

The Significance of Speaking Rate in Speech and Language Treatment

Abstract

The following questions are discussed:

- I. Has the average rate of speaking increased over the last decades?
- II. Have there been changes in the pragmatics of discourse which are symptomatic of a cultural change in average rate of speaking?
- III. Do research results indicate physiological limitations on the speed of language processing?
- IV. What effects does a slower rate of speaking show?
- V. Are increased and accelerated communicative expectations part of the etiological complex of speech disorders?
- VI. What are the consequences for clinical practice?

Key words: rate of speaking, articulation rate, pauses, speech comprehension, pragmatics

I. Has the average rate of speaking increased in the past decades?

I.1 What is "average speaking rate?"

In his analysis of changing language usage in German radio news from 1932 to 2001, Scherz-Schade (2004) defines speaking rate as measured and influenced by five parameters (s. Fig. 1):

- 1) **Articulation rate:** calculated from the number of syllables per time unit between pauses. Pauses are not included. This number can be an indication of speed and/or exactness of articulatory movement.
- 2) **Pause duration:** calculates the average time between articulatory phrases. There is a pragmatically important difference between pauses within an informative utterance and pauses between informative utterances: this will not, however, be covered at length here.
- 3) **Speaking rate:** calculated from the number of syllables per entire speaking time including the pauses between articulatory phrases.
- 4) **Length of articulatory phrase:** gives the number of syllables between two pauses. This influences articulation rate, because short phrases are articulated more slowly than long ones. Phrase length is also often directly related to the complexity of content. The strong influence of content complexity on speech comprehension is briefly discussed below; however, this will not be considered at length here.
- 5) **Percentage of pause time:** gives the relationship of pause time to entire speaking time.

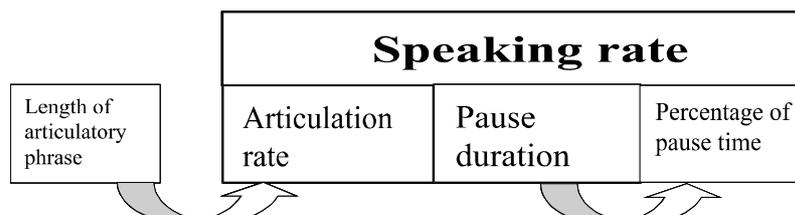


Figure 1: Parameters which influence speaking rate.

I.2 Methods of accelerating speaking rate.

Changing the parameters listed above influences speaking rate. Raithel and Brede (1993) describe the acoustic effects of accelerating articulation rate. Generally speaking, the formant frequencies are reduced. Increasing articulation rate usually leads more to a decreased exactness of articulatory movements than to an increased speed of movement: the goal positions of the articulators are not completely reached.

This strategy -- less exact movements at approximately the same actual speed of motion -- is used by most people when increasing articulation rate. Usually the affected vowels are still perceived as distinct, since most people are capable of combining fragments of perceived words to comprehend the whole. However the consonants are also affected, and in many cases comprehension is reduced as an end result.

There is also a second strategy of increasing articulation rate which consists of a true acceleration in the speed of articulatory movements. In "clear speech", the speaker consciously strives for clear and correct pronunciation. In clear speech the duration of individual sounds is lengthened and short pauses are inserted between words (Picheny et al. 1989). Normally clear speech is slower than average. With training, however, even non-professional speakers can avoid the reduction of formant frequencies described above while using clear speech and still speaking at average speaking rate. Under these circumstances, clear speech requires quicker movements (Krause and Braida 2002). However, normally hearing conversational partners use clear speech only for a repair of a misunderstanding or breakdown in communication assumed to be acoustically or perceptually caused.

An acceleration of speaking rate can therefore be achieved by raising the speed of articulatory movements or by decreasing their exactness. Another option is shortening pause duration (s. Figure 2). Pauses in speech are extremely complex phenomena which influence several parameters of speech and several syllables in their linguistic surroundings (Zellner 1994). Pauses may have physiological functions (breathing, swallowing), linguistic functions (syntactic or semantic, for instance emphasis: "it was ... too late") or super-ordinated, higher-level functions such as organising thoughts. They also may have a pragmatic function such as indicating a change of topic or speaker. Shortening pause duration influences speech comprehension by reducing both the clarifying function as well as the "catching-up" time which pauses allow for understanding and processing information. The pragmatics of discourse are also clearly influenced by shortening pause duration.

I.3 Which speaking rate is "normal"?

Which speaking rate is used and perceived as "normal" by speakers and listeners depends on several different factors. Firstly the language being spoken influences perception of "normal", e.g. Japanese is spoken more quickly than German (Iwasaki et al. 2002). Secondly culture plays a role: for instance, New Zealand English is spoken approximately 30 syllables per minute faster than American English (Macdonald 2004). Thirdly sub-cultures exert an influence, e.g. urban or rural (Ward and Nakagawa 2004). Fourthly inter-individual differences exist which are influenced by neurolinguistic or neuromuscular factors (e.g. individual highest possible speed of comprehension or of articulatory motion, see below). And lastly there are intra-individual differences, through which the same person varies speaking rate and/or expectations of "normal rate" depending on conversation partner, acoustic situation, content, health or mood.

There is little research on the extent to which these factors influence speaking rate. Smith (2004) established that children who had a dyslexic parent and who later themselves developed dyslexia (Group A: dyslexic parent, dyslexic child) already spoke more slowly than a control group at the early age of 30 months. Interestingly, the children in another group also had a dyslexic parent. These children, however, did not develop dyslexia themselves later (Group B: dyslexic parent, child has no dyslexia). They spoke just as quickly as a third group

of children (Group C: no dyslexic parents, no dyslexic children) at 30 months. This result would seem to indicate a general speech ability which also influences speaking rate.

Tsao and Weisner (1997) divided 30 speakers into 2 groups according to their rate of speech. This investigation showed that the habitual average rate of speech was significantly related to the individual highest possible rate of speech. The relative increase from habitual to highest possible speaking rate was approximately the same for members of both groups. According to the authors this may indicate a neuromuscular component of speaking rate.

There were, however, some members of the "slower" group who did not fit this pattern. They could speak very quickly if they wished. Therefore these speakers were not bound to their habitual average speaking rate by physiological factors, but rather had chosen slower speech for other reasons, for example cultural or personal.

"Average speaking rate" is also often not clearly defined. The quantitative data rarely describes similar speech parameters (articulation rate, percentage of pause time, etc.) The data varies considerably for this reason. Despite this restriction, some research findings are presented in Figures 2 and 3.

Information source :	1. Software	2. Radio	3. Teaching
"Slow":	120 words/min.		
"Normal":	180 – 200 words/min	250 SYLLABLES/min.	120 words/min.
"Accelerated":	300 words/min.	295 SYLLABLES/min.	

Figure 2: Speaking rate (German) 1. Menne et al (2004), 2. Horsch et al (1996), 3. Stegh (2002)

Information source:	1. Telemarketing	2. Speech pathology	3 Compressed speech
"Normal":	New York: 240 words/min. Midwest: 170 words/min. Average: 180 words/min.	a. 270 SYLLABLES/min. b. 140 – 180 words/min.	130 – 200 words/min
"Accelerated":		b. 210 words/min.	

Figure 3: Speaking rate (American English): 1. Humphreys (1996) 2a. Macdonald (2004) 2b. McCoy et al. (2005) 3. Arons (1992)

I.4 Has the average speaking rate increased in the past few decades?

No research data on the speed of average conversational speech was available. Informal observation of television programs and film from the years 1958-68 showed longer conversational pauses (e.g. inter-topic or inter-speaker pauses) than in modern programs or films. An informal comparison of the original film "Ocean's Eleven" (1960) with the modern version (2002) showed that speech comprehension as indicated by totalling incomprehensible utterances was approximately 50% better with the original version. Actual speaking rate could, however, only be objectively measured mechanically, which would require an independent investigation.

Scherz-Schade (2004) compared the relative speaking rate of German radio news in three eras. An analysis of radio news can only give an indirect indication of average speaking rate in conversational speech. Nonetheless, this investigation is of interest: firstly, it is one of the few research projects on this topic; secondly, the media have a known effect on speech and language. In Figure 4 only the results from the first and last era are shown. The increase in the articulation rate adds up to 30 syllables more per minute; the reduction in percentage of

pause time from 17.3% to 10.1% is equally dramatic. The two parameters together result in an increase of 50 syllables per minute.

To conclude, subjective data show decreased speech comprehension in the modern version of a film originating in 1960. Decreased speech comprehension implies a higher speaking rate. Objective data on speaking rate in German radio news in the last decades clearly show an acceleration. More objective data are needed on the question of increased speaking rate in conversation.

	Era 1 (1933 –45)	Era 3 (1990 – 2001)
Articulation rate	5.44 syllables/sec.	5.94 syllables/sec.
Average pause duration	0.64 sec.	0.44 sec.
Speaking rate	4.5 syllables/sec.	5.34 syllables/sec.
Articulatory phrase length	14.84 syllables	20.38 syllables
Percentage of pause time	17.3%	10.1%

Figure 4: Change in general speaking rate in German radio news during 3 eras (here Era 1 and Era 3 only) Scherz-Schade (2004)

II. Have there been changes in the pragmatics of discourse which are symptomatic of a cultural change in average rate of speaking?

The influence of a higher rate of speaking on communicative social behaviour is definitely complex and not yet widely researched.

Increased expectations concerning "normal" speaking rate and "normal" rate of speech comprehension could be suspected from the proven difference in radio speaking rate discussed above. In speech treatment, one concrete form of these increased expectations could conceivably be suspected in vocabulary tests which require active vocabulary to be retrieved and produced within a certain time limit.

A reduction in pause time also influences pragmatics. Social expectations pertaining to conversation partners reflect this change: in urban culture for example, conversational pauses are scarcely tolerated. Only a few seconds are allowed to pass before a "repair" is undertaken and the utterance is repeated or differently formulated. Rural cultures, on the other hand, tolerate longer pauses.

This aspect of pragmatics could reflect a general cultural change which is described by Scherz-Schade as follows: "There is a "fashion" reflected in everyday culture which interprets a higher speed as generally more modern and progress-oriented"(p. 286). The relatively recent research field associated with this cultural change is known as "time research" ("Zeitforschung"). Geissler (2004) for example researches the relationship of time and ecology. He postulates that humankind's acceleration of natural rhythms results in ecological damage. BSE for instance is a time phenomenon: it resulted from the attempt to accelerate weight gain in cattle by introducing new feed.

The results of an accelerated speaking rate on the communicative behaviour of those needing a slower speaking rate can be considered as an interactive parallel to the ecological damage caused by accelerating weight gain. Increased articulation rate and reduced pausing allow less time to process a message which has also been less clearly spoken. There is less time to form an opinion and less time to formulate an answer. Speakers who would have required a silent pause are forced to either speak without sufficient preparation or remain silent. Children especially often choose the latter option.

A conversational culture which will tolerate few pauses leads to a striking conversational phenomenon: in many situations it is considered acceptable for a conversation partner to answer a question addressed to another person. Especially in the case of children, the

original speaker will even answer his own question rather than allowing a silent pause to ensue. A person who frequently experiences having someone else answer for him comes to two conclusions: 1) it is too difficult to take part in conversation and 2) it is not really necessary -- someone else will answer. The results of this artificial communicative passivity are little researched but may be far-reaching.

In this context the fact that the number of developmental speech delays in German rural areas is lower than in urban areas (Heinemann, 1996) may indicate a correlation between speaking rate and speech disorders. Again there is little objective research data on the difference in urban and rural average speaking rates. However Ward and Nakagawa (2004) expect slower speakers in rural areas. And the average pause duration as well as the percentage of pause time tolerated in conversation are informally documented by many jokes about rural areas such as Ostfriesland, a province on the northern German coast (see Appendix).

In conclusion, changes in pragmatics which are symptomatic of a cultural change in average rate of speaking are little documented by research results. Informal and anecdotal evidence seem to support this theory.

III. Do research results indicate physiological limitations on the speed of language processing?

Speech comprehension is measured through 2 parameters:

- 1) Word comprehension indicates the decoding of the individual words and is usually tested through memory or recognition tasks.
- 2) Content comprehension indicates understanding of the entire contents. It is usually tested through more open questions pertaining to the subject matter.

Word comprehension requires phonetic/phonological analysis and semantic classification of the words. Content comprehension of flowing speech requires much more. Every word must be recognized, as above. Additionally the syntactic structure of the perceived utterances must be comprehended in order to facilitate storing the meaning in short-term memory, so that it may be integrated in the continuing perception and comprehension of speech form and content. Prerequisites of this achievement are perceptual ability, speed of comprehension and short-term speech memory. Content comprehension is much more affected by an acceleration of general speaking rate than is word comprehension.

The majority of research projects which (sometimes unintentionally) investigate the relationship between content comprehension and rate of speaking use mechanically accelerated speech. This allows them firstly to objectively and reliably report on the changes in speech which lead to their research results. Secondly it allows them to avoid the effect described above, whereby the amateur speaker articulates less correctly when accelerating speech rate. And thirdly, by using mechanically accelerated speech, the parameters of speaking rate can be varied more independently of each other than is possible in natural speech. For instance, rate of articulation may be left unchanged while varying the percentage of pause time or the length of articulatory phrase.

The validity of this research is somewhat open to question. The ability to comprehend mechanically accelerated speech is not necessarily identical with the ability to understand naturally accelerated speech. This research may be investigating a question which has little to do with real communication, in which most speakers who are speaking comparatively quickly also speak less clearly (see above I.2).

Nonetheless the results are of interest. Firstly, mechanically accelerated speech is now often heard outside the laboratory. In radio and television advertising as well as in radio and television programs, mechanically accelerated speech is used to ensure that the given time is optimally used (Arons 1992). This has caused the widespread disappearance of the

station-identification melodies which were formerly used to bridge the remaining seconds to the hour.

The results of scientific research using mechanically accelerated speech are also of interest because comprehension of naturally accelerated speech should logically be worse than comprehension of mechanically accelerated speech. This follows from the above-mentioned relative inexactness of accelerated articulation. Therefore if comprehension worsens when speech is mechanically accelerated, it must also worsen when speech is naturally accelerated. Shapiro et al (1998) list several studies which document that lexical processing of perceived content depends on processing the perceived form, that is that which can be heard of the utterance. A "top-down" strategy in which expected contents can be more quickly processed can only begin after the perceived form of the word has been processed. Therefore any increase in the rate of articulation which is achieved by the described decrease in exactness of articulatory goal positions will have a negative effect on comprehension, because less of the utterance will be perceived.

People are capable of adjusting their processing abilities: Fernald et al. (2001) found that even 18- and 21-month-old infants are capable of understanding entire words although they have heard only a part. This indicates that even at this early age it is possible to adjust to a quicker and therefore often less exact articulation mode.

Interestingly however, the researchers found distinct individual differences even in this population. They also found a connection between 1) reaction time 2) ability to recognize words and 3) size of vocabulary. Slower children who were not as capable of recognising incomplete words also had a smaller vocabulary.

McLennan and Luce (2005) show in their study that changing speaking rate only influences speech comprehension when speech comprehension is slow and effortful already. However, these authors discuss only word comprehension, not content comprehension. Also, investigating in which cases speech comprehension is slow and effortful yields interesting answers.

Ahissar et al. (2001) and Richardson et al. (2004) found that poor readers had few problems with word comprehension when syllables were accelerated. The problems became apparent with content comprehension of accelerated sentences. The authors conclude that the auditory cortex is flexible in processing sentences which are spoken at different speeds. However, the range of "decodable" speeds is not as wide for poor readers as for good readers. Also the highest decodable speed of poor readers is not as high as that of good readers. The authors theorise that cortical neurons determine the individual highest possible speed at which sentence content may still be processed: not all individuals can adjust equally well to accelerated speaking rates.

If "poor readers" are defined as those who read one standard deviation under the norm, then 16% of the population are affected. The percentage of poor readers in a given group of speech disordered individuals would be higher. People in the following groups also show restricted ability to process higher speaking rates: cochlear implant wearers (Iwasaki et al 2002), the hearing impaired (e.g. Uchanski et al. 1996), the cerebrally impaired (Campbell and Dollaghan 1995), older listeners (Schmitt and Moore 1989, McCoy et al 2005), children with specific language disorders (Montgomery 2004) and aphasics (Raithel and Brede 2003) are proven to be negatively influenced in content comprehension by an accelerated speaking rate. No research is necessary to include second language speakers.

Many people who are in none of the above groups also experience a negative influence of accelerated speaking rate on content comprehension. Wingfield et al. (1999), Schneider et al. (2005) and McCoy et al. (2005) tested the effects of speaking rate on comprehension. Older listeners were significantly more handicapped by quicker speaking than were younger listeners -- however, the younger listeners were also affected. According to Hosoi et al. (1992) and Uchanski et al. (1996) even word comprehension correlated negatively with articulation

rate, even with a professional speaker. The results of these studies showed that those with normal hearing show processing difficulties similar to those of the hearing impaired while processing accelerated speech, especially in high background noise.

As was discussed above, most speakers articulate less correctly when speaking more quickly. Secondly, many consonants are effectively more difficult to perceive than vowels. These consonants can no longer be heard in a noisy background. Missing consonants together with less correctly articulated vowels can fragment the words to the point where they can no longer be comprehended.

The interdependence of content complexity and speaking rate is also of interest. The negative effect of accelerated speech on comprehension is worsened by complex content. Again, this held true both for older and younger listeners, although older listeners were more affected. According to Bradlow and Pisoni (1999) this effect is even noticeable in word comprehension.

Normally hearing children are also affected by speaking rate: Nikisch and Biesalski (1984) showed with 48 normally hearing children from five to seven years of age that speech comprehension steadily decreases with increased rate of speaking.

One last example documents the influence of speaking rate on speech comprehension even in unexpected populations: an interesting research question concerning the relative speaking rate of New Zealand and American English was posed by M.J. Robb, Head of the Department of Communication Disorders of the University of Canterbury, New Zealand. In this case a professionally active speech and language expert still experienced speech comprehension problems four years after re-locating to a country in which the articulation rate was higher than that to which he was accustomed (Macdonald 2004).

In conclusion, research data indicates that the speed of speech comprehension has physiological and perceptual limits. It is also clear that speaking rate influences speech comprehension in unexpectedly large groups of people.

IV. What effects does a slower rate of speaking show?

A slower speaking rate refers in this context to a slower articulation rate, lengthened pause duration and higher percentage of pause time. Shortening articulatory phrase length, which is also affected by content, is equally effective but will not be discussed here.

As discussed above, the following groups are negatively affected by accelerated speech: cochlear implant wearers, the hearing impaired, older people, children with specific language impairment, normally hearing children from five to seven years of age, aphasics, poor readers, second language speakers and – especially in the case of high background noise or complex content-- normally hearing adults.

Concrete research results on the effect of a slowed speaking rate are as follows: Fernald et al. (2001) found a correlation between 1) reaction time 2) word recognition ability and 3) size of vocabulary (see above). Cooper (1998) showed in a first study that infants prefer normal over accelerated speech. In a further study infants were shown to prefer a speech rate which is only half as fast as a normal speaking rate. The reasons for this preference are not clear. However a slower speaking rate resulted in a longer concentration span. A slower speaking rate also results per se in more processing time, so that an increase in vocabulary is benefited by both factors.

Montgomery (2004) investigated the results of slowing speaking rate by 25% on sentence comprehension of school-aged children with specific language impairment. His thesis was that a reduction in speaking rate would assist the slower linguistic processing speed of these children. The results showed that a reduction in speaking rate improved sentence comprehension and did not overload a reduced phonological working memory.

Weismer and Hesketh (1993) found that both kindergarten children with specific language impairment and the normally developing control group learned new words more effectively

when they were produced more slowly. The same authors (1996) later showed that children with specific language impairment evidence the same pattern of correct recognition as the normal controls for words which were practiced slowly. The greatest result of deceleration was observed for the more difficult task: production of unfamiliar words.

Bradlow et al. (2000) investigated speech perception of normal and learning disordered children under normal conditions as well as with background noise and with "clear speech" (a manner of speaking which is clearer and usually slower than normal, see above). The results: 1) the learning disordered children showed reduced speech processing abilities in situations with background noise 2) both groups understood the sentences better when "clear speech" was used 3) 57% of the learning disordered children showed normalized sentence comprehension when "clear speech" was used. The authors conclude that the speaker's reduction of speaking rate and the consciously clear articulation during the clear speech were enough to bring the speech processing abilities of the learning disordered children to within normal range.

Raithel and Brede (2003) showed that a slower speaking rate resulted in aphasics' improved scores in the Token Test. Thus both learning and speech/language disordered children and aphasic adults learn more effectively as a result of slower speech.

The above results all pertain to changing speaking rate. Lengthening pause time and increasing percentage of pause time would also influence speech comprehension by reinforcing the semantically clarifying function of the pause as well as by increasing "catching-up time" for speech processing. Pertinent research findings are as follows: Reich (1980, quoted by Arons, 1992) showed that content-appropriately placed pauses have an observable influence on content comprehension and memory. This is especially the case where complex content is concerned. McCoy et al. (2005) and Wingfield et al. (1999) found that lengthening pause time allowed a "recovery time" in speech processing resulting in nearly normal speech processing in older adults, even when articulation speed was accelerated. Besides improving speech comprehension and memory, pauses which are well-tolerated by conversational partners have a second function. They enable people who find conversing difficult (for whatever reason) to take part in active communication despite challenging conditions.

Tharp and Yamauchi (1994) discuss the disadvantaged situation of native children in the United States school system. Interested and motivated Grade One children become silent, reserved and uninterested school failures by Grade Four. The authors describe problems arising not only from the second-language learning situation: the culturally differing pragmatics of discourse are apparently so incompatible that the children refuse further interaction as an end result.

Winterton (1976, quoted by Tharp and Yamauchi 1994) investigated a method of helping individuals from differing communication cultures work together: the teacher in the classroom lengthened speaker change pause times not only after a question but also after the answers of the schoolchildren. The results showed significantly longer answers as well as increased communicativeness of the less verbal children. The increased pause time allowed the children to respond to the communicative situation despite the cultural differences in conversing.

This discovery within the classroom also holds true for individual treatment situations.

Children with delay in speech development show more active communicative behaviour when they are given more (silent) time to understand and react to what has been said. Wilken (1997) for example reports that children with Down Syndrome often need more time to react verbally to speech. An improvement in attention span has been observed during work with language-delayed children and their parents (FiSchE program, s. Schelten-Cornish 2005) when lengthened speaker change pause times are used together with slowed articulation rate, short articulatory phrases, and clear speech with slightly exaggerated prosody. Developmentally delayed children make more effort to take part in conversation, verbally or non-verbally.

Actively and successfully taking part in conversations encourages not only speech development but also social abilities. (Girolametto et al. 1999).

To conclude, objective research results as well as clinical experience show the effect of slowed speaking rate. Indirectly, they also support Dannenbauer's (2001) statement that children with specific language impairment do not "catch up" linguistically. Because these children understand more slowly, they learn less effectively with a "normal" speaking rate and understand comparatively less. If the linguistic learning situation for these children were improved through slower speaking rate at least during speech treatment and (through parent training) at home, more effective learning would result. The same holds true for people with other communication disorders.

V. Are increased and accelerated communicative expectations part of the etiological complex of speech disorders?

This question is intentionally provocative, with the goal of achieving intellectual independence from cultural norms on the issue of speaking rate. It is to be considered whether an acceleration of speaking rate could be one of the complex causes of the dramatic rise in speech disorders observed since 1976/77 (Heinemann 1996). The following statements are supported by research results:

- 1) an inappropriate articulation rate makes physiological and perceptual demands which cannot be met by large groups of people.
- 2) A lack of tolerated pauses can cause people who have trouble conversing to remain silent and can result in their withdrawal from interaction.
- 3) Slowing speaking rate through changing various parameters of speech shows concrete and positive results on speech comprehension, speech production and communicative behaviour.

Speech treatment professionals are not excepted from the previously discussed cultural change which seems to have caused accelerated communicative behaviour. The thesis here is that speech and language researchers and clinicians (including the author) have uncritically accepted a cultural phenomenon -- the definition of "quick" and its synonyms as positive per se -- which is working to the detriment of those needing treatment. The progress of this phenomenon has apparently gone unnoticed. Uncritical (and unconscious) acceptance of the culturally-defined negative connotation of "slow" blinds us to important potential therapeutic possibilities. This can lead to disorders caused by the very people who are giving treatment: "iatrogenic" complications.

This hypothesis resulted from a discussion within a project group. The child being discussed was 5;10 years old and had begun to speak at three years of age. According to the research results discussed above, this child is more likely to exhibit relatively slow speech processing. Neuromuscular limitations were suggested by his speaking rate, which for example averaged 62 syllables per minute during reporting on his day's activities. This lies far below the speaking rate which is presently perceived as "normal" in German (s. Fig. 2). The slow speaking rate was caused in part by clonic stuttering. The main causes, however, were slow articulatory movements combined with long pauses for reflection and many re-casts. An example of the child re-telling "Little Red Riding Hood" is as follows: "the wolf l-l-lurked, waiting for her, at the side ... at the side ... at the side ... at the wayside" („der Wolf l-l-lauerte ihr am Rande ... am Rande ... am Rande ... am Wegesrand auf"). The pauses do not indicate stuttering symptoms but rather reflection. The child wishes to use his considerable vocabulary and grammatical knowledge: the German imperfect, dative and especially the genitive forms shown here are acquired by most children well after they begin school at six years of age. The high standards stem from the child himself, as shown by his equally close and critical attention to details of content.

This child's very slow speaking rate is his chosen method of meeting the challenge a conversation presents in a manner that satisfies his own standards. Despite his decelerated speech processing and production abilities and despite his own high linguistic expectations, he is able to take part in a normal conversation because his slow speaking rate allows it.

The long-term treatment goal suggested was an increase in speed of word retrieval and thus in speaking rate. My thesis is diametrically opposed to this: a slowed speaking rate should not be "treated" as a goal in itself, but rather encouraged and supported during therapy by a slowed speaking rate from the clinician. On this condition, facilitating – not accelerating – word retrieval can be pursued as a long-term goal.

The missing concept in the discussion was the perception of a slow speaking rate as a sign of a language system which simply needs more time to function in a manner facilitating communication. The cause may be neurolinguistic, neuromuscular, linguistic, cultural or personal.

Linguistic slowness must have NO negative connotation when seen in this light, but rather a positive connotation as a "support" parameter which should be encouraged, not eradicated.

VI. What are the consequences for clinical practice?

Speech treatment professionals who wish to draw practical conclusions can follow these suggestions:

- 1) a critical re-assessment of the negative connotation of "slow" through attending to the effects of speaking rate in communicative situations.
- 2) trial usage of a natural-sounding "clear speech" in every situation having to do with speech treatment, whether in interaction with people who have difficulty conversing or with their caregivers. Usually this will result in a decrease in articulation rate.
- 3) trial increase of percentage of pause time especially during treatment of children and adults with speech disorders. This includes both semantically meaningful pauses and tolerated pauses for reflection, both during speaker change and during one speaker's turn.

The last suggestion is especially difficult to implement. In our accelerated culture, conversational pauses are usually interpreted negatively and rarely allowed. An informal test of this hypothesis results from allowing a long silent pause before answering a question, while counting the seconds allowed to pass before the question is repeated or re-formulated. A tolerated pause time of five seconds or more is rare.

Therefore when percentage of pause time is to be increased, caregivers who are present during treatment must be informed beforehand. Otherwise they will efficiently prevent longer pauses by repeating or reformulating the question or even by answering it themselves. Secondly all pauses should be silently counted out to lessen the effects of cultural conditioning.

Although it is difficult to break through this conditioning and decelerate speaking rate, a conscious effort to do so does produce change.

Strengthened interactive behaviours of people who have difficulty conversing are often immediately evident. Consciously observing the results of slowed speaking rate clarifies why some cultures interpret a quick answer to a question as a lack of deliberate reflection, showing immaturity and/or disrespect.

Conclusion

This article reviewed research on rate of speaking. Results show that the parameters of speech having to do with speaking rate can strongly influence ability to actively take part in conversation. An inappropriate articulation rate coupled with an intolerance of pauses can cause speaking rate in the treatment situation to become a factor which may influence the prognosis negatively. A slow speaking rate is no guarantee of success in treatment; it may, however, act as one prerequisite.

Appendix: The following is a joke illustrating pragmatics in Ostfriesland, a rural coastal area in Germany. In this area tea-drinking is an important social occasion. Silence is regarded as a natural part of conversation.

Two people from Ostfriesland are having tea together. Silence reigns. After a time Harm Harmsen comments: “Well...” Jan Janssen quietly ponders this, then sums up the conversation: “That’s life.”

Bibliography

- Ahissar, E., Nagarajan, S., Ahissar, M., Protopapas, A., Mahncke, H., Merzenich, M. (2001): Speech comprehension is correlated with temporal response patterns recorded from auditory cortex. *Proceedings of the National Academy of Sciences* 98 (23): 13367 – 13372.
- Arons, B., Techniques, Perception, and Applications of Time-Compressed Speech (1992): *Proceedings of 1992 Conference, American Voice I/O Society*, 169-177.
- Bradlow AR, Pisoni DB. (1999): Recognition of spoken words by native and non-native listeners: talker-, listener-, and item-related factors. *Journal of the Acoustical Society of America*, 2074-85.
- Campbell T.F., Dollaghan C.A. (1995): Speaking rate, articulatory speed, and linguistic processing in children and adolescents with severe traumatic brain injury. *Journal of Speech and Hearing Research*, 38 (4), 864-75.
- Cooper, J.S. (1998): The ability of speaking rate to influence infants’ preferences for infant-directed speech http://www.isisweb.org/ICIS2000Program/web_pages/group1014.html, Okt. 2005.
- Dannenbauer, F. M., (2001): Chancen der Frühintervention bei spezifischer Sprachentwicklungsstörung. *Die Sprachheilarbeit* 46 (3), 103 – 111.
- Fernald, A., Swingley, D., and Pinto, J.P. (2001). When half a word is enough: infants can recognize spoken words using partial phonetic information. *Child Development*, 72, 1003-1015.
- Gebhard, W. (2004) Zur Diagnostik von Sprachverständnisstörungen im Grundschulalter, in: P. Arnoldy, B. Traub (Hrsg.) *Sprachentwicklungsstörungen früh erkennen und behandeln*. Karlsruhe: Von Loeper Verlag, S. 96-99.
- Geißler, K. (2004): Alles. Gleichzeitig. Und zwar sofort. Unsere Suche nach dem pausenlosen Glück. Freiburg: Herder.
- Girolametto, L., Weitzman, W., Wiigs, M., Pearce, P., (1999): The relationship between maternal language measures and language development in toddlers with expressive vocabulary delays. *American Journal of Speech-Language Pathology* 8, 364 – 374.
- Heinemann, M. (1996): Zunahme von Sprachentwicklungsstörungen – ein aktuelles Problem (Ursachen und Konsequenzen). In: dgs Westfalen-Lippe (Hrsg.): *Interdisziplinäre Zusammenarbeit: Illusion oder Vision? Kongressbericht Münster*, 53-61.
- Horsch, J., Ohler, J., Schwiesau, D. (Hrsg.) (1996): *Radio-Nachrichten. Ein Handbuch für Ausbildung und Praxis* (2. Aufl.). Leipzig, München: List Vlg. Zit. nach Scherz-Schade (2004).
- Hosoi H, Murata K, Ohta F, Imaizumi S. (1992): Effect of the rate of speech flow on speech intelligibility in normal and hearing-impaired subjects. *Nippon Jibiinkoka Gakkai Kaiho*, 95(4), 517-25.
- Humphreys, J. (1996): Find your optimum rate of speech. http://www.telemarketingsuccess.com/predictive_dialer/optimum_speach_rate.htmIwasak, Nov. 2005.

Schelten-Cornish, S. (2007) The Significance of Speaking Rate in Speech and Language Treatment. Die Sprachheilarbeit 52 (4), 136 – 145.

- Krause J.C., Braida L.D. (2002): Investigating alternative forms of clear speech: the effects of speaking rate and speaking mode on intelligibility. *Journal of the Acoustical Society of America*. 112, 2165-72.
- Krause JC, Braida LD (2004): Acoustic properties of naturally produced clear speech at normal speaking rates. *Journal of the Acoustical Society of America*. 115(1), 362-78.
- MacDonald, J. (2004): Can I have a quick word? <http://www.comsdev.Canterbury.ac.nz/news/2004/040506a.shtml>, Nov. 2005
- McCoy, S. L., Tun, P. A., Cox, L. C., Wingfield, A. (2005). Aging in a Fast-Paced World: Rapid Speech and Its Effect on Understanding. *The ASHA Leader* 12: 30-31.
- McLennan C.T., Luce P.A. (2005). Examining the time course of indexical specificity effects in spoken word recognition *Journal of Experimental Psychology, Learning, Memory and Cognition* 31(2):306-21.
- Menne, P., Ritter, M., Kuhr, T., Cascading Style Sheets – Formatierungssprache Sprechgeschwindigkeit: speech-rate (2004): <http://www.css4you.de/speech-rate.html>, Okt., 2005.
- Montgomery, J. (2004): Sentence comprehension in children with specific language impairment: effects of input rate and phonological working memory. *International Journal of Language and Communication Disorders* 39 (1), 115 – 133.
- Nickisch, A., Biesalski, P. (1984): Ein Hörtest mit zeitkomprimierter Sprache für Kinder. *Sprache-Stimme-Gehör* 8, 31-34.
- Ocho S., Nagura M., Hoshino T. (2002): Contribution of speech rate to speech perception in multichannel cochlear implant users. *Annals of Otolaryngology, Rhinology, Laryngology*. 111(8), 718-21.
- Picheny M.A., Durlach N.I., Braida L.D. (1989): Speaking clearly for the hard of hearing. III: An attempt to determine the contribution of speaking rate to differences in intelligibility between clear and conversational speech. *Journal of Speech and Hearing Research* 32 (3), 600-3.
- Raithel, V., Brede, B. (2003): Warum haben es Schnellsprecher schwerer? Untersuchungen zur automatischen Spracherkennung und zum aphasischen Sprachverständnis, *Forschung an der Universität Bielefeld*, 25/ http://www.uni-bielefeld.de/lili/personen/vraithel/raithel_wrede.pdf, Nov., 2005.
- Reich, S. S. (1980): Significance of pauses for speech perception. *Journal of Psycholinguistic Research*, 9(4), 379-389 zit. nach Arons (1992).
- Richardson, U, Thomson, J. M, Scott, S. K., Goswami, U. (2004): Auditory processing skills and phonological representation in dyslexic children. *Dyslexia* 10 (3), 215 – 233.
- Rützel, A. (2004): Eine wechselvolle Reise auf der Achterbahn der Zeitmaschine: Neue Aufgaben für Wissenschaftler - Zeitreserven als die Währung der Zukunft? <http://www.das-parlament.de/2004/01-02/Thema/014.html>, Okt. 2005.
- Schelten-Cornish, S., (2005). Indirekte interaktive Intervention bei Kindern mit Sprachentwicklungsstörungen: Analysen an Fallbeispielen. *L.O.G.O.S. INTERDISZIPLINÄR*, 13 (2), 105 – 111.
- Scherz-Schade, S., (2004): Deutsche Radionachrichten: Der Wandel ihres Sprachgebrauchs von 1932 – 2001. Dissertation der Fakultät I Geisteswissenschaften der Technischen Universität Berlin, edocs.tu-berlin.de/diss/2004/scherzschade_sven.pdf, Okt. 2005.
- Schmitt J.F., Moore J.R. (1989): Natural alteration of speaking rate: the effect on passage comprehension by listeners over 75 years of age. *Journal of Speech and Hearing Research* 32(2), 445-50.
- Schneider, B.A. Daneman M, Murphy, D.R., Speech Comprehension Difficulties in older Adults: Cognitive Slowing or Age-Related Changes in Hearing? (2005): *Psychology and Aging*, 20, (2), 261 – 271.

Schelten-Cornish, S. (2007) The Significance of Speaking Rate in Speech and Language Treatment. *Die Sprachheilarbeit* 52 (4), 136 – 145.

Shapiro, L., Swinney, D., Borsky, S. (1998): Online Examination of language performance in normal and neurologically impaired adults, *American Journal of Speech-Language Pathology* 7, 49 – 60.

Smith, A.B. (2005): Dyslexia and Early Speaking Rate Development, convention.asha.org/2005/handouts/293_Smith_Allan_072420_111405123922.ppt

Stegh, K.J., Präsentation, Einige grundlegende Überlegungen (2002): home.eduhi.at/teaching/art/Infoblaetter/Präsentation.rtf - Zusätzliches Ergebnis, Okt., 2005.

Tharp, R.G., Yamauchi, L.A. (1994): Effective instructional conversation in native American classrooms. Washington: National Center for Research on Cultural Diversity and Second Language Learning. www.ncela.gwu.edu/pubs/ncrcdssl/epr10.htm, Nov. 2005.

Tsao Y.C., Weismer G. (1997): Interspeaker variation in habitual speaking rate: evidence for a neuromuscular component. *Journal of Speech-Language and Hearing Research* 40(4), 858-66.

Ward, N., Nakagawa, S. Automatic user-adapted speaking rate selection <http://www.cs.utep.edu/nigel/papers/ijst.pdf>, Dez. 2005.

Weismer S.E., Hesketh L.J. (1993): The influence of prosodic and gestural cues on novel word acquisition by children with specific language impairment. *Journal of Speech and Hearing Research*. 36 (5), 1013-25.

Weismer S.E., Hesketh L.J., (1996): Lexical learning by children with specific language impairment: effects of linguistic input presented at varying speaking rates. *Journal of Speech and Hearing Research*. 39 (1), 177-90.

Wilken, E. (1997). *Sprachförderung bei Kindern mit Down-Syndrom*. Berlin: Ed. Marhold.

Wingfield, A, Tun, P, A, Koh, C.K., Rosen, M. J. (1999): Regaining lost time: adult aging and the effect of time-restoration on recall of time-compressed speech. *Psychology and Aging*, 14, 380 – 389.

Winterton, W.A. (1976). The effect of extended wait-time on selected verbal response characteristics of some Pueblo Indian children. Unpublished doctoral dissertation, University of New Mexico, Albuquerque, zit. nach Tharp, R.G., Yamauchi, L.A. (1994).

Uchanski RM, Choi SS, Braida LD, Reed CM, Durlach NI. (1996): Speaking clearly for the hard of hearing IV: Further studies of the role of speaking rate. *Journal of Speech and Hearing Research* 39(3), 494-509.

Zellner, B., (1994): Pauses and temporal structure of speech, In: E. Keller (Ed.): *Fundamentals of speech synthesis and speech recognition*, Chichester: John Wiley, 41-62. <http://cogprints.org/884/00/Zellner.SpeechPauses.pdf>, Okt. 2005.

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