptivesubacts corresponding to "red" and "pan", and which has the function Topic
- The second discourse act consists of:
- A declarative illocutionary force
- A speaker
- An addressee
- A communicated content, which consists of:
- A referential subact corresponding to "it", which has the function Topic
- An ascriptivesubact corresponding to "in its usual place", which has the function Focus
- Within this subact there is a referential subact corresponding to "its usual place", which consists of:
- A referential subact corresponding to "its"
- An ascriptivesubact corresponding to "usual"
- An ascriptivesubact corresponding to "place"

Similar analysis, decomposing the utterance into progressively smaller units, is possible at the other levels of the grammatical component.

Systemic functional grammar

Systemic functional grammar (**SFG**) is a form of grammatical description originated by Michael Halliday. It is part of a social semiotic approach to language called *systemic functional*

linguistics. In these two terms, *systemic* refers to the view of language as "a network of systems, or interrelated sets of options for making meaning"; *functional* refers to Halliday's view that language is as it is because of what it has evolved to do (see Metafunction). Thus, what he refers to as the *multidimensional architecture of language* "reflects the multidimensional nature of human experience and interpersonal relations."

Influences

Halliday describes his grammar as built on the work of Saussure, Louis Hjelmslev, Malinowski, J.R. Firth, and the Prague school linguists. In addition, he drew on the work of the American anthropological linguists Boas, Sapir and Whorf. His "main inspiration" was Firth, to whom he owes, among other things, the notion of language as system. Among American linguists, Whorf had "the most profound effect on my own thinking". Whorf "showed how it is that human beings do not all mean alike, and how their unconscious ways of meaning are among the most significant manifestations of their culture".

From his studies in China, he lists Luo Changpei and Wang Li as two scholars from whom he gained "new and exciting insights into language".

He credits Luo for giving him a diachronic perspective and insights into a non-Indo-European language family. From Wang Li he learnt "many things, including research methods in dialectology, the semantic basis of grammar, and the history of linguistics in China".

Basic tenets

Some interrelated key terms underpin Halliday's approach to grammar, which forms part of his account of how language works. These concepts are: system, (meta)function, and rank. Another key term is lexicogrammar. In this view, grammar and lexis are two ends of the same continuum.

Analysis of the grammar is taken from a trinocular perspective, meaning from three different levels. So to look at lexicogrammar, it can be analysed from two more levels, 'above' (semantic) and 'below' (phonology). This grammar gives emphasis to the view from above.

For Halliday, grammar is described as systems not as rules, on the basis that every grammatical structure involves a choice from a describable set of options. Language is thus a *meaning potential*. Grammarians in SF tradition use system networks to map the available options in a language. In relation to English, for instance, Halliday has described systems such as *mood*, *agency*, *theme*, etc. Halliday describes grammatical systems as closed, i.e. as having a finite set of options. By contrast, lexical sets are open systems, since new words come into a language all the time.

These grammatical systems play a role in the construal of meanings of different kinds. This is the basis of Halliday's claim that language is *meta-functionally*organised. He argues that the raison d'être of language is meaning in social life, and for this reason all languages have three kinds of semantic components. All languages have resources for construing experience (the *ideational* component), resources for enacting

humans' diverse and complex social relations (the *interpersonal* component), and resources for enabling these two kinds of meanings to come together in coherent text (the *textual* function).

Each of the grammatical systems proposed by Halliday are related to these metafunctions. For instance, the grammatical system of 'mood' is considered to be centrally related to the expression of interpersonal meanings, 'process type' to the expression of experiential meanings, and 'theme' to the expression of textual meanings.

Traditionally the "choices" are viewed in terms of either the content or the structure of the language used.

In SFG, language is analysed in three ways (strata): semantics, phonology, and lexicogrammar. SFG presents a view of language in terms of both structure (grammar) and words (lexis). The term "lexicogrammar" describes this combined approach.

Metafunctions

From early on in his account of language, Halliday has argued that it is inherently functional. His early papers on the grammar of English make reference to the "functional components" of language, as "generalized uses of language, which, since they seem to determine the nature of the language system, require to be incorporated into our account of that system." Halliday argues that this functional organization of language "determines the form taken by grammatical structure".

Halliday refers to his functions of language as metafunctions. He proposes three general functions: the *ideational*, the *interpersonal* and the *textual*.

Ideational metafunction

The ideational metafunction is the function for construing human experience. It is the means by which we make sense of "reality". Halliday divides the ideational into the logical and the experiential metafunctions. The logical metafunction refers to the grammatical resources for building up grammatical units into complexes, for instance, for combining two or more clauses into a clause complex. The experiential function refers to the grammatical resources involved in construing the flux of experience through the unit of the clause.

The ideational metafunction reflects the contextual value of *field*, that is, the nature of the social process in which the language is implicated. An analysis of a text from the perspective of the ideational function involves inquiring into the choices in the grammatical system of "transitivity": that is, process types, participant types, circumstance types, combined with an analysis of the resources through which clauses are combined. Halliday's *An Introduction to Functional Grammar* (in the third edition, with revisions by Christian Matthiessen) sets out the description of these grammatical systems.

Interpersonal metafunction

The interpersonal metafunction relates to a text's aspects of *tenor* or interactivity. Like field, tenor comprises three component areas: the speaker/writer persona, social distance,

and relative social status. Social distance and relative social status are applicable only to spoken texts, although a case has been made that these two factors can also apply to written text.

The speaker/writer persona concerns the stance, personalisation and standing of the speaker or writer. This involves looking at whether the writer or speaker has a neutral attitude, which can be seen through the use of positive or negative language. Social distance means how close the speakers are, e.g. how the use of nicknames shows the degree to which they are intimate. Relative social status asks whether they are equal in terms of power and knowledge on a subject, for example, the relationship between a mother and child would be considered unequal. Focuses here are on speech acts (e.g. whether one person tends to ask questions and the other speaker tends to answer), who chooses the topic, turn management, and how capable both speakers are of evaluating the subject.

Textual metafunction

The textual metafunction relates to *mode*; the internal organisation and communicative nature of a text. This comprises textual interactivity, spontaneity and communicative distance. Textual interactivity is examined with reference to disfluencies such as hesitators, pauses and repetitions.

Spontaneity is determined through a focus on lexical density, grammatical complexity, coordination (how clauses are linked together) and the use of nominal groups. The study of communicative distance involves looking at a text's cohesion—

that is, how it hangs together, as well as any abstract language it uses. Cohesion is analysed in the context of both lexical and grammatical as well as intonational aspects with reference to lexical chains and, in the speech register, tonality, tonicity, and tone. The lexical aspect focuses on sense relations and lexical repetitions, while the grammatical aspect looks at repetition of meaning shown through reference, substitution and ellipsis, as well as the role of linking adverbials.

Systemic functional grammar deals with all of these areas of meaning equally within the grammatical system itself.

Children's grammar

Michael Halliday (1973) outlined seven functions of language with regard to the grammar used by children:

- the instrumental function serves to manipulate the environment, to cause certain events to happen;
- the regulatory function of language is the control of events;
- the representational function is the use of language to make statements, convey facts and knowledge, explain, or report to represent reality as the speaker/writer sees it;
- the interactional function of language serves to ensure social maintenance;
- the personal function is to express emotions, personality, and "gut-level" reactions;
- the heuristic function used to acquire knowledge, to learn about the environment;

- the imaginative function serves to create imaginary systems or ideas.

Relation to other branches of grammar

Halliday's theory sets out to explain how spoken and written texts construe meanings and how the resources of language are organised in open systems and functionally bound to meanings. It is a theory of language in use, creating systematic relations between choices and forms within the less abstract strata of grammar and phonology, on the one hand, and more abstract strata such as context of situation and context of culture on the other.

It is a radically different theory of language from others which explore less abstract strata as autonomous systems, the most notable being Noam Chomsky's. Since the principal aim of systemic functional grammar is to represent the grammatical system as a resource for making meaning, it addresses different concerns. For example, it does not try to address Chomsky's thesis that there is a "finite rule system which generates all and only the grammatical sentences in a language". Halliday's theory encourages a more open approach to the definition of language as a resource; rather than focus on grammaticality as such, a systemic functional grammatical treatment focuses instead on the relative frequencies of choices made in uses of language and assumes that these relative frequencies reflect the probability that particular paths through the available resources will be chosen rather than others. Thus, SFG does not describe language as a finite rule

system, but rather as a system, realised by instantiations, that is continuously expanded by the very instantiations that realise it and that is continuously reproduced and recreated with use.

Another way to understand the difference in concerns between systemic functional grammar and most variants of generative grammar is through Chomsky's claim that "linguistics is a sub-branch of psychology". Halliday investigates linguistics more as a sub-branch of *sociology*. SFG therefore pays much more attention to pragmatics and discourse semantics than is traditionally the case in formalism.

The orientation of systemic functional grammar has served to encourage several further grammatical accounts that deal with some perceived weaknesses of the theory and similarly orient to issues not seen to be addressed in more structural accounts. Examples include the model of Richard Hudson called *word grammar*.

Role and reference grammar

Role and reference grammar (**RRG**) is a model of grammar developed by William A. Foley and Robert Van Valin, Jr. in the 1980s, which incorporates many of the points of view of current functional grammar theories.

In RRG, the description of a sentence in a particular language is formulated in terms of (a) its logical (semantic) structure and communicative functions, and (b) the grammatical procedures that are available in the language for the expression of these meanings.

Among the main features of RRG are the use of lexical decomposition, based upon the predicate semantics of David Dowty (1979), an analysis of clause structure, and the use of a set of thematic roles organized into a hierarchy in which the highest-ranking roles are 'Actor' (for the most active participant) and 'Undergoer'.

RRG's practical approach to language is demonstrated in the multilingual Natural Language Understanding (NLU) system of cognitive scientist John Ball. In 2012, Ball integrated his Patom Theory with Role and Reference Grammar, producing a language independent NLU breaking down language by meaning.

Chapter 5

Speech and Language Pathology

Speech acquisition

Speech acquisition focuses on the development of spoken language by a child. Speech consists of an organized set of sounds or phonemes that are used to convey meaning while language is an arbitrary association of symbols used according to prescribed rules to convey meaning. While grammatical and syntactic learning can be seen as a part of language acquisition, speech acquisition focuses on the development of speech perception and speech production over the first years of a child's lifetime. There are several models to explain the norms of speech sound or phoneme acquisition in children.

Development of speech perception

Sensory learning concerning acoustic speech signals already starts during pregnancy. Hepper and Shahidullah (1992) described the progression of fetal response to different pure tone frequencies. They suggested fetuses respond to 500 Hertz (Hz) at 19 weeks gestation, 250 Hz and 500 Hz at 27 weeks gestation and finally respond to 250, 500, 1000, 3000 Hz between 33 and 35 weeks gestation. Lanky and Williams (2005) suggested that fetuses could respond to pure tone stimuli of 500 Hz as early as 16 weeks.

The newborn is already capable of discerning many phonetic contrasts. This capability may be innate. Speech perception

becomes language-specific for vowels at around 6 months, for sound combinations at around 9 months and for language-specific consonants at around 11 months. It is also important that a newborn is already capable of detecting typical word stress patterns around the age of 8 months.

As an infant grows into a child their ability to discriminate between speech sounds should increase. Rvachew (2007) described three developmental stages in which a child recognizes or discerns adult-like, phonological and articulatory representations of sounds. In the first stage, the child is generally unaware of phonological contrast and can produce sounds that are acoustically and perceptually similar. In the second stage the child is aware of phonological contrasts and can produce acoustically different variations imperceptible to adult listeners. Finally, in the third stage, children become aware of phonological contrasts and produce different sounds that are perceptually and acoustically accurate to an adult production.

It is suggested that a child's perceptual capabilities continue to develop for many years. Hazan and Barrett (2000) suggest that this development can cotton into late childhood; 6 to 12 year old children showed increasing mastery of discriminating synthesized differences in place, manner, and voicing of speech sounds with out yet achieving adult-like accuracy in their own production.

Typologies of infant vocalization

Infants are born with the ability to vocalize, most notably through crying. As they grow and develop, infants add more

sounds to their inventory. There are two primary typologies of infant vocalizations. Typology 1: Stark Assessment of Early Vocal Development consists of 5 phases.

- Reflexive (0 to 2 months of age) consisting of crying, fussing, and vegetative sounds
- Control of phonation (1 to 4 months of age) consonant-like sounds, clicks, and raspberry sound
- Expansion (3 to 8 months of age) isolated vowels, two or more vowels in a row, and squeals
- Basic canonical syllables (5 to 10 months of age) – a consonant vowel (CV) combination, often repeated (e.g. babababa).
- Advanced forms (9 to 18 months of age) complex combinations of differing constant-vowel combinations (CVC) and jargon.

Typology 2: Oller's typology of infant phonations consists primarily of 2 phases with several substages. The 2 primary phases include Non-speech-like vocalizations and Speech-like vocalizations. Non-speech-like vocalizations include a. vegetative sounds such as burping and b. fixed vocal signals like crying or laughing. Speech-like vocalizations consist of a. quasi-vowels, b. primitive articulation, c. expansion stage and d. canonical babbling.

Speech sound normative data

Knowing when a speech sound should be accurately produced helps parents and professionals determine when child may have an articulation disorder. There have been two traditional methods used to compare a child's articulation of speech

sounds to chronological age. The first is comparing the number of correct responses on a standardized articulation test with the normative data for a given age on the same test. This allows evaluators to see how well a child is producing sounds compared to their same aged peers.

The second method consists of comparing an individual sound a child produces with developmental norms for that individual sound. The second method can be difficult when considering the differing normative data and other factors that affect typical speech development.

Many norms are based on age expectations in which a majority of children of a certain age are accurately producing a sound (75% or 90% depending on the study). Using the results from Sander (1972), Templin (1957), and Wellman, Case, Mengert, & Bradbury, (1931), the American Speech-Language Hearing Association suggests the following: Sounds mastered by age 3 include /p, m, h, n, w, b/; by age 4 /k, g, d, f, y/; by age 6 /t, ŋ, r, l/; by age 7 /tʊ , ʊ , j, θ/. and by age 8 /s, z, v, ð, ʊ /.

Early, Middle, and Late 8s

Shriberg (1993) proposed a model for speech sound acquisition known as the Early, Middle, and Late 8 based on 64 children with speech delays ages 3 to 6 years. Shriberg proposed that there were three stages of phoneme development. Using a profile of "consonant mastery" he developed the following:

- Early 8 – /m, b, j, n, w, d, p, h/
- Middle 8 – /t, ŋ, k, g, f, v, tʊ , dʊ /
- Late 8 – /ʊ , θ, s, z, ð, l, r, ʊ /

Speech and language assessment

Common speech and language therapy assessments include:

For children

Many assessments exist for investigating children's language. Here is a selection of commonly used assessments by speech and language therapy services in the UK:

- Talking Point Check the progress of your child's language development
- British Picture Vocabulary Scale (BPVS) - a receptive assessment of vocabulary
- Test for Reception of Grammar (TROG) - understanding of language (grammar)
- Preverbal Communication Schedule (PVCS) - preverbal communication checklist
- Derbyshire picture test - simple understanding
- Clinical Evaluation of Language Fundamentals (CELF-4) - Assesses receptive, expressive, and pragmatic language.
- Clinical Evaluation of Language Fundamentals: Pre-School (CELF-P) - Assesses receptive, expressive, and pragmatic language skills in Pre-School aged children.
- Assessment of Comprehension and Expression 6-11 (ACE 6-11) - a battery of receptive, expressive and pragmatic language tests
- RAPT - picture naming and grammar/content analysis

- RWFVS - Picture naming/vocabulary test
- STASS - expressive grammar
- The Bus Story Test - early narrative assessment
- CLEAR - phonology screening assessment
- STAP - expressive phonology
- DEAP - expressive phonology
- Peabody Picture Vocabulary Test (PPVT-R)
- Language for Thinking assessment - inferential thinking and understanding

For adults

- PALPA - Psycholinguistic Assessment of Language Processing in Aphasia
- Boston diagnostic battery
- Boston Naming Test
- Western Aphasia Battery (WAB)
- Reading Comprehension Battery for Aphasia (RCBA)
- Confrontation naming tests

Speech and language impairment

Speech and language impairment are basic categories that might be drawn in issues of communication involve hearing, speech, language, and fluency.

A speech impairmentis characterized by difficulty in articulation of words. Examples include stuttering or problems producing particular sounds. Articulation refers to the sounds, syllables, and phonology produced by the individual. Voice, however, may refer to the characteristics of the sounds

produced—specifically, the pitch, quality, and intensity of the sound. Often, fluency will also be considered a category under speech, encompassing the characteristics of rhythm, rate, and emphasis of the sound produced.

A language impairment is a specific impairment in understanding and sharing thoughts and ideas, i.e. a disorder that involves the processing of linguistic information. Problems that may be experienced can involve the form of language, including grammar, morphology, syntax; and the functional aspects of language, including semantics and pragmatics.

An individual can have one or both types of impairment. These impairments/disorders are identified by a speech and language pathologist.

Speech disorders

The following are brief definitions of several of the more prominent speech disorders:

Apraxia of speech

Apraxia of speech is the acquired form of motor speech disorder caused by brain injury, stroke or dementia.

Developmental verbal dyspraxia

Developmental verbal dyspraxia refers specifically to a motor speech disorder. This is a neurological disorder. Individuals suffering from developmental verbal apraxia encounter difficulty saying sounds, syllables, and words. The difficulties

are not due to weakness of muscles, but rather on coordination between the brain and the specific parts of the body. **Apraxia of speech** is the acquired form of this disorder caused by brain injury, stroke or dementia. Interventions are more effective when they occur individually at first, and between three and five times per week. With improvements, children with apraxia may be transitioned into group therapy settings. Therapeutic exercises must focus on planning, sequencing, and coordinating the muscle movements involved in speech production.

Children with developmental verbal dyspraxia must practice the strategies and techniques that they learn in order to improve. In addition to practice, feedback can be helpful to improve apraxia of speech. Tactile feedback (touch), visual feedback (watching self in mirror), and verbal feedback are all important additions. Biofeedback has also been cited as a possible therapy.

Functional training involves placing the individual in more speech situations, while providing him/her with a speech model, such as the SLP. Because the cause is neurological, however, some patients do not progress. In these cases, AAC may be more appropriate.

Dysarthria

Dysarthria is a motor speech disorder that results from a neurological injury. Some stem from central damage, while other stem from peripheral nerve damage. Difficulties may be encountered in respiratory problems, vocal fold function, or velopharyngeal closure, for example.

Orofacial myofunctional disorders

Orofacial myofunctional disorders refers to problems encountered when the tongue thrusts forward inappropriately during speech. While this is typical in infants, most children outgrow this. Children that continue to exaggerate the tongue movement may incorrectly produce speech sounds, such as /s/, /z/, /ʊ/, /tʊ/, and /dʊ/. For example, the word, "some," might be pronounced as "thumb". The treatment of OMD will be based upon the professional's evaluation. Each child will present a unique oral posture that must be corrected. Thus, the individual interventions will vary. Some examples include:

- increasing awareness of muscles around the mouth
- increasing awareness of oral postures
- improving muscle strength and coordination
- improving speech sound productions
- improving swallowing patterns

Speech sound disorder

Speech sound disorders may be of two varieties: articulation (the production of sounds) or phonological processes (sound patterns). An articulation disorder may take the form of substitution, omission, addition, or distortion of normal speech sounds. Phonological process disorders may involve more systematic difficulties with the production of particular types of sounds, such as those made in the back of the mouth, like "k" and "g".

Naturally, abnormalities in speech mechanisms would need to be ruled out by a medical professional. Therapies for

articulation problems must be individualized to fit the individual case. The placement approach—instructing the individual on the location in which the tongue should be and how to blow air correctly—could be helpful in difficulties with certain speech sounds.

Another individual might benefit more from developing auditory discrimination skills, since he/she has not learned to identify error sounds in his/her speech. Generalization of these learned speech techniques will need to be generalized to everyday situations. Phonological process treatment, on the other hand, can involve making syntactical errors, such as omissions in words. In cases such as these, explicit teaching of the linguistic rules may be sufficient.

Some cases of speech sound disorders, for example, may involve difficulties articulating speech sounds. Educating a child on the appropriate ways to produce a speech sound and encouraging the child to practice this articulation over time may produce natural speech, Speech sound disorder. Likewise, stuttering does not have a single, known cause, but has been shown to be effectively reduced or eliminated by fluency shaping (based on behavioral principles) and stuttering modification techniques.

Stuttering

Stuttering is a disruption in the fluency of an individual's speech, which begins in childhood and may persist over a lifetime. Stuttering is a form of disfluency; disfluency becomes a problem insofar as it impedes successful communication between two parties. Disfluencies may be due to unwanted

repetitions of sounds, or extension of speech sounds, syllables, or words. Disfluencies also incorporate unintentional pauses in speech, in which the individual is unable to produce speech sounds.

While the effectiveness is debated, most treatment programs for stuttering are behavioral. In such cases, the individual learns skills that improve oral communication abilities, such as controlling and monitoring the rate of speech. SLPs may also help these individuals to speak more slowly and to manage the physical tension involved in the communication process. Fluency may be developed by selecting a slow rate of speech, and making use of short phrases and sentences. With success, the speed may be increased until a natural rate of smooth speech is achieved. Additionally, punishment for incorrect speech production should be eliminated, and a permissive speaking environment encouraged. Electronic fluency devices, which alter the auditory input and provide modified auditory feedback to the individual, have shown mixed results in research reviews.

Because stuttering is such a common phenomenon, and because it is not entirely understood, various opposing schools of thought emerge to describe its etiology. The Breakdown theories maintain that stuttering is the result of a weakening or breakdown in physical systems that are necessary for smooth speech production. Cerebral dominance theories (in the stutterer, no cerebral hemisphere takes the neurological lead) and theories of perseveration (neurological "skipping record" of sorts) are both Breakdown theories. Auditory Monitoring theories suggest that stutters hear themselves differently from how other people hear them. Since speakers adjust their

communication based upon the auditory feedback they hear (their own speech), this creates conflict between the input and the output process. Psychoneurotic theories posit repressed needs as the source of stuttering. Lastly, Learning theories are straightforward—children learn to stutter. It should be clear that each etiological position would suggest a different intervention, leading to controversy with the field.

Voice disorders

Voice disorders range from aphonia (loss of phonation) to dysphonia, which may be phonatory and/or resonance disorders. Phonatory characteristics could include breathiness, hoarseness, harshness, intermittency, pitch, etc. Resonance characteristics refer to overuse or underuse of the resonance chambers resulting in hypernasality or hyponasality. Several examples of voice problems are vocal cord nodules or polyps, vocal cord paralysis, paradoxical vocal fold movement, and spasmodic dysphonia. Vocal cord nodules and polyps are different phenomena, but both may be caused by vocal abuse, and both may take the form of growths, bumps, or swelling on the vocal cords. Vocal fold paralysis is the inability to move one or both of the vocal cords, which results in difficulties with voice and perhaps swallowing. Paradoxical vocal fold movement occurs when the vocal cords close when they should actually be open. Spasmodic dysphonia is caused by strained vocal cord movement, which results in awkward voice problems, such as jerkiness or quavering.

If nodules or polyps are present, and are large, surgery may be the appropriate choice for removal. Surgery is not recommended for children, however. Other medical treatment

may suffice for slighter problems, such as those induced by gastroesophageal reflux disease, allergies, or thyroid problems. Outside of medical and surgical interventions, professional behavioral interventions can be useful in teaching good vocal habits and minimizing abuse of vocal cords. This voice therapy may instruct in attention to pitch, loudness, and breathing exercises. Additionally, the individual may be instructed on the optimal position to produce the maximum vocal quality. Bilateral paralysis is another disorder that may require medical or surgical interventions to return vocal cords to normalcy; unilateral paralysis may be treated medically or behaviorally.

Paradoxical vocal fold movement (PVFM)is also treated medically and behaviorally. Behavioral interventions will focus on voice exercises, relaxation strategies, and techniques that can be used to support breath. More generally, however, PVFM interventions focus on helping an individual to understand what triggers the episode, and how to deal with it when it does occur.

While there is no cure for spasmodic dysphonia, medical and psychological interventions can alleviate some of the symptoms. Medical interventions involve repeated injections of Botox into one or both of the vocal cords. This weakens the laryngeal muscles, and results in a smoother voice.

Language disorders

A language disorder is an impairment in the ability to understand and/or use words in context, both verbally and nonverbally. Some characteristics of language disorders

include improper use of words and their meanings, inability to express ideas, inappropriate grammatical patterns, reduced vocabulary and inability to follow directions. One or a combination of these characteristics may occur in children who are affected by language learning disabilities or developmental language delay. Children may hear or see a word but not be able to understand its meaning. They may have trouble getting others to understand what they are trying to communicate.

Specific language impairment

Interventions for specific language impairmentwill be based upon the individual difficulties in which the impairment manifests. For example, if the child is incapable of separating individual morphemes, or units of sound, in speech, then the interventions may take the form of rhyming, or of tapping on each syllable. If comprehension is the trouble, the intervention may focus on developing metacognitive strategies to evaluate his/her knowledge while reading, and after reading is complete. It is important that whatever intervention is employed, it must be generalized to the general education classroom.

Selective mutism

Selective mutism is a disorder that manifests as a child that does not speak in at least one social setting, despite being able to speak in other situations. Selective mutism is normally discovered when the child first starts school.

Behavioral treatment plans can be effective in bringing about the desired communication across settings. Stimulus fading

involves a gradual desensitization, in which the individual is placed in a comfortable situation and the environment is gradually modified to increase the stress levels without creating a large change in stress level.

Shaping relies on behavioral modification techniques, in which successive attempts to produce speech is reinforced. Self-modeling techniques may also be helpful; for example, self-modeling video tapes, in which the child watches a video of him/herself performing the desired action, can be useful.

If additional confounding speech problems exist, a SLP may work with the student to identify what factors are complicating speech production and what factors might be increasing the mute behaviors.

Additionally, he/she might work with the individual to become more comfortable with social situations, and with the qualities of their own voice. If voice training is required, they might offer this as well.

Aphasia

Aphasia refers to a family of language disorders that usually stem from injury, lesion, or atrophy to the left side of the brain that result in reception, perception, and recall of language; in addition, language formation and expressive capacities may be inhibited.

Language-based learning disabilities

Language-based learning disabilities, which refer to difficulties with reading, spelling, and/or writingthat are evidenced in a

significant lag behind the individual's same-age peers. Most children with these disabilities are at least of average intelligence, ruling out intellectual impairments as the causal factor.

Diagnostic criteria

The DSM-5 and the ICD-10are both used to make specific diagnostic decisions. Speech and language disorders commonly include communication issues, but also extend into various areas such as oral-motor function—sucking, swallowing, drinking, or eating. In some cases, a child's communication is delayed considerably behind his/her same-aged peers. The effects of these disorders can range from basic difficulties in the production of certain letter sounds to more comprehensive inabilities to generate (expressive) or understand (receptive) language. In most cases, the causal factors that create these speech and language difficulties are unknown. There are a wide variety of biological and environmental causal factors that can create them, ranging from drug abuse to neurological issues. For more information on causal hypotheses, refer to the section on models.

Developmental disorders

Developmental disorders tend to have a genetic origin, such as mutations of FOXP2, which has been linked to developmental verbal dyspraxia and specific language impairment. Some of these impairments are caused by genetics. Case histories often reveal a positive family history of communication disorders. Between 28% and 60% of children with a speech and language

deficit have a sibling and/or parent who is also affected. Down syndrome is another example of a genetic causal factor that may result in speech and/or language impairments. Stuttering is a disorder that is hypothesized to have a strong genetic component as well. Some speech and language impairments have environmental causes. A specific language impairment, for example, may be caused by insufficient language stimulation in the environment. If a child does not have access to an adequate role model, or is not spoken to with much frequency, the child may not develop strong language skills. Furthermore, if a child has little stimulating experiences, or is not encouraged to develop speech, that child may have little incentive to speak at all and may not develop speech and language skills at an average pace.

Developmental disabilities such as autism and neurological disorders such as cerebral palsy may also result in impaired communicative abilities. Similarly, malformation or malfunctioning of the respiratory system or speech mechanisms may result in speech impairments. For example, a cleft palate will allow too much air to pass through the nasal cavity and a cleft lip will not allow the individual to correctly form sounds that require the upper lip. The development of vocal fold nodules represents another issue of biological causation. In some cases of biological origin, medical interventions such as surgery or medication may be required. Other cases may require speech therapy or behavioral training.

Acquired disorders

Acquired disorders result from brain injury, stroke or atrophy, many of these issues are included under the Aphasia umbrella.

Brain damage, for example, may result in various forms of aphasia if critical areas of the brain such as Broca's or Wernicke's areaare damaged by lesions or atrophy as part of a dementia.

An acquired language disorder occurs after the person is injured or ill, it is neurological. One of the most commonly known acquired language disorder is aphasia. Everyday activities are easily affected because of a language disorder. Communication impacts how understanding the person is of this disorder.

There is a sender and receiver to communication, the receiver needs to be able to understand the communication process. The receiver should also be able to understand, so that they can respond and communicate back to the sender. The person needs to be careful how the sender/ receiver interprets the messages being sent.

There are 4 types of barriers to communication for the sender/receivers, Process barriers, Physical barriers, Semantic barriers, and Psychosocial barriers. Process barriers are the sender and receiver of communication. Physical barriers, one of the biggest and major barriers to communication, are caused by distractions.

The semantic barriers of communication are the words and meaning of the words and how they are used. Psychosocial barriers are the mental and emotional factors of communication. These barriers are important because of how to treat and an acquired language disorder. Noise plays a big role in the communication process, by helping to interpret the message and bringing out emotions and attitude.

Speech and language assessment

What follows are a list of frequently used measures of speech and language skills, and the age-ranges for which they are appropriate.

- Clinical Evaluation of Language Fundamentals – Preschool (3–6 years)
- Clinical Evaluation of Language Fundamentals (6–21 years)
- MacArthur Communicative Development Inventories (0–12 months)
- The Rossetti Infant-Toddler Language Scale (0–36 months)
- Preschool Language Scale (0–6 years)
- Expressive One-word Picture Vocabulary Test (2–15 years)
- Bankson-Bernthal Phonological Process Survey Test (2–16 years)
- Goldman-Fristoe Test of Articulation 2 (2–21 years)
- Peabody Picture Vocabulary Test (2.5–40 years)

In the United States of America

Under the Individuals with Disabilities Education Act (IDEA) 2004, the federal government has defined a speech or language impairment as "a communication disorder such as stuttering, impaired articulation, a language impairment, or a voice impairment, which adversely affects a child's learning". In order to qualify in the educational system as having a speech or language impairment, the child's speech must be either unintelligible much of the time or he/she must have been

professionally diagnosed as having either a speech impairment or language delay which requires intervention. Additionally, IDEA 2004 contains an exclusionary clause that stipulates that a speech or language impairment may not be either cultural, ethnic, bilingual, or dialectical differences in language, temporary disorders (such as those induced by dental problems), or delayed abilities in producing the most difficult linguistic sounds in a child's age range.

Management

Speech-language pathologists (SLPs) offer many services to children with speech or language disabilities.

Speech-language pathology

Speech-language pathologists (SLPs) may provide individual therapy for the child to assist with speech production problems such as stuttering. They may consult with the child's teacher about ways in which the child might be accommodated in the classroom, or modifications that might be made in instruction or environment. The SLP can also make crucial connections with the family, and help them to establish goals and techniques to be used in the home. Other service providers, such as counselors or vocational instructors may also be included in the development of goals as the child transitions into adulthood.

The individual services that the child receives will depend upon the needs of that child. Simpler problems of speech, such as hoarseness or vocal fatigue (voicing problems) may be solved with basic instruction on how to modulate one's voice.

Articulation problems could be remediated by simple practice in sound pronunciation. Fluency problems may be remediated with coaching and practice under the guidance of trained professionals, and may disappear with age.

However, more complicated problems, such as those accompanying autism or strokes, may require many years of one-on-one therapy with a variety of service providers. In most cases, it is imperative that the families be included in the treatment plans since they can help to implement the treatment plans. The educators are also a critical link in the implementation of the child's treatment plan.

For children with language disorders, professionals often relate the treatment plans to classroom content, such as classroom textbooks or presentation assignments. The professional teaches various strategies to the child, and the child works to apply them effectively in the classroom. For success in the educational environment, it is imperative that the SLP or other speech-language professional have a strong, positive rapport with the teacher(s).

Speech-language pathologists create plans that cater to the individual needs of the patient. If speech is not practical for a patient, the SLP will work with the patient to decide upon an augmentative and alternative communication (AAC) method or device to facilitate communication. They may work with other patients to help them make sounds, improve voices, or teach general communication strategies. They also work with individuals who have difficulties swallowing. In addition to offering these types of communication training services, SLPs also keep records of evaluation, progress, and eventual

discharge of patients, and work with families to overcome and cope with communication impairments (Bureau of Labor Statistics, 2009).

In many cases, SLPs provide direct clinical services to individuals with communication or swallowing disorders. SLPs work with physicians, psychologists, and social workers to provide services in the medical domain, and collaborate with educational professionals to offer additional services for students to facilitate the educational process. Thus, speech-language services may be found in schools, hospitals, outpatient clinics, and nursing homes, among other settings.

The setting in which therapy is provided to the individual depends upon the age, type, and severity of the individual's impairment. An infant/toddler may engage in an early intervention program, in which services are delivered in a naturalistic environment in which the child is most comfortable—probably his/her home. If the child is school-aged, he/she may receive speech-language services at an outpatient clinic, or even at his/her home school as part of a weekly program. The type of setting in which therapy is offered depends largely upon characteristics of the individual and his/her disability.

As with any professional practice that is informed by ongoing research, controversies exist in the fields that deal with speech and language disorders. One such current debate relates to the efficacy of oral motor exercises and the expectations surrounding them. According to Lof, non-speech oral motor exercises (NS-OME) includes "any technique that does not require the child to produce a speech sound but is used to

influence the development of speaking abilities". These sorts of exercises would include blowing, tongue push-ups, pucker-smile, tongue wags, big smile, tongue-to-nose-to-chin, cheek puffing, blowing kisses, and tongue curling, among others. Lof continues, indicating that 85% of SLPs are currently using NS-OME. Additionally, these exercises are used for dysarthria, apraxia, late talkers, structural anomalies, phonological impairments, hearing impairments, and other disorders. Practitioners assume that these exercises will strengthen articulatory structures and generalize to speech acts. Lof reviews 10 studies, and concludes that only one of the studies shows benefits to these exercises (it also suffered serious methodological flaws). Lof ultimately concludes that the exercises employ the same structures, but are used for different functions. The NS-OME position is not without its supporters, however, and the proponents are numerous.

Interventions

Intervention services will be guided by the strengths and needs determined by the speech and language evaluation. The areas of need may be addressed individually until each one is functional; alternatively, multiple needs may be addressed simultaneously through the intervention techniques. If possible, all interventions will be geared towards the goal of developing typical communicative interaction. To this end, interventions typically follow either a preventive, remedial, or compensatory model. The preventive service model is common as an early intervention technique, especially for children whose other disorders place them at a higher risk for developing later communication problems. This model works to lessen the probability or severity of the issues that could later

emerge. The remedial model is used when an individual already has a speech or language impairment that he/she wishes to have corrected. Compensatory models would be used if a professional determines that it is best for the child to bypass the communication limitation; often, this relies on AAC.

Language intervention activities are used in some therapy sessions. In these exercises, an SLP or other trained professional will interact with a child by working with the child through play and other forms of interaction to talk to the child and model language use.

The professional will make use of various stimuli, such as books, objects, or simple pictures to stimulate the emerging language. In these activities, the professional will model correct pronunciation, and will encourage the child to practice these skills.

Articulation therapy may be used during play therapy as well, but involves modeling specific aspects of language—the production of sound. The specific sounds will be modeled for the child by the professional (often the SLP), and the specific processes involved in creating those sounds will be taught as well. For example, the professional might instruct the child in the placement of the tongue or lips in order to produce certain consonant sounds.

Technology is another avenue of intervention, and can help children whose physical conditions make communication difficult. The use of electronic communication systems allow nonspeaking people and people with severe physical disabilities to engage in the give and take of shared thought.

Adaptability and limitations

While some speech problems, such as certain voice problems, require medical interventions, many speech problems can be alleviated through effective behavioral interventions and practice. In these cases, instruction in speech techniques or speaking strategies, coupled with regular practice, can help the individual to overcome his/her speaking difficulties. In other, more severe cases, the individual with speech problems may compensate with AAC devices.

Speech impairments can seriously limit the manner in which an individual interacts with others in work, school, social, and even home environments. Inability to correctly form speech sounds might create stress, embarrassment, and frustration in both the speaker and the listener.

Over time, this could create aggressive responses on the part of the listener for being misunderstood, or out of embarrassment.

Alternatively, it could generate an avoidance of social situations that create these stressful situations. Language impairments create similar difficulties in communicating with others, but may also include difficulties in understanding what others are trying to say (receptive language). Because of the pervasive nature of language impairments, communicating, reading, writing, and academic success may all be compromised in these students. Similar to individuals with speech impairments, individuals with language impairments may encounter long-term difficulties associated with work, school, social, and home environments.

Assistive technology

Augmentative and alternative communication (AAC) includes all forms of communication other than oral communication that an individual might employ to make known his/her thoughts. AAC work to compensate for impairments that an individual might have with expressive language abilities. Each system works to maintain a natural and functional level of communication. There is no one best type of AAC for all individuals; rather, the best type of AAC will be determined by the strengths and weaknesses of a specific individual. While there are a large number of types of AAC, there are fundamentally two categories: aided and unaided.

Unaided systems of communication are those that require both communication parties to be physically present in the same location. Examples of unaided systems include gestures, body language, sign language, and communication boards. Communication boards are devices upon which letters, words, or pictorial symbols might be displayed; the individual may interface with the communication board to express him/herself to the other individual.

Aided systems of communication do not require both individuals to be physically present in the same location, though they might be. Aided systems are often electronic devices, and they may or may not provide some form of voice output. If a device does create a voice output, it is referred to as a speech generating device. While the message may take the form of speech output, it may also be printed as a visual display of speech. Many of these devices can be connected to a

computer, and in some cases, they may even be adapted to produce a variety of different languages.

Inclusion vs. exclusion

Students identified with a speech and language disability often qualify for an Individualized Education Plan as well as particular services. These include one-on-one services with a speech and language pathologist. Examples used in a session include reading vocabulary words, identifying particular vowel sounds and then changing the context, noting the difference. School districts in the United States often have speech and language pathologists within a special education staff to work with students. Additionally, school districts can place students with speech and language disabilities in a resource room for individualized instruction. A combination of early intervention and individualized support has shown promise increasing long-term academic achievement with students with this disability.

Students might work individually with a specialist, or with a specialist in a group setting. In some cases, the services provided to these individuals may even be provided in the regular education classroom. Regardless of where these services are provided, most of these students spend small amounts of time in therapy and the large majority of their time in the regular education classroom with their typically developing peers.

Therapy often occurs in small groups of three or four students with similar needs. Meeting either in the office of the speech-language pathologist or in the classroom, sessions may take from 30 minutes to one hour. They may occur several times per

week. After introductory conversations, the session is focused on a particular therapeutic activity, such as coordination and strengthening exercises of speech muscles or improving fluency through breathing techniques. These activities may take the form of games, songs, skits, and other activities that deliver the needed therapy. Aids, such as mirrors, tape recorders, and tongue depressors may be utilized to help the children to become aware of their speech sounds and to work toward more natural speech production.

Prevalence

In 2006, the U.S. Department of Education indicated that more than 1.4 million students were served in the public schools' special education programs under the speech or language impairment category of IDEA 2004. This estimate does not include children who have speech/language problems secondary to other conditions such as deafness; this means that if all cases of speech or language impairments were included in the estimates, this category of impairment would be the largest. Another source has estimated that communication disorders—a larger category, which also includes hearing disorders—affect one of every 10 people in the United States.

ASHA has cited that 24.1% of children in school in the fall of 2003 received services for speech or language disorders—this amounts to a total of 1,460,583 children between 3 –21 years of age. Again, this estimate does not include children who have speech/language problems secondary to other conditions. Additional ASHA prevalence figures have suggested the following:

- Stuttering affects approximately 4% to 5% of children between the ages of 2 and 4.
- ASHA has indicated that in 2006:
- Almost 69% of SLPs served individuals with fluency problems.
- Almost 29% of SLPs served individuals with voice or resonance disorders.
- Approximately 61% of speech-language pathologists in schools indicated that they served individuals with SLI
- Almost 91% of SLPs in schools indicated that they servedindividuals with phonological/articulation disorder
- Estimates for language difficulty in preschool children range from 2% to 19%.
- Specific Language Impairment (SLI) is extremely common in children, and affects about 7% of the childhood population.

Discrimination

While more common in childhood, speech impairments can result in a child being bullied. Bullying is a harmful activity that often takes place at school, though may be present in adult life. Bullying involves the consistent and intentional harassment of another individual, and may be physical or verbal in nature.

Speech impairments (e.g., stuttering) and language impairments (e.g., dyslexia, auditory processing disorder) may also result in discrimination in the workplace. For example, an

employer would be discriminatory if he/she chose to not make reasonable accommodations for the affected individual, such as allowing the individual to miss work for medical appointments or not making onsite-accommodations needed because of the speech impairment. In addition to making such appropriate accommodations, the Americans with Disabilities Act (1990) protects against discrimination in "job application procedures, hiring, advancement, discharge, compensation, job training, and other terms, conditions, and privileges of employment".

Terminology

Smith offers the following definitions of major terms that are important in the world of speech and language disorders.

- *Alternative and augmentative communication (AAC)*: Assistive technology that helps individuals to communicate; may be low-tech or high-tech
- *Articulation disorder*: Atypical generation of speech sounds
- *Cleft lip*: Upper lip is not connected, resulting in abnormal speech
- *Cleft palate*: An opening in the roof of the mouth that allows too much air to pass through nasal cavity, resulting in abnormal speech
- *Communication*: Transfer of knowledge, ideas, opinions, and feelings
- *Communication board*: Low-tech AAC device that displays pictures or words to which an individual points to communicate

- *Communication disorder*: Disorders in speech, language, hearing, or listening that create difficulties in effective communication
- *Disfluency*: Interruptions in the flow of an individual's speech
- *Expressive language*: Ability to express one's thoughts, feelings, or information
- *Language*: Rule-based method used for communication
- *Language delays*: Slowed development of language skills
- *Language disorder*: Difficulty/inability to comprehend/make use of the various rules of language
- *Loudness*: A characteristic of voice; refers to intensity of sound
- *Morphology*: Rules that determine structure and form of words
- *Otitis media*: Middle ear infection that can interrupt normal language development
- *Pitch*: A characteristic of voice; usually either high or low
- *Phonological awareness*: Understanding, identifying, and applying the relationships between sound and symbol
- *Phonology*: Rules of a language that determine how speech sounds work together to create words and sentences
- *Pragmatics*: Appropriate use of language in context
- *Receptive language*: Ability to comprehend information that is received

- *Semantics*: System of language that determines content, intent, and meaning of language
- *Speech*: Vocal production of language
- *Speech impairment*: Abnormal speech is unintelligible, unpleasant, or creates an ineffective communication process
- *Speech/language pathologist*: Professionals who help individuals to maximize their communication skills.
- *Speech synthesizer*: Assistive technology that creates voice
- *Stuttering*: Hesitation or repetition contributes to dysfluent speech
- *Syntax*: Rules that determine word endings and word orders
- *Voice problem*: Abnormal oral speech, often including atypical pitch, loudness, or quality

History

In the mid 19th century, the scientific endeavors of such individuals as Charles Darwin gave rise to more systematic and scientific consideration of physical phenomenon, and the work of others, such as Paul Broca and Carl Wernicke, also lent scientific rigor to the study of speech and language disorders. The late 19th century saw an increase in "pre-professionals," those who offered speech and language services based upon personal experiences or insights. Several trends were exhibited even in the 19th century, some have indicated the importance of elocution training in the early 19th century, through which individuals would seek out those with training to improve their vocal qualities. By 1925 in the USA interest in these trends

lead to the forming of the organization that would become American Speech-Language-Hearing Association (ASHA) and the birth of speech-language pathology.

The twentieth century has been proposed to be composed of four major periods: Formative Years, Processing Period, Linguistic Era, and Pragmatics Revolution. The Formative Years, which began around 1900 and ended around WWII, was a time during which the scientific rigor extended and professionalism entered the picture.

During this period, the first school-based program began in the U.S. (1910). The Processing Period, from roughly 1945-1965, further developed the assessment and interventions available for general communication disorders; much of these focused on the internal, psychological transactions involved in the communication process.

During the Linguistic Era, from about 1965-1975, professionals began to separate language deficits from speech deficits, which had major implications for diagnosis and treatment of these communication disorders. Lastly, the Pragmatics Revolution has continued to shape the professional practice by considering major ecological factors, such as culture, in relation to speech and language impairments. It was during this period that IDEA was passed, and this allowed professionals to begin working with a greater scope and to increase the diversity of problems with which they concerned themselves.

Speech and language pathology in school settings

Speech-language pathology, also known as *communication sciences and disorders* is a fast-growing profession that, according to the Bureau of Labor Statistics, offers about 120,000 jobs in the United States alone. The American Speech-Language-Hearing Association (ASHA) has 166,000 members, who are audiologists, speech-language pathologists, speech, language, and hearing scientists, and speech language pathology assistants.

To begin practice in most areas of the United States, a prospective therapist must have an undergraduate degree (preferably in some area of communications) and a graduate degree (with two externships; usually about 2 to 2 1/2 years) in speech pathology. A 9-month, supervised clinical fellowship year is then completed, after which the Certificate of Clinical Competence (CCC) in speech pathology from the American Speech-Language-Hearing Association (ASHA) is granted.

In order to be certified clinically competent the Praxis exam must be passed. In some areas the master's degree is not required. In some areas additional requirements must be met: an additional certification from ASHA in school speech pathology and audiology, certification in special education instruction, and/or and must have passed any other federal or state examinations for licensure and certification. To retain the ASHA license a minimum amount of continuing education must be completed. A doctorate is not currently required (as of June 2011), but that may change, as it has for many other areas of

therapy. Speech-language pathology overlaps with many educational disciplines, such as communication sciences, linguistics, special education, and health care. This article will explore some of the fundamental elements of speech-language pathology, looking at the career in an educational setting.

Speech-language pathology

Speech-language pathologists (SLPs) often called speech therapists, are professionals who assess and diagnose individuals with speech, language, cognitive, and swallowing disorders. SLPs may also conduct research in the field, run a private practice, or work with large companies to improve employee-customer communication (American Speech-Language-Hearing Association). This article will focus on the aspects of speech-language pathology as practiced with young children in a school setting.

In speech-language pathology, important distinctions are made between speech, language, and communication.

Speech is the production of spoken language. Several parts of the body work together to produce sound waves, and this motor production of speech is called articulation. The parts of the vocal tract involved with speech include the lips, tongue, teeth, throat, vocal folds, and lungs. Speech disorders affect the physical mechanisms of communication and cause problems with articulation or phonology. Examples of speech disorders include stuttering, lisping, and voice disorders.

Language is a system used to represent thoughts and ideas. Language is made up of several rules that explain what words

mean, how to make new words, and how to put words together to form sentences. A community must share the same language in order to attach meaning to utterances. The method of delivery of language may be visual (e.g., American Sign Language), auditory (e.g., English), and/or written. Humans are the only creatures innately capable of using language to discuss an endless number of topics. Language disorders can be developmental or acquired (e.g., specific language impairment and aphasia, respectively).

Communication is the exchange of information and ideas through the use of speech and language. The transfer of information is often spoken, but may also be implied through body language or contextual cues such as intonation or hesitation. Usually, communication is a four-step process:

- Encoding: the speaker creates the message in his mind
- Transmittal: the speaker sends the message
- Reception: the listener receives the message
- Decoding: the listener breaks down the message in his mind

If a problem occurs at any step of the process, the message might not be communicated. Without the ability to communicate through speech and language, we would not be able to tell a doctor that we have a stomach ache, choose food from a menu, or say "I love you" to our children. Communication is a most basic component of human nature and it develops before we are even conscious of it.

PHAGIA & SWALLOWING The process of grasping, biting, sucking, mucose making, swallowing and routine eating ability.

Dysphagia can effect in many aspect of life. Dysphagia accurs in developments disorder and acquired brain and buccofacial anomalies or disease.

Speech and Language Pathology Jobs

Speech-Language Pathologists (SLPs) have several options when seeking employment. One of the most popular is to secure a school-based position through an agency that specializes in this area. One of the largest and most respected agencies is Therapy Source, a nationwide organization founded in 2001, and based out of Plymouth Meeting, PA.

Development of speech and language

Every child develops at a different rate, but most go through the same stages. Listed below are the average ages of some important language and comprehension milestones as developed by the American Speech-Language-Hearing Association. Please note that like with any developmental timeline, these stages may be quite varied and perhaps met in a different order.

A child who accomplishes these milestones differently may not necessarily have a developmental delay or speech disorder (and a child who hits these stages early is not necessarily a prodigy!).

- birth to 3 months
- startles to loud sounds
- smiles when spoken to
- responds to pleasure with 'cooing' noises
- 4 months to 6 months
- notices and pays attention to sounds and music
- shifts eyes in direction of sounds
- makes babbling noises that resemble speech
- 7 months to 1 year
- recognizes basic familiar words such as *cup* or *ball*
- imitates different speech sounds
- produces first words such as *bye-bye* or *mama*
- 1 year to 2 years
- listens to simple stories
- identifies pictures by name when directed (*point to the cow*, e.g.)
- speaks two-word sentences such as *more juice* or *where daddy?*
- 2 years to 3 years
- understands differences in meaning for basic words (*up-down* or *in-out*)
- produces three-word sentences
- can name most objects
- 3 years to 4 years
- understands questions
- talks about events
- speech is understood by most people
- 4 years to 5 years
- pays attention and responds to stories and questions
- speaks clearly
- tells detailed, ordered stories

Problems can arise at any stage of development, as well as much later in life. They can be the result of a congenital defect, a developmental disorder, or an injury. If a problem is suspected, an assessment should be made by an SLP who can diagnose and treat communication disorders.

Diagnosis of communication disorders

In a school setting, children are often screened when they start kindergarten. This process involves a rapid assessment to determine which children need further testing, diagnosis, or treatment. Often, a screening is a sort of informal interview between an SLP and a child or group of children.

The child may be asked to give their name, count, pronounce the names of pictured objects, and answer open-ended questions. The purpose of these tasks is to elicit a brief language sample from the child which the SLP will use to evaluate articulation, fluency, and other aspects of speech. Screenings usually last about five minutes (Oyer 10).

After a screening is done, an individual diagnosis must be made. This involves a one-on-one evaluation which may last two hours or more. If an individual has been referred for testing, either by a doctor, teacher, or other professional, the screening process is skipped and testing starts here. This session allows the SLP to gather information that will help in the diagnosis of a speech or language problem, as well as provide insight to possible causes, goals and objectives for therapy, and which techniques will work best for that

individual. Individual evaluations often include the following components:

- A visual examination of the oral cavity and throat (typically with a flashlight and tongue depressor) to determine whether the physical structures appear to be capable of speech production
- Tests of articulation of speech sounds in words and sentences as well as alone
- A measure of the ability to hear the difference between correct speech sounds and sounds actually produced
- Tests of expressive language and spontaneous speech
- Evaluations of fluency and voice
- A hearing test
- A case history

After this evaluation, the SLP will review the results and information gathered and determine whether the individual would benefit from speech therapy. Goals and objectives of therapy are outlined and a specific treatment plan is created, drawing on the strengths and weaknesses and unique situation of that individual (Oyer 11).

Common communication and language disorders

Disorders that affect children may affect adults differently, or even not at all. As the body grows and develops, the types of disorders that affect an individual change. Children typically

exhibit developmental language disorders, but may also experience problems due to illness or injury.

In developing children, language disorders are often related to congenital disabilities or neurological or physiological results of childhood illness. These seemingly unrelated problems can seriously affect speech and language development. Children that have cognitive impairments are often delayed in development of communication skills. Different genetic syndromes that often cause cognitive impairment, such as Down syndrome or Williams syndrome, often affect different areas of speech. Children with autism tend to have difficulty communicating and expressing their emotions or desires. Sometimes this is due to specific problems with articulation or semantics, but often it is an issue of neurological development directly related to autism. Brain injuries, tumors, or seizures in children can also cause loss of language skills. Children with attention deficit hyperactivity disorder (ADHD) commonly have learning difficulties which also affect their language development. Emotional disturbances early in childhood can also affect the growth of basic communicative skills. Perhaps more obvious are the developmental and communicative consequences of childhood hearing loss (Boone 200-05).

Some disorders commonly diagnosed in children:

Specific language impairment/ Developmental Language Disorder (#DevLangDis)

Some children have language development deficits that cannot be linked to neurological, intellectual, social, or motor causes. The child's language skills grow much more slowly than those

of typically developing children. While other children are speaking in complete sentences, using conjugated verb forms, the SLI child's speech sounds telegraphic- lacking grammatical and functional morphemes (e.g., *He go store*. rather than *He goes to the store*.) Their vocabulary remains relatively small while other children are adding new words every day. The SLI child often produces short sentences in order to avoid embarrassment and may have problems understanding complex or figurative structures (such as metaphors or multi-clausal sentences). Problems due to SLI can also lead to learning disabilities as the child fails to understand information being presented in science, language arts, or math classes. Studies suggest that the cause of SLI is a biological difference in brain anatomy and development (Boone 204). Treatment objectives generally focus on vocabulary development, verb morphology, memory and recall, and narrative skills (Goffman 154).

Articulation disorders

An articulation disorder may be diagnosed when a child has difficulty producing phonemes, or speech sounds, correctly. When classifying a sound, speech pathologists refer to the manner of articulation, the place of articulation, and voicing. A speech sound disorder may include one or more errors of place, manner, or voicing of the phoneme.

Different types of articulation disorders include:

- omissions
- certain sounds are deleted, often at the ends of words; entire syllables or classes of sounds may be deleted; e.g., *fi'* for *fish*

- substitutions
- one sound is substituted for another, often with similar places or manners or articulation; e.g., *fith* for *fish*
- distortions
- sounds are changed slightly by what may seem like the addition of noise, or a change in voicing; e.g., *filsh* for *fish*
- additions
- an extra sound is added to one already produced correctly; often occurs at the ends of words; may include changes in voicing; e.g., *fisha* for *fish* (Boone 256-58)

The phonemes that present the greatest challenge for children include /l/ as in *pull*, /r/ as in *mirror*, /ʃ/ ("sh") as in *shut*, /tʃ/ ("ch") as in *church*, /dʒ/ ("j") as in *fu**dg**e*, /z/ as in *zoo*, /ʒ/ ("zh") as in *mea**s**ure*, /θ/ ("th") as in *math* and /ð/ ("th") as in *this* (Boone 112).

Articulation disorders may be attributed to a variety of causes. A child with hearing loss may not be able to hear certain phonemes pronounced at certain frequencies, or hear the error in their own production of sounds. Oral-motor problems may also be at fault, such as *developmental verbal dyspraxia* (a problem with coordination of speech muscles) or *dysarthria* (abnormal facial muscle tone, often due to neurological problems such as cerebral palsy). Abnormalities in the structure of the mouth and other speech muscles can cause problems with articulation; cleft palate, tongue thrust, and dental-orthodontia abnormalities are some common examples. Finally, it is difficult for children to hear and produce all of the

different phonemes of a given language. Development is slow, and may take up to seven years. Sometimes, as children grow, articulation problems fade and disappear without treatment. Often, however, therapy is necessary. Treatment therapies may target semantic differences related to phonemic differences (e.g., teaching a child the difference between *toe* and *toad*, underlining the importance of the final consonant), physical-motor differences (e.g., using a mirror to show a child the correct tongue placement for a particular sound), or behavior modification techniques (e.g., repetitive production through prompts and fun learning games). Support and reinforcement of therapy practices, both in the classroom and at home, are crucial to the success of articulation disorder treatment (Boone 122-24, 259–62, 274–76).

It is necessary to note the difference between articulation disorders and dialectical variations. There are several dialects of English spoken in the United States, influenced by socioeconomic status, geographic isolation, and other languages either brought to the U.S. by settlers or indigenous languages of the Native Americans. These social dialects are rule-governed and are not to be considered lesser than, but simply different from standard English. Examples of dialectical features that may be mistaken for articulation disorders include the 'r-lessness' of New York City speech in words like floor, here, and paper as well as the reduction of consonant clusters in African-American Vernacular English (AAVE). If a word ends with two or more consonants such as in *cold*, and is followed by another word that begins with a consonant such as *cuts*, *cold* is shortened to *col*, producing *col cuts*. These features alone should not be treated as articulation disorders to be 'cured' by speech therapy. However, it is possible for a

child with a dialectal variation to also have a communication disorder. It is important for a speech pathologist to be able to tell the difference (Oyer 170).

Voice disorders

Children may experience problems with their voice due to misuse or abnormalities in the vocal mechanisms. There are two types of voice disorders: those of phonation, and those of resonance. Both types can be the result of either abuse or physical structure. Voice disorders are among the most successfully treated speech and language problems because they can be solved with surgery or reconditioning of the voice (Boone 286).

A **phonation disorder** is a problem with pitch, loudness, or intensity that originates in the vocal folds of the larynx. Phonation disorders may be *functional*, caused by continuous yelling or throat clearing, excessive smoking, or speaking at an abnormally low frequency or pitch.

The results may be an increased size or thickening of the vocal folds, lesions or polyps on the vocal folds, or problems with elasticity of the larynx. In these cases, the treatment involves resting the voice and learning to speak at optimal pitches and volumes, as well as eliminating external causes such as smoking. Phonation disorders may also be *organic*, due to viral growths, cancer, paralysis of laryngeal nerves, surgical intubation, or external traumas such as being hit in the throat with a baseball. These problems may require surgical removal of growths or reconstruction of the larynx, accompanied by voice therapy (Boone 287-96).

A **resonance disorder** occurs when any part of the vocal tract is altered or dysfunctional.

In the case of an *oral* resonance disorder, the tongue sits too high in the front or back of the mouth. When the tongue is too far forward in the mouth, a type of 'baby voice' occurs, and a lisp may also result. Treatment involves practicing back vowels such as /a/ in *father*, /o/ in *boat*, and /u/ in *spoon*, accompanied by back consonants like /k/ in *broke* and /g/ in *bog*. When the tongue sits toward the back of the mouth, the voice sounds dull, and problems with articulation at the front of the mouth may also occur. Treatment focuses on front consonants such as /w/ in *where* or *work*, /p/ in *pink*, /b/ in *ball*, /f/ in *laugh*, /v/ in *leave*, /l/ in *mail*, and /th/ in *with* or *bath* coupled with high-front vowels like /i/ in *wheat*, /I/ in *fit*, /e/ in *pay*, /E/ in *bet*, and /ae/ in *slat*. This type of resonance disorder is commonly seen in children with severe hearing impairment.

Nasal resonance disorders occur when the space between the oral and nasal cavities remains open or closed, producing a *hypernasal* or *denasal* resonance. Causes of hypernasality include paralysis of the velum, a short velum, or a cleft palate which allows air to escape to the nasal cavity. The speech of actor James Stewart is a recognizable example of hypernasality (although in this case, there was no structural problem; rather, he employed the highly nasal voice as part of his character). Denasality is often caused by a structural blockage which doesn't allow air to pass between the oral and nasal cavities. A child experiencing denasality may sound like they have a bad cold. If a structural problem is to blame, surgery is the most common treatment. After surgery, or if there is no

structural cause, voice therapy is often given, involving massive amounts of practice (Boone 305-12).

Fluency disorders

As a child's language and vocabulary grows, they may struggle to locate a particular word or sound. Normal dysfluency occurs in developing children as a repetition of whole words or phrases while the child searches for a particular thought or word. Around age three-and-a-half, children may compulsively repeat words or phrases. This tends to fade by the time the child is five.Stuttering, in contrast, results in repeated or prolonged speech sounds or syllables. Often, involuntary blocks in fluency will be accompanied by muscle tension due to frustration. The mouth may tighten up or the eyes may blink rapidly. A child may become so embarrassed by stuttering that they talk as little as possible to avoid the struggle. This may have serious academic and social implications. The cause of stuttering is unknown, yet widely debated. Most theories suggest emotional, psychological, or neurological origins. Psychological treatment aims at improving the self-image of the child and the child's attitude toward the problem, while other therapies attempt to increase fluency by modifying the rhythm and rate of speech (Boone 316-29, 335–38).

How many people are affected by communication disorders?

According to the National Institutes of Health, it is estimated that, in the United States,

- between 8 and 10 percent of people have a communication disorder
- 7.5 million people have voice disorders
- cleft palate affects 1 in 700 live births
- 5 percent of children have noticeable communication disorders
- stuttering affects more than 3 million people, mostly children age 2 through 6

According to the United States Department of Education, speech, language, and hearing impairments account for 20.1 percent of all Special Education students in the United States.

Benefits of speech therapy

Communication skills play an important part in life's experiences. In elementary school, children are developing language and learning to read and write. In order for a child to learn, he has to communicate and interact with his peers and adults. Spoken language is the basis for written language. As a child grows and develops, the two types of language interact and build upon each other to improve literacy and language. This process continues throughout a person's life. If a child has a communication disorder, they are often delayed in other areas, such as reading and math. The child may be very bright but unable to express themselves correctly, and the learning process can be affected negatively.

Speech therapy can help children learn to communicate effectively with others and learn to solve problems and make decisions independently. Communication with peers and educators is an essential part of a fulfilling educational

experience. Also, children who are able to overcome communication disorders feel a great sense of pride and confidence. Children who stutter may be withdrawn socially, but with the help of therapy and improved confidence, they can enjoy a fully active social life (*ASHA*).

Speech Buddies

Speech Buddies are a series of speech therapy tools that are used to remediate articulation and speech sound disorders using the widely accepted teaching method of tactile feedback. Articulation, or speech sound disorders occur when a person has difficulty producing a sound correctly. Sounds may be left off, substituted, added or changed, making it difficult to be understood. Often occurring when children are learning to speak, these errors are considered a disorder if they persist after a certain developmental age.

A developmental age at which a child should be able to correctly produce a certain sound is different depending on the difficulty of the sound. The B-sound is one of the first mastered, while the R-sound is more difficult and may not be mastered until several years later. Most articulation disorders are of no known cause, though many can be attributed to other disorders such as autism, or hearing impairment.

Speech Buddies help treat articulation disorders. There are five different Speech Buddies, each one addressing an individual sound: R, S, L, CH or SH. These tools teach correct tongue placement when trying to produce problem sounds. This type of learning is called tactile feedback, which uses the sense of touch to promote learning.

Preliminary research results from a single blind randomized controlled trial suggest that they may increase the speed in which a child can learn to correct his speech sound disorder. Ongoing research is exploring the use of Speech Buddies to help in other speech therapy applications including foreign accent reduction, developmental verbal dyspraxia, acquiredapraxia of speech from stroke or traumatic brain injury (TBI). Experts have published clinical experiences using Speech Buddies for articulation disorders and apraxia in industry blogs such as Play on Words, Mommy Speech Therapy and traditional publications such as the Chicago Tribune. On May 31, 2011, Dr. Max Gomez of WCBS-NY reported on how Speech Buddies are being used to reduce overall cost and treatment time of speech therapy.

Speech Buddies were invented by Articulate Technologies, Inc., in San Francisco, CA. Speech Buddies® and Speech Buddy™ are trademarks of Articulate Technologies, Inc. They are FDA listed medical devices.

Speech disfluency

A **speech disfluency**, also spelled **speech dysfluency**, is any of various breaks, irregularities, or non-lexical vocables which occur within the flow of otherwise fluent speech. These include "false starts", i.e. words and sentences that are cut off mid-utterance; phrases that are restarted or repeated and repeated syllables; "fillers", i.e. grunts or non-lexical utterances such as "huh", "uh", "erm", "um", "well", "so", "like", and "hmm"; and "repaired" utterances, i.e. instances of speakers correcting their own slips of the tongue or mispronunciations (before

anyone else gets a chance to). "Huh" is claimed to be a universal syllable.

Fillers

Fillers are parts of speech which are not generally recognized as purposeful or containing formal meaning, usually expressed as pauses such as "uh", "like" and "er", but also extending to repairs ("He was wearing a black—uh, I mean a blue, a blue shirt"), and articulation problems such as stuttering. Use is normally frowned upon in mass media such as news reports or films, but they occur regularly in everyday conversation, sometimes representing upwards of 20% of "words" in conversation. Fillers can also be used as a pause for thought ("I arrived at, um—3 o'clock"), and when used in this function are called hesitation markers or planners.

Language-dependence

Research in computational linguistics has revealed a correlation between native language and patterns of disfluencies in spontaneously uttered speech. Besides that research, there are other subjective accounts reported by individuals.

According to one commentator, Americans use pauses such as "um" or "em", the Irish commonly use the pause "em", the British say "uh" or "eh", the French use "euh", the Germans say "äh" (pronounced eh or er), the Dutch use "eh", Japanese use "ā", "anō" or "ēto", the Spanish say "ehhh" (also used in Hebrew) and "como" (normally meaning 'like'), and Latin

Americans but not the Spanish use "este" (normally meaning 'this'). Besides "er" and "uh", the Portuguese use "hã" or "é".

In Mandarin, "那个(nàgè)" and "这个(zhège)" are used, meaning "that" or "this", respectively. Arabic speakers say "يعـــني", the pronunciation of which is close to "yaa'ni", [jæو ni] or [jaو ni], (literally 'he means', there is no grammatical gender-neutral third person) and Turkish say "şey" in addition to "yani" (without the [و] found in Arabic) and "ıı".

Despite the differences between languages, pause fillers in different languages often sound similar because they tend to be the easiest and most neutral vowel sounds to make (such as the schwa), i.e the sounds that can be pronounced with a relaxed tongue or jaw.

Research

Recent linguistic research has suggested that non-pathological disfluencies may contain a variety of meaning; the frequency of "uh" and "um" in English is often reflective of a speaker's alertness or emotional state. Some have hypothesized that the time of an "uh" or "um" is used for the planning of future words; other researchers have suggested that they are actually to be understood as full-fledged function words rather than accidents, indicating a delay of variable time in which the speaker wishes to pause without voluntarily yielding control of the dialogue. There is some debate as to whether to consider them a form of noise or as a meaning-filled part of language.

Speech disfluencies have also become important in recent years with the advent of speech-to-text programs and other

attempts at enabling computers to make sense of human speech.

"Hmm"

Hmm is an exclamation (an emphatic interjection) typically used to express reflection, uncertainty, thoughtful absorption, or hesitation. Hmm is technically categorized as an interjection, like um, huh, ouch, erm, and wow. The first h-sound is a mimic for breathing in, and the second m-sound, since the mouth is closed, is representing that the person is not currently sure what to say ("erm" and "um" are used similarly). The pause filler indicates that the person is temporarily speechless, but still engaged in thought. The variety of tones, pitches, and lengths used add nuances in meaning.

Etymology

The expression is used in many different languages, however the origin of "hmm" is difficult to find, mainly because "the word is so natural that it may have arisen at any time," as highlighted by linguist at the University of Minnesota and an expert on word origins, Anatoly Liberman. It is possible Neanderthals might have used "hmm". Nicholas Christenfeld, a psychologist at the University of California, San Diego, and an expert on filled pauses, attests "hmm" is popular largely since it's such a neutral sound and that "it's easier to say than anything else". The earliest attestations of "hmm" are from Shakespeare, "I cried hum... But markt him not a word" (1598

Shakespeare Henry IV, Pt. 1 iii. i. 154). It may be a vocable that grew out of lexicalizedthroat-clearing.

Use as a filler word

"Hmm" is a "filler" word, such as "um" and "er". Use of "hmm" for "filled pauses" has been considered by many as stupidity and showing a lack of skill or competence, but many linguists attest this judgement is unjustified. Typically, "hmm" is uttered when the person is being especially conscious about whom they are talking with, and as a result are thinking deeply about what to say. Moreover, the use of "hmm" is often interactional and cognitive. The interactional function is to do with politeness: if someone is invited to a party and responded "no" without a filled pause, they might appear rude, but a reply of "Hmm, sorry, no" might appear much more polite, as it seems the speaker is giving the offer some thought, rather than abruptly declining.

Thoughtful absorption

The use of "hmm" is typically used during "thoughtful absorption", which is when one is engrossed in their flow of ideas and associations, that lead to a reality-oriented conclusion. The utterance of "hmm" is key for listeners to understand that the speaker is currently engaged in thought; if the speaker thought silently instead, listeners may be unsure if the speaker had finished their utterance. "Um" and "er" are also used during thoughtful absorption; however, typically the extent of the absorption of thought is more limited since "um" and "er" are usually spoken mid-sentence and for shorter

periods of time than "hmm". For this reason, thoughtful absorption is typically associated with the utterance of "hmm".

"Huh" – the universal syllable

Research has shown that the word/syllable "huh" is perhaps the most recognized syllable throughout the world. It is an interrogative. This crosses geography, language, cultures and nationalities.