Interactional patterns in computer-assisted phonological intervention in children

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Abstract

The focus of this study is interaction during speech and language intervention in children with phonological impairment. Interactional patterns between children and therapists in two different settings are compared; on the one hand 'tabletop' phonological intervention and, on the other hand, computer-assisted phonological intervention. The interactions are compared in terms of interactional dominance and coherence.

This paper describes work in progress. Background and method will be presented here, but at the time of writing analyses are still ongoing. Preliminary results will be presented at the conference.

Introduction

Phonological disorder in children is often communicatively impairing. Deviant speech production often leads to decreased intelligibility and communicative breakdowns. Repeated experience of communicative failure may in turn have serious consequences, at its worst leading to communicative avoidance. The overall goal for phonological intervention is to break this trend; to increase speech intelligibility and to strengthen communicative functioning.

The challenges for the speech and language pathologist (SLP) are plentiful. The target of intervention – the language – is also the medium through which intervention is performed. This might be considered a paradoxical hindrance, but it can also offer therapeutic possibilities. By creating an atmosphere where communicative initiatives from the child are encouraged, and thereby strengthen him/her in his/her role as an active learner and communicator, the SLP can intervene on many levels at once.

For many children with speech and language impairment, therapy is lengthy and may stretch over several years. Introducing computers to support phonological therapy might have positive effects on the child's motivation. Moreover, computer technology can provide additional therapeutic strategies than the SLP can offer by himself/herself. However, introducing computers in phonological intervention might affect the interaction between the child and the therapist, and these effects remain unexplored.

Approaches to phonological intervention

"Traditional speech training" (in Swedish: *traditionell talträning*, Nettelbladt, 2007) typically starts with perceptual training, where the child listens to the target speech sound in an attempt at promoting awareness of this particular sound. Proceeding to speech production, the child initially attempts to produce the target sound in isolation, before moving on to more complex contexts: syllables, words, phrases and conversational speech. Inspired by behaviouristic theory, the therapist serves as a speech role model and a teacher; through imitation and explicit reinforcement and corrections, the child is assumed to approach the adult target.

In contrast, other intervention strategies aim at phonological organisation (e.g. Howell & Dean, 1991). Here, groups of speech sounds and feature contrasts are the intervention targets, rather than individual speech sounds. Within this tradition, emphasis is on *meaningful* distinctions between speech sounds (phonemic distinctions) and on making the child aware that different phonemes are used to signal different meanings between words.

Communicative functionality is stressed in the phonological intervention approach Metaphon (Howell & Dean, 1991). In order to encourage changes in the child's speech

production, the authors argue that the child must realise that there is a mismatch between what s/he *means* to say and what s/he actually says, and that this mismatch often will lead to communicative breakdowns. This awareness, *communicative awareness*, is one of the cornerstones in Metaphon.

Computers in phonological intervention

In some areas, computer technology provides possibilities that go beyond what a human therapist can offer. For example, some programs (e.g. SpeechViewer and Box of Tricks, see Öster, 2006), provide immediate visual feedback on speech production. By modifying his/her speech production, the child is supposed to approach visual *and* acoustic targets. Obviously, tasks like this would be impossible without the use of computers.

Another advantage, suggested by some authors, is that the introduction of computers in intervention may have positive effects on motivation and attention span (e.g. Gierut, 1998).

Despite several suggested advantages of computer-assisted therapy, there are obvious limitations to how much support a computer can provide in phonological intervention. The task of facilitating phonological development and of strengthening communicative function will continue to rest on the therapist.

Earlier interactional studies

Earlier studies on interactional patterns in the conversations of children and different conversation partners and in different activities have had important clinical implications.

Hansson et al (2000) studied children with SLI in conversation with different interaction partners – peers, adults and SLPs. The results revealed that children with language impairment are more active communicators in conversations with peers than with adults. Moreover, as adults take more communicative control than peers, children produce longer utterances with greater lexical variation in child-adult conversations than in conversations with peers. It seems, the authors speculate, that communicative 'scaffolding' (as provided by the adults) enables the children to pay more attention to their language production. Thus, different conversational partners seem to stimulate different linguistic and communicative skills. These results were supported by Bruce et al, in their study of interactions between children with SLI in conversation with age-matched and younger children with typical language development. The more communicative support the conversational partner offers, the less communicative control the children with SLI take.

Hulterstam & Nettelbladt (2002) studied the effect of two different types of intervention approaches on the interactional balance between the child and therapist. Interactional patterns between children and SLPs in "traditional speech training" and Metaphon therapy were compared, and within both approaches, the therapist was the dominating party in the interactions. However, as was expected, the asymmetry was less pronounced in Metaphon.

Purpose

In this study, two different settings are compared in terms of interactional dominance; one 'tabletop' setting, where the child and the therapist centre in activities around physical objects like e.g. picture cards, and one where a computer program for speech training is introduced into therapy. The two-fold purpose is to reveal *if* the introduction of a computer into phonological intervention affect the interactional balance between child and therapist, and – if so – *how* this balance is affected.

It is hypothesised that introducing a computer into phonological intervention *does* affect the interactional patterns between the child and the therapist. As to the nature of these postulated changes, one of two different scenarios is suggested. One is where the overall verbal communication between the therapist and child is decreased as the computer is introduced, and where conversation is more centred around "right-and-wrong" in relation to the feedback from the computer program, than with the functional consequences of the deviances in the child's speech. This is, of course, a pessimistic scenario. The other, more positive scenario, is one where overall verbal communication between child and therapist is *not* decreased, and where the feedback from a third party, the computer, can breed meta-phonological (and/or meta-communicational) discussions between the child and the therapist.

The results are assumed to give clinical implications as guidelines on using computer-assistance in phonological intervention.

Method

Four sessions of phonological intervention were recorded, transcribed and analysed. The participating children were first recorded in a 'tabletop' ('computer-less') session with their respective therapists. Then, a couple of months later, the same child-therapist pairs were recorded again, now in a computer-assisted setting. The recordings were transcribed and analysed along the procedure described below.

Participants

Two children participated in this study; a 5 year old girl and a 6 year old boy. Both children had been diagnosed as having a moderate specific phonological disorder.

The girl's speech production was characterised by consistent dentalisation and traces of stopping; simplification of consonant clusters was frequent, and traces of assimilations and metatheses were found. /r/ was consistently produced as [j].

Dentalisation was also a salient deviation in the boy's speech production. Moreover, the boy showed frequent weakening of /r/. Occasional traces of assimilations were also found.

Recordings and transcriptions

The recordings were transcribed in the CHAT (Codes for the Human Analysis of Language) transcription and coding format (MacWhinney, 2000). CHAT is the standard format used in CHILDES, Child Language Data Exchange System (*ibid*), an environment which offers means of linking video recorded data with transcriptions, as well as tools for analysing the data.

Since the focus of this study is the communicative *function* of each utterance, more than the phonological *form* of the utterance, the transcriptions were coarse and closer to written language than to spoken.

Analysis

Two different analysis methods were applied, one automatic and one manual.

Automatic analysis: CHIP

The automatic analysis of the transcribed conversations was performed with the program CHIP (Sokolov & MacWhinney, 1990, MacWhinney, 2000). CHIP was developed within the CHILDES framework, as a tool operating on transcribed data of conversational interactions between children and adults.

CHIP inspects pairs of utterances and compares each utterance to 1) the latest preceding utterance by the *other* speaker and 2) the latest preceding utterance by the *same* speaker. The utterance pairs are then analysed in terms of *overlapping*, *added*, *substituted* and *deleted* words[1].

Manual analysis: IR

Initiation-Response analysis (Linell & Gustavsson, 1987) was performed manually on the transcribed data. Each turn (as defined by Linell & Gustavsson) was assigned one of 21 possible labels, based on its initiating and responsive characteristics.

Initiating features are classified as either soliciting or non-soliciting. Through soliciting initiations, a speaker explicitly requests his/her conversation partner for a response. Non-soliciting initiations are "weaker" in that they do not require a response from the partner.

Responsive features are classified by several different dimensions: *scope* (whether a response links to the immediately preceding turn or to a more distant turn), *focality* (whether a response links to focal or peripheral aspects of the present topic), *alter- vs. self-linkage* (whether a response links to the speaker's own or to the interlocutor's preceding turn), *expansion* (whether a response contains more information than requested or not) and *adequacy* (whether a response is accepted by the conversation partner or not).

The combinatorial possibilities of initiating and responsive features yield a total of 21 different categories, where each category corresponds to a score between 1 and 6. Based on these utterance scores, quantified analysis is performed.

Results

At the time of writing, only two therapy sessions (both 'tabletop') have been recorded, transcribed and analysed. The two computer-assisted therapy sessions will be recorded in the beginning of May.

Preliminary results will be presented at the conference.

[1] Here, the term *overlap* is used in the sense that is not related to simultaneous speech. Here, two utterances are *overlapping* if the same word(s) occur in both utterances.

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