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ABSTRACT

This conference proceedings document serves to establish the state of the art, highlight important methodological and conceptual issues, and identify priorities for future research in augmentative and alternative communication (AAC) systems. The document includes the papers from two opening presentations, issue papers and reactant papers, a summary of the discussion in each session, a short conclusion, and a compendium of biographical sketches of participants. Papers given in the opening presentations were "Dialogism and the Orderliness of Conversation Disorders" (Per Linell) and "Evaluating the Efficacy of AAC Intervention for Children with Severe Disabilities" (Stephen Calculator). Topics for the six sessions include: (1) challenges in conducting observational research to address interaction issues in the AAC field; (2) issues in the research and development of technical aids in AAC; (3) methodological challenges in applying single case designs to problems in AAC; (4) methodological issues in research with individuals with cognitive disabilities; (5) methodological issues in the study of language development for children using AAC systems; (6) and cross fertilization between speech technology research for disabled and nondisabled persons. (JDD)

Methodological Issues in Research in Augmentative and Alternative Communication

Proceedings from the First ISAAC Research Symposium in Augmentative and Alternative Communication Stockholm August 16 - 17th, 1990

Jane Brodin & Eva Björck-Åkesson
Editors

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Proceedings from the First ISAAC Research Symposium in Augmentative and Alternative Communication Stockholm August 16th to 17th, 1990 Arranged by the International Society for Augmentative and Alternative Communication (ISAAC) and the Swedish Handicap Institute.

Jane Brodin & Eva Björck-Åkesson
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The Swedish Handicap Institute

International Society for Augmentative and Alternative Communication

ISAAC
was founded by representatives of 7 countries in 1983. The purpose of ISAAC is

- **to advance the interdisciplinary field of augmentative and alternative communication;**
- **to facilitate information exchange;**
- **to focus attention on work in the field.**

Membership is international in over 35 countries and includes all those interested in augmentative and alternative communication. Activities include: conferences and scientific meetings, publications, scholarship and award programs, consumer affairs and developing countries.

The Swedish Handicap Institute

The Swedish Handicap Institute aims at improving the quality of life of people with disabilities by ensuring access to high quality and well-functioning technical aids and an accessible environment.

The Swedish Handicap Institute is under the auspices of the Federation of Swedish County Councils and the Swedish Government's Ministry of Health and Social Affairs.

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Forward

Proceedings of the
First ISAAC Symposium on Research In
Augmentative and Alternative Communication

The First ISAAC Symposium on Research in Augmentative and Alternative Communication (AAC) was held in Stockholm, August 16 and 17 1990. The symposium was organized by the Research Committee of the International Society for Augmentative and Alternative Communication (ISAAC) in cooperation with the Swedish Handicap Institute.

The symposium brought together more than 100 participants representing 16 countries. The participants included active researchers from a wide range of disciplines who were involved in basic research, applied clinical research, and technical research and development.

The First ISAAC Symposium on Research in Augmentative and Alternative Communication was indeed an exciting and stimulating experience. The symposium provided opportunities for researchers to identify questions as priorities for future research efforts, to discuss methodological problems, to problem solve, and to establish links for future networking and collaboration.

The Symposium would not have been possible without the hard work and commitment of a number of individuals. First and foremost, we wish to express our deep appreciation to the Swedish Planning Group chaired by Margita Lundman and comprised of Eva Björck-Åkesson, Jane Brodin, and Mats Granlund. We are grateful to Jane Brodin and Eva Björck-Åkesson for their efforts as Editors of these Proceedings. We also wish to thank Arlene Kraat, President of ISAAC, for her support and assistance with the Research Committee. We are especially grateful to the Swedish Handicap Institute and the Swedish Council for Planning and Coordination of Research (FRN) for their funding support.

The 1990 Symposium in Stockholm was an exciting testimony to the growth of research in the AAC field. We hope that the Proceedings help to lay the foundations for future research efforts in the field.

Janice Light and Alan Newell

Co-chairs

ISAAC Research Committee

Preface

The plans for the ISAAC Research Committee to host an International Research Symposium were a natural outgrowth of needs identified at a special interest group meeting on AAC research held at the 1988 Biennial Conference in Anaheim, California, USA. At this meeting participants from different disciplines expressed the need to discuss methodological and conceptual issues in the AAC field and to encourage information sharing and networking among researchers.

The Proceedings of the First ISAAC Research Symposium in AAC include the papers from the two opening presentations on the first day of the symposium, as well as issue papers and reactant papers presented at concurrent sessions in the morning and afternoon of the second day of the conference. The Proceedings also contain a summary of the discussion in each session and a short conclusion by the editors. The style across papers varies and represents the multidisciplinary and international character of the participants.

Included in the Proceedings is a compendi of biographical sketches of the researchers who participated in the symposium.

In the AAC context, the International Symposium on Research served to establish the state of the art, highlight important methodological and conceptual issues and identify priorities for future research. Cross-fertilization between different disciplines was also a central theme of the symposium. The active participation of the discussants and the lovely environment for the symposium gave rise to many new ideas, to new contacts, and to communication between the researchers. Many seeds of new knowledge were planted. It is our hope that these seeds will be fertilized in future research efforts.

Stockholm in January, 1991

Jane Brodin and Eva Björck-Åkesson

Forward

Preface

CONTENTS

OPENING PRESENTATIONS

SESSION 1

SESSION 2

SESSION 3

METHODOLOGICAL CHALLENGES IN APPLYING SINGLE CASE DESIGNS TO PROBLEMS IN AAC

SESSION 4

METHODOLOGICAL ISSUES IN RESEARCH WITH INDIVIDUALS WITH COGNITIVE DISABILITIES

SESSION 5

METHODOLOGICAL ISSUES IN THE STUDY OF LANGUAGE DEVELOPMENT FOR CHILDREN USING AAC SYSTEMS

SESSION 6

SPEECH TECHNOLOGY: CROSS FERTILIZATION BETWEEN RESEARCH FOR DISABLED AND NONDISABLED PERSONS

CONCLUSIONS

THE FIRST ISAAC RESEARCH SYMPOSIUM IN AUGMENTATIVE AND ALTERNATIVE COMMUNICATION

Enclosure

OPENING PRESENTATIONS

DIALOGISM AND THE ORDERLINESS OF CONVERSATION DISORDERS

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Face-to-face interaction is the most basic and universal form of human communication. Its most powerful means of communication is spoken language, though of course embedded in and accompanied by paralanguage. Yet, talk and interaction have not been very extensively studied until the last two or three decades. There are various reasons for this, among them long-standing traditions of devoting scholarly attention to written rather than spoken language, and the lack of inexpensive and suitable equipment for recording and analyzing on-line behaviour. However, there is now a rapidly expanding body of research within various disciplines which deals with conversation and face-to-face interaction. This has led to a shift of perspective and a development of new models, not only as regards dialogue and conversation but also for communication in general. In this contribution I would like to adumbrate this conceptual reorientation, *from monologism to dialogism*, and then suggest some of its implications for the study of communication disorders and, more specifically, augmentative and alternative communication (AAC).

Conversation: Communicators in dialogue

To make things a little bit more concrete, I shall use a few examples of conversational interaction, drawn from a dinner-table (Thanksgiving dinner) conversation taped, analyzed and extensively discussed in Tannen (1984). Extract 1 occurs rather early in the four-hour recording, when a couple of the six participants have discussed some interesting books (by Erving Goffman, in fact) that they have read, and D(eborah), 33, asks P(eter), 35, about his reading preferences:

Example 1 [1]: READING, EATING AND BEING BUSY:
(Tannen, 1984: 81-2)

(...)

1. D: do you *read*?

(1 s)

2. P: do I *read*? (0.5)

3. D: do you read things just for *fun*?

(1 s)

4. P: yeah (1 s) right now I'm reading Norma Jean the *Termite* Queen

[LAUGHS]

5. D: what's *that*? (1 s) Norma Jean like uh: (1 s) Marilyn *Monroe*?

6. P: it's.. no:. it's a book about.. (2 s) a housewife

7. D. is it a *novel* or what.

8. P: it's a *novel*.

9. D: yeah?

10. P: before that.. (1 s) I read the French Lieutenant's Woman? have you read that?
11. D: oh yeah? no. *who* wrote that?
12. P: John Fowles.
13. D: yeah I've *heard* that he's good.
14. P: he's a *great* writer. I think he's one of the *best* writers. (D:=hm)
15. D: (X)
16. P: *he's* really *good*.
17. D: (X)

(3 s)

18. P: but *I* get very *busy*. (1 s) y'know?
19. D: yeah I.. hardly *ever* read.

(1 s)

20. P: what I've been doing is cutting down on my *sleep*.
21. D: oy!
22. P: = and I've been (St LAUGHS) (1.5 s) and I s -
23. D: /I do that too but it's *painful*.
24. P: = yeah. fi:ve, six hours a *night*, and
25. D: = oh God, *how* can you *do* it. you *survive*?

(1 s)

26. P: yeah *late* afternoon *meetings* are hard (D:mmm) (1 s) but outside of *that* I can keep going pretty well
27. D: not sleeping enough is *terrible*.. (1 s) I'd *much* rather not *eat* than not *sleep* (Sa LAUGHS)
28. P: I *probably* should not eat so much, it would.. it would uh.. *save* a lot of time.
29. D: if I'm (like really) busy I don't I don't I don't eat. I don't yeah I just don't eat but I
30. P: I. I tend to spend a lot of time *eating* and *preparing* and (X)
31. D: oh: I *never* prepare food. (2 s) I eat whatever I can get my *hands* on.
32. P: = yeah.

The second extract from the same dinner-table discussion involves D(eborah), Da(vid), 29, Sa(lly), 29, and St(eve), 33, and the talk has now focused on hands (sic!):

EXAMPLE 2: SHAKING HANDS WITH RUBINSTEIN:
(Tannen, 1984:122-3)

1. Sa: *I* shook *hands* with *Rubinstein* once? (1 s) and his hand
2. St: yeah we *did together*.
3. Sa: that's *right*. we were *together*. wasn't it *incredible*?
4. St: (LAUGHING) oh it was like a cushion.
5. Da: = what's this?
6. Sa: I.. we shook hands with *Rubinstein*.
7. St: *Rubinstein's* hands.

(2 s)

8. D: and he had?
9. Sa: = his hands --
10. D: = short stubby hands?
11. Sa: = they were like... *jelly*, they were like.. (1 s) they
12. St: a famous concert pianist.
were like... *putty*. (0.5 s) just (D: really?)..
completely soft and *limp*. (1 s) just *mush*. it
13. St: mush (De: CHUCKLES)
was as though there was *no bone*
14. St: and warm.
15. D: and short stubby fingers?
16. Sa: short stubby fingers but just... *totally covered* with --
17. St: fat.
18. Sa: = fat.

There are of course countless observations to be made on these extracts (and particularly so for those who may get the opportunity to listen to the tapes), but I must be content with a few general points, as a background for the subsequent arguments. Note first the *context-dependence* of each and every contribution to a dialogue. One cannot rip out any single utterance and understand what it means in isolation, for example by figuring out what the words mean in and of themselves. This is obvious for both minimal responses like 1:8 (i.e. turn 8 of extract 1), 1:12 and 2:17 or expanded responses like 1:19, 1:24 or 2:4; it is just impossible to understand the meaning or appreciate the significance of, for example, "five, six hours a night" (1:24), "John Fowles" (1:12) or "it was like a cushion" (2:4) without knowing what questions they answer or what local contexts they appear in. The same is true of initiatives which take up new topics or topical aspects, such as 1:18 or 2:1. Every contribution is dependent on prior context and contributes to renewing context.

Understanding of utterances is something which is developed by participants by elaborating discourse and in responding to each other's contributions. Surely, there are intrapersonal cognitive processes going on in people communicating, but much understanding comes into being by being displayed and reacted to in social discourse. It is hard to know, out of context, what P means by "I get very busy" (1:18): what does he think of, more exactly? But D makes something of it in uttering 1:19, which seems to presuppose that P, through 1:18, implied something like "there is hardly any time for reading".

Another point, rather beautifully illustrated in the examples, concerns the collective, or collaborative, development and negotiation of meaning going on in dialogue. Note, for example, the topic development in (1) with topics gliding from reading to eating habits (and preparing food) via talk on sleeping habits. True enough, D seems to be the one who introduces eating (1:27), but she does it because there has been talk on lack of time and on sleeping, the latter topic first mentioned by P (1:20), who, however, in his turn is dependent on the common topic of reading which the two together developed into the topical aspect of "finding time for reading when you are very busy". The phenomenon of *collaboration in topic development* is perhaps even more drastically shown in (2), where Sa and St, in tandem, tell a story of a common experience (the two of them in fact lived together for six years).

Context-dependence, understanding-by-responding and collaboration in discourse are part and parcel of any dialogue or conversation, whether among the able-bodied or with

the disabled. Perhaps the dialogism involved stands out even more clearly in many conversations with severely handicapped people. Consider (3), which I cite from Kraat (1985:81), where an aided speaker using a language board communicates with a speaking interlocutor:

Example 3: GOING HOME WITH THE HOSPITAL VAN:

Aided Speaker: Home (language board)
Partner: "Home? What about home? Something about your sister?"
Aided Speaker: (gesture – no). Day of the week. (board)
Partner: "Sunday? Monday? Tuesday? ...Saturday?"
Aided Speaker: (gesture – yes)
Partner: "Something about home and Saturday. Are you going
going home on Saturday?"
Aided Speaker: Man (board)
Partner: "A man? Someone special is coming?"
Aided Speaker: (gesture – no)
Partner: "I should find out who this man is?"
Aided Speaker: (emphatic gesture – yes)
Partner: A relative? A friend? Someone in the Hospital?"
Aided Speaker: (gesture – yes)
Partner: "Someone in the Hospital. Let me see, a doctor?
a therapist? a friend?
Can you give me another hint?"
Aided Speaker: (Eye points to top of partner's head)
Partner: Head. Part of the head? Brains? He works with the head?"
Aided Speaker: Color (board) ....

This extract comes from a sequence of about 100 turns used to formulate the request "Can Carl (i.e. the security guard) possibly take me home on Saturday with the hospital van?". This is collectively accomplished through many constituent acts which compose (what could be seen as) one contribution. In trying to communicate this, the aided speaker must rely on his partner; a lot of verbalization and inferencing must be done by him or her. Though less conspicuously in many other situations, conversationalists always delegate some communicative work to their partners.

To illustrate the last-mentioned point I will finally present an extract from a project on aphasics communicating in various everyday and institutional settings which we work with in Linköping (Linell & Rundström, 1987). The male patient, P, who is around 70 and has considerable anomic symptoms, is here conversing with his female occupational therapist (around 30); having talked together on various leisure time activities, P now, in 4:1, initiates a new topic:

Example 4: THE TRIP TO SÄLEN (rough English translation)[2]

1. P: speaking of *that* then uh they've gone to-ah... they were going to how-is-it-called s- (2 s) hm (4 s, DRUMMING WITH FINGERTIPS ON THE TABLE) uh.. well, I'll probably recall that too, it is out towards sä- ah (3 s) well-uh (SIGHS) erhm. (SIGHS, DRUMMING) well..
2. T: who was going
3. P: = ha they were going, *Catherine* was going there, yes (T: yes) and then she was -uh (1 s), the *children* and the *old man*, or he (T: yes) the old man was going *here*, OK, and they went *yesterday* (T: yes), °with that°, and they were going to *stay* in somewhere in a (SHAKES HIS HEAD) in a such a small.. *cottage* up there (T: I see) *up* towards eh...
4. T: up towards?
5. P: = up towards on the world, wherever that is now
6. T: = I see, somewhere up in Norrland?=
7. P: = yes, ah, yes some some, where is it sa- sän- sän- no, no, I don't remember
8. T: ss- (P: X) does it begin with [es]? sä-? is it *Sälen*?
9. P: = yes, eh it was something like that, yes, yes, sa-, maybe that's what it was called, °Sälen°, *Sälen*, yes, that's it, I think, OK, and they (T: I see) were going to have a keet- they were going to have such a bo- what's it called some .. (SIGHS) eat, OK yes, they had such -eh °cards°, no, not *cards*, (2 s) uh (2 s) OK yes, they went somewhere by such °car° uh ah (LAUGHING IN EMBARRASSMENT, 2 s, DRUMMING) eating, no they don't *eat*, no, no, I am so stupid that it..
10. T: is it eh...
11. P: uh eat-, they uh (6 s, DRUMMING, SIGHS) what are they doing then?
12. T: what.. what were they going <u>to *do*</u>?
13. P: <u>when they</u> ... when they go by car, no, OK, first they go by *car* (T: yes) and then they had... uh, then they had (4 s, DRUMMING) well.
14. T: go *skiing*?
15. P: = yes, yes of *course*
16. T: they were going *skiing*!
17. P: = yes, OK, and there they were going to °be busy°
18. T: I see! the whole *family* then?
19. P: yes, everybody, yes
20. T: I see, and *Catherine* too then?
21. P: yes, it was intended that *I* would go there actually, or Marie Christine *too* there, but then I *was* not so well with, uh, I got that one with..., you know, with the cough and so (T: I see), so I didn't care, I let it go

22. T: what, is it *this* week, *now*?
23. P: yes, it was, it wa- it can, now now it turned so that it turned this time
    it went wrong all this just 'cause I was too early, *here*, so I don't
    know how it went you know, there was something *wrong* °there
    some way or another°, but they *went* in any case then (1 s) last week
24. T: *last* week?
25. P: yes, or yesterday, me see here, what is it now, yesterday, (3 s)
    °Sunday°, *Sunday* yes, that was yesterday OK
26. T: *yesterday* °they went°
27. P: yes, °I think it was° (NODDING)
28. T: m-hm

The gist of the story P wants to tell is basically this: P's daughter and her family went yesterday to Sälen for a skiing holiday. He gives a vague outline of this in 4:1, but has, as we can see, considerable difficulties verbalizing the whole story. Perhaps it is only vaguely present to him at the outset, but through collaborative work the various constituents get established: who went? (turns 2-3), where did they go? (turns 3-9), what for? (turns 9-16) and when? (turns 23-26; this last point was correctly stated by P already in 4:3, but later (4:23) he made a mistake). We can see the normal repair mechanisms employed in this conversation (self-initiations "what do you call it", other-initiations: "what? who? when?"). There is a recurrent, orderly structure in every constituent sequence: a) an attempt (usually insufficient) by P to reference a certain aspect, b) active repair-initiation by T and attempted answer by P, and then often repeated suggestions and candidate answers, and c) confirmation (of correct suggestion/answer) by P (often followed by echoing or reciprocated confirmation by T). When each point has been successfully made (or is just about to be made), P, who normally averts his gaze, confirms it by seeking gaze contact. Nothing is successfully communicated (i.e. made mutually known), unless it is first negotiated, i.e. attempted, accepted and confirmed, over a sequence of turns.

Monologism and dialogism

These are just a few arbitrary examples and some scattered observations. But they suffice to remind us of the inadequacies of the conventional and time-honoured model of communication, the *monological model of discourse and communication* (also named the transfer model, the conduit model, etc.) (Fig.1).

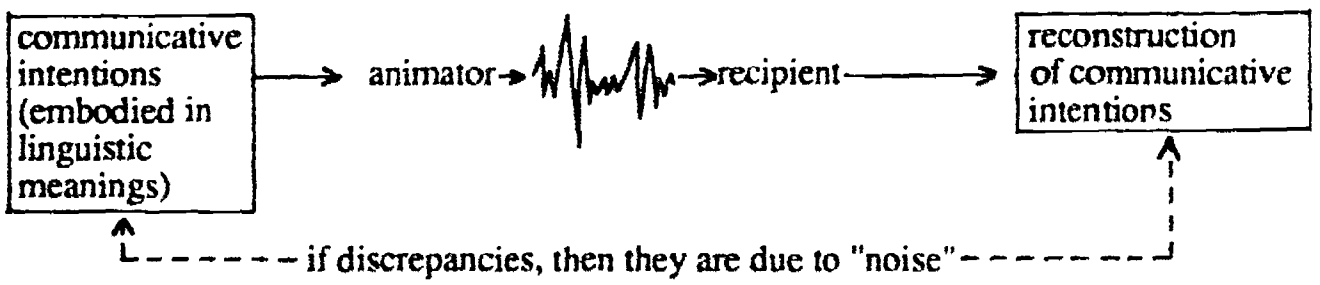

Fig.1. *The monological model of discourse and communication.*

This model is monological in character, because it assigns too much importance to the speaker/sender; the utterances or speech acts are seen as only his or hers. It therefore underrates the role of collaborative work by communicators, and the interaction (of the speaker/sender) with the other(s) and with present or taken-for-granted contexts. Somewhat more specifically, we can state some of its inadequacies in the following points:

1. The sender's communicative intentions are not complete or well-defined before verbalization. Of course, at some level speakers usually "know what they mean", but in dialogue, interpretations are typically negotiated and retrospectively reassessed (cf. (1)). Speakers regularly modify the emerging form and content of their contributions in response to what recipients are doing during the process (e.g. Goodwin, 1979).

2. The recipient has at least two significant functions in the process of utterance formulation, known as recipient design and co-authoring. The former refers to the point that "the sender's" communicative intentions are "recipient-designed" from the start, i.e. they are permeated by other-orientedness in that the speaker makes assumptions about the recipient's abilities and states of knowledge in and through what (s)he is saying. The notion of co-authoring points to all the listener behaviours influencing the speaker: the rhythmic co-structuration of the speech flow, the verbal and non-verbal feedback and back-channeling, filling-in utterances, the temporary taking over of the active utterer's role, as shown in the duetting of Example (2).

3. Secondly, even if the recipient is not overtly co-authoring, he is active in understanding, in creating sense and coherence (and hence preparing and pacing for further discourse). Understanding is not passive reception but creative inferencing.

4. Furthermore, monological models do not analyze properly the role of contexts: co-texts (the surrounding discourse), settings and cultural frames. I will return to this point presently.

Monological models have been very dominant for centuries in the language sciences. They are far from being only a generalization of Shannon & Weaver's (1949) model of information transfer, the "speech chain" pictured in so many textbooks of linguistics and psycholinguistics. In general, they are deeply rooted in dominant traditions of Western philosophy, in which Cartesian dualism tries to rip apart "things" like form and content, utterance and context, planning and execution, etc. They are also firmly integrated within the "written language bias" (Linell, 1982, 1988) which characterizes the language sciences and the essence of which is as follows: even if we (as linguists, psychologists, literature theorists, etc.) study spoken language, we tend to do so using theories and models which have been developed for the analysis of written, literate language.

Whatever the merits of monological models are for some purposes, they are inadequate for real-time dialogue and discourse (and, in fact, for communication processes in general). Research in recent years have highlighted the need for *dialogical* or *dialogistic* models. As I have hinted at, language users are "in dialogue with", i.e. intrinsically dependent on, partners and contexts in several fundamental ways; *globally*: when we use language, we exploit and develop cultural contexts, and *locally*: every contribution in a conversation is in dialogue with prior and next contributions. Briefly, this involves such points as:

1. Spoken interaction (and other forms of communication between humans) must be analyzed in terms of games (or, with other terms such as activities, speech events, sequences), which means that there is always (implicitly) an overall purpose (or,

rather, many purposes and functions) over and above any single action or any single actor's contribution.

2. This also means that every act or utterance is contextualized: sequentially occasioned and organized, only possible as an integrated element of larger activities (sequences). (This may be obvious for responses like answers to questions, but is true of initiatives too; nothing can be understood except in relation to something else in the context. Cf. examples above). Among the global conditions are situation types, settings, frames, etc., and locally, we find an other-orientedness in that the single utterance or conversational contribution is both a response to prior actions and itself projects next actions (providing conditions for further contributions to follow). If we look at the elementary structure, the interactional make-up, of conversational contributions in their local contexts, we find that they appear in sequential structures like source (for e.g. a comment; "commentable"), comment, and uptake (of comment) (or, e.g., repairable, repair (initiation), and uptake); presentation or attempt, acceptance, and completion (cf. Clark & Schaefer, 1987); initiation, response and reaction (to response), etc.[4]

3. Speaking and understanding are dynamic processes, involving active interpretive work in context (cueing or inferencing, in Gumperz', 1982, terms). Inferencing can only be performed by attentive, involved (engaged) human actors. Furthermore, they perform it partly or largely as collective endeavours.

In short, "dialogical" or "dialogistic" is intended to imply that every communicative or discoursal act or event intrinsically interacts with other such acts and events, and with local and global contexts and environments. ("Intrinsic", in turn, means that the act/event is not definable or analyzable as a unit which is independent of, or only extrinsically dependent on, contextual conditions in discourse, settings and frames. Speech-act theorists, on the other hand, call these "felicity conditions", treating them as extrinsic conditions, when, in fact, they are (part of) the essence of the utterance.) The term "utterance" may be taken as short for "utterance-within-context(s)".

Monologism versus dialogism, with their Cartesian and Hegelian assumptions, respectively (Markova, 1990a), are summarized in Table 1.

Table 1. Monologism and dialogism in theories of language and communication.

A. Monologism:

1. sender/speaker defines and produces messages (speaker monopoly)
2. code model of language: language as a ready-made, normative and static system of signs (fixed meanings associated with linguistic expressions)
3. conduit model of communication: meanings/messages are transferred/ transported from sender to recipient

B. Dialogism:

1. dialogical authorship: in formulating messages, senders/speakers are always "in dialogue with" other communicators and contexts
2. language as flexible resources: meanings of linguistic items and other symbols are open potentials for communication
3. communication as sense-making: both senders and recipients are actively engaged in understanding communicative behaviour by inferencing-in-and-from-contexts.

A methodological dilemma

If dialogism is an appropriate approach to communication, there will be some methodological implications for research and evaluation. At face value, at least, it casts doubt on many of those coding and scoring practices that abound not least in clinical linguistics and clinical psychology. Since these practices presuppose the unitization and categorization of discourse into atomistic, "monological" units of analysis, e.g. speech acts with independently codable properties, they seem to oppose a truly dialogistic conception. So are these practices to be abandoned? In my view, the answer is basically no, but with some important qualifications.

First, I believe that taking an extremist dialogistic stance, always and everywhere underscoring the reflexivity and indexicality of communication, would make empirical studies virtually impossible. Any scientific study must involve some reduction of the complexities in the data. Thus, in the case of communication, we have to bracket some aspects of dialogicality, for our methodological purposes freeze the dynamics and set aside (for the moment) some of its complexities and interdependencies (Markova, 1990a). Accordingly, one must be open for compromises. One point is of course the need for descriptive studies which explicitly aim at analyzing the complexity of selected examples of communication in well-defined contexts. But coding communicative performances by unitizing and categorizing discourse will also be necessary; otherwise, we would have to refrain from quantitative analyses of, for example levels of performance (except, perhaps, for some gross, global assessments). In doing so, however, we should select coding schemes which involve or retain some features of dialogicality; an example would be our initiative-response analysis (Linell, 1990; Linell et al., 1988) which is conceptually founded on dialogistic theory though still atomistic (unitizing and categorizing).[5]

Communication disorders and the nature of miscommunication

Turning now to so-called communication disorders, we might start by having another look at example (4). This may be seen as a piece of rather troublesome communication, lacking some of the features which are sometimes ascribed to genuine communication. For example, the aphasia sequence is fairly asymmetrical, there is an apparent textual disorderliness, and there are examples of miscommunications and misunderstandings. If we think that good communication should be characterized by interactional symmetry, that proper language is grammatically correct and textually fully coherent, and that aphasic disturbances yield non-communicative exchanges, then this example, and similarly many interactions with the linguistically disabled, would be an aberrant case. In contrast to this, I would stress the commonalities between this and "ordinary" conversations. (Actually, there is no such thing as *the* ordinary conversation or *the* successful communication; there only many different types of interactions featuring both similarities and specificities.) There are asymmetries in all kinds of communication, and inequivalences represent normalcy. Furthermore, the disorderliness in (4) is at most partial and largely only apparent. Miscommunication is not non-communication; by definition, miscommunication involves attempts to communicate. Hence, it is part of a communicative sequence (game) with some orderliness and coherence. Good (1989:5) observes that "the notion of ungrammatical conversation is itself incoherent". It might therefore be appropriate to introduce some fundamentals of a dialogistic theory of miscommunication.

First, the general theory of understanding tells us that understanding is, at one level, necessarily a matter of partial and fragmentary understanding (Rommetveit, 1990). There is not a simple dichotomy of (complete) understanding versus misunderstanding or non-

understanding. Whenever we seem to have "understood an utterance", upon further consideration, we would find that there always remains more to be understood. Thus, one should do away with the notion of "the (only) correct and complete apprehension of a given message (utterance, text)". Rather, we need notions like "understanding-for-all-practical-purposes" or inferencing what is relevant here and now.

Secondly, ambitions of and requirements on communication and understanding clearly vary across situations and with different persons involved in different activities. Indeed, with aphasics in a situation like (4), it may be enough to figure out what persons and events are referenced; there is no need, nor any chance, of getting involved in arguments about the semantic potentials of the words chosen, as would be relevant in some other settings. To put it differently, there are miscommunications with respect to different levels.

Thirdly, miscommunication is socially constructed. If it takes two to communicate, the same is true when we fail to communicate. That is, if A displays difficulties expressing (representing) or understanding (interpreting) something, B may still be able to understand or to help A to express it. At least, misrepresentations by A are regularly followed by attempts by A or B or A and B jointly to repair, i.e. to solve the communicative problems. Misrepresentation, misunderstanding and miscommunication are not acts by isolated individuals. Again, every communicative act is part of an overall game or sequence, which requires (at least implicit) moves by someone else.

Hence, fourth, just as there is some orderliness and sequentiality in all sorts of communication, miscommunication forms an ordered sequence. More specifically, the evolution of a local, focussed[6] miscommunication sequence is basically this:

0. precursors: elements (retrospectively identifiable as) possibly occasioning a (subsequent) misrepresentation or misinterpretation;
1. source (core utterance): utterance (interpretable as) displaying a misrepresentation or misunderstanding (of something occurring, or implicit, in the local context);
2. reaction: (oblique) response to (1) interpreting it as a misrepresentation or misunderstanding, and often initiating (or implying initiation of) repair;
3. attempted repair : attempt at resolving the problem occasioned or created through (1-2) and sometimes involving explicating comments;
4. reaction to repair: acceptance (confirmation) of repair, thus implying completion of repair, or initiating additional step(s) in a prolonged sequence of repair (negotiation);
(5. exit: resumption of main line of discourse, or introduction of new topic).

Note that nothing is a precursor or a source in and of itself; it has to be taken up as such in order to "count". Conversely, initiating repair is making something prior into a repairable, and reacting to something prior as a miscommunication will transform that prior act into it. The point is that the whole sequence (or at least its principal features) must be present for a miscommunication to be occasioned, developed and dealt with. A misunderstanding is not a singular act by one individual.

Applying this model to example (4), we find several instances of such sequences. There is a source in 4:1, which is treated as such by T's initiation of repair in 4:2 (although P displays self-repair already in 4:1). A solution (completion of repair) is delivered in 4:3, which, however, also introduces a new problem of reference (where?). This in turn brings about an initiation of repair in 4:4, followed by confirmation but no additional progression in 4:5. Then, we get further repair initiation (more of an initiative, suggesting a place) in 4:6, and confirmation but little progression in 4:7. A more specific suggestion is given in 4:8, ensued by confirmation, acceptance, and solution in 4:9, and so on.

Summarizing this section, I have proposed that communication disorders must be analyzed as social (joint) constructions. Surely, there are disorders, but there is also orderliness in them. This is so because communicators always approach encounters with the same propensities and methods, e.g. repair mechanisms, to accomplish order in dialogue. The structure of miscommunication sequences will be partly the same as in (mis)communication among persons who are not language- or communication-disabled. This is not to deny, of course, that in situations involving persons with communicative handicaps there often develop types of miscommunication which are partly qualitatively different: more severe and, hence, more difficult to repair, i.e. we get longer repair sequences (or repair attempts are abandoned at lower levels).

Some implications of dialogism for AAC

Kraat (1985), in her excellent overview of the state of the art in AAC, describes the implications of an interactional model for studying communication between aid users and others (pp.19ff). Such a model should, I believe, be "dialogistic". What are the consequences of such a theory for the understanding of, and the research on, communicative disabilities, communication disorders and AAC?

(1) We need a more *dynamic* view of disorders and miscommunication, which shows that things are gradual, disorders are also orderly, and miscommunication is communicative too.

(2) Disorders are *not individual* phenomena, since communication and communicative problems can never be individual; communication is intrinsically "dialogical". Handicaps are heavily dependent on the environments of the handicapped. Communicative disabilities or speech impairments may be individual parameters, but their communicative *effects* and manifestations are part of a collective structure, accomplished by both the disabled and their conversational partners, who all collaborate on the communicative problems.

Any speaker-listener is actively involved in his or her interlocutor's message, whether they are "natural speakers", or disabled, or aided or augmented, or not (cf. Kraat, 1985:30). (This is not to deny, as Kraat (ibid.;67) also points out, that both augmented communicators and natural speakers vary in interactive styles, e.g. in making concerted efforts vs. being autocratic or controlling.)
In line with these arguments, Calculator (1990) also notes that

> "Peck (1989) stressed the need to analyze environments (...) rather than limiting our focus or assessments to student abilities and skills" (p.21), and that
> "conversational breakdowns were as much a product of the interaction skills of listeners (...) as they were indexes of the communicative effectiveness of the adults with profound mental retardation for whom they were tabulated and attributed" (p.20).

Still, as noted above, there seem to be limits to how dialogistic you can be in actual research and evaluation.

(3) When we focus on the phenomenon of aided or augmented communication, we should not look upon the introduction of technical aids as a matter of simply *substituting or adding particular singular components* to communication situations. In comparison with non-augmented communication, the whole process or system, and the contexts, will change. A *new integrative pattern* will emerge, with unique properties (cf. Kraat, 1985:136, "the functional-adaptive model"). It is generally true that new technology brings about not only predicted but also unpredicted consequences. If we introduce new communication technology, it will lead to new

communicative practices and opportunities. "Devices" are integrated into communicative actions, as has been forcefully argued in neo-vygotskian theory (the notion of (inter- or intrapersonal) communication "incorporating" mediational means, e.g. Wertsch et al., 1990). (In fact, natural language itself may be seen as a psychological tool deeply integrated into human communication.)

(4) It follows that AAC should be *evaluated on its own terms* (Kraat, op.cit.:133). Since all communication is context-bound, dependent on activity types, people and artefacts present etc., it is only natural that communication and interaction with aided or augmented speakers in specific contexts have their unique features and should be evaluated accordingly.

In many ways these points are well documented and acknowledged in communication studies at large, as well as in a field like AAC, as both Kraat (1985) and Calculator (1990) bear witness to. In fact, I am rather confident that students of AAC are more sensitive to dialogical aspects of communication than many others. Yet, Calculator admits (p.21) that "although clinicians/instructors readily affirm such an approach (i.e. a dialogistic one/PL), their actions speak otherwise". Again, the same seems to be true in the general field of communication studies. The conceptual reorientation is there, but more in theory than in practice.

NOTES

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[1] Some transcription conventions:
underlining: overlapping (simultaneous) speech,
italics: stressed items,
° ° low volume
(2s): pause (length: 2 seconds)
.. : short pause
= : utterance latched on to preceding utterance without any break whatsoever.
(Tannen's, 1984, transcription has been slightly modified for my purposes.)

[2] The Swedish original is available at the Department of Communication Studies, University of Linköping.

[3] Of course, reliance on various kinds of background knowledge is important in this case. T knows P's relatives. Furthermore, if you have hints that somebody went to Norrland in spring, you can make pretty good guesses at skiing holidays, Sälen (a well-known Swedish skiing centre) etc. Interpretations are also, perhaps incidentally, cued by words like "cards" (Sw. kort) etc.

[4] The notion of three-step analysis has been argued by e.g. Mead (1934). For a recent discussion, see Markova (1990b).

[5] There are obvious similarities between this system and some models which have been applied to communication disorders, e.g. developments of Blank & Franklin (1980) and Tannock (1988).

[6] By focussed miscommunication is meant a sequence in which a source or core utterance can be identified. Not all cases in which people talk past each other involve such focussed miscommunication items.

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EVALUATING THE EFFICACY OF AAC INTERVENTION FOR CHILDREN WITH SEVERE DISABILITIES

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> "It is of primary importance that, as a field, we strive for continuing growth that is relevant and purposeful, in order that the same process can be experienced by the individuals for whom our field developed. I recognize that this objective can be expressed quickly and easily. Remaining relevant and purposeful takes more effort and time!"
> (McNaughton, S., 1990; p. 3)

The above charge issued by Shirley McNaughton at the first Annual Phonic Ear AAC Distinguished Lecture, calls for research activities which, through design and intention can be expected to have an impact upon those others for whom such efforts are targeted. Reflecting back on my own history in the field of AAC (in a young profession, one can attain the role of historian with few grey hairs to show for it), I continue to trace many of my current efforts to a conversation I had 12 years ago with Dolores Vetter, a professor of communication disorders at the University of Wisconsin, Madison. I was an aspiring doctoral student who had been swept under the wings (and aura) of David Yoder, my mentor. One day, I entered the office of Professor Vetter to solicit her feedback on a research idea which I was mulling around. She sat patiently as I explained how I would like to do a descriptive study which would entail a comparison of caregivers' verbal input to children vs. adults (all functioning in the profound range of mental retardation) in a residential setting. I awaited her encouraging words, and was instead shattered, as she turned to me and responded that such a study would represent nothing more than an exercise in 'intellectual masturbation'.

I can't recall the next two or three minutes of our conversation, although I seem to remember that I discovered every crease, stain, and imperfection in my sneakers as my gaze was riveted anywhere but at my tormentor. The story did have a happy ending - the purposeless study originally proposed was reworked into a comparison of different caregivers' styles of interacting with particular children. These data were then used as a basis for making recommendations to staff as to how to facilitate interactions with individual children, part of a package which became my doctoral dissertation.

Since that time I, like many of you, have struggled with the challenge of providing meaning to our field. AAC is an amalgam of ideas, orientations and approaches. We may find ourselves overwhelmed as we attempt to contribute to a body of literature which is aimed at an amorphous audience. In our attempts, we find that in order to be meaningful, we must broaden our perspectives beyond our professional ties, accessing and then applying information traditionally associated with the social (e.g., Brofenbrenner, 1979), behavioral (Rusch, Rose & Greenwood, 1988) and physical (exemplified by recent unpublished biobehavioral studies cited by Sailor, Gee, Goetz & Graham, 1988)

sciences. While the AAC logo emerges as a guiding symbol, our actions are perhaps best represented by a chameleon.

Applied and Basic Research

Ventry & Schiavetti (1986) drew a distinction between two primary forms of research: basic and applied. In basic research, the overriding goal is to contribute to the present body of knowledge, to answer the unanswered and perhaps never before proposed question.

Applied research is motivated by an existing need; the goal being to identify and then address problems of a social, economic, or other nature. As pointed out by Olswang (1990), applied research is often driven by theory and/or consumer need. Theory driven research begins with a question and a set of hypotheses. It then takes the form of a series of studies, the results of which advance the field by contributing to our understanding of AAC communication and how it differs from speech. The work of David Beukelman and colleagues (USA) related to vocabulary usage; Mary Ann Romski and colleagues on early symbol acquisition; and Kraat's (1985) comprehensive review of previous research in the area of interaction are but a few examples of the various systematic research programs which have contributed so much to our present understanding. Most recently, the paper presented by Hoag, Bedrosian, Calculator & Molineaux (1990) at this conference typifies applied research which is theory-driven. Here, the investigators operationalized Light's (1989) proposed model of communicative competence for AAC users in the form of a socially validated questionnaire. The latter was then used to evoke different raters' impressions of the communicative competence of a nonspeaking individual. In order to answer their question, the investigators developed a series of videotaped interactions in which all but two factors (the independent variables) were held constant: the presence/absence of listener reauditorization; and the average length of messages conveyed by the AAC user.

Based on the Hoag et al. study, a set of hypotheses/instructional guidelines might be proposed with respect to the content of instructional programs for other AAC users. However, validation of such operating principles would necessarily rest in the hands of practitioners and others, motivated by what Olswang (1990) refers to as consumer driven research. Here, the emphasis would be upon clinical application. The effectiveness of the recommended procedures would be put to the test in terms of their applicability and generalizability.

Efficacy Defined

Where the focus of applied research is directed to the outcomes of clinical/educational/instructional efforts, the term 'treatment efficacy' is offered. Olswang (1990) attributed such research to practitioners needs for accountability with respect to:

(A)Treatment effectiveness - Providing evidence that a treatment (in the absence of other potentially confounding variables) is responsible for a change in behavior.
(B)Treatment efficiency - Providing evidence that one treatment can be carried out more economically (time and cost) and/or exhaustively than others in terms of the number of targeted behaviors which are mastered by the student.
(C)Treatment effects - Providing evidence that changes in behavior associated with the intervention program are generalizable; sorting out the precise aspects of the treatment which were indeed relevant, and then identifying the corresponding effects of each of these components.

Efforts to document clinical efficacy. Given its clinical/educational focus, one would expect the field of communication disorders to be replete with investigations of clinical efficacy. However, a review of articles published in the Journal of Speech and Hearing Disorders and the Journal of Speech and Hearing Research, primary journals for dissemination of information in communication disorders within the USA, revealed this not to be the case. McReynolds (1989) found that in the period between 1960 and 1988, controlled studies of efficacy comprised approximately 10% of the articles published in these journals. These studies demonstrated that intervention can be beneficial in enhancing children's communication skills; however comparisons of the relative effectiveness of specific procedures with particular children have yielded inconclusive and inconsistent findings.

A similar lack of attention to efficacy research has been noted in AAC. Light (1988), following a comprehensive review of investigations which have examined interactions involving AAC users, noted a "lack of reliable and socially valid measures to evaluate the outcome of clinicial intervention with individuals using AAC systems. The measures used to date have been difficult to interpret and have yielded minimal information as to the actual effectiveness of daily interactions" (p. 75).

The latter studies would fall within the 'treatment effects' (defined earlier) category of efficacy research. Practitioners, whether they be speech-language pathologists, AAC consultants, teachers, occupational therapists, physical therapists, etc. search in vain for proven principles and procedures upon which they can base their assessment and treatment decisions. In the absence of data, decisions are made on the basis of past experience, clinical judgment, and common sense. Unfortunately, these are three qualities which, based on my own experiences as an instructor of undergraduate and graduate students, are as indispensable as they are unteachable.

The remainder of this paper will be devoted largely to a discussion of methods and actions which can be taken to provide a body of clinically useful operating principals for the practitioner. Material presented (and accompanying examples) will be drawn primarily from literature in the area of children and adults with severe disabilities. However, the reader should note obvious implications (if not generalizations) for other populations of AAC users as well.

Functional Assessment

One of the more common procedures for targeting and then assessing the outcomes of instruction relies on measures of individuals' abilities to function in their respective environments. Such instruments vary greatly depending on the setting(s) in which they will be used, the role of the individual who is employing the instrument (e.g., researcher, practitioner, speech-language pathologist, rehabilitative engineer, teacher, parent), and the intended uses of the information that is obtained (Frattali & Lynch, 1989). A review of current functional assessments led these authors to conclude that this area remains both fragmented and diverse in its development and use. Furthermore, they concluded that procedures which have been proposed resemble one another in their "incomplete, preliminary or ongoing nature of establishing reliability and validity" (p. 71).

Referring back to our earlier discussion of treatment effects, the population of AAC users with severe disabilties has been frequently described as one for whom efforts to promote generalizability of communication skills across environments and listeners is of paramount significance (Calculator, 1988 b, c; Calculator & Jorgensen, 1990; Falvey, 1986; Glennen & Calculator, 1985; Mirenda & Iacono, 1990; Mirenda & Mathy-Laikko,

1989; Reichle & Keogh, 1986; Snell & Browder, 1986). These and other investigators have recounted repeated instances in which behaviors displayed by these children under controlled circumstances fail to be employed by these same students in the absence of the stimuli under which the behaviors were originally taught. This has led various investigators (e.g., White, 1988) to propose that if our goal is to prepare students for the "real world" (which, based on feedback from my students at the University of New Hampshire lies somewhere between the ivory tower at the University and the insanity which confronts me each day upon arriving home to my wife and four very active children), then skills should be probed in situations which reflect that world to the greatest extent possible.

Incomplete, preliminary and ongoing (to borrow three descriptors earlier attributed to Frattali & Lynch, 1989) attempts to address this area of need have resulted in a variety of instruments (all lacking data related to reliability and validity). These procedures go by such names as discrepancy analyses (Brown et al., 1979; Cipani, 1989), communication repertoire summaries (Calculator, 1988c); matrices (Giangreco, Cloninger, & Iverson, 1990); communication needs lists (Beukelman & Garrett, 1988) and, most recently, a fur .tional analysis of opportunities to participate in regular school activities (Calculator ° .orgensen, 1990).

Cipani (1989) stated that the 'bottom line criterion' for determining the usefulness of any communication program should be the extent to which the student's competence increases in everyday situations. By teaching those skills which have already been associated with social-communicative competence, in present and future settings in which the student is expected to interact, instructors hope to ensure the efficacy of their efforts in terms of corresponding student outcomes.

In summary, then, attention to functional outcomes implies revisions in how we asses.s, intervene, and evaluate the impact of AAC. Clinically observed gains in the absence of evidence that individuals' everyday functioning has improved might represent nothing more than moot, self-sustaining, intellectual exercises.

Implications for Future Research. If the efficacy of AAC outcomes is evaluated relative to changes in AAC users' abilities to meet daily communication demands, there continues to be a need for reliable, valid, and 'user-friendly' methods of securing such information. One viable option may be offered by a procedure referred to by Bailey & Simeonsson (1988) as goal attainment scaling. The investigators provide evidence of the economy in staff time and effort of this technique for evaluating the extent to which clients attain predetermined goals.

As originally devised by Kiresuk & Sherman, 1968 (cited in Bailey & Simeonsson, 1988), goal attainment scaling consists of the following seven steps:

(a) Goals are specified for the client; (b) Each goal is assigned a priority weighting; (c) A continuum of 5 possible outcomes is specified, from worst, -2, to best, +2; (d) Performance is baselined for each objective; (e) Intervention is carried out for a specified period; (f) The extent to which objectives are attained is determined; (g) The extent to which goals are attained is evaluated.

This procedure represents an improvement over measures such as percentage of program objectives attained in that we are able to measure individuals' progress, or, partial attainment of objectives. At the same time, we are able to recognize that certain outcomes are more highly valued by the AAC user and others.

In addition, methods of evaluating the significance of newly acquired AAC skills in terms of various, associated changes are needed. Associated impacts might include changes in others' perceptions of the AAC user; changes in the user's self-image; employability of the AAC user; access to an increased number of community resources and settings; increased opportunities to participate in a broader number and variety of settings; changes in the number and nature of social relationships and friendships established and maintained by the AAC user. Several of these parameters were discussed in an earlier article (Calculator, 1988a), yet objective methods of documenting the types of changes just noted remain elusive and in need of further research.

Curriculum-based Assessment

Researchers might also be assisted in their efforts to measure functional outcomes of AAC instruction by examining literature in the area of curriculum-based assessment. Salvia & Hughes (1990) provide an extensive discussion of such procedures, drawing from earlier findings in this area as well as additional information from applied behavior analysis, mastery learning, and precision teaching. They discuss six defining components of such asssesments:

(1) Curricular match - The assessment reflects the content which the student has been taught.
(2) The behavior assessed is as direct a measure as possible of the behavior taught.
(3) Progress is evaluated relative to specific objectives as well as more general goals.
(4) Repeated asessments, or, probes are conducted throughout intervention in order to monitor the child's progress and to identify needs for program modification.
(5) They faciitate the investigator's/instructor's abilities to make valid inferences about why a student is failing to achieve, and to then act upon such hypotheses in the form of curriculum revisions.
(6) They are sensitive to small but important changes in pupil performance.

Social Behavior. Curriculum-based assessments might best be applied in determinations of the efficacy of AAC services relative to changes in students' social and adaptive behaviors. Salvia & Hughes(1990) view these as overlapping terms. They define social behavior as any action that affects another individual. Thus, any school activity which involves communication could be considered part of a social behavior curriculum. Indirect measurements of social behavior discussed by Salvia & Hughes include:

(1)Adult ratings. (Note: Calculator [1988c] demonstrated that different adults provide widely varying descriptions of nonspeaking individuals' communication skills. Such descriptions reflect impressions molded by their own successes with the person and do not necessarily reflect the latter's potential competencies in the presence of a different listener).

(2)Self-ratings. Salvia & Hughes provide guidelines relative to how such ratings (as well as the adult ratings discussed above) can be objectified. In the field of AAC, few published accounts of AAC users' perceptions are available. Where such data are available (e.g., Smith-Lewis & Ford, 1987; Sienkiewicz-Mercer & Kaplan, 1990), they tend to be retrospective in nature, and provide little direct benefit for the purveyor of the information. The insights offered, however, are of tremendous potential significance when placed in the hands and minds of others who will avoid repeating the series of mistakes and disservices these individuals have recounted. Structured,

systematic interviews and autobiographies continue to be an essential source of feedback from consumers as to the efficacy of the AAC service delivery system.

(3) Peer ratings of social behavior and acceptance. Such ratings (sociometrics) have been used to evaluate the relative status and acceptance of particular children relative to their classmates. One common application of peer ratings involves nomination, or what Asher & Taylor (1981) referred to as partial rank order procedures. For example, children can be asked to name their three best friends; the two child(ren)they most enjoy conversing with; the three children with whom they most enjoy working on projects; etc. The children may also be asked to name students who they perceive to fit various criteria. The converse of such measures would entail reactions to questions probing these same students' dislikes (e.g., the three children with whom they least like to converse). Scores are then reported in the form of sociograms, in which students' positive and negative preferences are mapped out, or total number of nominations/points which each child received.

An alternate procedure involves the use of rating scales, where students rank, or assign Likert-type ratings, to their peers on a particular social criterion. These measures can be repeated over time in order to assess the stability of students' attitudes, for example, through the various phases of an AAC program.

Such measures might hold promise in evaluating classmates' perceptions of a peer who uses various types of AAC systems; the manner in which these respective systems are used; etc. They may also offer promise in terms of documenting the relationships between access to AAC and users' access/comfort with increasing numbers and types of conversational partners and, more optimistically, friends.

Indirect measures of social behavior can be augmented with direct measures involving systematic observation of the student in a variety of settings. Recordings of behavioral data may be made in terms of frequency, rate, and duration (by timing the behavior or recording the number/percentage of intervals in which the targeted behavior arises: time sampling).

One interesting twist in applying direct and indirect measures of social behavior would be to examine relationships between the introduction of AAC systems and concurrent reductions in aberrant forms of behavior. The potential communicative value of behaviors such as head banging, hitting, scratching, shouting, crying, rocking has been well documented (e.g., Donnellan, Mirenda, Mesaros, & Fassbender, 1984; LaVigna & Donnellan, 1986). Further assessments of how the provision of AAC systems (and delineations of the most relevant aspects of this process) contribute to increased rates of socially appropriate communicative behavior concurrent with decreased rates of aberrant behavior are called for. A preliminary list of meaningful functional outcomes, and corresponding methods of measuring such outcomes, has been provided by Meyer & Janney (1989). For example, a desired outcome for such a student might be an expanded number of social relationships and a broader network of informal supports. Examples of this outcome would include increased participation in school activities and play with peers; friendships; fading of once-needed one-to-one staffing for the student. Outcomes might be measured by analyzing staffing changes, examining proximity between the child and staff, unsolicited offers of assistance from other school personnel and staff; observed friendship patterns and play.

More specific to AAC, Warrick (1988) has provided an extensive review of the literature examining societal attitudes towards people with disabilties, factors influencing such attitudes, and factors influencing the self-esteem of people with disabilities. Warrick calls

for future studies which pinpint factors that contribute to AAC users' developing positive characteristics, in terms of their self-esteem, perceptions of others, and so forth.

Adaptive behavior. Salvia & Hughes (1990) define adaptive behavior as any action that increases people's liklihood of physical survival and ability to cope with the social and physical demands of their environments. The behavior must be performed consistently by (rather than for) the individual in order to be considered adaptive. Coping refers to adjusting one's behavior to meet environmental demands and/or modifying the environment to conform with an individual's abilities and preferences.

Measurements of the efficacy of AAC services in terms of changes in adaptive behavior might consider:

(1) Daily living skills, or those skills necessary for managing one's life.

A. Self-help skills - Is the AAC user assuming greater independence and/or control over what he/she eats, how he/she dresses, how and when he/she practices personal hygiene?
B. Domestic skills - Can the AAC user maintain his/her immediate environment in an orderly fashion (e.g., recruiting the assistance of others to assist in managing chores such as laundering, dishwashing, table setting).
C. Play or leisure skills - To what extent does the AAC system enhance the individual's involvement in such activities; how does it enhance the variety and sheer number of leisure choices which are available to him/her?
D. Resource management skills - How is the AAC system used by the individual to budget time and money (e.g., access to community resources; purchasing; etc.)?

(2)Vocational skills (and range of employment opportunities).

(3)Social graces.

(4) Civic responsibility.

Functional assessments, systematic probing, and goal attainment adaptive behavior. One might note the conspicuous absence of communication from the above list, despite its consistently being referred to as an adaptive behavior within the professional literature. The reader is refered to the growing body of literature in the areas of skill cluster instruction, embedding of related services, and transdisciplinary models of service delivery for further information (Giangreco, Cloninger, & Iverson, 1990; York & Rainforth, 1989). This intentional oversight reflects an orientation in which communication is not viewed nor valued as a skill in and of itself, but is instead defined and valued in relation to the broader skills or activities in which it is used. This represents a departure from an earlier description of outcome measurements in AAC compiled by Culp (1987).

After reviewing the results of previous investigations which documented unique aspects of interaction involving AAC users, along with reports of AAC failures (e.g., rejections and/or failures to use AAC systems; converstional breakdowns; etc.), Culp proposed a variety of behavior parameters for measuring the impact of AAC. These included operation parameters (i.e., speed, accuracy, and flexibility); representation parameters (symbol recognition or indication, comprehension skills, expressive grammar skills, reading and spelling skills); and interaction parameters (e.g., Number of modes available to and used by the individual; frequency of initiations and responses; range of communicative functions used; frequency and types of conversational repairs).

Communication Relative to .... A recently completed study by Calculator, Nadeau, Brown-Herman & Reinhardt (1988) revealed that measures such as frequency of initiations and responses, mode usage, communicative intents, and conversational breakdowns were as much a product of the interaction skills of listeners (in this case, caregivers at a residential facility for persons with severe handicaps) as they were indexes of the communicative effectiveness of the adults with profound mental retardation for whom they were tabulated and attributed. The same adult displayed vastly different communication behaviors depending upon the person with whom he/she was interacting. All interactions examined occurred under highly similar circumstances, relative to time of day, settings, and materials used.

Similarly, Haring & Breen (1989) noted that opportunities for interaction vary across settings. The interaction opportunties afforded by a given setting should be known prior to any conclusions being reached about a particular students' abilities in that same setting. Reflecting back on two of my own previous investigations (Calculator & Dollaghan, 1982; Calculator & Luchko,1983), I now wonder whether the passive communication styles we noted in these investigations were indeed 'aberrant' or 'normal' given the constaints of the settings in which the interactions were sampled.

Peck (1989) stressed the need to analyze environments, and interactions associated with various settings comprising these environments, rather than limiting our focus or assessments to student abilities and skills. He further noted that although clinicians/instructors readily affirm such an approach, their actions speak otherwise. Peck discussed a variety of measures which can be used to analyze environments in terms of dyadic interaction patterns (e.g., familiarity with the child; repair attempts; adult compliance with child preferences; adult responsiveness to child initiations); situational characteristics (e.g., needs for assistance or objects; opportunities for choice making; protest situations); and setting characteristics (e.g., access and familiarity with the setting; activities available; social climate).

Culp (1987) also proposed various psychosocial (e.g. users' and others' attitudes about communication) measures of the impact of AAC which are more consistent with atttempts to examine effects relative to changes in adaptive and social behavior. In looking at communication gains associated with these broader issues, we can not only measure the impact of AAC through means which are socially valued, but can apply this same orientation to the selection of content for an AAC program. For example, Brown, et al. (1988) suggested using the following criteria in order to determine whether or not a particular skill is worthy of instruction:

(1) Considering all of the skills that could be taught, can those selected be deemed most important now and in the future?
(2) Will the skills selected result in the best possible instructional gains for the resources invested? (This is a particularly relevant issue in the case of students with the most severe disabilities, where resource needs are often great in terms of instructional time, instructional support, needs for technology).
(3) If selected, will the skills be those most likely to enhance the individual's quality of life?

Quality of Life

Schalock, Keith, Hoffman, & Karan (1989) predicted that quality of life may replace deinstitutionalization, normalization and community adjustment as the issue of the 1990s. This measure reflects the re-emergence of models of service delivery (e.g., transdisciplinary) which consider the whole individual within his/her social environment.

The authors used quality of life to refer to the degree of independence, productivity, and community integration which a person experiences, as determined by subjective reports and objective evaluations. For example, psychological indicators of quality of life include measures of personal satisfaction and happiness with various aspects of one's life.

Schalock et al. developed a quality of life index for persons with mild and moderate handicaps. Their instrument consists of a standardized questionnaire containing 28 criterion-referenced items which reflect environmental control ("Can you do what you want to do?", "Who chose the decorations in your bedroom?", "Who decides how you spend your money?"); social relations ("How often do you talk with the neighbors, either in the yard or in their home?", "How do you like this town"), and community utilization/involvement ("How often do you use public transportation?", "Do you have friends over to visit your home?", "How frequently do you spend time in recreational activities in town?"). Responses are recorded on a three point Likert-type scale, resulting in an Index (the total sum). The authors have reported consistent significant differences to suggest that a more successful quality of life outcome is observed for persons in more "normal" environments; higher indexes are obtained for persons with successful living and work outcomes.

The concept of quality of life interfaces nicely with our previous discussion of functional outcomes, and certainly presents promise as a means of measuring the efficacy of AAC programs, as one component of a much larger network of service delivery options.

A review of the files of 143 children with severe handicaps was completed recently for the purpose of identifying the most frequently used assessment procedures with these students (Sigafoos, Cole, & McQuarter, 1987). The investigators concluded that despite the lack of technically adequate, norm-referenced tests for these students, such tests continue to be used disproportionately relative to criterion referenced tests and adaptive behavior measures. Particularly disheartening was the author's contention the the technical inadequacies (in terms of validity, reliability, and normative data) of the tests most often used rendered them useless for making any educational decisions affecting these students.

There is a clear need to develop reliable, valid and efficient instruments for assessing the impact of AAC systems relative to social and adaptive behaviors in these children. No less energy should be directed towards encouraging the actual use of such measures by practitioners/instructors.

Applications for Children with the Most Severe Disabilities

The absence of data validating the existence of cognitive prerequisites for AAC use (e.g., Reichle & Karlan, 1985), concurrent with discussions/taxonomies of communicative behavior from early infancy (in terms of developmental ages) onward, has led to proposals of a zero exclusion criteria when determining candidates for AAC systems and programs (e.g., Brown, et al. 1979; Downing & Siegel-Causey, 1988; Rowland & Schweigert, 1989; Siegel-Causey & Guess, 1989). However, the provision of services to these earlier excluded children has proceeded more rapidly than data supporting the effects of such services. Sailor, Gee, Goetz, & Graham (1988) tie such discussions to ongoing debates concerning the extent to which, and how such students 'benefit' from education. The authors, again, suggest quantifying benefits relative to quality of life (e.g., the manner in which these individuals participate, represented on a continuum ranging from partial to independent participation in functional life activities; opportunities to make choices and indicate preferences; and similar measures). As discussed earlier, the authors also call for determinations of the extent to which changes associated with

various interventions are valued by the individuals receiving such services, and by society in general.

Given a belief that every child has the right to a public education, some might argue that it is then no longer necessary to document the outcomes of such instruction. Wacker (1989) attaches importance to such efforts in order to document what has occurred and to identify variables responsible for the occurrence. A further area of interest might be the identification of what does not occur (e.g., failures to master objectives, generalize learning, and/or alter self and others' perceptions).

Conclusion

The field of AAC, in all its manifestations, must assume responsibility for documenting its efficacy. Irrespective of one's professional or experiencial background, there are common denominators of efficacy which transcend professional roles. Several of these factors have been discussed above in relation to functional outcomes, social and adaptive skills, and issues bearing on the quality of life. What is the impact of AAC systems on the lives of their users and persons with whom they go to school, play, work, commiserate, laugh, enjoy?

As our efforts to document efficacy increase, first through heuristic endeavors such as quasiexperimental case studies (McEwen & Karlan, 1990), followed by well conceived single subject and group designs, let us be certain that the same outcomes which cause us to rejoice (as statistically significant and publishable findings) are of use to the persons necessitating the studies to begin with. These are the AAC users, their families, and the broader social network of educators and professionals whose primary goal is maximal inclusion of the individual within mainstream society.

How can we encourage partnerships between researchers, AAC users and significant others in their lives to assure ourselves that we are asking questions that warrant answers? How do we promote the interest of, and provide financial and emotional support necessary for, educators and therapists to collaborate in (rather than agree to) future research endeavors? Where access to the homes, classrooms, workplaces and other settings of interest are neither economical nor feasible, are we willing to allow our studies to advance that one extra step, one last phase, so that clinical outcomes can be probed quantitatively and/or qualitatively for evidence of transfer to these settings? As an interdisciplinary field, how can we foster interdisciplinary research which pushes us to higher levels than any of our respective professions, alone, permit? In the end, each of us will be our most critical judges as to the value of our efforts, and our long-term impact on the profession. For me, I would like to again enter Dr. Vetter's office, look her square in the eyes, and thank her for setting me on the right path home, leaving it up to me to determine how I chose to get there. In some way, I know deep down inside me that I, myself, will never arrive home. The process of getting there, through streets, bypasses and detours, remains more attractive than anything which might be waiting for me at the other end. I wish you all a highly stimulating conference and a successful, gratifying career!

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SESSION 1

CHALLENGES IN CONDUCTING OBSERVATIONAL RESEARCH TO ADDRESS INTERACTIONAL ISSUES IN THE AAC FIELD

ISSUE PAPER

The methodological challenge of interaction research in AAC

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Introduction

Communicative interaction studies in AAC are the recent result of the growing need to evaluate the communicative effectiveness of AAC users in different settings (such as educational, vocational, institutional and home environments). Despite the general growth in this area, our knowledge of the complex processes involved in communicative interaction is fragmented and suffers from theoretical and methodological weakness

Kraat (1985) was among the first to conclude that AAC interaction studies are confronted with specific difficulties. These are, amongst others, representativeness, reliability of data description (transcription) and data analysis, and underlying theories. These issues are not peculiar to AAC interaction studies; they emerge frequently in the vast amount of research on (caregiver-child) discourse in spoken language (McTear, 1985, Wells, 1985, Fey & Leonard, 1983; Conti-Ramsden, 1988).

Continuing research is needed, based on a set of well-founded methodological principles. Such principles can be derived from a consideration of the AAC interaction studies conducted to date, but also from communication and discourse analysis techniques, and general caregiver-child interaction research in so-called normal settings. It is our intention to promote discussion concerning the need for a sound theory and methodology in the study of communicative interaction in the AAC field. It falls beyond our scope to present a detailed overview of (AAC) interaction studies. For this, readers are referred to Kraat's state of the art report on "Communication Interaction Between Aided and Natural Speakers" (Kraat, 1985) and the more recent review by Light (1988).

The methodological discussion reflects two general themes. Firstly the claim that interaction research needs to be useful for clinical practice and, at the same time, directed by an underlying theory. Secondly we meet the issue of research validity of AAC interaction research. Problems with research validity are caused by the use of theories and methodologies derived from other disciplines on the one hand, and by specific generalization problems originated in the interindividual differences of subjects (AAC users, including their communication-partners) on the other hand. The way in which

researchers choose and justify an underlying theory is of primary concern for the validity of their study. There seems to be a controversy concerning the proper role of an underlying theory in guiding observational research. At least some authors argue that behavioural science can proceed without its major activity necessarily being the development and testing of a theory (for a discussion see Siegel & Ingham, 1987). Most studies in the AAC field are observational, descriptive and quantitative in nature. The research overview given by Light (1988) indicates that at least some of the difficulties in generalizing results from observational AAC interaction studies are caused by the use of poorly defined discourse units and limitations imposed by specific clinical purposes (like subject selection, data collection and analysis techniques). The types of observation, data collection and analysis techniques used reveal the primary concern with clinical, therapeutic objectives. Without explicitly saying that there is a causal relationship between the primary clinical concern of AAC interaction studies and their methodological constraints, clinical practice and research tradition seem to be in conflict with each other.

Most of the methodological problems indicated above can be considered as possible threats to research reliability, external validity and validity of statistical proof.

The term reliability refers to consistency and reproducibility of observation and measurement (Thorndike & Hagen, 1977). Failure to obtain consistent and reproducible levels of interjudge agreement leaves an investigator in the position of being unable to interpret the data. Very high or very low levels of reliability are not problematic. Interpretative problems arise when reliability coefficients fall between very low and very high levels. It seems to be difficult to define what constitutes an "acceptable" level of reliability. For example, factors such as complexity of the behavioural coding system , the number of reliability checks conducted, the influence of artifacts and bias, and the method used to calculate the reliability coefficient must be considered in assessing reliability and it is practically impossible to standardize these aspects (McReynolds & Kearns, 1983; 131-132).

None the less, the researcher needs to plan the reliability phase of his study carefully, because reliability problems cause validity threats. Cook & Campbell (1979) stress the importance of considering reliability and validity threats during the planning stage of research as early as possible. External validity refers to the approximate validity with which we can infer that the presumed causal relationship can be generalized to and across alternate measures of the cause and effect and across different types of persons, settings and times (Cook & Campbell, 1979, 70). Statistical proof validity deals with valid inference-making between the variables used and the population (or subjects) selected (Cook & Campbell, 1979, 39). In the remainder of the paper we will refer to both aspects of validity as 'research' validity.

In the following sections we will focus on the methodological difficulties mentioned above and make suggestions for possible solutions of these problems.

Reliability, validity and representativeness

The most important aspect of research reliability and validity is representativeness. The term "representativeness" comprises most of the methodological issues presented above. In order to plan and conduct representative research the investigator must operationally define his research questions at hand, the behaviours of interest, develop a corresponding scoring method, and select an appropriate method for data collection and description. Representativeness in AAC interaction research suffers from elementary methodological limitations. Most of the AAC interaction studies reported to date have been based on small groups. The interpretation of results has suffered from the

limitations of numbers and from a large number of confounding background variables. The studies also are difficult to compare: they vary according to the number of subjects studied and to the extent to which subject characteristics are specified; characteristics like age, sex, etiology (and onset), prognosis, family background, birth order, past experiences, cognitive status are often not explicitly described (see also Udwin, 1987). As is the case in studies of spoken discourse, AAC interaction studies need to consider different discourse situations. The use of specific communication modes, communicative strategies and styles can differ from one setting or situation to another. The communication partner also plays an important role in the specific use of communication styles and strategies. Because of this range of variability in AAC-users and their communication partners across the various studies reported to date, the term "research population" is hardly applicable in the field.

The overall picture shows a high degree of heterogeneity of subjects, objectives of the studies and the research methods followed. The main characteristics of well designed and documented research are the reproducibility of the design (in order to control or verify research results) and the comparability of the results to other similar studies (in order to generalize research results). ACC interaction studies seem to have more differences than similarities. This leads to interpretation problems and difficulties for comparing (or generalizing) results with other studies and other subjects, groups or settings.

In summary, most problems with reliability and validity in AAC interaction studies deal with one or more aspects of representativeness. Representativeness is influenced by:

-subject selection,
-sample collection and the context of observations,
-transcription,
-segmentation into discourse units,
-data analysis and statistics,

We will discuss these issues in the next paragraphs.

Subject selection

As outlined above, a major problem is subject selection. It is hardly ever possible to find a large research group of subjects, which is homogeneous enough. There are too many individual diffirences between nonspeaking persons which are beyond experimental control, for example the nature and the gravity of the communication handicap vary. This inevitably means that much of the interaction research has to deal with varying amounts of heterogeneity within the samples selected and with a range of confounding variables. Several researchers prefer therefore to use single subject studies as an alternative to group studies (see for an introduction McReynolds & Kearns, 1983). The issue of single-subject designs in the field of AAC is a topic of one of the other sessions during this research symposium, we will not discuss this issue here. In conducting evaluation studies of training programmes or studies on communicative development, the best approach is to include a control group in the design. A prerequisite for a control group, however, is that it must be matched to the experimental group. As discussed above AAC subjects reflect a high degree of variability in their communication handicap and background variables. Without successful matching, a control group is more or less useless. A balanced research design with experimental and control groups is difficult to achieve, but should be considered where possible.

Sample collection and context of observations

Once we have selected our subjects, we have to decide which kind of interactions we want to record in order to gather data for analysis. Many authors make a distinction between communicative behaviour used in natural environments and observations in artificial situations (e.g. the recording studio). In natural as well as in artificial situations the language behaviour studied can be either elicitated or spontaneous. The corresponding methods used for describing the language are linguistic transcriptions for spontaneous language and testscores or ratings for elicited language behaviour. In the former case, the interaction may be structured and restricted in many different ways or not structured and open ended. There is continuum between high and low imposition of structure between standardized testing and obtaining a naturalistic interaction sample. Standardized tests with the corresponding norms barely exist, however, for AAC. To date, the precise relationship is still unclear between performance in artificial conversations and performance in naturally occurring conversations.

The majority of the interaction research uses videotaping as a technique for datacollection. Videorecording allows us to preserve events so that repeated observations can be made and the reliability of the observation system can be tested through computations of the inter- and intrajudge reliability. In order to minimize the influence of camera and observer one is recommended to film with a lightsensitive camera in a fixed position, without the presence of an observer in the same room. In some clinical-therapeutic situations, the observer can take place behind a one way mirror screen. In naturalistic settings, it is possible to use a monitor and control the recording process in an adjacent room. For example, the reliable scoring of eye-gaze in situations where an ETRAN or other "gaze dependent" AAC system is used is problematic because of the possible interferences of observer-directed eye-gazes.

If the aim of research is to investigate naturally-occurring communicative behaviour, it is necessary to evaluate the representativeness of the discourse sample to be studied. As stated earlier, representativeness is determined by situation, context and participants of the discourse to be observed. Whether data are collected in one particular situation or in different situations, it is important to describe these aspects carefully, since they appear to have great influence on communicative performance. Since the transcription of video material is very time-consuming, the majority of interaction studies analyse only a selected sample of the observed behaviour.

The decision how large a selected sample has to be in order to be reliable, is related to the question of representativeness. Heim (1989) employed a method to evaluate whether a timesample of behaviour is large enough to be representative for the behaviour during the whole interaction in a particular situation. She divided each sample into two equal halves. An estimate of the sample reliability can be obtained through comparing the scored behaviours in the first half of a sample to the scores in the second half of the same sample ('split-halves-reliability'). If the difference in the frequencies of various scored behaviours in both halves is not significant, it can be assumed that the sample size is large enough to be representative for the particular recorded interaction situation as a whole.

Most researchers ask one or both observed participants to judge the representativeness of their behaviour in the observed interaction. This is less easy that it seems, and often produces unreliable results. Individuals tend not to act and behave consistently, even when the situation, context and partner are held constant. This does not mean that only one way of behaving is representative for the overall performance and all the others are not. Judging the representativeness of AAC discourse is even more problematic, because of the limited amount of opportunities, situations, and communication partners involved.

Representative language behaviour of the disabled AAC users is also difficult to detect because most of the communicative initiations are realized by the speaking communication partner.

To circumvent this problem, we may consider a research design in which several distinct observations under similar conditions are possible. Regularities in behaviour become apparent within repeated measurements designs. By repeating measurements, the chance of capturing an average of the behaviour of an individual increases. A reasonable number of observations of the same individual in the same setting and with the same partner seems desirable for generating useful hypotheses about performance of AAC users. 'One-shot' observations to sample interaction appear to be less reliable.

Transcription

Not all researchers consider it necessary to go through the process of transcribing their material prior to coding and analysis. On-line coding during observation or from video-recordings is used by some researchers and, more frequently, by diagnosticians. This procedure, which circumvents transcription, requires a totally reliable coding system. Transcription, on the other hand, is necessary for micro-analytical purposes, since it allows for the development of analytical categories and codes in the research design. This flexibility is important in AAC, where the existence of categories is an essential focus of research.

The use of data transcription, normally based on video-recordings, facilitates the reproduction of studies and permits careful comparisons of data across AAC users (and partners), situations, settings and cultures. Moreover, transcription allows the researcher to approach the data with a minimum of preconceived notions and categories of behaviours. Nevertheless, some problems remain in ridding transcription of preconceptions. Transcription itself is already a process of representing behaviours in a sequential order. Some behaviours in terms of the research questions seem more important than others. It is difficult to avoid inferring communicative intentions from language data during the process of transcription (Ochs, 1979).

The accuracy, completeness and conventions for transcription are important criteria for ensuring reliable and valid data representation. Many different formats and notations are used by different researchers. Most systems are modifications of methods for language samples of verbal children (e.g. Bloom & Lahey, 1978; Ochs, 1979; Chapman and Miller, 1983). For example, transcripts usually contain some context information; in AAC this information plays an even more important role since it is necessary to fully understand the conversation.

Background information about the transcription procedures employed is unfortunately often absent or very limited. Reports on interaction studies (including those on AAC) have generally not addressed the reliability of the transcription process. What is needed is a well-defined framework for transcription of AAC interaction in order to register the dynamics of discourse systematically.

One method to minimize preconceptions and interpretations is to transcribe the different behaviours separately in a predetermined, sequential order. One can start with transcribing the behaviours of one part of the dyad, for example first the vocalizations, next eyegaze, and then subsequently body posture, gestures, actions, facial expressions etc. Next the behaviours of the other participant can be registered. If different aspects of behaviour are being registered separately from each other and for each partner

individually, the risk of introducing too much (confounding) interpretation into the transcript is diminished.

Segmentation of the transcript into units for analysis also involves interpretation and should therfore be avoided in the transcription phase. In addition to the transcribed behaviours of both partners, the transcript format needs to include linguistic and nonlinguistic context information concerning the ways in which the interactants react on each other and on situational events.

Segmentation into units for discourse analysis

Segmentation into units is a crucial step in the analysis of any discourse for the purpose of qualitative and quantitative evaluation. As stated above, AAC researchers often adopt underlying concepts and theories from other disciplines, such as pragmatics, discourse and conversation analysis and language acquisition. Such theoretical concepts as turn-exchanges, initiation-response moves, communicative intentions are often implemented in the AAC field without sufficient justification. Mathy-Laikko & Yoder (1986) addressed some of the resulting problems with the interpretation of AAC interaction data. We will discuss some to these problems in short.

Spoken communication is usually segmented into utterances and/or conversational turns. One turn can contain one or more verbal and nonverbal behaviours. In general, conventions to segment utterances for speaking individuals include intonation patterns, pauses in the flow of speech and grammatical criteria as independent clauses and their modifiers. These conventions are hardly applicable to augmented nonvocal communication. In the field of language research as a whole and in the field of AAC research in particular, there is little agreement about the definition of turns and utterances. As Buzolich & Wiemann (1988) noted, "there is no universally accepted definition of a conversational turn". The notion 'turn' depends on the particular theoretical model employed. Although their own research is directed towards specific turn exchanges in AAC interaction, they do not specify the definition of turn which they finally used. While some researchers reserve 'turn' for behaviour with communicative intent, others use the term for interactional behaviour in a broad sense, including nonverbal acts like "drawing" (Marriner et al, 1984). The problem of the notion 'communicative intent' is that we cannot observe intentions directly from the record. The actual behaviour has to be interpreted from the perspective of the researcher and then inferences have to be made about the intentions of interactants. As stated earlier, incorporation of these kinds of inferences during transcription froms a serious threat to the validity of the measures.

The boundary between conversational turns is commonly defined as a change from one participant to the other or a pronounced pause between two turns of the same participant (Sacks, Schegloff & Jefferson, 1874; Duncan & Fiske, 1977). Whereas several AAC researchers use a criterion of three seconds (Marriner et al., 1984; Buzolich & Wiemann, 1988; based on Duncan & Fiske, 1977), others apply a criterion of only one second (Light, 1985; Heim, 1989; based on Garvey & Berninger, 1981). In general we can state that any choice made for the one criterion or the other is rather arbitrary. Marriner et al (1984) not only use a three-second criterion but also add the requirement that there be a change of topic. In this case again it is necessary to interpret when a change of topic has taken place, which introduces a further subjective element into the segmentation process. Their definition of turn becomes even further problematic since, after segmentation, the turns can be classified as 'communicative' or 'non-communicative'. One can then ask whether a change of topic can really be non-communicative. Marriner et al. suggest that turns are far too small a unit of analysis for nonspeech interaction, because AAC users may need several turns to exchange one proposition. They introduce the concept of

"communicative unit" instead of the term "utterance". An utterance which they define as "a word or group of words which convey meaning" can consist of several different turns (e.g. the naming of letters on an alphabet board). These researchers use "utterance" or "communicative units" as their unit of analysis. This has been taken up by others (e.g. Fishman & Timmer, 1983). Apart from the considerable role of interpretation, the above definitions may be well applicable to the interaction of very competent AAC users with alphabet boards. However, in the case of nonspeaking children, it is often very difficult to decide whether an act clearly contributes to the topic and content of the conversation, especially when topics change.

Besides using time as a criterion for turn boundaries, timing parameters are taken into account by almost every researcher analysing interaction data. It is obvious that timing plays an important role in programming exchanges of turns. Firstly silence is seen as a signal that the partner can produce a communicative turn. Many studies have found that speaking partners do not give AAC users enough time to take the floor (e.g. Halle, Baer & Spradlin, 1981; Light, 1985; Heim, 1989). Secondly there is the problem of determining the duration of turns and pauses. It is not at all an easy task to decide the precise duration of a pause between two spoken utterances. Obviously, it is much more complicated to determine the duration of an act produced by means of gestures, signs, or the selection of graphic symbols (e.g. Picsyms, Blissymbols, PIC, sigsyms). The few published descriptions of specific transcription procedures for AAC interaction (e.g. Light, 1985, and some studies described in Kraat, 1985) do not specify criteria for determining the onset and the end of distinctive behaviours produced through nonvocal modes. Yet, to this end Heim (1989) has formulated criteria based on repeated observations and comparisons of behaviours. Although up till now there is little theoretical basis to work with, well-formulated criteria facilitate consistent segmentation and analysis. Clearly, segmentation is needed in order to obtain units that can be coded during the data analysis phase. However, the process of segmentation in units of analysis has to be clearly distinguished from the process of analysing these units.

Very often segmentation is seen either as a part of the transcription process or as a part of the coding process. In the interaction study of Light (1985), segmentation in utterances of the speaking partner is part of the transcription process, while segmentation in discourse units (turns and turn opportunities) is part of the process of analysing. The danger of this procedure is that coding problems may lead to the temptation of changing the segmentation decisions. In other words, while segmentation has to be the basis for analysis, at the same time it can be influenced by analysis. Segmentation and interpretation of discourse data seem to be the most difficult to handle in (AAC) interaction studies. There is a strong need of an underlying theory which can lead to adequate solutions for transcribing, segmenting and analysing AAC interaction data.

Data analysis and statistical interpretations

The analysis of discourse needs to follow the flow of the communication process and the way in which the interactants manage that discourse flow. This requires transcripts containing all kinds of behaviour occurring during the communicative exchange (Van Balkom et al, 1989) The lack of adequate means to describe the communicative behaviours of both partners and the context as completely and neutrally as possible makes it difficult to interpret the data correctly and meaningfully. The transcripts need to contain sufficient information for defining discourse units on different hierarchically ordered levels, permitting macro and micro analysis. The micro analysis is focused on discourse units defined as verbal (utterances) and nonverbal acts. The macro-analysis is directed towards discourse units defined as turns, themes and topics. The assignment of communication functions is possible for discourse units at micro as well as macro level

(Wells, 1985; Van Balkom et al, 1989). As mentioned earlier and also indicated by Light (1988) most of the studies to date have analysed interaction from the researchers "third party" perspective. Inferences of the intent of the interactants have to be made from observable behaviours. The level of inference required may seriously threaten the validity and reliability of the transcription and the measures employed (see also Ochs, 1979).

Discourse data are categorized or coded along specific questions of interest to the researchers. Contemporary researchers have generally been asking quantitative questions. Predetermined coding systems are usually derived from adult models or normal development models. Whether these models are appropriate and sufficient for the AAC population can be questioned.

In general, categorized data in interaction research are nominal data. This allows only the application of inferential statistical methods. The vast majority of interaction studies have used transcription procedures and analysis taxonomies centered on individual discourse behaviours in isolation from each other and from the partners' behaviours.

Recent approaches in developmental psycholinguistics and discourse analysis have worked out methods to explore the dynamics of the reciprocal behaviours of both parts of dyads. Up till now, only a few AAC researchers have attempted to take into account sequential aspects and interrelationships among the behaviours analysed (Light, 1985; Buzolich & Wiemann, 1988; Heim 1989). These researchers have all used the technique of lagsequential analysis originating from the research tradition of developmental psychology in the last decade (Sackett, 1979; Gottman & Bakeman, 1979, Allison & Liker, 1982). It is presupposed that the behaviours of both participant are mutually dependent in a systematic way. In the field of psychology this kind of analysis is directed towards the relationships between two parallel strings of sequential behaviours of both parts of a dyad. There are several statistical techniques to find sequential interrelationships. One of the most frequently used techniques is the transition matrix. In such matrices the frequencies of each cell indicate how often a particular category of behaviour is followed by another particular category. These frequencies can be transformed into proportional data, the so-called conditional probabilities, or the chance that particular behaviour occurs, given a specific previous behaviour.

The application of lagsequential analysis to communicative interaction data is not without difficulties. Sequential data in psychological research are usually collected through "time-sampling" methods. Studies of communicative interaction predominantly segment in "events" (i.e. utterances, turns, etc.). The result of segmentation is a sequence of behaviours in which succesive actions of both participants are represented.

Psychologists make a distinction between 'autodependent' behaviours (determined by previous behaviour of the same participant) and 'crossdependent' behaviours (determined by the previous behaviour of the partner). The degree to which each factor influences behaviour can vary, but is a feature of each interaction (Harinck et al, 1988). Especially when both participants communicate simultaneously, autodependency may play a significant role. Because the coded string of behaviours of each part of the dyad is discontinuous, possible autodependent factors cannot be taken into account.

Van der Heijden et al. (1988) describe a few more general problems related to lagsequential analysis. They mention the great number of computations needed, especially when there are many different categories of behaviour. A related problem is the eventually low frequencies of some categories. To circumvent this problem, sequential analysis is often carried out for the total number of observations of all dyads together. But when the total number of dyads is relatively small, it is not at all

inconceivable that some conclusions on relationships in the data are based on just one particular dyad. Secondly, the computations are not mutually independent.

Finally, it is difficult to test the statistical significance of transitional probabilities, because there are great numbers of observations involved in most interaction research. The risk for "capitalizing by chance" is considerable.

There are a few recent developments which may make it possible to solve some of the just mentioned problems. A relatively new techinique in interaction research is "loglinear analysis", which makes it possible to unravel the relative strength of autodependency and crossdependency (Allison & Liker, 1982). An alternative method to analyse cross-tables,which may be the solution to the problem of low frequencies of specific categories is the so-called "correspondence analysis" (Van der Heijden et al., 1988). It is not our aim to elaborate on all these methods here. We simply wish to draw attention to the fact that statistical methods are being developed in related fields, which may be useful for AAC interaction research. Certainly these methods should be thoroughly explored in AAC interaction research.

Possible solutions for reliability and validity threats

For most studies in AAC interaction, the design is a complex one. Dependent on the research questions at hand, the researcher will have to consider which methodology will be most efficient in finding answers to the questions posed. A representative situation or set of locations and a representative subject or subject group should be selected. The following design features can be taken into account in order to reduce error terms (see also Cook & Campbell, 1979:49):

* each subject might be his own control (as it is the case in within subject designs and when serving in more experimental groups and situations),

* samples might be selected which are as homogeneous as possible (according to a set of strict selection criteria),

* randomization in subject selection and assignment to different experimental groups takes care of many threats to research validity, the use, where possible, of a control group,

* pilot testing of the setting, registration technique, procedures needed for transcription, units for data analysis and analysis categories to be used,

* the formulation of as many concrete definitions as possible and offering as many as possible clear examples,

* the collection of all the needed information in a coding manual for conducting the actual research,

* the use of then same coding procedures, manuals and sheets for all observational sessions without making intermediate changes,

* the use of a coding manual in a standarized way and the training of fellow researchers and assistants in the research team,

* to try to gather (and publish) as much evidence as possible concerning the reliability of the transcription and analysis procedure,

* to make estimates of the desired magnitude of the expected data and results of the data analysis, before the research starts,

* to check the methodology used with similar interaction studies,

* the concrete operationalizations of research questions should be based on underlying theoretical notions, specified in the research report.

Future Directions

The methodological issues discussed above have all contributed to a questioning of research reliability and validity in relation to the relevance of the data collected and analysed in AAC interaction studies. Future research in the field needs to consider the following aspects:

* a policy to justify more explicitly the theoretical and methodological decisions used in the planning and conducting of interaction studies,
* the reproduction of earlier conducted studies in order to control the reliability and generalisability of research data,
* more pilot studies in the pre-planning phase of interaction studies in order to control reliability and validity before the actual research starts,
* more research reports of the pilot studies conducted and the implications made,
* theoretical evaluation of the correctness of definitions and terms used in AAC interaction studies.

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REACTANT PAPER 1

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In their paper on the methodological challenge of interaction research in AAC, Hans van Balkom and Margeriet Heim are focusing on two main questions: one is on methodological issues related to observational research in the field of communicative interaction of individuals using AAC systems. The other is on problems and limitations related to methods in studies of spoken discourse.

Theoretical issues

Van Balkom and Heim point at several important issues concerning methodological questions in the research field of AAC. One is the underlying theory, or rather the lack of an underlying theory in AAC research. This in turn brings us to the issue of value systems and beliefs. Which sets of beliefs are underlying our research? How do we look upon the individual in need of AAC?

- Is it a person who lacks abilities and who has to be taught, trained and changed in order to communicate on our premises?

- Or is it a unique individual with specific prerequisites and competences to whom we have to adapt?

The angle from which we focus our research questions will influence our way of conducting the research and therefore the results, but also the way the results come into practice. The belief that the use of signs or fingerspelling would hinder the development of speech was influenced by the earlier belief held by linguists that a true language could only be a spoken language, is but one example (Bloomfield, 1933). The consequences of this misconception are still influencing the education of the deaf.

Recent research on infant development and of mother-infant relationships have now provided us with a new insight in early human development and of interpersonal communication. The studies have given us theoretical knowledge into developmental processes in interpersonal communication that are valuable also in the research field of AAC.

One is that human beings are from the first minutes of life concentrated on one main issue - to interact with the social environment (Stern, 1985; Trevarthen, 1988). Human infants can be said to have an innate motive for intersubjectivity - for direct communication of psychological states (Trevarthen, 1988).

The other is that the infant is not merely a recipient of impressions and information. The infant is an active explorer, aquiring knowledge in the interactions - actions - with the environment. This was already made clear to us by Piaget (1947), although he did not study the role of the partner in social interaction.

The results of the microanalytic studies of mother - infant interaction have indicated that small, often disregarded expressions of the face, the body or the voice, can be revealed

to have meaning in interpersonal communication. Even the absence of a response can be of great significance. Corresponding studies of deaf infants and of blind infants as well as some studies of infants with multiple functional disabilities only confirm the view that the infant is capable of communicating with his social environment from a very early age and that infants seek meaningfulness.

These research results indicate that we ought to regard the AAC person as an unique individual with specific prerequisite and competences, as a person with an innate motive to communicate and as an individual seeking meaningfulness.

The studies of mother-infant interaction have given us new insights into interpersonal processes involved in all human interactions, which can be of great importance while entering the comparatively new field of AAC research.

Representativeness, reliability and validity

Van Balkom and Heim discuss the problems with representativeness, reliability and validity. These questions are classical in all scientific research, and as most of us are trained in using methods from natural sciences with large groups, control groups, independent observers etc., we will always find it difficult to conduct studies in the field of AAC. We will for example never or seldom find large enough groups to fulfill the requirements for the use of many statistical analysis. As van Balkom and Heim write, categorized data in interaction research are nominal data. It is only on the interval scale level that group differences can be made.

Instead of striving towards a goal we might never reach, or while some of us will be striving towards this goal, let us in the meantime concentrate on making longitudinal case - studies.

Case study methodologies can provide a broad base of descriptive information that can be tested empirically. In case studies, we can identify and systematically answer questions related to different research questions, interventions processes or development of clinical practices. In this context it is important to point out again, as many others have already done, that a case study does not necessarily represent an "ideal intervention" or a success story. Even failures are important to report (Blackstone, 1989) as well as descriptions of rare phenomena (McEwen and Karlan, 1990).

The wealth of information case studies can provide is often not possible in research investigations that must examine a limited number of variables under controlled conditions. Instead of regarding the large number of background variables as confounding, let us start our research from the point of views that humans are complex and living in a complex world. But to be of value and to move the research forward the case study reports must include systematic and carefully described information on subject characteristics, like age, sex, ethiology, family background, birth order, past experience, intervention made as well as detailed information on methods used, behaviors observed, analysis made, etc.

By adding case studies together and by comparing them to other studies conducted by other researchers - provided that these also are very well defined and described - case studies can play an important role in theory building in developing new methods as well as for the development of new practices of intervention.

The use of video in collecting data and analysis of video recorded interactions.

Video recordings have become a popular or even the most popular device in conducting studies of interpersonal communication. There are several pros and cons to the use of video. There are for example ethical questions to be regarded: How are the videotapes used? How are they stored? Who has the responsibility of the video tapes? What will happen with the tapes when the study is finished? To whom belongs the material?

There are different practices in differenct countries concerning the handling of video recording material. My experience is that the person or persons being video recorded have no idea how much information there is on even a very short sequence of videotape, information telling us a lot about psychological states and about relations just to mention some type of information. Therefore, we scientists have great responsibility when handling the tapes.

But there are other problems to be dealt with in observational research, as van Balkom and Heim are pointing at. One is how large a selected sample of interaction has to be in order to be reliable. I find the method employed by Heim (1989) to evaluate if a time sample of behaviours is large enough to be representative for the behaviour during the whole interaction in a particular situation, very attractive, i.e. to divide each sample into two equal halves and compute the sample reliability by comparing the scored behaviours in the first half of the sample to the scores in the second half.

Video-recordings give us possibilities to study interactional processes, the interplay between two or more persons. I was very pleased to read that van Balkom and Heim are putting great stress on the dynamics of discourse; that interpersonal communication involves two or more partners, and that it is not only the communicative behaviours of the "AAC" person to be observed in detail, but also the partner 's communicative behaviours in relation to the "AAC" person must be taken into serious consideration.

The more traditional observational techniques only concern the problem person or the target person not the partner. Many of us now know that the problem for persons with functional disabilities is often related to the inability of the surroundings to interpret the AAC persons communicative expressions; that teachers or parents often are too impatient to await a response or to narrow minded to understand the meaning of unconventional use of expressions. Transcriptions of video-recorded interactions enable us to focus on both macro and micro levels of analysis. All of us working with video transcriptions are well aware of how difficult it is to find a level that is appropriate to the objective of the study: from a very detailed level, using non-inferential, non-evaluative categories of descriptions to a higher level in the hierarchy, where inferences of the meaning of the interactions are made from the observed behaviours. The researcher's dilemma is to find a level where it is possible to make enough detailed descriptions of what is going on, without being too thorough, getting lost in all the details. But in order to explain any phenomenon it is first necessary to describe it thoroughly, accurately and objectively.

Transcriptions must therefore involve different levels of analysis, from a microlevel to a higher order level. The microlevel analysis must be carefully made, using independent observers who register well-defined behaviour units, reaching high interjudgement agreement. If the platform is solid, inferences can be made without threatening the validity and the reliability of the study.

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REACTANT PAPER 2

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The Methodological Challenge of Interaction Research in AAC (van Balkom & Heim, 1990) sheds light on several important limitations in the current body of research on the interactive abilities of individuals and their partners using AAC. The paper analyzes three major aspects of the research process as they apply to interaction studies in AAC including:

1. Situation and interaction context selection.
2. Subject selection.
3. Theoretical background and type of analysis used.

The authors begin their analysis of the research in this area by stating that the limitations found in the current studies, which often limit the generalizability or reliability of their findings, have also been found in the large body of research on interaction and discourse of speaking caregiver-child dyads. We might disagree with the author's contention, then, that future AAC interaction research might use the methodologies drawn from this vast amount of research on interaction with speaking individuals.

These methodologies may also have limited applications for AAC interaction research because of the vast differences between a speaking conversation and a conversational interaction completed by AAC users and their partners. Both van Balkom and Heim allude to these differences and are more thoroughly described by Mathy-Laikko and Yoder (1986).

We may also choose to differ with the author's suggestions to further apply the methodologies of more traditional experimental research to interaction research involving nonpseaking individuals using AAC. As the authors themselves say, many of the problems with research validity in this field have come about as a result of applying theories and methodologies from other fields . They also point to the "interindividual differences" of AAC subjects. We must therefore question the validity of attempting to use group experimental design procedures such as control groups and homogeneous grouping of subjects for AAC interaction research. The vast individuality of persons using AAC make "representational" subject selection extremely difficult. We instead agree with the authors other suggestions of completing empirically based research using single subject designs and repeated measures and time sampling techniques to increase the reliability and validity of research in this area.

We also agree with the authors on the importance of continued research in this area using the more standardized transcription analysis procedures. Publications regarding the effectivenss of interaction strategies in AAC have been fewer in the last several years. Light's discussion of previous research and future directions (1988) was the last work of its kind to be published in the AAC Journal to date. We must continue our efforts in evaluating the effectiveness of AAC systems to provide optimal interaction capacity to their users. Efficient and effective interactions are the key to the user's life-style as an active participant rather than a passive observer in all of his or her environments (Higginbotham and Yoder, 1982).

The authors offer an excellent discussion of possible strategies for standardizing the transcription analysis process. We agree with the authors that the units of analysis of discourse, e.g., "turns", topics, and themes must be operationalized to increase the generalizability and replicability of these studies. Through replication of single subject studies, we may begin to build our knowledge on what actually "works" in providing optimal interactions for persons using AAC. Blackstone (Jan. 1990) includes on her wish list for continued research some basic "answers" to what are the "best" interaction strategies and processes which facilitate learning and empower AAC users.

We must disagree, however, with one final contention of the authors of this important document. We interpret them to view the clinical concerns and research traditions to be in conflict with one another. We feel that research must support the clinical practice in this field for its findings to have external validity, i.e., to be useful to the subjects of the studies. The knowledge gained through case studies and other quasi-experimentally designed works of persons currently practicing in the field of AAC have been invaluble in moving this field forward from a novice pioneering profession to the policy making stage in which it finds itself today. This type of "clinical" research must continue to benefit the non-speaking individuals of the world.

Other Research Directions

We concur with the future directions of AAC research as offered by van Balkom and Heim. Further qualitative and quantitative research regarding AAC interactions in the areas of subject and situation/context selection which also needs to be completed includes:

1. An examination of the overall effectiveness of current techonological and training advances in ACC regarding interactive abilities. Technology, though useful to non-speaking individuals, may also prove to be a barrier to effective and efficient interactions (Cohen, 1986). There are few current interaction research studies involving recent advances in technology (Higginbotham, 1989).

2. Effectiveness of interaction strategies (using both light and high technology) in the areas of both performance and competence of users and communication partners. The quality of the discourse, the communication functions, and communcation modes should be examined.

3. The development of language knowledge and/or language reacquisition through the use of high and light technology. Specific information regarding the acquisition of language comprehension and expression (content, form and use) needs to be obtained.

4. AAC user's development of vocal/speech abilities also has not been adequately researched. Included in this area is the need for additional information regarding how the AAC system user acquires nonspeech forms so that more effective teaching techniques may be developed.

5. The roles of persons involved in AAC interactions through both light and high technology should be examined. These questions are examples of those remaining unanswered in this area:

- What are the cultural implications for the individual AAC system user and his/her partners and for society as a whole?
- What are the ecological and social demands for the AAC system user in all life domains?
- What are the most effective strategies for training AAC system users and their partners?

6. Interactions of handicapped infants and their caregivers (with and without "formal" augmentation) obtained through a variety of measures, several of which were identified by van Balkom and Heim, including longitudinal studies, cross cultural studies, diaries, and additional observational studies. These questions need to be answered when looking at unaided communication with this very young population:

   - How do caregivers talk and interact with their children who are "at risk" for severe communication disorders?
   - What strategies do they use for handling and repairing communication breakdowns?
   - What general adaptive strategies are used for interacting?
   - What adaptive strategies are used to increase speed and efficiency of interaction?
   - What verbal and non-verbal patterns facilitate or inhibit interaction?
   - What are "interferring" nonverbal behaviors?

In conclusion, van Balkom and Heim have brought to the surface many of the problems and some valid solutions for increasing the usefulness of AAC interaction research. They offer excellent options for transcription and data analysis problems which have limited the validity and reliability of the current body of literature in this area.

While remembering the individuality of non-speaking individuals and the vast differences between their interactions and those of speaking persons, future researchers in this field will increase the validity and reliability of their results by heeding many of the precautions outlined by van Balkom & Heim. Future research in this area may then be applied to practice to increase the efficiency and effectiveness of interactions using AAC.

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SUMMARY OF THE DISCUSSION: CHALLENGES IN CONDUCTING OBSERVATIONAL RESEARCH TO ADDRESS INTERACTION ISSUES IN THE AAC FIELD

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As David Yoder and Patsy Coleman noted in their reaction paper at this session, research activity to address interaction issues in Augmentative and Alternative Communication (AAC), while initially strong in the early and mid 1980s, has lagged somewhat in recent years. Perhaps the strongest message to emerge from the discussion at the International Symposium on Research in Augmentative and Alternative Communication was the renewed interest and commitment to research into interaction issues. Repeatedly, participants noted how much we still have to learn about interaction involving people who use AAC systems. Myriad questions remain unanswered. The call for renewed research efforts to begin to address these questions was reiterated again and again throughout the discussion.

Participants noted that we have much to learn from past research efforts in the field. The early studies on interaction have laid some foundations for future research efforts. However, participants also cautioned against blindly repeating methodologies used in early research studies without critically analyzing these approaches and their relative contributions and limitations. It was noted that many of the early studies on interaction in the AAC field borrowed methodologies from other fields and applied them to the AAC field without a clear conceptualization of what was being measured and why. As a result, the findings of these studies have been difficult to interpret. Implications for theory and clinical practice have not always been clear.

Participants argued that future research efforts should build on our past knowledge, but should explore new methodologies to further our understanding of critical interaction issues. In general, there was the call for us to broaden our perspective in our research efforts, to question our assumptions, and to adopt a wider range of methodological approaches to allow us to begin to unearth the theoretical and clinical knowledge required to further the field.

Participants proposed a number of methodologies that might prove fruitful in extending our knowledge in future research studies. Gunilla Preisler and many of the other discussants noted the need for detailed longitudinal case studies of children and adults to document the emergence and ongoing development of interaction skills, including documentation of typical and "atypical" cases. There was also a call for researchers to explore ethnographic methodologies, through the use of participant and nonparticipant observations. These methodologies would allow researchers to address the interaction process on its own terms, without preconceived assumptions based on the models of interactions of natural speakers.

Whatever methodologies are adopted by future researchers, participants in the discussion noted that we need to better articulate the research questions to be addressed and insure that the measures to be utilized are valid ones. Specifically, discussants pointed out that interaction is a dynamic process. This process can not be described adequately if it is reduced to static measures such as frequency counts. Rather, future research efforts

should aim to develop measures that capture the dynamic flow of the interaction. These research efforts need to consider the dyad, not just the individual who uses an AAC system in isolation. Future research efforts should not limit themselves to quantifying communication, but should seek to capture the qualitative aspects of the interaction as well. Studies should focus on the process of interaction, not just on the products. To do so, future research efforts should give greater attention to the nonverbal and nonlinguistic aspects of interactions and not just to the linguistic output.

A number of the discussants argued that future research efforts ought to give greater consideration to the perspective of the participants in the interactions. Past research efforts have tended to consider only the perspective of the researcher - a third party observer of the interaction process. Attempting to understand the complexities of interaction from this one perspective is inadequate; our knowledge will be limited and unnecessarily constrained. By considering the interaction process from multiple perspectives (that of the augmentative communicator, the partner, and the observer), we can begin to extend the breadth of our understanding of interaction, its goals, limitations, and facilitative strategies.

In all of these future research efforts, we must insure that the interactions we are studying are truly representative of the daily experiences of people who use AAC systems. As a group, we struggled with the problems of representativeness and ecological validity. We did not arrive at a magical solution to these problems, but certainly became more cognizant of the potential pitfalls as they were outlined by Hans van Balkom and Margriet Heim.

Throughout the discussion, the participants reiterated the need for more careful and thorough documentation of our research in the field - thorough documentation of subject and dyad characteristics, sampling procedures, transcription and coding procedures, and data analyses. It is only through such careful documentation that we can truly learn from past research efforts, build on their strengths, and avoid their pitfalls. Given the limitations of our current knowledge, there was the call to proceed in our future research efforts with enthusiasm and commitment, but also with caution. We need to be careful when we draw conclusions that we have not made unjustified assumptions and ignored alternative, potentially significant, interpretations. As consumers of research, we need to hone our critical skills so that we are constantly questioning and analyzing the results reported at conferences and in publications. With so much to learn in the AAC field, we need to avoid the pitfalls of blind adherence to beliefs that, in the end, may be prove to be limited in their perspective or completely unfounded.

There was the sense throughout the discussion of the breadth and depth of knowledge still to be discovered in the AAC field. In the search for new knowledge and better understanding, many participants urged us to turn our attention outward to learn from other fields - to explore their knowledge bases, theories, methodologies, and approaches to statistical analysis. As a field of study AAC does not exist in isolation; there is a wealth of potential knowledge to be gleaned from other fields. Yet as new knowledge from other fields is introduced to the AAC field, we must do so critically. As we discover ideas and approaches that may have relevance, we must carefully test them out to insure their validity in the AAC field.

As we search for new knowledge, Sarah Blackstone reminded us that we have much to contribute to other fields as well. As we develop our understanding of interaction involving persons using AAC systems, this understanding will serve to enrich and augment the information bases in other fields of research and practice.

The participants at the discussion on interaction issues in AAC left with an extensive research agenda laid out before them. They left with a more acute awareness of the potential pitfalls and methodological challenges that may threaten our investigations. But more than anything else, participants left with a commitment to tackle these problems and to pursue further research from varied methodological and conceptual perspectives in order to extend our understanding of interaction issues in AAC. I feel confident that we will discover many answers to the questions posed at the Symposium through our research efforts in the next two years. No doubt we will also unearth many new questions that need to be solved through future research efforts. I personally look forward to ISAAC 1992 and the next International Symposium on Research in Augmentative and Alternative Communication as a time to reevaluate our progress toward our goal of better understanding interaction and as a time to set ourselves new challenges.

SESSION 2

ISSUES IN THE RESEARCH AND DEVELOPMENT OF TECHNICAL AIDS IN AAC

ISSUE PAPER

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Introduction

Research issues in the development of technical aids should depend on the mission and goals which one wants to achieve. A presupposition for research in Augmentative and Alternative communication (or probably for research in rehabilitation and the handicapped in general) is that it has to be application orientated; application can be nearby or in a far future. Thus, to quote recommendations like "we should do more..." or "interaction studies get more and more attention in the AAC- research society, thus we should also..." are not sufficient and probably dangerous if a reasonably clear picture cannot be given about how the possible results will improve communicative abilities of handicapped people. Ergo, just giving a list of issues or "hot" topics should be a false start of this paper.

Although it is practically impossible, a paper like this should first define the mission of AAC research and the goals which can or have to be achieved within a certain time frame.

The use of technology in AAC can be thought of in the following categories:

a) Technological tools for diagnosis of impairments and assessment of the resulting communicative (dis-)abilities. It is thought that technology can assist the clinicians in their tasks by execution of accurate measurements, the statistical evaluation of these measurements and correlating the different variables which are measured.

b) Technology supported treatment and training. It is not just for reasons of efficiency that (information-) technology is used in treatment, but also a larger variety of treatment and training modules can be used. Objective measuring of the patients' progress is, in principle, possible.

c) Technology for supportive functions. This denotes the use of technology for communicative functions which can roughly be split up into two subcategories, i.e.,1) aids to be used in direct, personal communication, and 2) technology to be used in environmental interaction, especially information handling tasks.

d) Technology to be used in research. As will be seen later on, research becomes much more complex due to elaborate and complex data collection, advanced statistical techniques required in new approaches and new research methodology (single case designs), and size of databases to be used in research.

These four main categories will be referred to later on. Most emphasis will be laid on technology for supportive functions. This is just a preference and choice of the author and not a denial of the other categories.

Mission and goals

The general mission or ultimate goal is to improve communication of persons with a communicative disability. This can be done with special therapy and training and/or assistive technology. Of course, this is kicking in an open door, but it is necessary to realize that technology is never a goal in itself. It is always supportive to certain functions. From this it is also evident that a complete and total solution cannot be obtained in many cases.

Especially where special technology has to be used it will be clear that the tool or aid is in itself a hindrance and will influence the communication situation; in the design of systems one needs to know the effect of using communication systems (1); which is thus a legitimate goal and important research issue. Considering the ultimate goal it will be clear also that development of special technology for research is subordinate to all other goals and that technology for diagnosis and for assessment is subservient to the goals set in training/therapy and design tasks in supportive tools. A closer look at the particular goals to be set in the aforementioned application fields will give the following results. With respect to technology for training and therapy the aims are to enhance the learning process by perseverance (technology does not become tired and is less expensive compared to labour costs of therapists), by a broader range of possible training modules (just a matter of more memory in a computer), by a systematic and immediate feedback (technology is more consistent but never more flexible than the limits foreseen in the design itself). Underlying research issues which have to be studied are the measurement of the effects of endured training and therapy (2), and, with the purpose of the design of new training models, the analysis of needs and achievable goals (3) in training/therapy related to a description of the client's impairments (diagnosis/assessment). As we have to accept that the usage of technology for supportive functions changes the communication situation (issue # 1) and provides, in most cases, only a partial compensation of the disability, we have to create new solutions for improving the disability status. Criteria for better compensation relate to "naturalness" of the communication (e.g. quality of synthetic speech), adaptable to user's abilities, higher speed, portability of the devices, etc. Design is always related to achievable goals, i.e.: what is the technology capable of in the near future (4), and related to compromises which means that we need measures to compare various (compromise) results or in other words measures for "overall efficiency" of the system and "bench" tests (5). Design has also to be based on a (global) description of the potential user group. And if we make comparisons between systems there is also a need for a more formal and uniform way to describe the communicative (dis-)abilities of groups of users. Actually, this issue should prevail and be a guidance to specify technology diagnosis and assessment. We have to be aware of the fact that communication is much more than just conversation; it is also (physical) interaction with the environment. And this poses sometimes very serious problems when there is a severe motor impairment, as well. The environment itself is changing very rapidly. More information is made available for everybody via electronic networks. The accessibility of this information is not always accounted for. Networking (from telephone to Integrated Digital Services Network to Integrated Broadband Communication Network) and computers are the carriers of this information and, in principle, do not pose in principle limitations for use by handicapped people. However, the services and terminals (i.e. human interfaces with these networks) tend to be limitative because of their focus solely on the non-handicapped user groups. The presentation forms of information via these networks will range from high-quality (synthetic) speech, to video and complex graphics

while all possible combinations will be possible. Thus, the last but one issue is the design of methods in network information handling (presentation and control) that guarantees accessibility for handicapped persons (6). The fourth area is technology for research which should only be focussed on problems in the aforementioned areas. It is difficult to mention specific issues, but one might suggest that registration and automatic processing of interaction (7) is important for all other areas: the analyzed results give insight in communicative disability (assessment) progress during training and effectiveness of systems. An elaboration of these issues is presented in the following sections.

The effect of the use of communication systems

Natural communication is, generally speaking, conducted without technical systems. The inclusion of an aid in the (feedback) loop changes the situation dramatically (Aided Discourse). This fact is generally known, but it is not quite well known what the type of effects are. The primary focus of this research should be on the linguistics aspects of the altered communication situation: changes in vocabulary, grammar, spelling and probably also pragmatics. A question to be addressed from the viewpoint of therapy and training is that an altered linguistic use should be accepted, avoided, or used in a creative way to improve the user's linguistic capabilities. In addition to the pure linguistic aspects, it is important to consider an insufficient portability, which might inhibit the user's mobility, cause stigmatization. Also ergonomic aspects must be taken into account (false positioning of the aid can prevent eye-contact and or inhibit other activities).The measurement of the effects of endured training and therapy

Design of new training models

An initial training which goes with the use of a new communication aid is relatively easy to verify. More difficult to evaluate is the effect of ongoing training and therapy: quantitative as well as qualitative. Communication itself is necessary for training instruction and guidance. The communication itself may also improve by this training as is mentioned above: vocabulary and linguistic skills. A difficulty to be mentioned is that the variable to be trained (this could be better spelling or better knowledge of vocabulary) cannot be at the same time the measure for improved communication skills. An example of this is found in computerized training of aphasia patients. The computer assists in learning words and meanings, to write correct spelling, to relate concepts to words, etc. Whether or not an actual improvement on these variables is found, it is quite possible that the communicative abilities (to be defined in some way) improve. Just the presence of a therapist or having a microcomputer (for training) at your disposal might have an effect on the patient's communication. Underlying reasons or an explanation might be just exposure to stimulating situations.

The analysis of needs and achievable goals

If we accept that learning and development are important factors in case of the help of technology, it will become important to have a rough prediction of the achievable goal or level of communication and the needs for special type of communication. The aid to be designed and the learning tool to be developed have to cope with the growth in capabilities of the trainee or client. The achievable goals and the formulation of needs of a person are related and a preplanned therapy can be optimized if one knows what has to be achieved. For this reason it should be considered to register the course of therapy. Afterwards it might be possible to relate the initial impairments and disabilities with the

final achieved level of functioning. As was mentioned earlier, if the interventions themselves are registrated, as well, one could also gain insight in the effectiveness of therapies. However, in discussing this issue it is quite satisfactory if any relation between initial and final state can be found dependent on the practically formulated needs.

What is technology offering us in the near future

Technological development is going fast. It is, therefore, in principle, difficult to forecast on this issue on a period of more that 5 to 10 years. But if we extrapolate a bit on technology which is already in use in advanced products or in prototypes we will be close to reality. Anyway, a full dissemination and spread of new technology takes a decade. Two approaches have to be considered: rehabilitation technology as a spin-off from other areas, and the development of rehabilitation technology itself. Other areas of concern are consumer products, aeronautical and space technology and business products. Aeronautical and space technology may seem a bit far fetched to think of, but it cannot be denied that new materials, miniaturization in electronics and communication is stimulated very much by this field. The design of very complex integrated circuits has become available for use in everyday products. Technical communication is important in this area and that caused an increase in telematics development. Consumer products and business products do profit from these developments, as well, but the major effect in consumer and business products are (not always) user friendliness and very low selling prices due to mass production. The general message we have to take from this is two-fold: first make your profit out of it by using and modifying these products to be used in AAC, and second, be aware of the fact that these new consumer and business product can and will also, here and there, inhibit AAC-clients in coping with equal opportunities and keeping integrated in our society. In software development it is seen that memory seems not to be a limitation anymore. Thus large and very flexible software programmes become available. Software development systems (i.e. software itself) gave artificial intelligence (AI) a push forward. But in AI or elsewhere, the basis for any new application is good understanding of what is needed and good models of this knowledge. Thus, after a year or two of growing interest in AI and expert-systems it comes down to the problem itself: the research needed to fill those systems with models and data. The development of new software goes on. To be mentioned are the neural network approach (learning systems) and UIDS (User Interface Development Systems) for designing interfaces. This software is not useful, yet, for applications and research in AAC but it might be in the near future. The possible application might be for improving the input of communication aids (man-machine interaction optimization or dialogue and predictive systems). Development of broad-band communication by satellite and glass fiber networks is an area which promises a lot of changes in our society and a lot of challenges for those with a communicative or mobility handicap. First of all, it is necessary that those telecommunication networks and tele-services will be designed in such a way that they are accessible to disabled people. This is a difficult job, because, optimization for one type of impairment might give an unusable system for others, (e.g. for a hearing impaired person, a complete visual information transfer is good but cannot be used by a visually impaired person). This issue is addressed in an EC-project (IPSNI: Integration of People with Special Needs in Integrated Broadband Communication (IBC)). On the other hand, the new possibilities of IBC can be very worthwhile for people with disabilities. Services like tele-banking, tele-shopping will be quite useful for everybody, but one can also think of special services which relate to certain disabilities. Examples are translation services, information services, assistance on call, specialized training. Definition and development of the interfaces with the network and the specialized services has to be based on the needs of the potential users.

Networks are fixed and bound to certain entry points. The access to entry points, however, does not have to be bound to a certain location (see telephoning from cars and planes). Thus, it seems possible that the AAC user group could get transportable access to networks and to services. It means that highly complicated software and enormous data banks can be used from any place. The weak link seems to become the ("hand held") terminal itself. Due to miniaturization in the electronics field it is not a problem anymore to have an enormous amount of functions available in the portable terminal itself. However, usage of the functions require good control (keys, joy-sticks and such) and a display for feedback. This constitutes a very difficult field of research which is bound by many practical restrictions. These terminals might also be used in discourse and for mobility control. Integration of these three functions require intelligence to be built in the terminal-communicator-controller device. A final remark in this paragraph has to be addressed to the (unsolvable) problem of communication by physical contact with other people or the environment in case of severe paralysis. A partial solution (actually a very small part) is the use of environmental control equipment and robotic aids. Robotic manipulators are not available, yet, either in type or in number to make a broader experience available from this viewpoint. But if a robot manipulator is available as a personal aid one can expect that this aid will be used also to show emotion: to drop things on the floor, to scratch oneself, or maybe even to touch somebody to draw attention. As AAC promotes an integral look on impairment, disabilities of a person to create optimal solutions, one should take this aspect of communication into account.

Measures for "overall efficiency"

Immediate evaluation of a new principle or a new technical aid for communication is necessary to get insight in the practical value of a potential product on the market. This is very important because the amount of effort or costs to be spent once a first prototype exist is often many times more than the development cost itself. The problem is how to do the evaluation. A large number of aspects have to be taken into account. First of all, what is efficient communication. A measure or a set of measures has to be developed which take care of speed as well as comfort of use, mental and physical load during use, availability in every situation (is it truly portable), etc.

Furthermore, different user groups require different characteristics of the aid and therefore a scanning system cannot be compared with a direct access system. Finally, communication situations in which an aid has to be used differs for different users. It is suggested therefore that measures for efficiency have to be developed which account for load, speed and vocabulary size. User characteristics and situations can only be realized by setting up a series of so-called bench tests, which are tests which represent those characteristics and situations. The bench tests should also describe the method and procedures for testing and, thus, an objective comparison can be made between different designs. A bench test which accounts for user characteristics can only be made if communicative (dis-)abilities of different users can be formally described and classified.

Accessibility

Accessibility to the "toys" and technical aids of the non-handicapped society has been an issue addressed by rehabilitation engineers in the last two decades. It has always been an approach which rather tries to "repair" and adapt systems than that it has been an effort to be a part in the design-process of new systems. An exception is probably the computer access project carried out by the Trace Centre which tries to influence large computer manufacturers to open up possibilities for easier adaptation and even anticipate necessary adaptations. The general problem will not be solved if a more structural approach is

realized. One can think of laws which set criteria for use by the handicapped and the elderly. And, of course, a basis has to be laid in the education of engineers. Design criteria should not just be focussed on the 95-percentile or something like that, but weigh also the difficulties of the (100-95) percentile group, especially seen within the group of the elderly and people with impairments. A good example of changes in the society with a major influence on communication is telecommunication. This was discussed before. In this paragraph it should be emphasized again that it is extremely important to follow and analyze future changes in order to anticipate on the negative consequences, or better to have a change to prevent bottle-necks for the handicapped.

Recording interaction

As experience with aids for communication is sparsely documented and documented in a way that comparisons cannot be made there exists a need for continuous registration of the use of communication aids. Built-in recording devices do not necessarily mean that more weight or more volume is needed. Although, with a complete recording of the use of the aid (which is not advisable from a privacy point of view), just half of the interaction is recorded. The value of having data on half of the communication is important to improve designs, to understand learning and to evaluate the effectiveness and reliability of the system.

Final remark

As this paper is meant to stir up a discussion and is based on the personal views of the author, which may change in time, it is advised that this paper should be read together with the papers of the reactants, i.e. papers of Norman Alm and Gregg Vanderheiden.

References

Background information can be found in:

-The Proceedings of the "Visions Conference", March 9-10, 1990 Wilmington, AI du Pont Institute/University of Delaware.

REACTANT PAPER 1

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Of the four categories of technical help for AAC which Mathijs Soede has described, this paper will focus on devices for actually helping the user to communicate -- what Mathijs has called the supportive function of technology. I have concentrated on this area because it is the primary application area, is probably the most difficult task, and therefore could be the main arena for controversy over research strategies.

If there is one overriding issue which should concern researchers in the field of AAC it must be that despite the promise which ever more sophisticated technology seems to offer, technical AAC devices are still largely underused or even rejected. It is difficult to be precise about the scale of this, because comprehensive studies haven't been done, and because we know that communication will always be multi-modal, and the technical aid will only be part of an overall communication strategy. Nevertheless, the anecdotal evidence of many clinicians has been borne out in a number of research studies in the U.S. and U.K. (Culp et al ,1986, Calculator, 1988, Williams and Grove, 1989, Winyard and Jolleff, 1990). The words of one research team still ring true : 'High reported percentages of aid rejection and low reported percentages of aid use are alarming' (Culp et al, 1986, p 23).

If, despite all our best efforts, technical AAC devices are at best occasional helps and at worst are dust collectors, what implications does this have for the sort of research we should be doing?

I would like to suggest three explanations for our problem, and then outline research strategies which would be suitable in each case. The research proposed in what follows may in some cases not be appropriate for those of us in the field of AAC research to do directly. In these cases we must learn from the latest work in related fields, and apply this knowledge to our task. In a field so all encompassing as human communication, a cross-disciplinary approach is essential for success.

Three reasons which could explain the lack of success of AAC devices so far are :

(1) Technical AAC devices are a false hope.
(2) Technical AAC devices have potential, but so far training and support in their use have been inadequate.
(3) Technical AAC devices are not yet providing appropriate help.

Each of these possibilities implies different research strategies, as follows:

Research directions if technical AAC devices are a false hope

The improvement of non-technical methods of AAC should start by examining human communication, in its many manifestations. In particular, more knowledge is needed about how speakers converse, and how they have developed their communicational abilities. Both unimpaired and impaired communicators need to be studied as to language

use and development. Such research might suggest ways to reproduce appropriately some of the crucial learning steps for non-speakers which are available naturally to unimpaired children.

For non-speakers, the special situation of negotiating one's communication with another person could be further studied (Light et al, 1985.) One goal of such research would be to be able to offer guidelines to care givers and others interacting with the non-speaker to enable them to maximize the non-speaker's participation and independence in this communicational situation.

Research into labelling and stigmatization of physically impaired non-speakers could give strategies for minimizing this. It has often been expressed by non-speakers that of all their difficulties, this is the hardest one to cope with, and to do anything about. Sociological studies could give 'ammunition' and general guidelines to advocacy groups and individuals. Strategies are needed at the level of an individual in their social settings, at local level, and at a wider, political level. At the individual level, case studies of non-speakers who are considered expert communicators, and who manage to overcome some of the stigmatization problems, could identify what successful approaches and techniques they use which might be transferable to others.

Studies of the non-speaker's situation which are done with a systems theory approach could uncover social strategies for increasing their participation and communication possibilities. A systems theory approach would take into account the fact that the non-speaker is part of a social system, and their attempts to communicate in that setting are a function of the setting as well as their own actions. An example of an idea produced by this sort of perspective is the suggestion that time spent training someone with dysarthric speech might be better spent training a group of people around them to understand their speech (Goehl, 1986).

Finally, and this will be the case in any of these categories, we badly need a flow of creative ideas for helping to solve this problem. One way to encourage this is to allow room for quite speculative and open-ended research, even in such an application oriented field as ours.

The non-technical approaches described above need not be seen as representing a completely Luddite position, of course. The perceptions provided by the research suggested could be fed back into any technical development, and help orient it into more useful directions.

Research directions if technical AAC devices have potential, but the potential is unrealistic because, so far, training and support in their use have been inadequate.

In classifying technical devices which we all use, a very helpful distinction has been made between tools and appliances (Rodgers, 1985). An appliance is something which we plug in and expect to use right away to its full capability -- an example being a refrigerator. A tool, however, needs some skill on our part before it can be useful. The skill can require minimal training, as with a hammer, or a great deal, as with a car.

It is clear that a device for communicating with others comes into the category of a tool, and a complex tool at that. Yet it still can happen that the attitude to these devices is that they are appliances, that they will somehow help the person to communicate right away. Some of this may be due to the 'Computers are magical' mythology, which is the other side of the 'Computers are evil' myth. We must work toward dispelling both of these

misconceptions, by pointing out the potential and the limitations of computer technology. Part of this policy will be to recognize that both initial and ongoing training are essential for success in using AAC devices.

Thus we should encourage research into training techniques and press for the appropriate infrastructure support of users of the end products of our research.Until systematic and continuing training and support is automatically part of the provision of an AAC device, it is difficult to make sensible judgments about successful and unsuccessful training methods. At present, if we are asked about training for AAC device use, we could echo Gandhi when he was asked what he thought about Western civilization. He said he thought it sounded like a good idea.

Research directions if technical AAC devices are not yet providing appropriate help

The key role for human communication

As a field, we have become aware that communication is a great deal more than just passing messages. In order for AAC devices to offer appropriate help, we need a clearer understanding of what human communication consists of, and from this standpoint. where technical devices could help.

It is difficult to overemphasize the importance of communication for human beings. In fact, it is the ability to communicate in a sophisticated way with each other which can be said to describe the uniqueness of our species. It is what has allowed us to work cooperatively and to build and maintain social units. From this perspective, the seriousness of the isolation implicit in being a non-speaker is apparent.

Another fundamental fact about communication is that we cannot not communicate. Human beings are so in tune with each other, and are so continuously monitoring each other that any act of non-communication is itself treated as a communication (Grice, 1967, 1978; Watzlawick et al, 1968 pp.72-79). Hence the discomfort caused by too much silence in an interaction, which normally conveys boredom, anger, inattention, or some other negative attitude about the encounter (Newman, 1982). A person who is continually not communicating, or is continually sending out inappropriate non-verbal messages, is in fact communicating very vividly to others in a way which can be misunderstood by unfamiliar people. Hence the mistaken attribution of deafness, or lack of intelligence, to a non-speaker.

An aspect to studying human communication which is easy to overlook, because it is so obvious, is that we need to use language and communication in order to study and discuss language and communication. This puts us in a self-referential situation which creates practical difficulties with, for instance, notational methods for transcribing conversation, but also leaves us with the more profound philosophical puzzle of never being able to observe our object of study from an external standpoint. The fact that we share this problem with many other philosophical investigations does not make it any easier.

The need for novel approaches

Given the difficulty of the problem we are trying to solve with AAC devices, it does seem sensible to agree with Mathijs Soede that 'a complete and total solution cannot be obtained in many cases'. This can be seen as another way of saying that the technology

will always be just another help for a person who will continue to use multiple communication modes.

Another implication of the great difficulty of this task is that we will have a continuous need for new ideas and fresh approaches to the problem. This has been said above, but needs emphasizing. We need to bring all the creativity we can to our endeavour. Mathijs Soede argues that our research should be 'application oriented'. I would agree in the sense that we are engaged in a task which is more like engineering than pure science. Nevertheless, we need to have some means of encouraging creative new ideas, and there must be room for some speculative research and trying out of what at first seem like 'way out' ideas.

It is a humbling fact that a great many of the significant technical advances in history have started with an accidental discovery. As has been pointed out, of course, it is important for the accident to happen in the presence of a prepared mind. Thus Roentgen, for instance, discovered x-rays when he left a piece of radium in the same desk drawer as a sheet of photographic film on which lay a key. The history of science is full of stories of discoveries resulting from spilled beakers, petri dishes left uncovered, and other happy mistakes and chance events.

Cross-disciplinary approach

One way of ensuring the flow of new ideas is to maintain a cross-disciplinary approach to our research. This is necessary, not only because the field of human communication is such a rich and fundamental area of study, but also because one form of creativity is to apply an old idea in a new place. A clear example in our field of this type of creativity through cross-fertilization was the use of the Bliss symbol system, which of course had been designed for an entirely different purpose some 25 years previously.

A cross-disciplinary approach in our research means technicians and therapists working closely together, preferably as members of a research team rather than communicating with each other through specifications and laboratory reports. It also means our field being closely aware of developments in all the other desciplines dealing with human communication, including psychology, sociology, linguistics, philosophy, and artificial intelligence.

Involvement of AAC users in research

The direct involvement of users of AAC systems in our research is also of importance -- not only as evaluators of new systems but being involved at the earlier stages of producing new ideas. Given the complexity of the problem we are addressing, one way to proceed is to have as tight a 'feedback loop' as possible between new ideas and their implementation in prototypes which are tested by non-speaking people.

This method of design parallels what many AI researchers say their work requires. The argument is that with a very complex AI system, the only way to discover how it will behave is to run the program. In fact this rather informal sounding statement has been proven mathematically to be precisely the case for at least one class of AI systems. There is literally no way of predicting the state of such a system in the future based on its present state. You must run the program and watch what happens (Wolfram 1984, p 148).The equivalent for AAC development is to say that the only way to know how well a device will work is to try it out from an early stage in real situations.

Creative expression as communication

Mathijs Soede has very usefully widened the definition of communication to include 'communication by physical contact with other people or the environment'. As part of seeing communication as a means of expressing one's personality and participating more fully with others we should also include creative expression as a form of interpersonal communication.

Music, poetry, visual art, drama all are ways of communicating very importantly with others. We have some examples of technical devices being enablers in this area. Midi systems now allow the creation of musical pieces in one's own time, to be played back at whatever speed is appropriate. The fact that written work can be created and stored with a word processor, and printed out to the same standard as that achievable by an unimpaired person has already resulted in a number of AAC users expressing themselves powerfully through the written word. Most computer users have found enjoyment in being able to make pleasing visual art work with the computer handling much of the low level physical skill, and this would seem to lend itself naturally to helping people with limited movement or physical control to create visual art work. Synthetic speech has allowed for singing, and for the participation by non-speakers in drama.

All of these creative areas could benefit from technical advances, and from the imaginative application of technology. Part of our research effort should thus go into exploring ways to help AAC users to express themselves creatively with the help of technology.

The advantages of being an AAC user

Mathijs Soede has made the thought provoking statement that we must consider that when using AAC devices, 'the tool or aid itself is an impairment'. The addition of an intrusive extra element into a personal interaction cannot help but affect the interaction. Certainly this should be an important research issue. A goal of this research would be to minimize the negative effects of this intrusion.

There is another way to look at this unusual communicative situation. Given the fact that the AAC user is further impaired by having to use a technical device in order to interact, would it not be a fruitful line to pursue to try to turn this disadvantage into an advantage? We know that communication is about more than message passing. It is about, among other things, creating and maintaining an impression of the communicator's personality in the minds of others.

It has been remarked that for an AAC user, using a computer system can be seen by others as a positive feature in that it implies high intelligence and familiarity with 'glamorous' technology. This suggests that, since the person must use a computer to communicate with anyway, it might be appropriate to pursue, to discover and to test ways in which the AAC user could exploit having powerful computer at their side. In a small way, the use of sound effects with a speech synthesiser is an example of the AAC user being better than the unimpaired speaker in communicating.

Given the increasing power, speed, and portability of computers, a large number of possibilities could present themselves. This suggestion is not derived from the technical possiblilities, however, but from the fact that, in communicating with each other, our primary purpose is to realize our intentions, and the method of realizing them is secondary.

Three possible explanations have been given for our failure so far to provide non-speakers with technical AAC help which allows them to create fluent and precise communication. Each explanation suggests a range of research needed to improve our performance. Whatever technical help is offered, it cannot be stressed too often that, as said above, the intention comes first, and the method second. The more clever our technology, the less visible and intrusive it will be.

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REACTANT PAPER 2

Confounding Factors in Holistic Communication Aid Evaluation Paradigms

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Dr. Soede's paper "Issues in the research and development of technical aids in AAC", is a wide-reaching paper touching on many of the issues, both methodological and programmatic in the field of AAC research and development. I do not find any great differences in opinion or position between myself and Dr. Soede, so let me begin by discussing a few amplifications or extensions of his comments, and then raising a couple of additional issues that we may want to throw on the table.

Access to technologies in the environment

I found Dr. Soede's discussion of the types of technologies in AAC very interesting and useful. There is one category which is omitted from his list, although he does discuss it later on in his paper. It should be the fourth category in the sequence (D), and could read something like "Technology in the environment which must be dealt with". We normally focus just on the role of technology as a tool or aid. Most technologies, however, are not developed for persons with disabilities but rather to increase the abilities of able-bodied persons. As a result, most of these technologies are designed in such a way that they assume a person with intact physical, sensory, and cognitive abilities. The newer systems are being made even more efficient (for able-bodied users) by using interfaces which take advantage of the multiple abilities of a fully able-bodied user. All of these trends are creating the potential for an increasingly technified society which may or may not be accessible to persons with disabilities. In short, as products become more "friendly" to able-bodied persons, they sometimes become more infriendly to persons with disabilities. Even products which are designed to be disability-sensitive are often not accessible to persons with severe or multiple disabilities. In the next generation of augmentative and alternative communication systems, we must include the issue of access to and control of the other devices which the AAC user will encounter in their daily lives.

Confounding factors in research design

In his elaboration on the issues, Dr. Soede lists a number of things which can affect the usage of communication aids, and makes the point that the introduction of the communication aid into the communication event changes the event. While this is true, I think that we must be careful to not put too much focus on just the aid's introduction as a source of bias. Almost anything we do, including trying to measure the communication, is going to have an effect on the communication. We have something which is somewhat analogous to the uncertainty principle in physics, where you can determine where a particle is or how fast it is moving, but not both at the same time. Introducing a communication aid will indeed change the communication: so will introducing an

observer into the environment, talking to an individual about the fact that you might do some research, or talking with the mother casually about the general topic (as we all must do to get permission either for minors or the participants themselves). All of these put an immediate focus on the communication process and change the tone and amount of user communication, as well as the overall attention paid to the individual. There are of course designs to help control for these effects, such as multiple baseline, etc. With communication aids, however, it is very difficult to do truly blind or double-blind tests with effective and convincing placebos. As a result, our research has a tendency to follow the course of all research, and to focus in on minor and isolated topics or points which often seem quite academic compared to the overall process and complexities of a communication intervention program. On the other hand, holistic studies which try to use real-life communication programs provide the researcher with so little control that without larger (unobtainable) numbers, very little can be reliably said. I think that this is one of the primary challenges of a field such as ours: we must find methods for reliably measuring and comparing interventions in real-life situations.

Evaluations of aids

This leads us to two Gordian knots in AAC research regarding aid evaluation. The first is that posed by trying to evaluate aids by means of benchmark, and the second is posed by efforts to evaluate aids by means of placement with a client.

Since it is so difficult to find matched clients and go through the process of providing them with (and training them) on all of the different aids being compared, it seems that the development of some type of a benchmark test would greatly simplify the process of evaluating and comparing communication aids. So far, however, attempts in this direction have failed, and I would expect them to continue to fail. For a while, keystroke effiency was used, but that has now been found to not necessarily correlate with communication speed. Furthermore, communication speed doesn't necessarily correlate with effective communication. We all know of people who communicate in great volume and at great speed and yet fail to express themselves, while others may speak sparingly and slowly and communicate with great effect. Any of a number of other factors, including portability, the ability to interrupt, the ability to afford the aid, repairability, and body image, may turn out to be more important than speed, ideas per minute, or any other measure of operational performance. Even as a measure of one dimension of a communication aid, benchmarks rapidly fall down. For example, comparing a disability against a scanning aid yields one set of relative efficiencies for one individual, and an inverse set of relative efficiencies for another individual with different physical characteristics, even though both individuals had severe athetoid cerebral palsy. Thus, any benchmarks would have to be qualified by all of the characteristics of the user. Even if we had good descriptive terms that everybody understood and agreed on (which we don't), benchmarks would still not be useful, since we would have as many benchmarks for a single aid as there are major types and combinations of disability and ability (physical, sensory, and cognitive). There may be a role for benchmarks. However, at this juncture it looks like any light that they might shed would be overshadowed by the confusion and misinterpretation which would accompany them.

This brings us to the second method for evaluating communication aids, placing them with clients. A number of times, programs have proposed to provide evaluative Consumer Reports-type information to the field by placing the aids with clients, studying them in a longitudinal basis, and reporting the results. The proposition here is that if an aid didn't improve the person's communication or they weren't using it after a certain period of time, the aid was in some way inferior to other aids which were used and were effective by this person or others. However, I would posit that this is not an evaluation

of the aid, but rather an evaluation of the clinical placement. If an aid is placed with an individual which does not benefit that individual, then I would suggest that what we have is not a bad aid, but a bad placement. I might be tempted to go so far as to say that there are no bad aids: there are only bad placements. There may be unreliable aids, expensive aids, hard-to-repair aids, but all of those adjectives also apply to a Ferrari or any other high-performance car. (Any Ferrari dealer will tell you that purchasing the car means entering into a long-term and close relationship with your mechanic). Now, it may be that there is an aid which is "not the best aid" for anyone; that is, there is always some other aid which is better Even here, however, there would be no a priori way of determining that other aids would always be superior for all clients. It would simply come out in the wash (if we have perfect clinicians who conduct perfect evaluations). All of us know of aids that have been placed with clients where the aid has been more than useless. We may, however, have recommended these same aids ourselves for other clients with different characteristics. Thus, generic aid evaluation through client placement does not seem to be a viable approach either.

Evaluate concepts rather than whole aids

So where does this leave us in terms of evaluation? I think that we will find that it is impossible to develop generic measures of communication aids. Instead of trying to judge whole aids as being better or worse, I think that we should focus our attention on individual principles and issues in the evaluation, placement, and use of communication aids: for example, the effect of visual acuity on image identification, the effect of color on the visual accuracy, the effect of head movement on visual tracking in scanning, the effect of ability to interrupt on flow and amount of communication, etc. This unfortunately means that clinicians will not have any simple charts with five black dots versus five hollow dots, a la Consumer Reports, which they can use to compare the effectiveness of augmentative and alternative communiation aids. (Charts of features or mechanical durability, etc. are still possible and valuable, but not overall effectiveness, or goodness.) Rather, it means that we will continue to need augmentative and alternative communication specialists who are aware of the many factors that affect communication aid learning and use, and apply them to each client's unique combination of abilities, disabilities, constraints, environment, preferences, etc. This is an extremely difficult task now, and as our knowledge increases it is only going to be more difficult to be an attuned, aware, and knowledgable clinician.

SESSION 3

METHODOLOGICAL CHALLENGES IN APPLYING SINGLE CASE DESIGNS TO PROBLEMS IN AAC

ISSUE PAPER

Why use single subject methods in AAC?

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I first learned about the methodology of single case design (SCD) research in 1968 while researching a PhD concerned with the operant conditioning in pigeons. The two arguments in Sidman's Tactics of Scientific Research (1960) that were immediately impressive were experimental. First, variability should be experimentally analysed rather hidden in a statistical error term. Second, averaged data often obscured rather than illuminated psychological processes: averaging smoothed out important and interesting discontinuities. Although, these were good arguments, the behavioural processes that I was investigating were those of unexceptional pigeons. Children with learning difficulties relating to language and communication are, by definition, exceptional, and it was when I started working with them that some of the strongest arguments for single case methodology fell into place.

First, the very heterogeneity of the population made group designs seem pointless. Each child experienced a customised intervention that produced change for him or her - so, obviously, children should act as their own controls. Second, because experiments always concerned ways of producing useful changes for children, clinical significance was paramount; without it, statistical significance was largely irrelevant. Finally, it was important to monitor change over time - to see whether new procedures were working and modify them if they were not. Merely taking pre-and post-intervention measures suggested a wholely inappropriate confidence in untried procedures.

Most people using single case methodology in AAC probably worked through the above points. They didn't want to lose sight of the fact that the language-delayed children they were working with were individuals and not subjects, but they also saw the need to experiment in order to make unambiguous statements about the effects of procedurs that they were developing. Single case methodology seems to provide an ideal solution - experimental control and rigour, without any of the clinical costs of group design experimentation.

I support the use of single case methodology for precisely these reasons, but I have my doubts about any ideal solution. The approach is very useful, but not problem-free. In this paper, I outline some of the methodological challenges that arise when SCDs are applied to problems in AAC. First, consider the function of SCDs.

The function of single case design

SCDs are ways of carrying out controlled experiments. To the extent that such designs are successful, they provide ways of making confident statements about the effect of an independent variable (IV) on a dependent variable (DV). In AAC, the IVs are procedures carried out by a teacher or experimenter and the DVs are communicative acts by language handicapped individuals. The DV may relate to either learning or performance. For example, the speed of acquisition of manual signs taught by total communication is a learning DV; the rate at which such signs are used as requests is a performance DV. Single case methodology aims to evaluate the impact of IVs on DVs in ways that exclude alternative explanations, and which have some generality. Factors which allow alternative explanations are said to threaten the internal validity of a SCD; factors which limit the generality of the conclusions that can be drawn are said to threaten its external validity.

Internal validity of single case methodology with AAC

A range of factors threaten the internal validity of experimental work on AAC. The most pressing stem from the population that we work with and context in which we work. Since people who benefit from AAC are by definition developmentally delayed, improvements that follow intervention to enhance communication skills could arise from the intervention, or could be the result of developmental changes that are independent of it. Threats to validity arising from these internal processes are particularly acute because our participants may learn only slowly, and interventions may therefore be protracted. Second, our working context is the everyday environment of our research participants, and it is inhabitated by many professionals and other carers who are equally concerned to facilitate communication. Unfortunately, from a methodological standpoint, their inputs are uncontrolled, and thus threaten the internal validity of any conclusions we may wish to draw. Single case methodology overcomes these threats by deploying controlled experimental designs such as the ABAB and multiple baseline design.

In principle, the ABAB design overcomes both problems by showing that changes in the DV appear whenever the IV is applied, and disappear whenever it is removed. If there is a close linkage between repeated applications of IV and changes in the DV, the possibility that either uncontrolled internal or external factors are at work can be ruled out.

For example, in one study (Carr & Kologinsky, 1983), children repeatedly showed high levels of manual signing when signed requests were reinforced by an adult, and low levels when signing was ignored. ABAB designs are most useful for looking at these kinds of changes in AAC performance - learning when to communicate, rather than how to communicate. However, there are problems. First, if newly learned communicative behaviour fails to return to baseline during the second 'A' period of an ABAB design, this might be because the initial change was the result of an uncontrolled factor. Alternatively, the initial change may have been the result of intervention, but its maintenance is due to factors external to the experiment. For example, a child may learn to use a communication board to request edibles as the result of a structured intervention, but this behaviour may be maintained by intermittent reinforcement from caregivers when the intervention is temporarily removed.

In addition, the power of the ABAB design stems from the removal of what appears to be an effective treatment. This can give rise to considerable ethical problems. For example, recent work shown that self-injurious behaviour (SIB) often serves a communicative function, and its frequency can therefore be reduced by teaching individuals to use specific signs or words which have functionally equivalent effects. In this context, an ABAB design would involve ignoring newly acquired requesting skills, and looking for

correlated increases in SIB. The potential costs and benefits involved in evaluating the ethics of such a design are very finely balanced.

To summarise: although widely used, the ABAB design has significant drawbacks because it may be neither desirable or possible to reverse the changes brought about by communication teaching. The most widely used alternative is the multiple baseline design. Rather than using reversal as a way of ensuring internal validity, the multiple baseline uses progressive introduction of the IV to a number of DVs. Where change in each of the DVs is closely correlated with introduction of the IV, there is little doubt that the IV, rather than some uncontrolled factor, is responsible for the effect.

However, the multiple baseline design has a major problem which relates to the possibility that the DVs selected may not be independent of each other. If DVs are clustered, changes in some produced by the application of the IV may induce correlated changes in others, although the IV has not yet been applied to them. Such clustering, or covariation of responses, is much more common than originally supposed when multiple baseline designs were devised. Moreover, it is particularly likely to be the case in AAC where lingustic, and therefore structured, DVs are involved. For example, a child who learns how to indicate plurality when vocabulary items A, B, and C are successively taught may rapidly generalize a rule relevant to all items, including D, E, and F, for which the intervention has not yet been applied. There will thus be a change in performance of the latter items before the IV has been applied. The logic of the multiple baseline design means that such a change cannot be unambiguously attributed to the training procedure.

To summarise: multiple baseline designs can unequivocally show that treatments lead to learning, but such a conclusion can be compromised when the baseline responses are not independent.

Like all SCDs, the ABAB and multiple baseline designs use repeated measurement of the DV to track changes resulting from application of the IV. This design facet is essential to the logic of single case methodology, but it creates some subtle problems. Because the SCD experiment in AAC is concerned to teach communication, experimenter and participant are interacting directly together. Thus, where probe trials are carried out to assess whether a child has learned a particular communicative skill, there is a risk of unintentional cueing or reinforcement of the correct responses by the experimenter. Subtle cues may give the impression that learning has occurred when in fact it has not, or may produce unintended forms of learning. In addition, the very repetition of probe trials can vitiate their effectiveness. For example, probe procedures use noncontingent rather than contingent reinforcement to maintain a participant's motivation without teaching the performance being probed. The logic of this procedure, however, relies on participants failing to discriminate probe sessions from teaching sessions. This position has its problems. If participants fail to discriminate noncontingency, they can learn inappropriate responses. If on the other hand they do discriminate noncontingency, their motivation to perform at all during the probe tests may be undermined.

External validity of single case methodology with AAC

External validity raises a second series of pressing questions for researchers using single case methodology to investigate AAC. External validity is about generalisability - the extent to which the specific conditions of an experiment limit the importance of its findings. Generality is often assumed rather than investigated. For example, the implicit assumption behind many sign teaching studies is that teaching carried out in a specific context (e.g., one-to-one with a teacher in a quiet room at the child's school) and relating

to a specific language function (e.g., naming pictures) would have a beneficial effect in other contexts (e.g., at home with parents) and would subserve other functions (e.g., requesting the items for which names have been taught).

One aspect of generalisability, central to a series of studies we carried out at Southampton, concerned the best way to teach an initial signing repertoire. Neither of the ABAB or the multiple baseline design is suitable for comparing two treatment procedures to see which produces the most effective acquisition of AAC skills. The SCD most often chosen for this purpose is the alternating treatments design. In this, two or more treatments are presented on a daily basis, but with order counterbalanced or randomised to control for carryover effects. For example, Remington & Clarke (1983) trained two sets of signs, one using total communication and the other sign alone training. In this study, we took great care to make sure that the groups of signs were matched for iconicity, transparency and performance difficulty, and that all corresponded to words which were not in the children's receptive vocabulary. In this event, we observed no differences between total communication and sign alone in the study above, but concluding that these procedures were equally effective might be valid only under a limited range of circumstances.

First, the findings may be the result of multiple treatment interference, in other words they may occur only when the child was being taught by both methods simultaneously. Secondly, the result observed may be restricted to signs which correspond to unknown words. Both of these problems emphasize the question of external validity. In fact, other studies have shown that total communication can produce more rapid learning than sign alone. Assuming such studies cannot be faulted on internal validity, the differences must be due to some factor which limits the generality of each by interacting with the teaching method variable.

The alternating design can be used to assess this kind of interaction, but it rapidly becomes unwieldy. For example, the study cited was one of a series where we were interested in the interaction between teaching method (total communication versus sign alone) and the children's receptive knowledge of words corresponding to signs trained (known versus unknown words). Ideally, all four of these conditions should have been assessed within a single alternating treatments design, but this was clearly impractical. As a result, our conclusions about the way the variables interacted were from four separate pairwise comparison studies, each involving different participants - not an ideal procedure, given that single case methodology was developed to respect the individuality of each case. Furthermore, some interactions are simply outside the scope of single case methodology: the approach cannot, for example, be used to analyse interactions between global subject characteristics, such as developmental level, and a treatment variable.

One additional threat to external validity arising from its N=1 character is subject attrition. The logic of single case methodology is that the external validity of a finding is strengthened through the use of constructive replication. This involves carrying out similar experiments on a number of different individuals, changing aspects of the procedure, and seeing if the same basic result is obtained despite these variations. Attrition is a particular problem because it is difficult to continue teaching when little is being learned. The likely outcome is probably that the least able individuals are under-represented in replications, with a consequent unjustifiable inflation of the confidence that we place in our intervention methods.

A continuing challenge

The studies described above show that none of the major SCDs is problem free so far as internal and external validity are concerned. Nevertheless, a great deal of progress has been made in terms of understanding the processes of aquisition of AAC, particularly in comparison with early and uncontrolled group studies, which sometimes said little more than that participants communicated better at the end of an intervention than they did at the beginning! The careful methodology of single case research has removed many interpretive problems inherent in studies of that kind, but has it removed something else too?

The essence of single case methodology is control, and that may be the problem. Control is a one-way process, from experimenter to subject, To see clearly the effects of an IV on a DV we remove all other possible sources of control and thus lay bare the basic relationship we wish to study. Our experiments are designed to show how a teacher's manipulations of the environment control a participant's behaviour. Unfortunately - perhaps- communication is all about how behaviour controls the environment. It concerns how individuals acquire and use verbal behaviour to alter the world that they live in. In one sense, this shouldn't be a problem. Signle case methodology was developed to analyse operant behaviour, and precisely the same issue arises there. The pigeon controls its food supply through its behaviour, just as the food supply (programmed through a schedule of reinforcement) controls the behaviour of the pigeon. Since single case methodology works well enough in that context, why should there be a problem when the operant behaviour we are concerned with is verbal, and our subjects are language-delayed human beings?

The choice afforded by the environment seems crucial. The pigeon has Hobsons' choice- peck it or leave it. On the other hand, the language handicapped individual lives in a social environment which can, and potentially will, richly and differently reinforce a huge variety of communicative behaviours. Any good teacher of AAC takes advantage of every opportunity her student presents - she creates a social environment using a combination of some basic behaviour modification skills, sensitivity, and inspired opportunism. To some degree, any form of experimentation removes the opportunity to take advantage of serendipity - that's the nature of control. Even the best single case research can get in the way of teaching.

In summary, the continuing challenge for single case methodology with AAC is the challenge faced by any experimenter - that of understanding the subject matter without changing its nature in the process. Just as Skinner box behaviourists learned from ethologists that there was a lot about animal behaviour that they were missing, so single case methodology interventionists still have a lot to learn from teachers and from colleagues pursuing an observational approach to AAC acquisition.

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REACTANT PAPER 1

Considering Single Subject Experimental Designs in Social Interaction and Discourse Research

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Research methodologies are designed to capture specific facts about our world. Good research methodologies are fashioned to produce data consistent with the theories and beliefs of the investigator. When incongruent with the research endeavor, a research design can obscure and undermine the results of an investigation. Therefore, it is important to ascertain the principles underlying a given research design to determine whether it is consistent with your philosophies and research objectives. In this essay, I will discuss the application of Single Subject Experimental Designs (SSED) for doing research in communication interaction and discourse. This essay will focus on 3 topics related to SSED:

1. The use of SSED in communication interaction and discourse research

2. The application of SSED for the study of unique individuals, and

3. The use of statistical analysis procedures with SSED.

SSED has been presented as an emancipation from statistical analysis and group-level designs, with emphasis on the utility and validity of graphically based analysis. Proponents of SSED have criticized traditional group-level research designs and associated statistical approaches for their inability to handle the types of challenges presented by single subjects whose behaviour changes over time. Kratochwill (1978) notes that single-subject design is one of a large and "diverse set of research methodologies involving the study of individuals and/or groups using time as a variable" (p.2). While the version of SSED presented by Remington was developed to serve the needs of operant psychologists, a number of disciplines, including biology and physiology, psychiatry, psychology, econometrics, have developed similar approaches to evaluate the change of systems over time.

Below is a listing of some of the features distinguishing SSED from other research methodologies, based on discussions by Barlow and Hernsen (1984), Kratochwill (1978), Ottenbacher (1986) and Remington, (1990):

Features of SSED:

- SSED permits the systematic investigation of variables controlling the behaviour of single organisms through the precise specification of the stimulus, behaviour to be modified, reinforcement of the behaviour, and the replication of treatment phases across subjects, contexts, behaviors, and variation of the treatment itself

- SSED is designed to assess time related behavior changes.

- SSED permits analysis of behaviour of unique individuals. Because of it utility with single individuals, SSED cuts costs associated with group level experiments.

- Through the use of graphical analysis, a researcher can use SSED to evaluate level, trend and variability, while avoiding the potentially obscuring effects of group level statistical analysis (e.g., data averaged over time, standard deviation scores, significance levels). SSEDs may overcome many of the constraints imposed by "statistical analysis" (random assignment, multiple subjects, limits on distributional characteristics of data).

- SSED is useful for determining/displaying clinically significant results and avoids confounding clinical or "real world" significance with statistically significant results). Users of SSED are primarily interested in large treatment effects, and don't want to dwell on small effects that can be statistically but not clinically or practically significant.

As noted by Remington, the "essence of single case methodology is control". SSED allows the researcher to exert a specifiable influence on a defined behaviour, then to observe the effects of the stimuli on the behaviour over time and treatment conditions. SSED us ideal for use in the laboratory or in highly controlled situations when the subject is expected to respond to a stimulus, or learn through differential reinforcement of his behaviours. A good example of an operant approach to SSED is the multiple baseline design used to evaluate the impact of vocabulary teaching to a single subject within an operant conditioning framework (Remington, 1990). We can see that the words are being taught in a regimented and sequential manner, with success measured in terms of percentage of correct responses within each teaching session. The task being performed (vocabulary acquisition) is depicted as a process of repeated imitation of a signed or total communication model with optimal performance being the percentage of correct responses. The analysis is motivated by clearly demonstrating training-related performance changes within and across vocabulary items.

Use of SSED in Communication Interaction and Discourse Research

It is not my intention to argue against the theoretical framework discussed by Remington. It is just that the behaviourist and experimental principles of SSED are contrary to some of the basic aims of social interaction and language researchers. Without careful perusal of SSEDs assumptions we run the risk of being seduced by the look-and-feel of a rigorous research methodology while being undermined by its contrary philosophies.

Interaction Research.

By design, interaction research focuses on describing and measuring the relationship between subjects, such as reciprocity, cooperation, control, behavioural contingency, etc. For example, in terms of language acquisition, the interactionist would attempt to evaluate how the form and use of a word or expression arises from the interaction itself. Interaction investigators of augmented interactants and their partners have focused on examining how augmentative devices are used in conversation, the extent to which discourse is understood, misunderstood and repaired, the reciprocity and responsiveness of the interactants (Blau, 1987, Buzolich and Wiemann, 1988; Higginbotham, 1989; Farrier, Yorkston, Marriner and Beukelman, 1985; Harris, 1982; Light, Collier and Parnes, 1985a, 1985b, 1985c). Such investigations, by necessity, would involve the observation and analysis of the behaviour of all participants involved in the communication.

In contrast to interaction research, SSED portrays the nontargeted interactant (e.g., experimenter, teacher) as a stimulus provider whose behaviour serves to stimulate or reinforce the behaviour of the subject. The subject of the investigation is viewed in a respondent role without much control of his or her situation, except to respond to the stimuli. Depicting the subject as a respondent excludes viewing him as an active participant in learning and interaction and inhibits us from entertaining ideas about how social interactants influence the acquisition of language, or how one individual affects another through their communications.

Some interaction and discourse researchers also hold to the belief that communication is interactively achieved and a product of the relationship between the participants with the specific context. Their interests focus on the structure of interactional communication and how these communication patterns are affected by the situational features, such as, the interactants, their communication goals, the particular social physical environment - including the communication device (Blau, 1987; Buzolich and Wiemann, 1988; Higginbotham, 1989). Emphasis on situational specificity in the assessment of communication interaction contrasts with the SSEDs focus on experimental control of context and stimulus delivery, as the interaction approach emphasizes the importance of non-intrusive, naturalistic investigations. When treatment conditions are necessitated, maximum effort is made to reduce the intrusiveness of these interventions (Higginbotham, 1989; Rauck, 1990).

For the behaviourally oriented interaction researcher, much of the experimental control offered by SSED can be utilized if we account for the performance of all individuals involved in the interactions under study. The requirements posed by SSED for replication across conditions, subjects etc. are still valid ways of maximizing external validity. While individual behaviours may not be descriptive of many social events, interaction patterns can be quantified (e.g., turn exchange), although some care must be taken to assure that the sequential dependencies among the behaviours being investigated are not definitionally predefined. With observations occurring in naturalistic research settings, increased performance variability is likely and effect size may be relatively small. Time-series statistical procedures may provide additional support to graphical techniques for the analysis of interaction data (Kratochwill, 1978; Barlow and Hersen, 1984).

Discourse Analysis

When we begin to involve the minds of the participants as a topic of study, our research focus must extend to include the types of meanings or understandings constructed by the participants and their motivations and strategies employed in their communications. From the viewpoint of a discourse analyst or cognitive psychologist, to understand the communicative performance of interactants, one must take into account the interactants' knowledge about the world and each other, their respective cognitive and linguistic skills, and their on-line formulations of understandings (Higginbotham and Duchan, 1988; Tannen, 1989). Such research has been extremely valuable for uncovering the conversational and discourse mechanisms underlying turntaking , the transaction of misunderstandings and repair, topic development, etc. and holds promise for accounting for the unique interactional characteristics of augmentative systems users and their partners (Buzolich & Wiemann, 1988; Blau, 1986; Higginbotham, Mathy-Laikko and Yoder, 1988).

Because of the need for discourse research to obtain spoken or written texts from naturally occurring situations without manipulating the environment or constraining talk, SSED has little obvious application. The goal of the discourse researcher is to uncover the set of communication resources (e.g., prosody, grammar, syntax, semantics, facial

expressions), used to accomplish a given communication task. The discourse analyst may focus attention on explaining how a particular discourse structure functions across different communicative contexts or revealing how a variety of discourse structures perform similar functions. Results for the discourse researcher are described qualitatively instead of quantitatively.

Use of SSED with Unique Individuals

One of the most attractive justifications for the use of SSED in studying nonspeaking and other communicatively challenged persons is that these individuals are different in their physiology, psychology, language, and/or behaviour compared to normally functioning individuals, as well as, among themselves. SSED takes this uniqueness issue directly into account by focusing on individual performance with replication across learned skills, contexts and sometimes other individuals. I don't argue the use of SSED is inappropriate with challenged individuals, or that all of the individuals we work with and study are unique in certain ways. But I do question the suffiency of this uniqueness criteria when rejecting group level designs and /or statistical analysis approach. Despite a communicatively challenged person's physical, cognitive or communicative challenges, other abilities are similar to their fellow humans. For instance, augmentative systems users produce understanding of our language and communicative gestures similarly to nonhandicapped persons. If they didn't, they wouldn't comprehend or utilize our culture at all. The unusual communication patterns observed in these individuals are due, in part, to their restrictive communication technologies, and not their handicap per se. As has been shown by Higginbotham (1989) and Blau (1986), many of the "unusual features" of augmented communication are common to interactions of normal people attempting to communicate across restricted communication situation (e.g., over the phone, barrier game) or when precise interpretation of the communication is necessary (e.g., dispensing name and address, delivering an instruction). Other studies have shown that even motorically handicapped individuals display similar performance trends for learning perceptual-motor skills. Thus unless we can show that the handicapped individual is unique with respect to the skill being investigated, then the decision to employ SSED should be based on convenience and economic or ethical reasons, but not uniqueness, per se.

If we don't have to consider our communicatively challenged subjects as being necessarily unique, then one attractive option available to us is the ability to utilize nonhandicapped individuals as subjects for certain aspects of our research. Indeed the use of nonhandicapped persons can be an attractive alternative to the use of handicapped individuals because of the costs and difficulties in utilizing communicatively challenged persons as subjects, and the ethical considerations involved in employing communicatively challenged persons for research. Normally functioning persons may be used as single subjects or employed in group-level time-series studies in which data distributions may be constructed. After preliminary phases of an investigation have been completed, the performance of communicatively challenged individuals may then be compared to the performance distributions created by the nonhandicapped group. Comparisons between the challenged individual and nonhandicapped group may be made in terms of a direct comparison, or some type of evaluation for trend, with adjustments made for differences in terms of the midpoint or even the scale of the distributions. Groups of communicatively challenged individuals may also be analyzed. Kratochwill (1978) discusses the use of multiple-N time series designs and their advantages for demonstrating generalizability of treatment effects to other individuals and groups.

Use of Statistical Analysis in SSED

In making the case for using statistical techniques in single subject design, I would like to propose that statistics should be used in tandem with the graphical analysis techniques of SSED used to analyze difference, trend and variability in one's data set. There was a time when statistical analysis was synonymous with group level designs and inferential statistics of the parametric type. In recent years, data analysis has progressed. Exploratory data analysis techniques, such as those developed by John Tukey, allow us to understand the characteristics of our data sets before making predictions about it (Mosteller and Tukey, 1977). The term "clinical significance" is frequently used when talking about SSED, referring to the notion that large differences are desirable and that small differences are unimportant. However, small differences can be just as important as large differences for language and communication. While large changes in responsiveness to a well defined stimuli may be desirable or expected in the laboratory, when assessing performance in naturalistic settings with its multitude of influences, communicative changes are typically small and performance variability may obscure accurate visual assessment of these small to moderate behavioural changes. The real world significance of a change in an individual's performance lies in the heads of the participants involved, not the scientist or clinician. For example, a 5% change in responsiveness to questioning by a communicatively challenged individual to his parents may evoke a large shift in language comprehension, perception about the individual's communicative competence or have a discontinuous effect on the future responsiveness of a communication partner. The determination of significance must be gauged by other means than whether data is appropriate for visual analysis.

When behavioural data is variable or autocorrelated (subsequent performance can be predicted from the preceding performance) behaviour analysts can and do make errors when evaluating differences between the baseline and treatment phases using graphical techniques (Gottman and Glass; 1978). Statistical approaches to SSED have overcome many of the previous criticisms directed against inferential statistical approaches. As noted by Mosteller and Tukey (1977) and others, when carefully developed and combined with graphical analytical techniques within an exploratory data analysis framework; the appropriate statistical method can reduce analytic error by effectively evaluating within vs. between group variability, thereby improving the researcher's assessment of differences in level and trend (Barlow and Hernsen, 1984; Elashoff and Thoresen, 1978; Gottman and Glass, 1978 Levin, Marascuilo and Hubert, 1978; Ottenbacher, 1986). For example, Levin et al; apply nonparametric randomization procedures to SSED provide a quantitatively simple approach to detect differences in both level and trend, as well as, decrease autocorrelation between data points (Siegel and Castellean, 1988). Gottman and Glass (1978); Ottenbacher (1986) and Barlow and Hernsen (1984) provide several methodologies involving timeseries analysis for the assessment of level and trend. Statistical analysis methods also facilitate the development of appropriate inferential methods. When used after the appropriate amount of exploratory study, inferential statistical methods can improve the external validity which is of special concern to SSED research.

Conclusion

Work in augmentative communication is multidisciplinary, to say the least. When engaging in research it is important for the validity of our studies to understand the philosophies underlying a candidate research methodology and to evaluate the impact a given research method on the theoretical and procedural aspects of our studies. As I have argued here, SSED has application in some aspects of social interaction and discourse analysis, but has a difficult time accounting for interaction and intrapersonal aspects of individual subjects.

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REACTANT PAPER 2

The special case of early expressive communication intervention with children with the most severe handicaps

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Single case designs are better adapted to the characteristics of the children in need of AAC (Remington, 1990). However, also SCD have certain basic requirements that have to be fulfilled. 'The most fundamental design requirement of single-case experimentation is the reliance on repeated observations of performance over time' (Kazdin, 1982 p.104). In order to verify a hypothesis these repeated observations have to satisfy three requirements:

1. Stability within phases
2. Change between phases
3. Recurring changes

Projects trying to document their success with teaching the first communications skills to children with the most severe handicaps may encounter difficulties on all three points.

To illustrate this I will use examples from one child, Tom, from a research project I carried out some years ago (Smebye, 1986). We developed methods for teaching children first to use existing behaviors to communicate their wishes for more food & drink during lunch. When such presymbolic expressive communication was established, the children were to learn the use of symbols, such as tactile symbols or deaf signs. At the onset, the children had no way of indicating what they wanted except by accepting or rejecting the presented offers. Training took place within the regular meals. The adult chose an existing behavior that the child should learn to use to convey to the adult when he wanted more. The training within the meal was done entirely on child initiative: it was totally up to the child when and how many times the behavior was to be emitted. No prompts or cues were given by the adult. As quickly as possible the child was given free choice between drink and food throughout the meal.

As the project progressed we had increasing problems with finding ways of fulfilling the mentioned design requirements. The data presented are recordings made on the site by the child's caregivers. No reliability-testing of these observations have been carried out so far.

The discussion will focus on the first learning stage: learning new uses of old behaviors. This stage presents us with the greatest methodological challenges.

Stability within phases - the search for data-units

Anyone working with early expressive communication will have to face the problem of documenting that a child who at one point was not able to communicate, at a later point in time is able to communicate reliably and steadily. The main problem is to find an adequate unit of data to measure the learning process.

In SCD 'the greater the variability in the data, the more difficult it is to draw conclusions about the effects of the intervention' (Kazdin, 1982 p.109). Lack of stability makes it difficult to decide on trends and level during each phase.

A. FREQUENCY MEASURES. Simple tallying of behaviors would not yield stable data. When developing expressive communication, variability in frequency is a sign of mastery. The frequency should vary according to the actual wish for the available offers. This was seen with Tom:

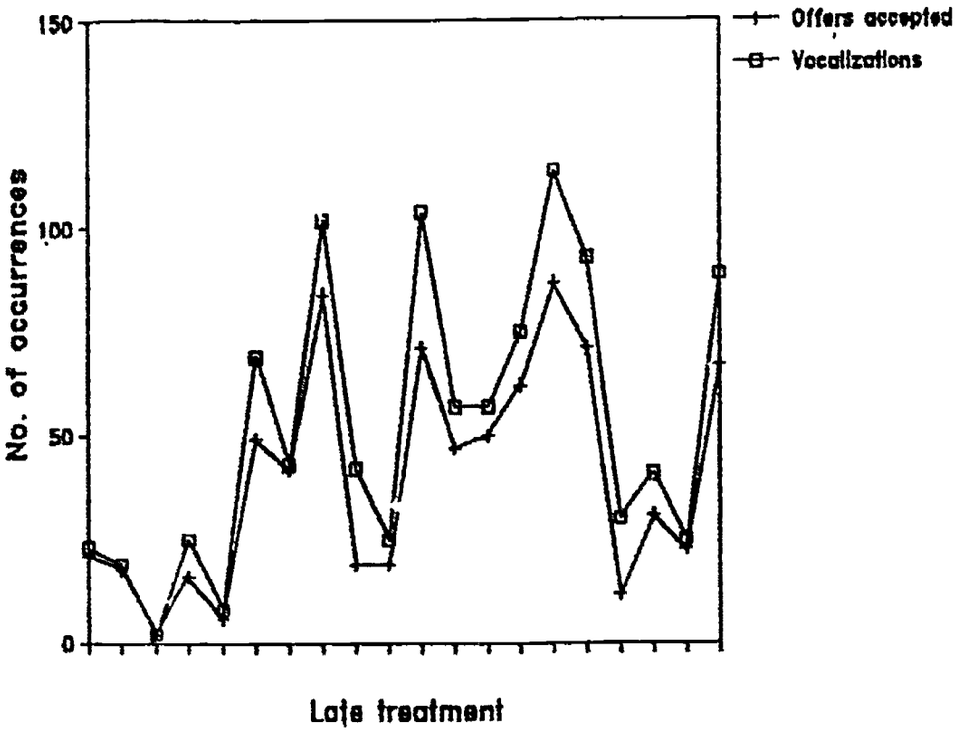

Figure 1. Variations in requests for food & drink during lunch

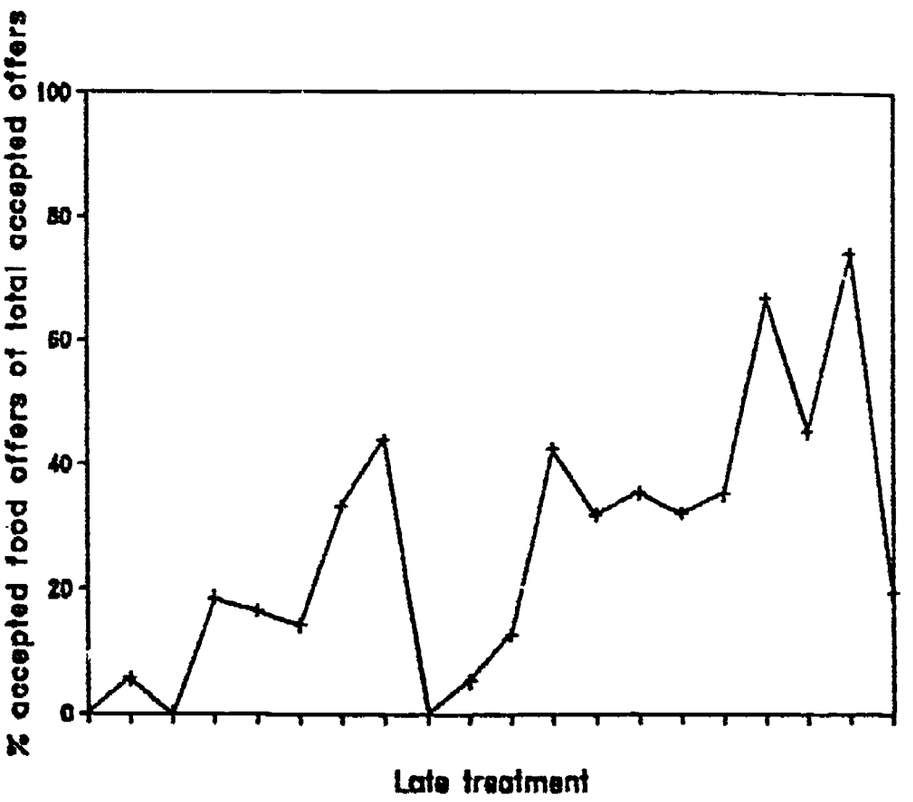

Figure 2. Variations in preferences for food during lunch

As he learned the new function of his vocalizations, the frequency and preference varied according to how hungry or thirsty he was. This variability is present in all children, but will be greater in handicapped children. Many of them suffer from fluctuating medical conditions that strongly influence their preferences and behaviors. This makes simple frequency-counting an unreliable basis for assessing treatment effects.

B. TRENDS IN DATA. Calculating trends in responding yields no unequivocal indication of the learning progress. We have repeatedly found in our clinical work that the first change observed is an increase in frequency that is not related to the actual wish of the children.

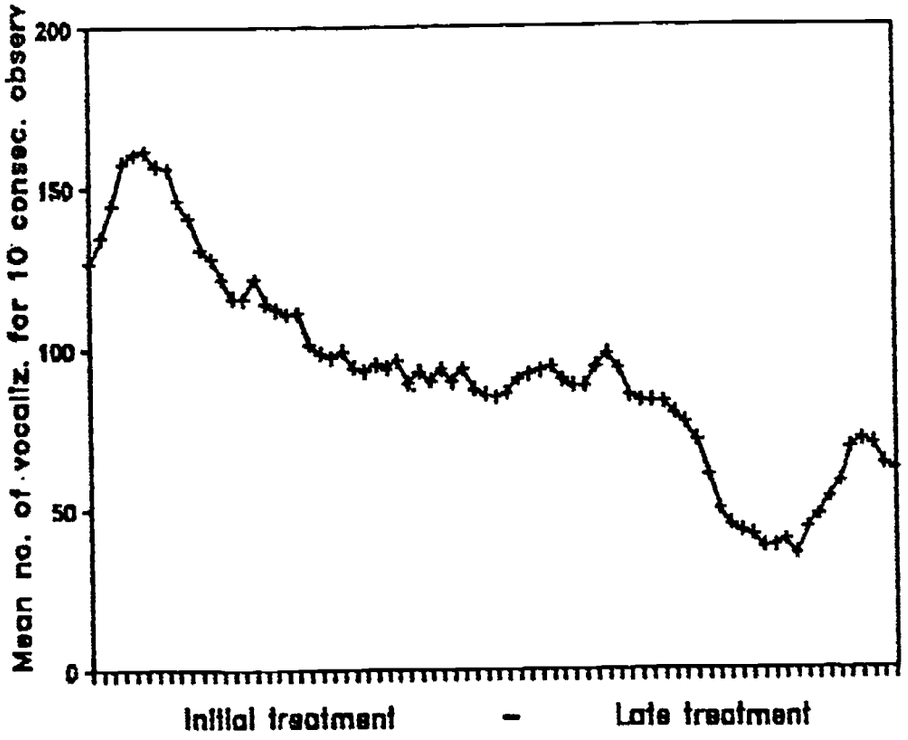

Figure 3 : Trends in requests during lunch

After a few weeks Tom drank more during lunch than ever before or after. During one meal - at the age of four and a half years - he drank more than one litre of whole fat milk before eating one and a half slices of bread - all on his own free initiative! During that period he quit drinking at home during evenings and even weekends. At a later stage his performance seemed to be controlled by the actual wish for more. This is in line with many studies of early development indicating that children at first seem to be more controlled by mastery motivation: 'the joy of communicating per se,' than by the results of their behaviors (e.g. see White, 1959).

C. PERCENT CORRECT RESPONSES. This leads us to a third way of recording behavior. Mr Remington (1990) presented several figures where the data-units were 'percent correct.' When training is carried out on child initiative, it is difficult to find an objective criterion for deciding whether the response was correct or not. Registering how many offers were accepted did not seem to give clear results.

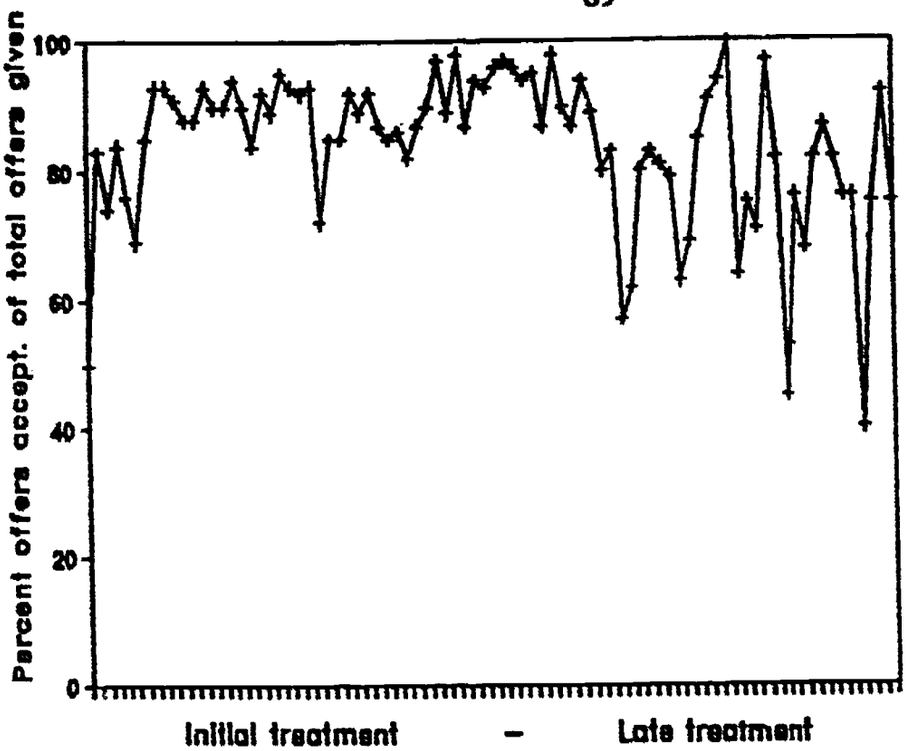

Figure 4: Variation in offers accepted during lunch

Not all acceptances could be interpreted as true indices of requesting. In ear'y stages we observed many instances of 'pleasing effect:' the children would accept offers they apparently did not wish for. A particularly difficult problem was seen when children had no clear preferences of the different alternatives in a choice-situation: The children would accept whatever alternative they got, making their choice between alternative signs appear totally accidental.

Not all instances of rejection could be interpreted as non- learning. Many children have used their newly acquired ability to convey other communicative functions than requesting. Many better-functioning children than those involved in this particular project, have used their signals to direct the adult's attention without wanting another offer. Others have used their new skill to tease: They clearly ask for more, but reject the offer, smiling as the puzzled caregiver puts the offer away.

Judging in advance which response would be 'the correct' one, when the child is given a free choice on his own initiative, is in fact looking for the child's intention. The concept of 'intention' is a very complex and controversial one (MacKay, 1972). We have found it necessary for our work to try to come to grips with this concept (Smebye, 1990; see also Harding, 1989).

D. SEARCH FOR QUALITATIVE CHANGES. The earliest development in expressive communication may be conceptualized as learning communicative functions (Coggins & Sandall, 1983). A possible solution to our search for units of data would be looking for qualitative changes in responding - indicating such a development. Work is under way within the area of developmental research to make this possible (see e.g. Coggins & Carpenter, 1981). Examples that can be mentioned are dual focus of attention both on wanted object and on the adult; deliberate attempts at soliciting help from the adult. Unfortunately, most of the published examples were not appropriate for Tom, since he was severely visually, physically and mentally handicapped.

Many projects focusing on early expressive communication do not run into the problems described here, thereby avoiding the methodological problems causing so much frustration in our project. This is because their methods are based on adult- initiative. A review of relevant research and theory (Smebye, 1990) indicates that early

communication intervention will achieve better results if based on child-initiative. It must therefore be an important challenge to develop strategies for tackling the variability seen in expressive communication. It is unfortunate that basing testing and training on adult-initiative should make life so much easier for the experimenter if it makes development so much harder for the children with the most severe handicaps.

Change between phases - documentation of change

When working with the children with the most severe handicaps, documenting change may be problematic. The development of entirely new behaviors, such as the use of symbols in requesting for more food and drink, are easily observed. But the earliest stages depend on changes in certain parameters of existing behaviors, e.g. use of vocalization. One complicating factor is the often long timespan needed for learning to take place. Tom learned to use his vocalizations reliably after almost half a year of training. One girl in our project needed more than a year to achieve the same level of learning - and even then we were uncertain of whether she understood the meaning given to her vocalizations. This impedes meaningful analysis of changes since too many external variables may contribute to changes in level and trend.

Recurring changes - the search for multiple baselines

Use of reversal designs is dubious both when working with expressive communication in general (Remington, 1990) and when working with severely handicapped children in particular. This leaves us with the use of multiple baseline - either across children or across behaviors. Both were problematic in our project.

Three of the five children in the project group learned to use symbols. But all of them learned only the two for food and drink during meals that were taught in an integrated manner. This made across-behavior-designs impossible.

Two characteristics of children with severe handicaps make across-children-designs problematic. There is a great diversity in target behaviors: While Tom first learned to use vocalization and then tactile symbols, another child first used stretching and then deaf-signs. Second, we observed a great difference in learning rate between the different children. This makes it difficult to get comparable learning profiles.

Is internal validity always threatened?

Where do these methodological problems leave us? Our discussion shows how problematic it is to satisfy the requirements of even Single case designs when working with the earliest communication training with the children most severely handicapped. This is unfortunate. Documentation is important when working with AAC. It is important for securing necessary funding, involving professionals in training programs and encouraging the daily caregivers. It is also an important tool for systematizing experience in such a way as to make it possible for us do a better job in the future than what we are able to do today.

However, lack of methodological control does not necessarily leave us with invalid results. Ensuring a certain level of internal validity is a 'sine qua non' for all experimentation. The purpose of SCD is to control for the influence other factors might exert on the changes seen in the dependent variable. But no control is needed if no other known factors could have caused the result. Such a situation may arise as the children

advance to higher stages in the learning process. Three of the five children in our project-group learned to use symbols during meal. The results for two of them are presented in Table 1.

Table 1. Necessity of methodological control with two children learning AAC

	TOM	ELLEN
Step 1:		
Behavior change:	Vocalizing for 'more'	Stretching for 'more'
Treatm. necess.?[1]	NO	NO
Method. control?[2]	YES	YES
Step 2:		
Behavior change:	Tactile symbols for 'food/drink'	Deaf-signs for 'food/drink'
Treatm. necess.?	YES	YES
Method. control?	NO	NO
Step 3:		
Behavior change:	Computer speech for 'food/drink'	(Speech for 'food/drink')[3]
Treatm. necess.?	YES	NO
Method. control?	NO	YES

[1] Was treatment necessary for observed behavior change?
[2] Is methodological control necessary?
[3] Ellen did not actually reach this step.

Tom and Ellen learned to use behaviors not seen in the populations they belong to. None in the children's family or regular surroundings were using the symbols they came to use. No control was needed to document that their end-results must be attributed to the project they participated in. An interesting thought is that if Ellen progressed at a later stage into substituting her signs with speech, we would not have the same certainty in stating that her speech-learning came from participation in the project. Lack of control of internal validity may not prevent results with great external validity. After Tom learned to use tactile symbols controlling computer speech, it became easier to feed him. Also more distant caregivers were more apt to let themselves be controlled by Tom's communication during meals. The changes left little doubt that the quality of life for him and his surroundings was improved as a result of the project.

David Crystal, in his opening greeting to the ISAAC conference in Cardiff in 1986, challenged us into presenting case- studies as a basis for advancing our understanding. Including methodological control, such as the use of SCD, will in most instances give us a better basis for new understanding. However, too much focus on control of internal validity may be at the cost of studies with greater external validity.

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SUMMARY OF THE DISCUSSION: METHODOLOGICAL CHALLENGES IN APPLYING SINGLE CASE DESIGNS TO PROBLEMS IN AAC

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Bob Remington's issues paper provided an excellent introduction to our discussion regarding single case design methodology in AAC. He began by describing the primary arguments for its use - (1) a reaction against group designs and their inability to respond to the heterogeneity of the population; (2) the desire for clinical significance, not just statistical significance; (3) the need to monitor change over time, not just to take pre- and post-intervention measures. Although the single case design appears to offer experimental rigour without the clinical disadvantages of group designs, Bob emphasized that single case designs are not without their problems. They offer ways of undertaking controlled experiments. In so doing they impose constraints in order that the impact of the independent variables upon the dependent variables can be clearly identified. Controls are essential for researchers to reach conclusions that have some generality (have external validity) and to prevent resorting to alternative explanations (threatening the internal validity) in explaining their findings.

Bob used two examples of single case design - the ABAB design and the multiple baseline design - to demonstrate the problems that can arise. Within experiments in which the experimenter and participant are interacting directly together, there can be unintentional cueing by the experimenter and there can be a problem in identifying and analyzing interactions between subject characteristics and treatment variables. Many tests standardized on the speaking non-disabled population do not apply to the AAC population and individual differences make it difficult to develop standards re: type and extent of descriptive information to record. Within single case designs, we need to document much more about the individual and the context in which they are functioning, but we have not yet clearly identified the information to be obtained nor the methods for obtaining it.

Subject attrition was presented as a further problem. It is likely that "the least able individuals are underrepresented in replications" (p. 9) leading to a further weakening of the external validity of findings.

It was the imposition of controls that attracted the most attention from the group. Within the single case experimental design, control is a one-way process, from experimenter to subject; whereas within clinical and educational settings, the therapist or teacher and the student interact with each other, and the therapist or teacher creates a learning environment in response to the student's behaviour. "Even the best single case research can get in the way of such teaching" Bob concluded by cautioning against destroying the very thing we're trying to understand.

In responding to Bob Remington's introducory paper, Jeff Higginbotham broadened the topic by asking us to consider the value of having many research approaches in order to accomplish different objectives. For studies of language and discourse, he described a phenomenological approach that relied on descriptive information and the application of non parametric statistical methods. Jeff then told a wonderful fish story. I apologize to Jeff for the colour and texture that are lost in this written summary, but the story went something like this:

"Picture a lagoon, shared by two tribes of natives, each of which relied on catching the fish in the lagoon for survival. They lived on separate sides of the lagoon and only met once a year when they came together for a huge party. One tribe fished for the small fish at the top of the lagoon, casting finely meshed nets near the surface of the water. They justified their work as a noble endeavour for it provided a regular supply of food for the tribe, but on the whole they found fishing to be a pretty repetitive and routine activity.

The other tribe fished with strong nets made of large mesh and trolled the bottom of the lagoon. They never knew when they would catch fish, but when they did they were huge and would feed the tribe for a month or more. The fish they caught were sometimes described as monsters that tore the nets apart! These tribesmen found their work dangerous but exciting and loved to tell tales of their heroic achivements.

As can easily be imagined, there were vigorous discussions at the annual gathering of the two tribes about the real size and characteristics of the fish in the lagoon!"

Jeff went on to relate to the need in AAC research for different conceptual nets, recognizing that each will be influenced by our underlying assumptions, our theories and our pre-theoretical notions as to what research it is. The type of net and the direction of our search will determine the kind of information we obtain or indeed if we "catch any fish at all"!

Given this perspective, single case design can be viewed as one of many research techniques to be used in AAC. Other techniques are needed when the objective of the research is to take into account such factors as all the participants affecting the outcome, communication being the product of the relationship between the participants, or the meanings and understandings being constructed by participants.

Jeff returned to individual differences and to the ways in which single case studies are able to take this into account. He emphasized, however, that only the individual is unique with regard to the skill being investigated should a single case design be chosen solely because of its provision for individual differences. Jeff supported the use of group designs when dealing with performance variables where uniqueness is not a factor. He then asked us to critically examine our restistance to the use of nonhandicapped subjects within group design studies. A fruitful discussion on the appropriate use of nonhandicapped subjects in AAC research followed. It was recognized that some AAC studies could quite effectively begin through group designs using nonhandicapped subjects, to be followed by comparison studies between the performance of communicatively challenged individuals and the performance distributions of the nonhandicapped group. We came to an appreciation of the value of this approach, when appropriately used, in protecting communicatively challenged individuals from the intrusion and time requirement of countless research studies and in taking advantage of the large number of subjects available in the nonhandicapped population.

Jeff's emphasis upon the value of statistical procedures which allow evaluation of within group variability in addition to between group variability, reinforced the need for different approaches toward different research objectives.

Helge Smebye's presentation provided very fitting clinical closure. In outlining the problems he had encountered in using single case designs, he offered direct examples for the limitations he had identified in single case design studies. He emphasized that effective use of single case design requires that repeated observations show certain characteristics that allow the documentation of treatment effect. These are stability within phases, change between phases and recurring changes.

In research with multi-handicapped persons, focussing upon expressive communication, Helge had problems obtaining data with the above characteristics. Because expressive communication is strongly influenced by the child's initiative, he found the clinical program to be in conflict with the experimental model. He gave instances of children's responses not reflecting their actual skill level. Sometimes, they were more controlled by mastery motivation, "the joy of communicating per se" than the results of their behaviors; sometimes they accepted offers in order to please the adult rather than really wanting the item; sometimes they used a new skill to tease; sometimes they made a deliberate attempt to gain help from the adult. Interpretation of their performance had to take into account their intensions - a difficult task!

Helge's presentation seemed to speak for all clinicians. Their settings are child-directed and control imposed for research purposes by the adult which may strip the intervention of its value.

Discussion by the group brought forward the following observations:

1. There must be a balance between what is required clinically in order to provide effective learning opportunities for the individual and what is required by the research design. We must be careful about what we might sacrifice in being more systematic.

2. We need many conceptual "nets" to obtain different types of information from different approaches. This will involve the innovative use of complementary procedures and methods of analyses.

3. We must identify and describe qualitative as well as quantitative changes and use techniques that work toward a marriage between them.

4. We must take into acount how behaviours are inter-related and observe small units of behaviour.

5. We must ensure that the research method(s) selected is (are) appropriate to the research objectives.

6. We need to appreciate the value of many types of "fish" and become more aware of the "nutritional value" to be gained from each. (Thanks to Pat Mirenda!)

This session, thanks to our three presenters and the thoughtful discussion they stimulated, provided a very satisfying learning experience. It gave those present a much better appreciation, not only of single case designs, but as well, of the broader issues relating to (1) clinical intervention and research objectives, (2) the ethical considerations relating to research in clinical settings, (3) the strengths to be derived from various research and statistical approaches and (4) the factors to consider in the appropriate involvement of nonhandicapped and handicapped populations as subjects in AAC research. I hope those present and those reading the discussion papers will be stimulated to think further on the issues raised and to share their ideas in the AAC Forum.

SESSION 4

METHODOLOGICAL ISSUES IN RESEARCH WITH INDIVIDUALS WITH COGNITIVE DISABILITIES

ISSUE PAPER

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I am going to talk about methodological issues in research with individuals with cognitive disabilities. I am a phonetician committed to language development and language intervention with mentally retarded children. This is a delicate focus because to me language as an abstract system of conventional symbols (Bloom & Lahey, 1978) is impossible without cognition.

I have collected experiences from working with mentally retarded children in a research project, "Early language intervention in children with Down syndrome" (1) and (Johansson, 1990 a, b). This project started as a basic research project in 1981 and ended as an applied research project in 1989.

I share my interest in language acquisition and mental retardation with many other researchers although the tradition is not very old. Twenty-five years ago mentally retarded children and children with language disorders did not receive language training in our country except for a few very favoured persons. The knowledge of the state and course of language acquisition in mentally retarded children was very rudimentary. It was a common belief even in the late seventies, that their language development was normal but slow. According to this opinion the methodology of the language intervention was adapted to normality in learning and development and the success of language training was not great.

The need for descriptive and experimental linguistic research with mentally retarded children has been and still is enourmous. In order to provide successful language intervention we have to know in what specific and general ways the language development of mentally retarded children differ from that of normal children. We have to know about inter- and intraindividual differences and the origins of these differences. Today, we usually forget that mentally retarded children are individuals and treat them as members of the large group of mentally retarded children or of some subgroup, e.g. autistic children or children with Down syndrome.

Theoretical considerations

The design of research in language development is dependent upon theoretical considerations. I would like to give a few examples of important questions to ask:

Is the language of mentally retarded children an imperfect copy of adult language? Or, is it to a higher or lesser degree than in normal development the output of a creative system of the child?

Is there some kind of universality of language development in mentally retarded children in the same way as it is assumed in normal development (Jacobsson, (1941; 1968)? Or, is the development individual to a higher or perhaps lesser extent?

Are there biologically programmed schedules for language acquisition to the same extent as it is assumed to be in normal development (Chomsky, 1965))? Or, is the development of mentally retarded children more or perhaps less dependent upon interactive context?

Is the development continuous as it is assumed to be in normal development? Or, should a stage model of language development be better or worse adapted to mentally retarded children than to normally developing children?

Is the assumed asymmetry between comprehension and production of the same character in children with mental retardation and normally developing children?

Are there units of language acquisition of the same size in mentally retarded children as in children with normal development?

Do the concepts of arbitrariness, open-endedness, duality or markedness apply to the language of mentally retarded persons in the same way as to the language of non-disabled persons?

Or, to sum up: Can we use theories and models of normal development in research and intervention in children with a development that is not normal?

According to the theoretical framework choosen, hypotheses and an experimental design are to be formulated. Important questions are how to obtain reliable and representative data, how to quantify and formalize data and how to present data in order to give the listener or reader a chance to evaluate them.

Aim

In defining the aims of a study one task is to specify the level or levels of research. It is important to make clear on what level the study is being concentrated; on a discourse level, a sentence or phrase level, a word level, a phoneme (chereme- or a feature level? However, the study may at the same time be concentrated on one or more of the following levels: a pragmatic, a semantic, a lexical, a syntactical, a morphological, and a phonological or phonetic level.

Subjects

In choosing subjects there are a lot of intriguing questions. We usually talk about the mentally retarded as if they belong to a special and homogenous group of people. I would here like to mention three important questions:

1. Which group is the population? Is it all the mentally retarded in one country - or in the world? Is it some subgroup of the larger group of the mentally retarded? What criteria do we need to specify the population?

2. How can we get a representative sample from the population? Which criteria are needed? In Sweden we have one problem that might be unfamiliar to researchers from other countries. We have a small population and if we want to study language acquisition in children with e.g. Rett syndrome in Sweden the entire population is about 100 persons in all.

3. Which group can be used as a control group? Which are the best criteria for matching children in an experimental and control group in a language study; mental age, chronological age, some kind of linguistic measurement e.g. MLU?

Experimental design

In designing an experimental or observational study of language development, questions have to be raised about transcription systems, statistics and above all dependent and independent variables.

Transcription

In order to work on the language material collected on tape- or video recordings the data has to be systematized. As a first step the utterances have to be transcribed. This is combined with difficulties as there is a lack of widely used transcription systems that take verbal as well as nonverbal language forms into consideration. What are we to do when the child's speech is comprised of segmental and suprasegmental sounds that are not represented in the international phonetic alphabet (IPA)? How can we transcribe signs, Bliss or other alternatives to speech in order to allow quantifications and taxonomies? What are we to do with utterance forms that are not language forms, yet integrated in the utterance?

Dependent and independent variables

On the basis of studies of normal language acquisition, it is well known that many variables may interfere with language acquisition. One of the most crucial questions in an experimental or observational study of language development in mentally retarded children is then to decide which variables are independent and which are dependent variables. And which are the unknown " third" variables? E.g. do sex, age, social and cultural background or emotional state mean the same thing to language development of children with mental retardation as it does to normally talented children?

However, I think that by far the most important question is the following one: What is mental retardation and what kind of interferences are unique to mental retardation?

My own research has been guided by the hypothesis that an individual is mentally retarded if he or she does not manage to cope with the expectancies and attitudes of other people. Mental retardation is, therefore, a problem within relationships between the individual and other human beings in the individual's environment. These problems are different in different societies depending on the degree of influence by political, religious, cultural and ethnical factors. This hypothesis also states that an individual

becomes mentally retarded due to malfunctions of the informative systems, the representational and memory systems or of the acting system of the child.

An important task for research in language development in mentally retarded children is, then, to define these isolating factors and to develop educational devices that eliminate or limit the negative effects of them. This is an objective for researchers in linguistics in cooperation with researchers in i.e. psychology, education and technology. This creates, however, another problem; different disciplines have different research paradigms. We are today not very successful at understanding each other across the borders of different disciplines.

I would like to mention some variables in mental retardation that may interfere with linguistic research. I am sure these points may be obvious to many of you but certainly not to all people involved in language intervention in mentally retarded children. This is a problem; those trained in linguistic research are not always aware of the problems in mental retardation and those who are trained in the field of mental retardation do not know very much about linguistic research.

Information processing

The first step in learning is the processing of information which includes general and specific perceptual and cognitive factors but also emotional and motivational factors. Inefficient verbal mediating processes are known to contribute to memory and learning disabilities (e.g. Cherkes-Julkowski et al, 1986) Thus to have a language is of vital importance to the child's opportunuties to learn.

Mentally retarded children have problems learning in general and with language learning. The child may be unable to selectively choose among linguistic and other kinds of stimuli in a proper way due to deficits in attention, discrimination and/or identification. This process of selection is influenced by the needs and the interests of the child. This means that the process may be defective due to low motivation. However, the process is also influenced by the emotional state of the child, and it may be due to sadness or distress.

For many children it is harder to pay attention to, to discriminate and to identify auditory rather than visual or tactile information. Even the thresholds of stimuli may be different. Some kinds of stimuli have to be much more intense but other kinds of stimuli may be less intense than normal to evoke a response.

The mentally retarded child may be unable to categorize, to generalize, to sequentiate, to integrate, to code, to organize these codes for saving in memory and to recognize or recall linguistic and other kinds of information in a proper way. The character of these problems may be different in different situations and at different times, and this seems to be related to the actual motivational and emotional state of the child.

To illustrate these points let us imagine two experiments. A child has a sister named "Bibbi" and a dog named "Diddi". When both are in front of the child she cannot point to "Bibbi" better than at a chance level. Is this due to hearing problems, language problems, general perceptual deficits, auditory perceptual deficits, e.g. discrimination, or to motivational factors? The child knows that "Diddi" is a dog and she can say the word dog. When introduced to other dogs she does not know the word dog any more. Is this due to a general disability in generalizing across situations, contexts and persons, to a specific disability generalizing linguistic form or linguistic content, to memory deficits or to motivational factors? How can we know for sure?

Acting systems

Language learning and language performance require also a system for acting. This system includes the planning and the execution of motor activities. Hypotonia, hypertonia, hypermobility of the joints, low strength of the muscles, ataxia, apraxia and dyspraxia are just a few common words associated to the motor performance of mentally retarded children. All these words indicate that mentally retarded children, also those without obvious motor handicaps, have motor problems. And without motor activity there is no language to observe.

Motor intervention is without any doubt also a contributing step in language intervention. The children have to learn how to use their muscles in order to sit, to walk, and to grip by means of which they - according to the theory of Piaget - learn about the world and start building concepts.

In order to speak the individual has to make fast and very exact coordinations between a great number of tiny muscles in the respiratory, phonatory and articulatory organs. This is a very demanding process which requires a neuromotor maturation. This may be delayed in some mentally retarded children. As it is very important to the individual to have access to an acting system in language development, the children in language intervention should be given an alternative, but of course not a pure compensation, to speech as soon as they start learning language.

However, the acting of a person, requires not only muscles strength and neuromotor maturation but also mental energy. It is supposed that the mental energy is the result of a motivation to act and to learn combined with psychological well-being, e.g. to feel accepted and beloved.

Mental strategies

The cognitive machinery just outlined, varies in efficiency due to superordinate mental factors, e.g. mental speed. The normally talented person's perception, representation, memory and planning of motor answers have a certain duration that fits the expectations of other people. In the mentally retarded person the mental speed is much slower (e.g. Lincoln et al., 1985) and it does not necessarily fit common expectations.

In research with the mentally retarded it is important to take into consideration the time factors. In order to carry out a testing task, to learn a new word or to communicate with another person, the individual has to have time to receive, to process and to react to the information given. Other people have to learn to wait and not to be afraid of silence and eventless pauses.

Evaluation

To bring this paper to an end I would like to remind you of one important thing. The researcher must be aware of how he or she influences the interpretation of the study and the child studied. There is no objectivity in the lexical meaning of the word. Attitudes, knowledge and experiences do play an important role.

The researcher must also be aware that he or she may not understand the intentions and the contents of the child's behavior and answers. According to the theory of linguistic determinism and relativism (Whorf, 1956) the normally developing child develops his or her thoughts under the influence of the words and grammar of his native language to

some extent. The perception of the child is directed to those entities in the environment that are coded to him or her by linguistic means. People with the same native language and language competence are assumed to understand the thoughts of each other better than people with different native languages or language competencies.

Note

1. There are 28 research reports, most of them in Swedish, published in "Down syndrom; Språk och Tal. ["Down syndrome; Language and speech"], Department of Linguistics, University of Umeå.

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REACTANT PAPER 1

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Iréne Johansson has presented a multifacetted view on the function of impairments of mentally retarded persons and their communication in which I partly agree. My opinion, though, is that it is important to define and demarcate the theoretical construct cognitive impairment and its relations to other theoretical constructs such as perception, motor ability and communicative ability. This is especially important in research concerning the most profoundly impaired. In it decisions and statements concerning perceptual-, cognitive-, communicative-, and motor functions are inferred from a rather limited number of overt behaviours. Hence important problems are the construct validity of the theoretical constructs used and the content validity of the assessment instruments used. An additional problem is how these different constructs and measures relate to each other.

I will try to briefly discuss my definitions of the concepts cognitive ability and communicative ability. Finally I will ask some open ended questions around how these concepts relate to each other.

Cognitive ability can be defined either from the perspective of IQ as measured by norm-referenced IQ-tests or from the perspective of qualitative criteria-referenced measures based on theories of cognitive development, e.g. the Piaget based Uzgiris & Hunt Scales (1975) or levels of cognitive functioning, e.g. the A, B, C model proposed by Kylén (1974, 1981).

If a functional approach is taken cognitive assessment in research with persons exhibiting cognitive impairment ought to focus on describing the impaired persons present level of cognitive ability in terms of the major cognitive processes that may be related to communication (Mirenda & Iacono, 1990). Hence, a qualitative measure of cognitive ability is preferred. The major cognitive processes can be defined as response classes. To adapt the environment to the person's present cognitive ability, it is necessary to know the stimulus classes to which the cognitive processes are related.

Cognitive processes are demarcated from perceptual processes in that they are independent of the modality of the stimuli that are processed. Still, major cognitive processes have to be related to the person's "concepts of reality", i.e. the response classes have to be related to functional stimulus classes such as experiences of time, quality, space, quantity and cause (Kylén, 1974, 1981; Granlund & Olsson, 1987; Granlund, Olsson & Karlan, 1990). To develop different "concepts of reality" at least two distinctive types of cognitive processing are needed. Sequential processing stressing a serial or temporal ordering of stimuli, and simultaneous processing which demands a gestalt-like integration of stimuli (Kaufman & Kaufman, 1983). Different handicapping conditions within mental retardation have different profiles of cognitive impairment.

Communicative ability can be analysed from three different but related perspectives; communicative form, communicative content and communicative use (Bloom & Lahey, 1978).

Communicative form is defined in terms of the level of complexity of the code used to convey information, e.g. reflex, signal, symbol, or multi-symbol utterances (Dunst & Wortman-Lowe, 1986; Granlund & Olsson, 1987). It is also defined by the mode/modes for the expression, e.g. sound, motor action, or object/graphic representation. Different levels of code and different modes of communication can occur simultaneously. There has been some controversy on how a cognitive impairment affects a person's ability to use more complex levels of code, e.g. symbols, in communication (Kahn, 1983, Reichle & Yoder, 1983, Kangas & Lloyd, 1988).

Communicative content is defined in terms of the referent for which a certain form is used. The referent can be an experience in the "here-and now-situation" or an internal representation of a group of objects/actions and/or relations between objects or actions, in other words, a concept. For persons exhibiting mental retardation it is easier to learn, retain and express concrete concepts in comparison to abstract concepts (Kylén, 1974; Luftig, 1983).

Communicative use is defined in terms of communicative intentions, presuppostions and social organization of discourse (Roth & Speckman, 1984). Communicative intention is defined as the message a speaker wishes to convey. It can either be focused on a single message e.g. questions for information, comments on actions, or it can be focused on communicative contexts involving both partners e.g. social interaction (dialogue over several turns not involving objects), joint attention (dialogue over several turns involving objects), or behaviour regulation (interaction of short duration intended to use another person as a mean to reach a goal). The second focus context is preferred when non-linguistic communication is analysed.

Mueller & Vandell (1979) argue that one developmental pathway to the ability to participate in dialogues over several turns is based on the object-free mutual engagement between mother and infant in the first months of the child's life. Another pathway is the object mediated. Physical objects are hypothesized to play major contextual roles in the emergence of peer social interactions in children. Hence, object mediation is seen as an important and very different pathway to dialogues over several turns than the object-free pathway. Dialogues over several turns involving objects emerges later in the developmental sequence as compared to object-free dialogues. Data from research with persons exhibiting profound cognitive impairment reveals that behaviour regulation interactions is more complex than social dialogues over several turns for this population. Data also reveals that object-free dialogues are more complex than dialogues involving objects (Granlund & Olsson, 1987, McLean, Snyder-McLean & Cirrin, 1981).

Presuppositions is defined as the speaker's message in relation to the specific information needs of a listener and the context. Persons with cognitive impairments can have problems in adjusting their messages to the listener. Calculator & Delaney (1986) report that mentally retarded adults generally repeated their ambiguous messages rather than revised them in reparing conversational breakdowns.

Social organization of discourse is defined as the ability to maintain a dialogue between and among partners over several conversational turns. The questions asked around social organization of discourse partially overlap the questions asked around presuppositions. Concerning social organization of discourse, Granlund & Olsson (1987) and Rowland (1988) report that profoundly retarded adults and children with profound multiple impairments almost exclusively have a respondent discourse role in their communicative exchange.

Contemporary accounts of the cognition/language relationships have been reviewed and analyzed by Rice (1983). Partly the same reasoning can be applied to the superordinate concept communication and its relationship to cognition:

> Cognition hypothesis; communicative ability is part of more general representation abilities. Cognitive ability is the base by providing the meaning.
>
> Local homology, parallel development; both communicative ability and cognitive ability are derived from common deeper underlying systems. Associations between communication and cognition differs with development/level of functioning.
>
> Interaction hypothesis; communicative and cognitive ability mutually influence each other.

To me, the local homology hypothesis seems most plausible in research with individuals exhibiting profound cognitive impairment.

To summarize: In research with individuals exhibiting cognitive impairment prerequisites for studying the communicative ability/cognitive ability relationships are a high degree of construct validity for theoretical constructs used and a high degree of content validity for assessment instruments used. Therefore, I finally would like to ask you some open ended questions of considerable importance to me:

1. Can theories concerning normal development or normal funtioning be used in research with individuals exhibiting congenital impairments?

2. What is the interrelationship among concepts concerning cognitive ability and concepts concerning communicative ability?

3. Is it possible to theoretically demarcate major cognitive processes and their influence on specific communicative intentions (defined as contexts)? As an example, is sequential processing and related cognitive concepts such as "concepts of time" more related to the communicative intention joint attention (dialogue over several turns involving objects) than to the communicative intention behaviour regulation?

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REACTANT PAPER 2

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In the past five years in particular, increased attention has been paid to the AAC needs and requirements of individuals with cognitive disabilities, including those with mental retardation, autism, and multiple impairments. In North America, a number of excellent books have been published in this area in the past 3 years, replacing the virtual void that existed prior to 1988. Some examples include Calculator and Bedrosian's Communication Assessment and Intervention for Adults with Mental Retardation (1988), Siegel-Causey and Guess' Enhancing Nonsymbolic Communication Interactions Among Learners with Severe Disabilities (1989), and a 1990 text by Baumgart and her colleagues, entitled Augmentative and Alternative Communication for Persons with Severe Handicaps. Each of these texts is based on the extant research base, and thus reflect both the current state of the art and the current state of the science of AAC in the area of severe handicaps.

As reflected in these books, we are now in a position whereby much of the basic research that characterizes most specialty fields has been completed. This means that we can begin to ask more sophisticated questions that present increased challenges in terms of methodology. For example, we know that even individuals with the most severe cognitive impairments can be taught to use simple AAC techniques; at one time, this was a basic question that remained unanswered. Now, the challenges are (a) to document effective instructional approaches for learners at all levels of cognitive impairment and (b) to develop processes for making determinations about the best approaches to use in specific circumstances. Complex questions such as these will require careful, systematic approaches based on a few of the characteristics of this population of which we were reminded by Dr Johansson. I would like to discuss those that I believe to be most salient.

Number 1. The population of individuals with cognitive disabilities is both similar and dissimilar to the nondisabled population.

Some of the similarities lie in areas that we think of as being related to basic human-ness: we all need shelter, sustenance, nurturance, and input and opportunities necessary for continuous learning and growth to occur. Many fundamental similarities can also be found across the two populations in terms of the ways in which learning occurs; for example, the principles of operant conditioning appear to apply equally to persons across the ability range. On the other hand, there are differences in this regard as well, and some of these learning differences between people who are nondisabled and people with mental retardation are substantive enough to have research-related implications. For example, the results of research conducted with nondisabled subjects cannot be assumed to be directly applicable to individuals with cognitive disabilities, nor vice versa. Yet, much of the reserach in this area continues to be conducted with subjects who are nondisabled and is often reported as if generalizability across the two populations can be assumed automatically. One solution to this problem has been to conduct research with

subjects who are, indeed, cognitively disabled but who have sufficient speech to meet their ongoing daily communication needs. The generalizability of such research endeavors to individuals who are AAC users is also assumed but has not been empirically demonstrated. In the next phase of AAC research in the area of mental retardation, it will be critically important to test the validity of these two assumptions by conducting systematic replications across persons with and without cognitive disabilities and with and without the ability to speak.

Number 2. The population of persons with cognitive disabilities is heterogeneous.

All people with cognitive disabilities are not alike in terms of how they learn and communicate, any more than all nondisabled people are similar in this regard. People with Down syndrome develop and learn very differently than do people with autism, who are in turn very different than people with multiple handicaps, and so forth. This calls into question the appropriateness of two commonly-used reserach practices in this area: the use of group designs and the use of parametric statistics. I believe the methodology of single subject research to be, in most instances, more appropriate and ultimately more useful than are group designs for this population, for a number of reasons: (a) single subject research encourages the provision of detailed, individual subject descriptions, and thereby encourages the researcher to acknowledge the heterogeneity of the subject sample; (b) single subject research encourages us to provide a level of individual subject data that permits careful analysis of individual learning patterns and styles; and (c) since each subject acts as his or her own control, single subject research allows us to avoid the unresolved issue that is frequently present in group designs regarding whether subjects in a control group should be matched to the target subjects by chronological age, mental age, language age, some combinations of these variables, or some other set of variables. Small group, repeated-measures designs where subjects act as their own controls across conditions can also be useful alternatives in some situations. When such group designs are used, analysis of the resulting data will be more appropriately accomplished through the use of non-parametric statistical tests that are designed for use with subjects samples drawn from heterogeneous populations that do not conform to a normal distribution.

Number 3. People with cognitive disabilities have difficulty generalizing skills across novel people, materials, environments, and tasks.

Much of the research in the field of mental retardation to date has been conducted with subjects in school or work programs that are solely attended by other persons with cognitive disabilities. What we think we know about motivational, attention, information processing, and other mental abilities of these individuals is based primarily on the results of such research efforts. As a field, I am afraid we have, until quite recently, bought into the belief that segregated schools, residences, and workshops are the optimum places for persons with mental retardation to learn and develop their skills -- and I believe we are drastically wrong about that belief. Future research efforts need to incorporate appropriate communication opportunitites with nondisabled friends, coworkers, and neighbours, so that we can truly begin to examine and demonstrate the capabilities of these individuals as integral members of society. Our research efforts must be carefully structured in order to demonstrate meaningful outcomes. The routine inclusion of a generalization phase in single subject research, and the routine use of natural cues and consequences in intervention studies will go a long way in meeting this goal.

Number 4. Scores from standardized tests and other measures are inadequate descriptors when applied to persons with cognitive disabilities.

Dr Johansson alluded to this issue in her discussion of the importance of relationships for persons with mental retardation. It is becoming increasingly clear that the communication progress that can be made by persons with mental retardation has more to do with environmental and interpersonal variables than with mental age or some other arbitrary score. Yet, the research in this area often fails to provide subject descriptions much beyond chronological age, test scores, and current communication skills. We need to begin to provide much richer subject descriptions in our research studies, including information about where and with whom subjects live, work, and recreate; the type of activity schedule or curriculum that predominates during instructional time; the approach that is typically used for instruction (for example, a structured behavioral approach, an adaptive play approach, etc.); the extent to which subjects are encouraged to make decisions about the many facets of their lives, and so forth. Provision of such information acknowledges that variables far beyond those inherent in a research setting impact on the lives of these individuals in very important ways, and that how subjects respond to an intervention task has at least as much to do with their backgrounds and experiences as with the task itself. Such descriptors are, I believe, considerably more relevant than are mental age, IQ, language age, or other such scores.

I have confined my remarks to methodological issues, since that is the topic of this symposium. In some ways, however, a more interesting issue is related to the focus of research involving people with mental retardation, and the nature of the research questions themselves. What do we really know, in an empirical sense, about AAC and persons with cognitive disabilities? What are the questions that we should be asking at this point in the evolution of the field? I would like to spend a few minutes discussing this issue, because I believe that the issue of WHAT we study is just as important as HOW we study it. Here, then, for what they are worth, are my Top 5 "wish list" of research questions for the next 5 years:

1 **Persons with the most severe handicaps.** I want to see empirical demonstrations of intervention approaches designed to build nonsymbolic and other beginning communication behaviors with persons labelled "profoundly" cognitively disabled. Clinical demonstrations are becoming increasingly common in this regard, but few empirical accounts of such approaches are currently available. One exception is the work of David Wacker and his colleagues at the University of Iowa, whose report of the use of a simple microswitch and tape recorder system to allow children with profound, multiple handicaps to make choices is an important example of many of the methodological issues discussed previously.

2 **Symbol assessment.** There has not been a single time I have done an AAC presentation in the past 5 years that someone has not asked me how to determine the appropriate type (or types) of aided or unaided symbol(s) to use with persons with mental retardation. I tell whoever asks what I think, and how I make such decisions, and always end up by saying that we simply don't have an empirically validated approach to this issue in the field as yet. Research in the area of symbol assessment as a clinical issue is critically important, especially now that we have available a host of studies that provide theoretical bases for such research.

3 **Choice-making.** In recent years, researchers outside of the AAC area have emphasized the importance of providing numerous and regular opportunities for choice-making to persons with mental retardation. Unfortunately, we have virtually no research base that tells us how choice-making skills are best taught to beginning

communicators. Thus, we again rely on accumulated clinical experience in this regard, and this is simply not sufficient. Research in this area is critically important.

4 **Voice output communication aids.** There are a host of questions that remain unanswered regarding the use of VOCAs with this population. Some have to do with identifying variables that can guide clinical decisions about whether or not a "high tech" approach might be appropriate. Some of them have to do with the impact of the use of such technology on the AAC users themselves. Other questions have to do with listener's perceptions of people with mental retardation and how such perceptions may be influenced by the use of a VOCA. Research concerning such issues is necessary in order to make optimum use of the technology that is now, finally, available, for use with this population.

5 **Facilitator training.** It is clear that, under most circumstances, an intervention that solely involves the AAC user him- or herself is destined to be either partially successful or to fail entirely, especially when the AAC user is a person with mental retardation. Research designed to identify strategies for training family members, friends, coworkers, and the community at large regarding interactions that facilitate communication are becoming increasingly necessary.

The next phase of AAC research as it applies to persons with cognitive disabilities will be exciting, frustrating, complex, and challenging. As the myths about the potential impact of AAC on the lives of persons with mental retardation have been addressed in the research literature over the past 5 years, the unanswered questions and the methodological issues that confront us have become increasingly clear. I look forward to opportunities to explore these issues, none of which are clear-cut, so that we can continue to demonstrate the power of AAC for enriching the lives of persons with mental retardation.

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SUMMARY OF THE DISCUSSION: METHODOLOGICAL ISSUES IN RESEARCH WITH INDIVIDUALS WITH COGNITIVE DISABILITIES

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The major presenter, Irene Johansson, and the reactants, Mats Granlund and Pat M'renda, made a number of interesting points that are included in their written papers so I will not repeat them here. Their presentations provoked a lively and free ranging discussion covering a wide variety of topics. Rather than try to summarize everything that was discussed, I will focus this summary on what was most relevant to research issues, the major purpose of this conference. There seemed to be a reasonable level of agreement on the points I have summarized below. As might be expected, however, there was far from unanimity.

Data from normal language and cognitive development are important for understanding the development of cognitively impaired individuals

There was considerable discussion about the importance of the data and models derived from research with non-handicapped children and how they should be applied to understanding the problems and treatment of the handicapped child. There was general agreement that data on normal development provides a critically important baseline against which to evaluate atypical development. One way it can be used is to help determine if the cognitively impaired child is showing a developmental pattern that is different from normal development or whether it is a pattern that is simply delayed. The research paradigm that relates most closely to this issue is one in which two comparison groups are used, one that is matched to the cognitively impaired group on chronological age, and a second that is matched on mental age (or performance on some other criterion task). The question is whether, on the task interest, the impaired group performs like their younger mental-aged matched peers (i.e. developmental delay) or whether it performs differently from either of the two comparison groups (i.e. a developmental difference). Unfortunately, the studies employing this design usually produced results that are somewhere between these two points - not as good as the age matched peers but significantly better than their performance matched peers.

There is a need for many more descriptive studies of atypical development

In addition to the data on normal development, many of the participants felt that it was equally important to obtain reliable and comprehensive data on the patterns of atypical development that are found in individuals with cognitive handicaps. Some of the questions they felt it important to get answers to in this area were questions such as what milestones can the parent expect their cognitively impaired child to achieve, what plateaus are likely to be encountered, how will the introduction of AAC systems alter the development path, does the impact of the AAC system depend on the type of system introduced and the age at which it is introduced.

There are no explicit cognitive levels or functions that have been established as being necessary prerequisites for the successful use of specific types of AAC systems.

There appeared to be near unanimity on this particular issue. Most participants felt that the objective of establishing concrete, measureable cognitive prerequisites related to each of the different classes of AAC systems is a conceptually attractive goal (e.g. research that could lead to statements such as "It is necessary for the child to have achieved the developmental level of object permanence before that child can learn to use a Bliss symbol system"). None, however, felt that, at this stage, it is possible to do this. Many felt that such explicit relationships are not likely to be established in the near future. Not enough is known about the kinds of cognitive prerequisites a particular system requires, and, even if such prerequisites were known, there are no reliable and valid instruments for assessing cognitive level or functioning in the profoundly impaired individual. Some participants indicated a concern that the premature adoption of prerequisites could lead to situations where an individual would be denied the opportunity of trying a potentially useful system.

Research and clinical studies should provide much more descriptive information about the functional capabilities of the subjets.

The studies in the AAC literature of cognitively impaired individuals usually report only some very basic descriptive information about cognitive capabilities of the subjects in their study (e.g. performance IQ and perhaps some Piagetian developmental measures). While this information may be quite useful for normative purposes, it is of very little value in helping the clinician decide how the subjects in the study relate to the individuals in his or her case load. Most studies provide no information at all about what is perhaps the most important, namely, how well the individual is able to handle the communication demands posed by his or her day to day living situation before and after intervention. The participants called for a much richer description of the subjects involved in AAC evaluations, and, in particular, an increased focus on assessing the subjects in terms of their ability to meet the day to day communication demands of their living environment.

When doing research in the uses of AAC with cognitively impaired individuals, the enormous heterogeneity of the subject population must be taken into account.

A number of issues were discussed in relation to the great heterogeneity of the population of individuals with profound cognitive impairments. One was related to point four above: If we are able to make any generalizations at all, there has to be a much fuller description of the subject's functional communication capabilities than has been the case in prior research and clinical evaluations. The second conclusion was the great caution that must be exercised when trying to generalize from the subjetcs in a given research or clinical evaluation to the population of cognitively handicapped individuals at large. In all probability, the effectiveness of a particular system and training method will depend critically on the specific characteristics of the user. The third issue raised by the participants on this general topic was that research on intervention strategies should explicitly take into account the great variability in learner characteristics in their choice of measures and of research design when trying to evaluate the effectiveness of an AAC system or training program. In many situations, case study methods or single subject designs should be the designs of choice.

When setting up an evaluation study of individuals with cognitive handicaps, the effectiveness of the AAC system should be assessed in a situation that is a close to the situation in which it is intended to be used.

One of the most difficult things to accomplish with an individual who has profound cognitive impairments is the transfer of learning to new situations. Individuals may perform perfectly well in the test environment only to fail totally when they try to use their system in a different situation. Moreover, the target environment includes not only the physical surroundings with all its natural distractions but also the people with whom the individual will normally be interacting. Communicative competence depends as much on the skill of the person who is interacting with the AAC user as it does on the skill of the AAC user or the effectiveness of the AAC system itself.

In research and evaluation studies, the intuitions of the clinician should be honoured as much as the empirical data.

In many situations the clinician has a very good idea of what system is best for a given individual even though there may not be empirical data to support the clinician's conclusion. If they are reported at all, the clinician's intuitions tend to be discounted, in many cases because they are not easily quantifiable. The participants disagreed strongly with this.

They felt that the researcher's job should be to try to capture and report these intuitions in a systematic way wherever possible and make them an important party of the overall evaluation.

In spite of the many issues and problems raised by the participants, the general tenor of the discussion was very positive. There was agreement that research into the use of AAC systems with individuals with profound cognitive impairments has played a very important role in helping to improve the systems and service delivery. The expectations are that research would probably play an even more central role in continued development in the future.

SESSION 5

METHODOLOGICAL ISSUES IN THE STUDY OF LANGUAGE DEVELOPMENT AMONG CHILDREN USING AIDED LANGUAGE

ISSUE PAPER

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Lack of speech is not a disease (although it may be the result of one) that can be treated. For most people who lack the ability to speak, it is a stable condition that they will have to adapt to by learning a non-vocal communication system. Growing up with a communication aid and becoming an aided speaker is a result of developmental processes that are both similar and different from the processes of learning to speak. For example, aided language development may be regarded as "graphological development". This may be more discontinuous than vocal language development, since there are significant differences between the final achievement, orthographic writing, and intermediate stages, e.g. use of pictures, PIC or Bliss.

Today, there is no need to demonstrate that it is possible to understand speech without the ability to speak (cf. Lenneberg, 1962). New and more advanced questions are raised, but there is very little research, or even discussion of aided language development outside an intervention framework. This determines the theoretical basis and the issues that are discussed.

In this introduction, I will raise issues related to the general framework of the research, methodological approaches, comparisons between aided and non-aided speakers, and representativeness of aided language samples.

The general framework

Research on unusual language development is part of a general effort to understand language development. Although language forms differ, there is no difference between the principles governing the development of a child learning to speak and a child learning aided language. As pointed out by Lenneberg (1967), the study of unusual language development is a valuable source of knowledge for understanding language. Such studies may test the explanatory power of a theory or model. In some ways, the role of unusual language development in language research is analogous to the role of split brain operations in brain research. Such operations have provided information about how the brain functions under unusual circumstances, i.e. when the two hemispheres - that have evolved to work together - are separated. This information has contributed significantly to the understanding of cerebral functioning.

The study of unusual language is not always a search for inferior performance, as has been demonstrated in sign language research. Learning aided communication implies a special learning situation, which may be an advantage in some areas. For example, the use of analogies in aided language (cf. von Tetzchner, 1988) put a great demand on the

ability to take different perspectives. There is a general discussion about how experience influences this ability (cf. Donaldson, 1978), and the performance of children who have grown up with graphic sign systems may shed light on this issue. The difference between what aided speakers hear and what they express may lead to new understanding concerning the relationship between language comprehension and production in general.

Although there are similarities in methodology and objects of study, many of the issues in intervention research and language acquisition research are quite different. In intervention research, the main focus is on the effects different intervention programs have on development. In language development research, the focus is on the description of development and possible relationships between different linguistic and developmental measures. Twenty years ago, research on the sign languages of the deaf increased dramatically. The educational emphasis, which regarded signing only from the point of view of vocal language, was abandoned. This extended the scope of the research, and led to a great number of studies that focused on the special characteristics of manual languages, and their implication for linguistic theory in general (e.g. Bellugi & Studdert-Kennedy, 1980; Klima & Bellugi, 1979; Siple, 1978). Today, a similar change of approach may positively influence research on aided language, and the understanding of its development.

There is also another reason for differentiating between developmental studies and intervention. Collaboration between practitioners and researchers is important. However, people who are responsible for the implementation of a program are often strongly engaged in its success. Therefore, it is preferable that developmental studies are made by people who are not responsible for the intervention, and who have no interest in the success of a particular program or methodology. The research questions should be formulated independently of the program goals.

Approaches

Most research on aided communication is based on observational studies, mainly in the classroom, for a very limited period of time. Although this kind of studies may be valuable, there is a need for other approaches. In particular, it is important to increase the variety of situations that are used. Too often, published studies are just descriptions of interesting clients. Projects must be properly designed and planned, whether they are observational or experimental. There are hardly any longitudinal or semi-longitudinal studies. In language development research, longitudinal studies, although limited in number, have been extremely important. They have provided a basis on which many experimental and short term observational studies are grounded. Aided language research lacks this basis. Also experimental studies are rare. Maybe the difficulties in communicating with the subjects scare experimenters away. Or maybe the communication problems take so much of the researchers' attention that the possibility of making other studies with aided speakers is overlooked. Within communication research, structured communication tasks may be very valuable. For example, the standard situation developed by Glucksberg and Krauss (1966) may be useful. Field experiments, combined with every-day observations, may also be a valuable approach. One may create "natural" encounters between communication aid users, and with different partners. One should take care not to study only communication behaviors that have been taught in the classroom. It is more important to obtain a variety of measures.

It has been advocated to focus on case studies (Crystal, 1986). Such studies are important, especially to ensure valid descriptions, i.e. descriptions that contain sufficient information to make comparisons with other children possible. However, there is a tendency to generalize findings and overlook individual characteristics. The state of the

art within aided language research is in many ways similar to the child language research of the sixties. At that time, there was an emphasis on the biological basis of language. Environmental differences were considered of minor importance. Research focused on similarities between children (e.g. Klima & Bellugi, 1964; McNeill, 1970). The result was that individual differences were disregarded as "noise". Developmental studies of the seventies and eighties have focused much more on differences between children, and have demonstrated much less regularity than assumed by the earlier researchers. To investigate individual differences, it is important to have group studies (longitudinally and cross sectionally). Case studies may to a certain extend be compared, but the methodology and the descriptions are rarely similar enough to make direct comparisons valid.

Comparisons

In natural language research, it has been discussed whether one should compare children's language to adults' use of language. For children using aided language, comparisons with adults' forms of aided language are not possible, due to the lack of adequate descriptions of language used by people who have grown up as aided speakers. Typically, children using aided language have been compared to speaking children. Such comparisons may fail to catch the system conveyed by the aided speakers' use of language. Further, one cannot assume that aided and speaking children have the same underlying conceptual systems, i.e. that it is only a matter of using different word forms.

Comparisons of aided and natural speakers are important, as well as comparisons of children using different systems. However, it is not clear what measures can be used in such comparisons. For example, there is no valid basis for matching the children's skills. For example, mean length of utterance (MLU) is a widely used measure of linguistic complexity in the early stages of language development (cf. Brown, 1973). It is also often used as a basis for matching children. For comparisons of children using aided communication and natural speech, it is meaningless. Size of expressive vocabulary differ widely between aided and non-aided speakers (von Tetzchner, 1988). In aided speech, two or more graphic signs may correspond to one spoken word or to a sentence, and the form and length of utterances are dependent on available vocabulary. Often, children are matched according to test performance. However, language tests, as well as other tests, are based on the assumption that performance on the test items predict performance in general. Thus, the performance on the test item in itself is not important, but the information it provides about the person's function in general is.

Among normally developing children, the assumption above is likely to be true, but this is not the case for children with unusual language development, since their experiences and behavioral skills are so different from the sample used for standardization of the test. For example, "Auditory reception" on the Illinois Test of Psycholinguistic Ability (Kirk, McCarthy & Kirk, 1968) measures the ability to answer yes-no questions, a linguistic practice that is used much more among non-speaking than speaking children. Thus, matching based on performance on this test may lead to overestimation of the aided communicators' language skills. Instead of comparing children, it may sometimes be better to compare situations instead of forms, i.e. to investigate how a communicative situation is handled by children with different communicative means. Degree of participation in different situations will differ. Thus, comparisons of means and relative performance in different situations may provide information both about language acquisition, and the life of aided speakers.

The role of language in language development is also of interest. One may compare the development of aided speakers in different language cultures, similar to the cross

linguistic research project in Berkeley. The coordination may be an ISAAC task. The use of language by aided speakers in cultures with "natural" logographic writing systems may increase the understanding of the role of the language system and form in language acquisition.

Representative language samples

In the study of language use, the validity of the observations depend on the representativeness of the language sample. Because aided speakers have fewer utterances per day, it may be extremely time consuming to obtain a representative language sample. Also, check lists may be of little value. These, similar to tests, are based on an assumption of a relationship between a specific observation and general development. The few studies on aided language development in the last ISAAC conference, all used free play, eating, or classroom situations. This practice may provide a misleading picture of the children's language use. Motor handicapped children have less play experience than children with normal motor skills, and because they may use their hands for both playing and communicating, they have particularly little experience in communicating while playing. Thus, this widely used situation in normal language research may not be equally useful in studying aided language development. Among motor handicapped children, active child-parent communication may be less related to play and other activities, but rather appear in special communication situations.

The classroom situation is the most often used paradigm in aided language research. However, conclusions are often drawn on speaking children's language performance in general, not on their use of language in similar situations. Since teachers always dominate the communication in classroom settings, the result may be an underestimation of the aided speaker's skills. Meal situations are popular in intervention. However, similar to play situations, it may be difficult to eat and communicate at the same time. In addition, meal conversations are rarely about the food that is eaten, but rather about other kinds of things. In many cases it is necessary to limit the number of situations used. The situations that are chosen in research, however, may not be optimal for gaining knowledge about aided language development. Further, it is not known how these situations relate to each other and language development in general.

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REACTANT PAPER 1

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Stephen von Tetzchner had provided us with many thoughtful questions and issues for discussion. I would like to amplify some of these points and raise additional questions and concerns.

Some general questions relative to AAC research

AAC language acquisition - Do we expect it to be conventional or atypical?

There certainly are many language researchers who would eloquently argue that there is a lawful evolutionary process that underlies language development. Very similar hierarchies of language development appear across individuals, even in instances of quite impoverished language learning environments. This has lead researchers to conclude that certain properties of language are more 'innate', and less influenced by specific environmental experiences. These properties appear 'resilient' across multiple conditions.

One might conclude, therefore, that children who are exposed to spoken language and given AAC systems would also acquire these 'resilient' aspects of language in a similar lawful manner in spite of productive differences. In demonstrating that knowledge productively, these children would obviously use different symbolic forms, and perhaps exhibit differing proportions of language behaviors. However, the general evolutionary process and end points would correlate with that observed in normal language acquisition.

Goldin-Meadow and Mylander (1990), among others, suggest that not all language parameters are equally robust and resilient to environmental influences. Some language behaviors are more fragile and therefore more prone to environmental and experiental differences. It may well be that the language learning environments and communication experiences of many of the children needing AAC are indeed different enough, or deprived enough, to produce 'atypical' patterns in communication development.

We are certainly aware from the studies of Moeller and Luetke-Stahlman (1990), Shere and Kastenbaum (1966), Wilcox, Kouri, and Caswell (1990) that the input provided to some children can be quite sparse, lack diversity, or have minimal semantic coherence relative to the child's intentions. It is also the case that many of the communication skills that need to be developed by some AAC children are rather unique or disproportionate in contrast to children acquiring verbal production. For example, the pragmatic use of prestored sentences; use of attributes and associated 'hints' to reference ideas unavailable in an AAC lexicon; the disproportionate percentage of yes/no questions asked of them; and the need to acquire the ability to follow adult-directed topics and extensions early.

Given this perspective, one could conjecture that language development in children using AAC would have some 'atypical' aspects and patterns as von Tetzchner suggests. In this case, the differences would not just be alternate modes/forms to express the natural hierarchy, or different proportions of specific communication behaviors. Rather, deviations or variations in the 'normal' language acquisition process would be exhibited. Those variations might occur within the hierarchical evolution of a specific aspect of language (e.g., development of semantic relations; syntax), or be reflected in an uneven, horizontal development across categories of behaviors that are usually developmentally correlated (e.g., specific semantic, syntactic, or pragmatic skills that generally co-exist at specific ages or MLU groupings). There have been enough suggestions of an atypical pattern to warrant examining this issue more clearly and fully.

What I would like to see at this important juncture in our inquiry, is an openness to the possibility of 'conventional' and 'atypical' development profiles. In order to capture the possibility of variations, researchers necessarily need to approach the study of AAC language acquisition with an open mind, and use descriptive methodologies. Longitudinal and in-depth behavioral studies of children language comprehension and production appear to be a rich productive source for that study.

Are we looking for an AAC development or multiple AAC development profiles?

AAC techniques are currently used with a highly diverse group of children. Among them, children with neuromuscular and structural deficits who often exhibit relatively intact cognitive skills; children with varying degrees of mental retardation; children who exhibit autism or specific language disorders; children with delayed speech development or severe phonological disorders; and, children with multiple handicaps, including sensory deficits. The language acquisition patterns of these disability groups are not uniform for children who are speaking (Johnston, 1982). It is quite likely that diverse development patterns will be observed in these subgroups using AAC systems as well.

It is also the case that AAC techniques, symbol forms, and devices have varying capabilities with regard to language production and communicative interaction. At present we do not know how these diverse capabilities influence the development that we see. It may be that a child producing language through an extremely slow scanning system demonstrates a very different profile than the child directly selecting or producing forms at a much faster rate. A child using a semantic based symbol system such as Blissymbolics may develop differently than a child using word picture symbols, or a child having access to a large percentage of whole, prestored sentences. Children with some concommittant verbal skills or rich gestural repertoires may evolve differently than the children who has minimal resources. As we explore the language development process, research needs to be highly aware of the differences in production options available to each individual child.

Which language development are we talking about?

Typically, the language development we are referring to is the comprehension and production of spoken language with its complex interplay of semantic, syntactic and pragmatic rules. In approaching the study of persons using AAC systems, it is tempting to view this as a parallel form of that language expression - one that is accomplished through an alternate symbol form and mode.

AAC systems, however, are not comparable to natural language expression in many respects (Kraat, 1985). In most cases, these children are attempting to express ideas and intentions through systems that have very restricted lexicons (selected by others), can be markedly slow, often require partner assistance, may have unique visual/graphic forms and combinations rules, and/or are less intelligible than natural speech. One can only conjecture about the 'child production rules' that might be required for competent AAC development. Comprehension using AAC modes may also have a qualitatively different structure. To date we have minimal information about the nature of adult input to AAC children needing to comprehend language via symbols, pictures, or signs. It is likely that this does not parallel spoken language. The Moeller and Luethe-Stahlman (1990) study of Signing Exact English in the homes of hearing-impaired children gives us a glimpse of that potential difference. We need to understand what AAC language rules and usage these children are attempting to understand.

It appears likely that children who are communicating through AAC systems may need to acquire two sets of comprehension and/or production abilities, or at least two-pronged abilities. These would include comprehension of spoken language, comprehension of AAC input, some knowledge of how people who talk are supposed to communicate, and production rules for effectively communicating through their available lexicon and system features. All are of interest.

Specific methodological concerns

We face enormous methodological challenges in the study of AAC language development. I would like to add some specific issues to the impressive list begun by von Tetzchner.

AAC productions do not necessarily represent the child's knowledge of language

Traditionally, children's linguistic output has heavily been used to document and outline stages in language development. Either emerging behaviors or a specified percentage of occurences of behaviors have been used as evidence of increased knowledge. In AAC productions, however, there appears to be a discrepancy between what an individual know and the nature of his/her utterances. One sees this dramatically in the performance of adults who were normal speakers and become AAC users because of neuromuscular disease. Communication production becomes adaptive to the available medium and its characteristics.

Children speaking through AAC produce utterances that are filtered through their available means and the communication strategies effective in using them. One certainly cannot assume that these productions are representative of what the child knows, or would say given his speech for one day. Recently, we were poignantly reminded of this discrepancy in our clinic. We observed two children (age 4 & 7) who rapidly became verbal after an extended period of language board use. As these children transitioned from board to speech, they produced verbal language that was quite dissimilar to their productions via their language boards. The 4 year old, for example, typically produced 'object' or 'actor' utterances when using his board even though the lexicon for more complete or grammatically complex utterances was known and available. In speaking, this child immediately produced a variety of complete and relatively complex grammatical structures. His board utterances remained unchanged during that transition time.

At this stage, we do not fully understand the relationship of a person's language knowledge to the AAC productions that we see. However, we have enough evidence to caution our use of AAC productions as representative of that knowledge.

Influence of training on production patterns observed

AAC production is not only influenced by the child's knowledge and the AAC system characteristics. It is also frequently shaped by months of 'communication training'. It is relatively rare that a child is provided with an AAC lexicon without also receiving specific training in communication production/use. Consequently the behaviors that we see are a combination of novel use and taught routines/uses. This poses a particular challenge for language researchers for whom the natural, evolutionary patterns of language are of primary interest.

The lack of an adult competency model for AAC

To date, we are far from a description of what AAC competency looks like, or agreement on how best to approach that investigation. We do, however, have a sense that this production has a special subset of communication rules and strategies that optimize it. There also appear to be limitations on what can effectively be accomplished in this medium in contract to natural speech.

Until we have a more definitive profile of adult AAC competency (or system-specific competencies), we do not have an understanding of what it is that children using AAC systems are supposed to develop over time. This leaves the study of productive development in AAC without an appropriate model.

The multi-modal and multi-partner nature of AAC communication

Recent studies of AAC communication highlight how multi-modal it is even at advanced language levels (Kraat, 1985, Light, 1988). Gestures, vocalizations and non-verbal behaviors are frequently interspersed with linguistic elements to code referents in the immediate environment, regulate interactions, add semantic meaning, or to speed up the communication process. These non-verbal and vocal behaviors are included in language transcription and coding schemas of normal children at very early levels of language development (e.g., pre-linguistic). However, speech comes to dominate over these gestures or vocal behaviors before they become too complex.

Researchers studying AAC communication need to develop schemas and coding systems for the non-verbal behaviors that occur. These are more semantically, pragmatically and grammatically complex than those observed at early stages of normal language development. The observations made of deaf children's novel gestures (Goldin-Meadow, 1987, Goldin-Meadow & Mylander, 1984) may lend a starting point.

Speaking partners often co-construct utterances with the AAC user. This may be in the form of guessing, confirming, elaborating, or paraphrasing after one or more message elements are produced. This co-construction may occur because of the lack of specific linguistic forms in the AAC lexicon; the particular indication technique that is used; or to speed up the overall communication act. These are not typical utterances or speaking turns. Without careful attention to how to code and analyze these co-constructed utterances, a skewed view of language production occurs. In interaction research, Marriner, Yorkston, and Farrier (1984) have suggested that the technical and communicative utterances be analyzed separately, and that the unit of analysis be the communicative act. This may facilitate the study of the older child or adolescent.

However, with young AAC children, the subjectivity involved in the prediction of intended communication acts and form is highly problematic.

An opportunity

As we begin to formulate research studies and develop a data base in AAC development, we are afforded an unique opportunity. We are not yet encumbered with a particular approach or framework for that investigation. We have an opportunity to step back and take a thoughtful look at available models, philosophies and methodologies in language development study across several disciplines. We are also in the unique position of being able to benefit from the suggestions, criticism, and methodological dilemmas of past research efforts in language acquisition (Chapman, 1982). The field needs to use this opportunity to extract those philosophies and methodologies that will best reflect this special form of communication development, and that will be most fruitful in displaying the unique accomplishments of children using AAC.

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REACTANT PAPER 2

Methodological approaches to AAC and other "technologies" of communication from a developmental perspective

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Introduction

The study of language development by children using Augmentative and Alternative Communication (AAC) systems is of course a paradoxical enterprise, since one main aspect of such studies, i.e. children's speech, is lacking or seriously disturbed. The paradox, however, has the advantage of highlighting principle aspects of communication and forms of communication which are of general interest. I will focus on such aspects, and thereby hope to place AAC into perspectives which might be fruitful for this field of research.

We would like children using AAC to reach the same language proficiency levels as able-bodied children, within the levels possible, with respect to the particular impairments of those children. If this is our goal, what are the means for achieving it and for establishing that we actually have achieved it? These are two major methodological problems, and I will address some aspects of both.

Furthermore, what we can hope to achieve in terms of language development can only be discussed in relation to what we consider essential in normal functioning. I will draw attention to one specific aspect of this very broad area. It falls within the domain of metalinguistics and metacognition. But first it is necessary to say a few words concerning normality in human communication, a topic which is unavoidable when discussing AAC.

Forms and technologies of communication

Spoken communication is usually considered a direct and normal way of expressing thoughts and feelings. The face-to-face spoken communication between people is a phenomenon which is transparent and taken for granted, in the sense that the means for communication, speech, is not reflected upon consciously. Such communication is normal in the sense that it develops naturally in a social context as a realization of a biological potential. I would like to suggest the possibility that children using AAC perhaps never experience communication with language as a transparent phenomenon in the way able-bodied children do. They are forced to communicate via external aids and techniques, and thereby to treat communicative messages as objects in very concrete ways. This is different from able-bodied children who can concentrate on communicative goals, rather than the communicative means, since they master spoken communication. Children using AAC, on the other hand, have to learn to master the external means before they can express their intentions and goals. This is of course a simplification, since they can use bodily communication, but one major reason for the development of

AAC is undoubtedly the difficulties of relying on bodily communication only, as a means of communication.

This is a reasonable way of arguing about what is normal and not in language development, but it does not solve the whole problem. Does it follow, for example that the stage of development when the kind of spoken linguistic communication we are familiar with appeared for the first time, is the normal one? This immediately raises the question of cultural aspects of communication. By the time linguistic communication developed among homo sapiens, there was certainly a cultural dimension of human activities.

Some researchers date the appearance of the human species to about 40 000 years ago, others considerably further back. The question of the first appearance of the human species is not of real importance. What is of interest is the fact that face-to-face spoken communication has been the primary mode of communication during the larger part of the existence of the human species, and in that sense, a normal mode of communication. We know very little, if anything, about the cultural variation of linguistic communication during prehistoric times. However, we know that a qualitative step was taken about 5000 years ago, when external media began to be used for communication, i.e., the beginning of reading and writing. When writing entered the historical scene, the cultural dimension became an aspect of human communication which differed from the characteristics of oral communication. It is no longer possible to talk about normal communication in any straightforward way. Writing is a cultural artifact, a "technical" innovation, which has developed into many variants of writing. It is a new way of preserving information and knowledge. Reading and writing are now normal in the sense that they are highly valued within certain cultures, i.e. they represent norms which should be striven for.

Therefore, one conclusion is that on a general level there is no difference between AAC and reading/writing. They represent cultural artifacts and technical innovations in the service of human communication. Undoubtedly there are arguments of the kind mentioned above for considering oral communication normal, but in literate cultures reading and writing are the characteristic modes of communication, in the sense that they are fundamental to the cultural features we associate with technically advanced societies. Therefore, literate people, in principle, communicate with an AAC system. Why is this an important observation? Because there are theories about the ways literacy, i.e., a technology of communication has influenced human communication and conceptions, which might be of relevance when studying AAC. The question is how, and if, the fact that some children use AAC in itself influences language and conceptual development.

"Talking" about communication and language

AAC is, thus, a cultural artifact and enters into central human activities as a means of communication. A methodological approach which stresses the conceptual characteristics of AAC seems fruitful. The focus of this suggestion would not, in the first place, be on piagetian-cognitive levels, or similar types of theories, but on AAC as a technology which interacts with the users, in as much as it potentially gives rise to reflections and conceptions about the means of communication. The analogy is the perspective on literacy advocated by David Olson (1977). This perspective implies that certain types of human communication viz. reading and writing with an alphabetical code, structure and, in particular, shape thinking about communication in crucial ways. Lexical items such as claim, state, assert, believe, infer, assume, are examples of concepts which might be facilitated by literacy (Olson & Astington, in press) and allow you to talk, and thereby to think about linguistic communication. It seems that this methodological approach could be challenging and fruitful when applied to AAC. It would make it necessary first to

develop a proper framework for conceptual characteristics of AAC, and secondly, techniques for studying them when used by communicatively handicapped children. These considerations are of course not special features of the perspective suggested here, but they do highlight the limits of communication. How can we know in what ways AAC-users conceive their communication, and what cognitive consequences a particular AAC system has when the communicative medium is the AAC system in question? Of particular methodological relevance to AAC, is a modification of the hypothesis suggested by Olson, viz. that one can be literate without being capable of reading and writing. This means that development of concepts typically connected to reading and writing, such as those mentioned above, might be possible through oral discourse and contrary to the suggestion that reading and writing directly facilitate the development of concepts about communication. A literate person would, in this perspective, be someone who can "participate in a certain form of discourse, whether one can read and write or not." (Olson & Astington, in press). However, we will never know whether this is the case for a nonspeaking child if we do not have access to an AAC system which allows such an ability to be expressed. Therefore, AAC is a sine qua non, but we must also have proper methods for studying the interdependence between the child's conceptual apparatus and the AAC system, or systems in question. In Hjelmquist, di Benedetto, and Hedelin (1990) we present an attempt to this end.

Another way of putting this is to say that AAC is a crucial means for learning, not only in the sense that it opens channels to the world, but also, and more importantly, that the characteristics of AAC influence the conceptual structure for which it is a means of communication. Whether this influence is trivial or not, is the really important question which must be asked. Does AAC allows a meta level of reasoning about communication and language? It is essential that it should do so, since that is what is offered able-bodied children who learn to read and write (irrespective of the possibility that such a meta level might develop in oral communication as well). The idea that children in literate Western societies change their perspective on language, from implicitly using it as a transparent medium for communication, to explicitly treating at as an object with specific characteristics, is therefore of relevance also for children using AAC.

AAC and literacy

While it is clear that most of us communicate by AAC, because we are literate people, it is not clear how to relate the qualified meaning of AAC, i.e. as a tool for communicatively handicapped children, neither to literacy, nor to spoken communication due among other things to the fact that AAC is not a well- defined concept.

One type of AAC is the technique which produces synthetic speech when the speaker uses written text as input (Hjelmquist, Dahlstrand, & Hedelin, 1990). This type of device represents the introduction of a specific interface between speaker and listener. Literacy is a precondition for this communication but otherwise "just" an alternative mode of presentation. This represents a solution which in principle seems attractive to a child who cannot speak, i.e., if he or she can read and write. In practice this is, of course, not the case, since situations requiring speech are not suitable for exercising literacy skills. Writing is a slow process, and awkward for interactive purposes.

Since alphabetic writing is slow, AAC offers other possibilities in terms of sign systems of different kinds. Keyboards with Blissymbols is one example. Rapidity of communication might be one reason for using this device. However, the user's intellectual abilities could also be an important factor. This points to another aspect of AAC, its potential as an "easier" way of communication. Many non-speaking children also have cognitive limitations which present problems for acquiring communicative

abilities. From this perspective, AAC can offer alternative literacies. This gives us a first rough classification of AAC, viz

a. As a mediator of "standard" communication

b. As a simplifier of communication, due to practical considerations or to the cognitive level of the user

In the first case, a), we have, among other things, devices which convert text to speech synthesis, and similar devices for handling orthography which a non-speaking child can produce. In the second case, we have a number of systems which are "short-hands" and simplifications, for practical or cognitive reasons (Bliss, Pictogram etc).

However, the concept alternative literacy is not only relevant to AAC, since literacy is not a well-defined concept with respect to ordinary reading and writing. A wide range of cross-cultural research shows that literacy and the functions of literacy, are highly variable phenomena (Scribner & Cole, 1981). This ties in with the suggestion that what we typically associate with literacy, is the ability to reason about communication in certain ways and that this could be accomplished on the basis of oral discourse only (Olson & Astington, in press).

Conclusion

Literacy as a technology of whatever kind is not suited as a substitute for spoken communication. Historically, literacy was developed for different purposes, freeing it from the constraints of social interaction. Some of these constraints include rapidity, immediate feedback, and speech as an integrated part of the whole communication event, including bodily communication. Characteristic for many people with speech communication problems is that they are poor at expressive bodily communication as well. Paradoxically, children with severe motoric problems therefore are more or less forced into using some kind of "literacy" communication. They have to externalize their communication, and make communication an object of reflection in ways which are not necessary for able-bodied children.

On the other hand, a positive conclusion which resulted from what has been briefly discussed above, with respect to literacy and conceptual development, is that the oral discourse directed to a child using AAC could be extremely important. This is so since the type of discourse which allows talking and thinking about communication might develop independently of the encoding and decoding activities associated with writing och reading with an alphabetic code. If, and how, the development of this type of discourse is influenced by AAC, remains an important problem.

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SUMMARY OF THE DISCUSSION: METHODOLOGICAL ISSUES IN THE STUDY OF LANGUAGE DEVELOPMENT FOR CHILDREN USING AAC SYSTEMS

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Stephen von Tetzchner started his presentation by emphasizing that the state of the art in the study of language development among children using aided language is at an initial level. He meant that we must be aware that the major questions to be asked in the area still are under development, and that a metatheoretical perspective is necessary. However, he claimed that the framework must be part of efforts to understand language development in general. Deepened knowledge about differences between development in an aided speaker and a non-aided speaker may lead to new understanding about language development in general. He also argued that now is the time to look at the area from a distance and not be too result-oriented.There is a need for an elaboration of the theoretical framework in this area.

Arlene Kraat posed the question "Why do we want to study language development in the first place"? She also asked whether we are interested in language development in general or in language development with AAC users. Should we be more interested in communication development, rather than language development?

Erland Hjelmquist discussed the question of what kind of metalanguage AAC gives rise to, and also the importance of metalanguage for language development.

The question of communication versus language development was central in the general discussion. Participants argued that it is important to start looking at the communication process, and how language grows within that process. It was also emphasized by a number of participants that the experiences of children who use AAC are different from those of children without impairments, and that we must learn how this difference influences the development of language. Future research efforts should be directed to this question. For example descriptive studies of the environment for AAC users are needed in order to gain knowledge about how experiences may differ for children using AAC. The relation between the environment and what the child does is also important to consider.

Participants noted that there are different populations of children using AAC, and that the communication and language development in these populations of children differ. The development of children with physical handicaps and no cognitive deficit is certainly different from that of children with physical handicaps and cognitive deficits, and the development of children with mental retardation differs from that of children with language disorders. Thus, we should be cautious about extrapolations depending on differences in samples.

A number of discussants argued that there has been too much emphasis on language production in relation to language comprehension. This raised the question of how to study comprehension in AAC children, and also how much evidence we have to suggest differences in comprehension between AAC children and speaking children. This led to a discussion about differences and similarities. There should be cautions not to make premature presumptions.It was emphasized that we are now beginning to have tools to

observe both production and comprehension of language, and that systematic observations are needed. Good descriptions and careful and thorough documentation is also necessary for futher development in this area.

Steven von Tetzchner concluded the discussion by making the analogy that we are now in the stage of peering through small holes, and that what we see depends on the hole we are looking into. In the future we need to integrate the accumulated knowledge and develop good theoretical models.

Important issues for future research are;

* The critical subject variables in language production and comprehension that we should strive to report;

* Methods for studying comprehension in AAC children;

* Differences in comprehension between AAC children and speaking children;

* The relation between comprehension and the use of AAC systems;

* The use of compensatory strategies;

* Methodologies for descriptive studies of the language environment

* The structure of different languages and the relation to language development and the use of aided systems;

* The design of "devices" to give the child power over language acquisition, for example "babble-boards"; and

* Longitudinal descriptive studies as a basis for collaboration and future research.

To sum up, the state of the art is that we are beginning to develop tools for research. What is needed now is systematic observation and good goal descriptions. In the future, integration of the bits and pieces of accumulated knowledge is of high priority, and I feel confident that the research efforts to come in the years ahead will result in a more integrated picture of the language development in children that use aided language.

Finally, Lyle Lloyd encouraged the participants to use the journal of Augmentative and Alternative Communication and the ISAAC Bulletin as a basis for sharing between and within disciplines.

SESSION 6

SPEECH TECHNOLOGY- CROSS FERTILIZATION BETWEEN RESEARCH FOR THE DISABLED AND THE NON-DISABLED

ISSUE PAPER

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Disabled people can benefit greatly from "spin-off" from research and development which is unconnected with their particular requirements. In addition, and less often appreciated, however, is that the lessons learnt from the design of systems for disabled people, and also products which have been developed for them, can be of subsequential benefit to the general field of human computer interface design. This is particularly relevant to speech technology research. Close links should be formed between these two design and development disciplines as this would be to the mutual advantage of both.

Parallels between the disabled and the able-bodied

There are many parallels between the problems experienced by the able-bodied and the disabled, and it is appropriate that these should be exploited as much as possible. In functional terms, disabled people are not qualitatively different from the able-bodied - they are simply further away from the mean of human abilities than are the majority. Disabled people can benefit from general technological advances, but it is also true that the results from application research for the disabled can be of substantial benefit to other more commercial developments. This "spin-off" is due to a number of reasons:

* The needs of the disabled are, in general, only an exaggeration of those of the able-bodied. Designs which take into account the needs of disabled people can thus often produce a better product for the able-bodied, as well as for those temporarily or permanently further away from the 'average' person.

* A consideration of the needs of disabled people can bring into focus the real needs of human beings. (These are often concealed when the customer is as versatile and pampered as the average citizen of a developed country).

* Research into extra-ordinary conditions can assist in investigations of the nature of human processes.

* Able-bodied people can be handicapped by their environment in exactly the same way as are disabled people. Extreme environments can produce obvious impairment of function.

Table 1 gives some examples:

Table 1. Environments which handicap the able-bodied

Environmental factors	Impairment caused by environment
Noise Large distances Protective helmets	Hearing impairment
Low light levels Fog Undersea	Sight impairment
Protective clothing Cold Undersea Space	Motor impairment
Stress Danger	Cognitive impairment
Large distances Rough terrain	Mobility impairment

An extreme example of the above, is a soldier on the battlefield who is blinded by smoke, deafened by gun fire, cannot be heard by his comrades, is lying in two feet of mud in a flack jacket (thus having little mobililty and limited manupulative skills), and is cognitive impaired due to sheer terror and/or shell shock. This is before he is injured!

Which way the spin-off?

There are many examples where the original driving force for technological developments came from the needs of disabled people. The most fabulous, and ironic, is the original impetus for the work of Alexander Graham Bell which led to the telephone. Other examples include the cassette tape recorder and the microgroove record which were both developed for the blind. More recent examples are a speech transcription system developed in the U.K. originally for the deaf now being used for court reporting, and the use in speech research of equipment originally developed for speech therapy. Also, the first reported work on the addition of emotion to synthetic speech was driven by the needs of non-vocal people.

People with communication dysfunction can and have benefitted from technological advances, particularly the developments in speech syntheses techniques. With current funding arrangements, however, it is unlikely that rehabilitation research budgets can support fundamental work in this field. Nevertheless there are close parallels between the requirements for speech technology within rehabilitation and those of more main stream application areas. Table 2 indicates some of these parallels.

Table 2. Application Areas in Speech Research

Commercial Application areas	Rehabilitation Application areas
Information presentation without the need for a visual display	
* Telephone access to data bases * Alarm systems * 'Eyes busy' systems * Talking toys	*Reading systems for the blind *AAC devices for the non-vocal * Talking books calculators, and other equipment
Hands-off data input	
* Parcel sorting * Telephone access to data	*Computer access for motor typewriter * Listening disability *Environmental control bases
'Natural' interfaces between people and computers	
* Natural language systems * Dialogue design for speech input/output systems * Systems for naive users	* AAC devices for the non-vocal * Systems for language and cognitive dysfunction

There is a wealth of research opportunities in application of speech technology within rehabilitation which would provide valuable insights for speech researchers. As can be seen, the field of augmentative and alternative communication figures prominently in these lists, and there would be many advantages in speech technology researchers linking their research needs with those of researchers in the AAC field.

Research questions in common

The application areas for speech research in commercial environments are paralleled by similar application areas within rehabilitation, and in particular AAC. It is thus not surprising that there is substantial overlap in the research goals within these two application areas. Some of the research questions which are being asked in both fields are shown in Table 3.

Table 3. Some Research Questions common to Commercial and AAC Speech Research

What factors control the intelligibility of (natural and synthetic) speech? How can we improve the naturalness of speech? How can we improve the acceptability of synthetic speech?
What causes breakdown in speech communication? How to repair breakdowns in conversation?
What are the effects of communicating via synthesized rather than natural speech? What are the effects of limited vocubalary on speech communication? What are the effects of poor recognition performance on speech communication?
What dialogue designs encourage spoken communication? What are the relationsships between semantics and pragmatics in spoken communication?

Conclusions

Speech communication is a very complex field of research. The experience of disabled people trying to communicate when normal speech is not possible can tell us a great deal about this communication modality, and much of this is not obvious. In order to provide appropriate prostheses for non-vocal people, bioengineers and clinicians have to try to understand the nature of speech communication at a deep level. The insights which they have had, and the models which they have developed of speech communication, are very valuable when considering how best to provide interactive systems with appropriate dialogues for human-computer interaction via voice.

The feedback from the results of studies of extra-ordinary conditions can be of great value in our progress towards a general understanding of speech commmunication, and thus our development of new improved speech analysis and synthesis techniques and of designs for spoken diaglogue. An integrated consideration of the needs of both the able-bodied and the disabled is strongly recommended. It produces a symbiosis of ideas which can be of benefit to all in this exciting and worthwhile field.

REACTANT PAPER 1

Cross fertilization is nice ... but where's the fertilizer?

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Discussion

Professor Newell's paper "Speech Technology: Cross Fertilization between Research for the disabled and the non-disabled" begins with a discussion of how the community of people with disabilities should be able to derive "spin-off" benefits from research in general, and in particular suggests that close links should be formed between the two disciplines of human computer interface design, and augmentative and alternative communication (AAC).

We agree with that concept and statement, but what does it really mean or imply? How can such links be formed so that both disciplines can benefit from each other? Are there professional types and companies who do it? Is it easy to say, but another thing to make it work? Oh... and yes, do the links formed between the two disciplines of human computer interface design and AAC matter in the daily lives of individuals who are speech impaired?

We are talking about curb cuts and velcro, right? Curb cuts for people with disabilities have turned out to be a tremendous benefit to the general population also. Likewise though in the other direction was the development of velcro for other uses but which is so useful now in the AAC world.

In preparing this paper, we talked with several company presidents of speech I/O companies in the U.S. One president told us he had really thought a lot about the speech market for people with disabilities, especially, in his case, speech recognition. He said his market research showed if they could reduce the price about five fold or 80%, they could bring a useful product to the market that many users would buy. He also said there was no profit left if they did that. The company would lose money ... end of discussion. Notice that he did not say he couldn't do it, but that a simple matter of economics was the controlling factor. This is certainly understandable.

Another company president, Dr. Sam Viglione, now with McDonnell Douglas Aircraft Company, told us he also had been interested in applying speech I/O technology to the needs of people with disabilities. Dr. Viglione is president of the American Voice I/O Society, an expert in pattern recognition techniques, and former president of Interstate Voice Products in Anaheim, California, which concentrated on the speech recognition side of the industry. Sam has experience over the years providing people with disabilities with equipment. He made several points:

1. Tons of research can be done. Governments, major companies, grants, and so on are often willing to fund research to apply speech I/O technologies to meet the needs of people with disabilities.

2. It is even easy to develop durable, reliable products once you have research backing from grants and research contracts. In fact, the commercial sector's resources systematically apply the field of human computer interface design to product development.

3. It is harder to get the product to the market place and sold. However, people, agencies, institutions do manage to come up with the money for devices that provide speech I/O even if government entities do not. To this point then, Sam said, it is still worth it, even it there is not much potential for profit.

4. The real problem for the commercial sector (the burnout factor in this cross fertilization process) is the follow along training and support of the client, the care givers, (we'll add professionals to his list) and maintenance of the equipment.

"That," Dr. Viglione says, "is what seems to kill every effort to really get speech recognition off the ground and applied with success to people with disabilities." Maybe we need to think about and approach the cross fertilization of speech technology and AAC with a more business like approach from the "beginning"!

Let's take a moment and look at how AAC manufacturers proceed. The May, 1989 (Vol. 2, No. 3) issue of Augmentative Communication News reports the results of an industry wide survey of manufacturers of communication aids in the AAC field. The process of bringing a product to market is described. As part of this survey the natural cross fetilization between good human factors, design considerations of equipment, and product research and development was investigated. Did the manufacturers use human factors people and human computer interface designers in the design of their equipment? Did they know what a human factors engineer was (i.e., someone trained in usually engineering or psychology, with a thorough knowledge of vision, lighting, display design and layout principles, a knowledge of physiological and psychological capabilities and limitations of human beings, and so on)?

Most were not really sure what a human factors person was and only one had a part time human factors consultant. As the topic was discussed and it became clear that the contributions the human factors people can make to the field is in better training techniques, better equipment design and better manuals to provide the support so badly lacking as mentioned above by Dr. Viglione, most said someone like that would be helpful, but...they couldn' afford it.

We are back again to economics as a controlling element. In our first example, a non-AAC manufacturer of speech recognition equipment found economics to be a bounding factor to the solution. The same applies to the AAC manufacturers like Prentke Romich, Adaptive Communication Systems, Words +, Phonic Ear, Inc., and Zygo Co. who know very well the necessity of pouring enormous resources into consumer support mechanisms.

Cross fertilization is needed, but "where's the fertilizer?"

Finally, why are we talking about the need for speech technology in the first place? We ask this because the current technology can do a lot but one has to understand what it can do. One of the authors (Poock) presented another paper at ISAAC a few days ago, pointing out over ten human factors methodological use variables affecting speech recognition system to see if they get better performance by training it fast or slow, and then speaking to it fast or slow? etc. We have been called in as consultants on industrial applications where there was a problem and in 30 minutes were able to increase production 50% by showing them how to properly train and speak to that particular speech recognition system. The point here is that many speech I/O systems can be made

to work quite well if users (and professionals who serve them) learn how the systems work.

Perhaps our cross fertilization efforts should look for fertilizers that are more software rather than hard technology driven.

We suggest it may be time for funding organizations to give grants in a different manner. Whether it be a government or independent research organization in Sweden, Canada, Australia, the U.S. or whatever... we suggest funding agencies have a certain amount of money set aside which only be awarded to joint proposals from both the AAC field and the human computer interaction field for example. An AAC manufacturer would have to do joint research on an idea in cooperation with a university human factors group. An AAC researcher in a university would have to work with an AAC manufacturer to get the manufacturer's input and so on. When there is money to be awarded and granted, individuals and organizations try to get it for themselves. How about requiring they must do it jointly, and thus bring together speech I/O scientists, researchers and manufacturers with their counterparts in the AAC field? This could be one way to start some cross fertilization between research communities for the disabled and non-disabled as Professor Newell suggested would be of mutual benefit to both.

Which way the spin off?

In this section of his paper, Professor Newell suggested there would be many advantages for speech technology researchers to link their research needs with those of researchers in AAC. This is fine, but one could also say those researchers in AAC ought to link their research to those of the speech researchers. Whichever way it goes does not really matter ... the important thing is some linking take place, and the question then is how, as we have already pointed out above.

Dr. Tony Vitale of Digital Equipment Corporation's Assistive Technology Group, told us he would expect to see "spin off's" as pieces of technology but not necessarily products. The money that drives technology lies in the commercial domain. He said we might expect to see all personal computers equipped with speech I/O capability with some natural sounding speech output and emotion reflected in five years. Natural sounding speech, he believes, will come first followed later by additions of emotion to the natural speech. Projects addressing some of the research questions listed by Professor Newell are major undertakings and may benefit greatly from a cross fertilization. However, as Professor Newell points out, there is a need to "understand the nature of speech communication at a deep level." For example, before we can "improve the naturalness of speech" we need to understand what exactly are the characteristic of acoustic signals that result in "natural" speech. It is easy to say we want natural speech but how will we know when we have it? Tony knew of Newell's work on emotion, and also mentioned some very good work that was done by Cahn (1990) of MIT on implementing emotional effects.

It is also our opinion that politics play a direct role in determining the successful contribution of speech I/O technology for AAC users. There is more chance for successful commercial enterprises and cross fertilization in countries where it has been mandated or decreed that the government will provide certain equipment for potential AAC users. That is not true in the U.S If it were to happen, it would open up millions of potential sales paid for by the government, and a lot of companies would see the potential for a profitable market. Then one could expect successful ventures in one country that would provide international spin offs of technology to other countries and thus help the world wide AAC community.

Another political trend may have an effect on cross fertilization ... the threat of world-wide peace ... ah, if it were only so. High tech companies who previously have

contracted with the Department of Defense in the United States, are beginning to look around for new opportunities. Already, they are looking in our direction! Let's hope they like the smell of our fertilizer!

In our interviews, it was pointed out that one of the most potentially successful areas for introducing speech I/O technology would be in rehabilitation hospitals, veterans' hospitals, etc., i.e., centers of excellence. Here clients could use current technology, help test and evaluate new technology, and in most cases have technical support available. At the same time, large hospitals can pass on the costs of support people which a small manufacturer may not be able to without raising prices. We know. We also know that center-based service delivery in AAC is not what is needed for successful technology application. What is needed is support provided to individuals and their caregivers within the environment people will be using their technology. Again, it may be the cross fertilization between soft (instructional) technologies (e.g., distance learning approaches) that makes the difference.

As we were thinking about this section, we started dreaming about a support person who might travel a given geographical area for equipment maintenance support. In the area where we live, the person might be co-funded by the Departments of Education and Rehabilitation at the state level. Both agencies give lots of money for equipment to people with disabilities. The scenario still is people buy equipment and a year later it is not being used because it is broken, someone couldn't make it work right, etc. Money has gone down the drain.

Living in California, we will call this new support person position a "travelling guru". Our travelling guru (TG) will be knowledgeable in PC computers and most AAC devices on the market and will be paid by the state to travel say, every two weeks, from Southern California to Northern California and back again. The person's duty will be to check out and fix peoples' equipment and computer programs for example. In the state there will be a central point which anybody can call to say they are having a problem with their AAC device. (In the U.S. the contact point might be the lead agencies who are receiving monies from the government under the Technology Assistance Act of 1989, P.L. 100-407.) The TG is notified and within a week, let's say, the client will probably get some help.

We suggest this knowing full well our current manufacturers are very helpful and willing to solve a problem. We also know families are embarrassed to call a manufacturer, even on an 800 number toll free. Hence it is not unusual for a client to have received no help on a problem that our TG could solve in minutes. We have seen many cases where a client's problem could have been solved in a matter of minutes, but the family spent 3 weeks "not solving it" because they had not asked what a "C" drive was when the manufacturer talked about it on the phone. The main job of the TG is to help make clients more productive. If we can do that, persons with even severe disabilities can participate in their education, their community, and bring home a pay check or earn some support. They will be happier, family members will be happier, and our government agencies will not have to pay out as much to the client over their lifetime. In other words, our TG has now provided a service and also reduced the total rehabilitation costs.

Summary

We would make the case as Professor Newell does in his summary by saying a symbiosis of ideas between disciplines can be very useful. But even if they are useful and productive, and the greatest product ever invented does indeed occur for use in AAC, it can and will fall flat on its face if the underlying support structure for the technology and product is missing. Yes, there is a need for more cooperative research. Spin offs can and hopefully, will occur. Professor Newell has asked for more cross fertilization. We hope we have provided some fertilizer!

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REACTANT PAPER 2

Fertilizers for Speech Technology Researchers

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Introduction

I have been asked by the symposium organizers to give reactions to Alan Newell's paper, entitled "Speech technology: Cross fertilization between research for the disabled and non-disabled. From my perspective the ideas in the paper are largely uncontroversial. Hence, my reactions will not be contrastive to the opinions put forward by Newell but more geared towards expanding on some of the topics and sharing some experience from research in speech technology. Some thoughts will also be given on how future research and development could be organized to improve the cross fertilization that I think, to a large extent, is here already.

Speech technology - special needs for the disabled?

Speech research is by nature a very cross-disciplinary activity. Many speech technology projects have failed because this fact has not been realized. The strongest driving force in most research is the urge to contribute to the basic understanding of the studied phenomena, in our case the human speech communication process. In this perspective the applications, for disabled or non-disabled, are not the primary concern of the researcher. Most of the knowledge that is generated is neutral in relation to the application.

Most of the basic speech technology developed, in terms of algorithms and systems, is also general and can be integrated in a variety of different applications. So one question is: how special are the needs for the different groups of disabled persons? I want to argue that the needs by and large coincide with the needs in general applications. More natural-sounding speech synthesis, adaptable to different voices and different speaking styles that could convey attitudes and emotions (Carlsson, Granström & Hunnicutt, 1990, Carlsson, Granström & Karlsson, 1990, Galyas & Rosengren, 1989) is certainly of interest in a speech prosthesis. However, it is equally important in "translating telephones," where a conversation has to be synthesized in a different language while retaining the mood, intention and voice characteristics of the original speakers.

Of course there exist special application needs that require special, focused research initiatives such as the need for super-human speaking rates of speech synthesis for the blind (Granström, 1989), but the general feeling is that the possible cross fertilization comes more into play when developing applications using speech technology.

Technical aids as vanguard applications

Early market projection for speech technology forecasted multi-billion-dollar sales for 1990. In that perspective reality looks rather gloomy today. The only application area (if it was even mentioned) that developed according to expectations is the application for the disabled. There are many reasons for this. Introducing a radically new technology in

competition with existing solutions in the public domain puts great demands on careful design of products and applications, powerful marketing and excellent support.

The use in AAC products offers an interesting alternative. The need is often indisputable, the customers easily identified, and it is possible to start the operation on a smaller scale. It is still true that Infovox AB, that in 1984 commercialized the speech recognition and the multi-lingual text-to-speech systems originally developed in our department, get the major part of its revenues from sales connected to applications for the handicapped (Magnusson et al., 1984).

Accepting the old truth that most people are handicapped in some situations, one could expect that applications for the disabled could pave the way to more general use. One example from another area is DDN, the digital newspaper for the blind that potentially could be of interest to people that spend much time driving. Another example is the translation of Blissymbol strings to natural spoken or written language (Hunnicut, 1986). This application has the virtue of being a limited domain, where an extensive dictionary can support the syntactic analysis. Eventually experience gained in this project will be of benefit for a more general linguistic component in the open-ended text-to-speech system.

Is funding available?

Substantial resources are created for speech technology in national and international research programs. In Europe this is done within organizations like Esprit and COST. The latter already has projects specifically concerned with the need of the disabled and there are advanced plans for a large rehabilitation research initiative within EEC, following the small scale "concerted actions". The European Science Foundation (ESF) has proposed a multi-disciplinary "network on communication and handicap".

On the Nordic scene, the Nordic Committee on Disability has for several years supported cooperative projects. We have been involved in projects adpting the text-to-speech system to Danish, Norwegian and Icelandic for the disabled (Granström et al., 1987), Granström & Gustafson, 1986, Carlsson et al., 1990). The alternative - starting national projects from scratch - would have been much slower and economically prohibitive for such small language communities.

Side effects of the coordinated research are of course that application development could be shared and that the market base for the involved industries is expanded. An example from Sweden, showing the increased acceptance of the research needs, is that both STU, the Swedish Board for Technical Development, and FRN, the Swedish Council for Coordinating of Research have programs for support to handicap-oriented research. Hence, the economic base for conducting cross disciplinary research in this area seems to be expanding.

Where are the problems?

As you probably have noticed I have a rather positive view on the general problem area of speech technology research and its ultimate use for disabled persons. This is not to say that we live in an ideal world. Things could certainly be improved, but I think that most of the problems lie outside research proper. One key issue is to get industrial involvement.

Prototyping, manufacturing, distribution, customer training and maintenance are reported to be difficult and different from many other market areas known by potential industry. Making the market base larger by making devises adaptable to different needs and languages would improve the situation. Representing a small language community, I

think it is appropriate to stress this need in an English speaking symposium. Some light is perceived in this area looking at the rather recent involvement of companies like IBM, with products like the Screen Reader and Speech Viewer, and Digital, with its handicap division.

While most things look promising, there is still one single activity that I want to bring up, that I think is of paramount importance for research and development in our area. That is recruiting researchers and creating an appropritate research infrastructure. In the university environment, recruiting has been a problem for some time, due to low salaries and job security. Creating academic positions specifically aimed at solving problems for the disabled within or in close contact with research departments that are strong in basic speech research will certainly serve that longterm purpose.

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SUMMARY OF THE DISCUSSION: SPEECH TECHNOLOGY: CROSS FERTILIZATION BETWEEN RESEARCH FOR DISABLED AND NONDISABLED PERSONS

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The discussion following the presentation by Alan Newell and the prepared reactions by Sarah Blackstone and Gary Poock and by Björn Granström revolved mainly around conditions for research and development work: how to make it more efficient, how to utilize the results, how to improve the conditions for researchers and how to boost the whole research area.

From Research & Development to Market

Broader, stronger market

It was pointed out that even though the market for assistive devices for the disabled is growing in the world, between 20% and 100% in different countries, the market has to be stronger in order to move R&D results into actual use. It was felt that professionals and users are inexperienced in taking on new technology and new devices and need more education.

Governments should be approached to take more responsibility for providing equipment to disabled persons. The analogy with the military system for promoting new technology was mentioned.

More support should go into adaptation of existing devices. It was suggested that an international fund be set up to support the necessary adaptations of assistive devices to different languages and cultures. This could be a task for the European Economic Community or the United Nations' Economic Commission for Europe.

Multidisciplinary R&D projects

In order to facilitate the transition of R&D projects into the marketplace, projects should be more multidisciplinary. Without disagreement, some discussants remarked that multidisciplinary projects may be more difficult to fund in countries where funding agencies follow traditional disciplines.

It was felt important that human factors specialists should be more involved in the projects.

It was also pointed out that early involvement of manufacturers in R&D projects will make it easier to transfer results into marketed products.

Better specifications

In order to arrive at the right products and the right adaptations, clinicians and researchers have to be able to formulate better product specifications, based on needs and on research results.

Telecommunications

It was pointed out that the largest area of application of speech technology is telecommunications systems. Companies and people in telecommunications should be made aware of the needs of disabled persons. It was remarked that there are several joint European projects with this objective.

Make general products accessible or adaptable

Another important way to implement results is to adapt products for the general, non-disabled market for use by disabled persons. It was felt that there must be better opportunities to do this. It was even suggested that all equipment produced for general use should be accessible by disabled persons.

Basic Research

No special needs for the disabled

Considering the basic speech technology research, it was felt that there are no special needs for disabled persons. The same basic research issues apply to both the disabled and the non-disabled population.

Funding is available

Most discussants felt that money is not a problem in basic research, that funding is available, at least for the general field of speech technology. However, it was pointed out that funding may be hard to find to try out new technology with different groups of disabled persons.

Good researchers are not available

If money is not a problem, most participants considered finding good researchers a serious problem. There is no career structure and most researchers work on short contracts with low salaries.

More efforts should be made to attract research students to the field. The potential is there; it is a relatively new area and it has real human value.

Interface between basic technology and user

Finally, there seemed to be agreement that the real problem is not the speech technology research but rather the interface between the technology and the user, in our case the disabled user.

That is where more research is needed, where funding is harder to find, where there must be a more multidisciplinary approach and where the market mechanisms must be changed.

CONCLUSIONS

THE FIRST ISAAC RESEARCH SYMPOSIUM IN AUGMENTATIVE AND ALTERNATIVE COMMUNICATION

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This report reflects the state of the art in AAC research from a worldwide perspective and from a number of related fields. It is interesting to note that the collective knowledge in these fields is so multifaceted, rich, and expansive. Each of the contributors has added valuable knowledge and has also illuminated and questioned relevant methodological issues. This report shows that we are now at the stage where we are beginning to understand what questions to ask in AAC research. The contributors emphasized the need to develop theoretically sound and well founded models for research, development work and intervention

The field of AAC does not exist in isolation. New knowledge and understanding may serve to enrich other fields of research and practice and vice versa. It is, however, important to be cautious and critical when integrating knowledge from other fields into the AAC field. The need for multiple perspectives in AAC research was stressed, for example data from normal language, communication and cognitive development are important in furthering our understanding of the development of disabled individuals.

Today we have reached the realization that the communication process is extremely complex. It is a dynamic process between individuals that occurs in a context and is accomplished by means of multiple modes. The need for including facilitators/ conversational partners in the study of communication was identified by a number of researchers. Contextual factors were also emphasized as being of major importance in the study of the communication process. Greater consideration must be paid to the perspective of the participants in the interactions. New methods for involving AAC users in the research process should be considered. Until today the third person perspective of the researcher has dominated. We have neglected consumer and partner perspectives.

Researchers at this conference agreed that there is a need for both qualitative and quantitative research and for the integration of the two perspectives. The use of qualitative research methods, such as a phenomenological studies, ethnographic studies and studies from a social anthropological perspective was suggested, as well as cross-cultural studies. Both applied and basic research are also needed in the AAC field, and multidisciplinary work is essential. The need for longitudinal studies of both typical and atypical cases was also stressed.

The issues of measurement and validity and reliability in AAC research was a focus of discussion from different perspectives. It is important to study interactions that are truly representative of the daily experiences of the participants. An emphasis on contextual factors was called for, especially in studies with multiply handicapped subjects.

Development of valid and reliable procedures for observation and data analysis was discussed. Careful sampling procedures, detailed descriptions of subject and dyad characteristics, thorough description of transcription and coding procedures, and careful documentation that allows for replication was demanded.

Individual differences in communication abilities and in the communication process were considered important topics for further studies. The least able individuals are underrepresented in studies in AAC. The lack of studies on communication by multi-handicapped subjects was stressed. Careful descriptive case studies, especially those focused on profoundly and severely handicapped individuals were demanded. Descriptive studies of competent and sucessful communication were also sought, so that we can learn to delineate the variables that are important for the development of good communication. Researchers were urged to share their mistakes and less successful studies as well as their successful studies. The use of single case studies was recommended as a good way to handle some of the methodological problems.

From a technical point of view it seems that the market for AAC equipment is growing today. The provision of AAC equipment varies in different parts of the world. There is a need for more education for both professionals and consultants regarding the systems available in this field. It was emphasized that cooperation between technicians and human factors specialists should be encouraged by all means. For creative technical developments, there is a need for valid product specifications based on the needs of the AAC users. Telecommunications was stressed as a new area of rapid development where speech technology is used. For further development, joint efforts across continents and countries is desirable.

The symposium identified a number of research priorities in AAC. This document is a starting point for future research. One of the most critical questions for the future is how to integrate the rich web of variables important for functional use of AAC. The ultimate goal for all researchers in AAC, whether in speech technology, psychology, education, computer technology or speech pathology, is to enable individuals with severe speech disabilities and communication disorders to participate in social interaction to the highest possible degree. To obtain this goal, it is important to consider the whole interaction process involving both the AAC user and other people that are part of the communicative interaction and also the devices used for communication. The symposium provided an excellent basis for future research and international cooperation, so that we can begin to meet this goal.

Enclosure

List of participants, research interests and background in AAC

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RESEARCHERS IN THE AAC FIELD - present at the ISAAC Research Symposium in Stockholm, August 1990

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Background in Research in AAC and interests
- Responsible for pregraduate, postgraduate training in AAC at the University
- Primary involvement in the use of symbol systems (eg Makaton) in schools
- Multilingualism and use of AAC strategies (eg symbol systems) in a residential setting
- Inservice training of teaching staff in AAC
- Symbol systems and use with facilitation & literacy

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Background in Research in AAC and interests
Since 1985 I have been involved in developing ideas for improving communication systems, particularly for helping users more fully to take part in social interaction. This has included work on conversation modelling, human/human and human/computer dialogues, and large scale text storage and retrieval.

Special interests:
- Conversation modelling
- AI techniques applied to AAC systems, in particular natural language processing, semantic and pragmatic modelling, simulation of cognitive tasks involved in communication.

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- Principal program manager
- Research and Development administration

AZEVEDO, LUIS, M.Sc., Researcher

Technical University of Lisbon
CAPS/Complexo I/Inst Sup Tecnico
Av. Rovisco Pais
1096 Lisboa Codex
Portugal

Phone 351 1 3524309
Fax 351-1-3523014

Background in Research in AAC and interests
Responsible for a project on "Non Vocal Communication". Responsible for project about "Implementation of AAC system in microcomputers".

Special interests:
- Graphic systems for non-vocal communication
- Technical aids for AAC

BALBI-KAYSER, MARGRITH, Ph D, Researcher

CH- 6370Stans
Tottikonstr. 2
Switzerland

Phone 041-61 68 56

Background in Research in AAC and interests
Companion in"Technische Kommunikationshilfen für lautsprechbehinderte Zerebralparetiker: Psycholinguistische, entwicklungspsychologische und sonderpädagogische Aspekte". Participa- tion in Sum...ier-Institute: "Introduction to Augmentative and Alternative Communication" AAC- Center, University of Lincoln Nebraska (Beukelman, Mirenda).

Special interests:
- Single case studies: methodological problems
- Cerebral palsy, mental handicap and severe handicap

BARRETT, KATHRYN, Head of speech pathology

Spastic Centre of N. S. W.
189 Allambie Road
Allambie Heights, N S W 2100
Australia

Phone (02) 451 9022
Fax (02) 451 4877

Background in Research in AAC and interests
No background in research but interested in clinical issues in AAC

BASIL, CARMEN, Professor in developmental psychology

Universitat de Barcelona
Dept de Psicologia Evolutiva i de l' educatio
Adolf Florensa s/n
08028 Barcelona
Spain

Phone (3)3346833
Fax (3)3347290

Background in Research in AAC and interests

Ph D thesis on "Social interaction in non-speaking severely handicapped children using communication boards". Currently involved in the project (sponsored by the Spanish Government via Dgicyt) "Interaction and language delvelopment by children using AAC; Design of language supportive environments". The research aims at a better understanding of interaction processes which enable communication and language acquisition.Similarities and differences in social interaction and learning conditions caused by the presence of a handicapped child will be studied. On that bases, language supportive environments will be designed. Longitudinal observational data will be collected during preschool ages.

Special interests:
- Interaction issues in the AAC field
- Language development by children using AAC systems
- Role of social interaction in the construction of different development skills in areas such as language, cognition and socialization
- Design of supportive environments for development improvement in children using AAC systems

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BEATTIE, WILLIAM, Research assistant

Microcomputer Centre
University of Dundee
Dundee, DD1 4HN
Scotland
United Kingdom

Phone 44 382 23181
Fax 44 382 23435

Background in Research in AAC and interests

Two years use of communication software in a special educational environment. Mainly concerned with the use of a predictive writing tool (PAL) to help children with physical disabilities or some form of language dysfunction.

Special interests:
- Prediction techniques
- Language dysfunction
- Speech output.

BEDROSIAN, JAN, Associate Professor.

Dalhousie University
School of Human Communication Disorders
5599, Fenwick Street
Halifax, Nova Scotia B3H 1 R2
Canada

Phone (902) 494-7052

Background in Research in AAC and interests

I have just completed a second investigation of the peer communicative interaction skills of AAC users. Steve Calculator, Linda Hoag and I are also conducting a series of investigations regarding perception of communicative competence in AAC users. My other research interests in AAC involve the development of intervention programs to facilitate peer communicative interaction skills using single subject designs.

BJÖRCK-ÅKESSON, EVA, Ph. D., Lecturer

University College of Jönköping
Box 1026
S-551 11 Jönköping
Sweden

Phone 46 36-15 77 97
Fax 46 36-15 77 18

Background in Research in AAC and interests

- Multidisciplinary project on communication aids for people with speech impairment
- Director of longitudinal project on development of communicative interaction in preschool children with physical handicaps (cerebral palsy) and their parents.

Special interests:

- Communicative competence and interaction.
- The role of the parent/facilitator in the communication process.
- Intervention programs for physically disabled children.
- Theories of development in children with disabilities.
- Educational programs in AAC.
- International cooperation.

BLACKOE, VIRGINIA, Chief speech therapist

St. George's Hosptial
Long Leys Road
Lincoln
United Kingdom

Phone 44 522 512 512
Fax 44 522 530 698

Background in Research in AAC and interests

This has taken the form to date of single case studies relating to differing disabilities and AAC systems. It is an area I wish to develop further and have the opportunity to do so through the communication aids centre.

Special interests:

- Development of effective AAC systems for differing client groups.
- Identification of effective training for carers/staff working with clients using AAC.
- Development of effective functional communication in AAC users.

BLACKSTONE SARAH, Ph. D., Clinician

1 Surf Way, Apt 215
Monterey, CA 93940
USA

Phone 408-649-3050

Background in Research in AAC and interests

Author - Augmentative Communication News - 6 issues/year , Clinician in private practice and President and CEO of Sunset Enterprises. Background in Interaction patterns of children using AAC and primary partners, effectiveness of clinical strategies, selection techniques for equipment and other assessment issues and application in educational settings.

Special interests:

- Service delivery in AAC
- Quality assurance in AAC
- Training strategies for partners (and users)
- Use of multimodalities
- Integration of AAC users in educational and vocational settings (also community)

BLOCKBERGER, SUSAN, M.A., Speech/language pathologist

Sunny Hill Hospital for Children
Dept of Communication Disorders
3644 Slocan Street
Vancouver, B C, V5M 3E4
Canada

Phone 604-434 1331
Fax 604-436 1743

Background in Research in AAC and interests

Speech/language pathologist, technical assistive devices service. One day per week of my position is stated for research. I have conducted two studies related to AAC, one on peer attitudes toward a child using various AAC techniques, and one survey comparing VOCA use by ambulatory vs nonambulatory children. I have submitted a grant to examine efficiency of 3 types of follow-up contact by the testiary centre following introduction of a technical aid into the community.

- The interplay between attitudes and expectations (of the AAC user, significant others, and society in general) and outcome of AAC use
- Service delivery issues - How can we be most effective and cost efficient in delivery of AAC
- VOCA use by autistic children
- Relationship between cognitive development and AAC and a specific way of exploring the relationship between cognition and language in general

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BLOUIN, MAURICE, Ph. D., Researcher

Centre François- Charon
525, Boul Hamel
Quebec, Quebec 61U 2S8
Canada

Phone 418-529-9141

Background in Research in AAC and interests

- Research in a Tehab center
- Research in Anthropology
- Director of a computer laboratory

Special interests:

- International classification of impairments
- Disabilities and handicaps
- Use of computers for superior functions
- Remediation, text production and literacy

BOOTH, LYNDA, Special education teacher

Microcomputer Centre
Dundee University
Dundee, DD1 4HN
Scotland
United Kingdom

Phone 0382-23181 x 4146
Fax 0382-23435

Background in Research in AAC and interests

Special education teacher seconded to Microcomputer centre. Two years evaluating software developed in Microcomputer Centre in educational setting. Special schools and mainstream taking part - physically handicapped children and language impaired children involved with the research project.

Special interests: Language dysfunction and Application of computers in special education.

BRAUN, URSULA, Ph.D. Student

Dortmund Universtiy
Triftweg 2
3548 Arolsen
West Germany

Phone 05636-1306

Background in Research in AAC and interests
Extensive 4-months AAC-tour through the US, since 1 1/2 years working on dissertation-research with focus on electronic voice output devices vs boards, trying to help establish AAC as a field in West Germany through ISAAC.

Special interests:
- Voice output communication aids
- Interaction research

BRODIN, JANE, Ph.D. Student, Researcher

Department of Education
Stockholm University
S-106 91 Stockholm
Sweden

Phone: 46-8 162000
Fax 46-8-158354

Background in Research in AAC and interests
Spent 12 years working at The Swedish Handicap Institute. At present on leave for research at Stockholm University about play and communication in profoundly mentally retarded and multiply handicapped children. Director and co-ordinator for a great number of eduactional and research activities for children with mental retardation and multiple handicaps (severe disabilities)

Special interests:
- Profound mental retardation
- Mother-child interaction
- Communicative competence in severely disabled children
- Play as means of communication
- Social skills

BROUMLEY, LIZ, Research assistant

Microcomputer Centre
Maths & Computer Science Dept
The University
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Scotland
United Kingdom

Phone 0382 23181 x 4711
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Background in Research in AAC and interests
From 1988 I have been doing research into using artificial intelligence techniques in communication prostheses. I am particularly interested in using AI to create a communication system which is sensitive to the needs of the user in his/her own environment, and which facilitates social interaction.

My main research interests are in the application of natural language processing knowledge representation and conversation analysis to communication systems, particularly for adults with acquired language disorders.

BUZOLICH, MARILYN, Ph.D., Director

443-7 Green Ridge Drive
Daly City, Ca 94014
USA

Phone 415 992-7039

Background in Research in AAC and interests
Director of non-oral Communication Services; Augmentative Communication Specialist, Co- Founder and Clinical Director of the Bridge School, a private educational program for communication system users.

Doctoral dissertation "Interaction analysis of adult augmented and normal communication". Clinical research in communicative competence, interaction management and communicative functions. Research in early communicative development of severely handicapped youngsters. Developed assessment and intervention strategies. Co-author of manuscript in preparation on Auditory scanning and curriculum for school age system users.

Special interests:
- Interaction
- Communicative competence
- Literacy
- Predictors of success in using high tech system
- Integration with a purpose!

CALCULATOR, STEPHEN, Associate professor

Dept of Communication Disorders - PCAC
University of New Hampshire
Durham N H 03824
USA

Phone 603 862-2110
Fax 603 862-2030

Background in Research in AAC and interest
Have authored and co-authored a number of studies (primarily descriptive) which have appeared in various journals (AAC and Journal of Speech and Hearing Disorders), and contributed numerous chapters to books dealing with AAC, communication problems/techniques for persons with severe disabilities, etc.

Special interests:
- Enhancing interaction between AAC users and nondisabled peers
- Evaluating the impact of AAC systems
- Role of AAC in facilitating the inclusion of severely disabled children into regular education settings.

CARMELI, SARA, Speech language pathologist

172 Haroe Street
Ramat-Gan 52343
Israel

Phone 03 747813

Background in Research in AAC and interest
Integration of research in psycholinguistics with augmentative communication.

CLAYTON, COLIN, Rehabilitation engineer

The Wolfson Centre
Mecklenburgh Square
London, WCIN ZAP
England

Phone 071 837 7618

Background in Research in AAC and interests

Spent five years working as a rehabilitation engineer at the Wolfson Centre Communication Aids Centre. Part of my brief is to act as technical consultant during communication aid assessments. Several devices have been developed at The Wolfson Centre including a phrase speaker, switches and other access devices.

My main interest is in developing electronic access devices to enable AAC users to operate non-specialised computers and equipment. My two principle projects have been a Multi-Switch Encoded Emulator, and a Tongue Sensing System. The Tongue Sensing System enables users to access equipment by their tongue within the mouth. My main aim is to provide access devices that capitalise on a persons abilities enabling that person to communicate in the most effective way possible.

CREGAN, AILSA, Educational consultant

Cregan Smith Associates
The End House
76 Wood Close
Hatfield
Herts Al10 8TX
England

Phone 707-264587

Background in Research in AAC and interests

Develpment of a graphic symbol system (Sigsymbols) design - related to manual signs - for flexibility of teacher/therapist use, including possibility of vocabulary extension. Use of the above by different populations.

Special interests:
- Factors and processes involved in learning of AAC systems. Inter-system reinforcement of learning.
- Development of social skills and inter-user interaction
- Development of conventional literacy skills via graphic symbols

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DAHL, IRENE, Researcher

Royal Institute of Technology
Dept of Speech Communication and Music Acoustics
Box 70014
S-100 44 Stockholm
Sweden

Phone 46 8 7907562
Fax 46 8 7907854

Background in Research in AAC and interests

Project worker in a project that started in 1983. Responsible for the pedagogical design of software based on synthetic speech and the formative evaluation of the effect of this new technical aid for reading and writing disabled children 7-16 years old not physically handicapped. Previous experience from working as a primary school teacher, speech therapist and teacher assistant.

Special interests:
Effects of reading and writing development with computer and synthetic speech output (Educational research and teaching aids).

DAHLEN, JEFF, B.S, Director of engineering

Words + Inc
1545, N Verdugo Rd, Suite 118
Glendale, CA 91208
USA

Phone (818)-500-9509
Fax (805)-949-0973

Background in Research in AAC and interests
Three years in research and development of new devices and software in AAC. BS in Electrical Engineering, Stanford University, 1983.

Special interest:
- New hardware devices and software
- Improvements in communication efficiency.

DAVIES, ENA, Senior lecturer in speech therapy

Cardiff Institute of Higher Education
Western Avenue, LLandaff
Cardiff CF5 24B, Wales
United Kingdom

Phone 551111 ext 4215

Background in Research in AAC and interests
Working with undergraduate speech therapy students: Supervising degree projects. Teaching AAC course to degree students.

Special interests:
- Assessment
- Prescription
- Application of AAC with cerebral palsy children and adults.

DEMASCO, PATRICK, Associate Director of REC

Alfred I duPont Institute
Applied Science & Engineering Laboratories
P.O.Box 269
Wilmington, DE 19899
USA

Phone 302-651-6830
Fax 302-651-4019

Background in Research in AAC and interests
Associate Director of Rehab Engineering Center on AAC at Tufts University and University of Delaware. Member of ISAAC and RESNA. Research activities have included work in eye-tracking and PC-based AAC design.

Special interests:
- Natural language processing
- Development methodologies.

DWYER LITTMAN, SHARON, Speech language pathologist

W.E. Fernald State School
Box 9108
Belmont, MA 02178-9108
USA

Phone (617)-894-3600
Ext: 2285

Background in Research in AAC and interests
- Interaction issues in the AAC field with individuals with severe developmental delays
- Use of voice output communication aids with individuals with severe developmental delays.

FAGERBERG, GUNNAR, Director

Thames Valley Childrens' Centre
779 Base LIne Road East
London, Ontario, N6C 546
Canada

Phone 1519 685 8683
Fax 1519 685 8699

Background in Research in AAC and interests
Director, Inroads Project at the University of Western Ontario & Thames Valley Childrens' Centre. Research director at the Swedish Handicap Institute.

Swedish coordinator, IPCAS Project etc. Specially interested in technology.

FAWCUS, ROBERT, Professor

City University
Dept of Clinical Communication Studies
Northhampton Square
London EC1 VOHB
United Kingdom

Phone 071-608 0080
Fax 071-250 0837

Background in Research in AAC and interests
Director of postgraduate studies. Supervision of students at B.Sc, M.Sc. M.Phil and Ph D levels. Teaching at BSc and MSc level. Many years of involvement in both technical and behavioral aspects of AAC.

Special interests:
- Applications of technology in assessment and design of augmentative systems.

FAWCUS, MAGARET AILSA, Senior lecturer

City University
Dept of Clinical Communication Studies
Northhampton Square
London EC1 VOHB
United Kingdom

Phone 071-608 0080
Fax 071-250-0837

Background in Research in AAC and interests
Director of undergraduate studies. Supervision of students of BSc and MSc level. Teachning at BSc and MSc level. Responsible for research program in our Dysphasic group with those who require AAC.

Special interests:
- AAC Needs of severe dyspraxic dysphasic adults.

FINNE, TONE, Ph.D. Student, Speech therapist
Norwegian Institute of Special Education
Nordlandsloyfa 20
N-1251 OSLO 12
Norway

Phone 02-248490
02-252190

Background in Research in AAC and interests
Teacher in ordinary school for 20 years. Speech therapist as from -85 and doctoral student as from -88.

My project theme is still the same as when I started my education in 1984, communication-aids for speech-impaired people. When working at the ordinary school in Voss, in 1977, I has a girl with CP in my class. We started with Bliss in 1978 and in 1981 we got the first micro- computer-based communication system to Norway, Splink. It was arranged as a project with economic resources from the government. Besides my studies I have been working part-time at The Norwegian Center for Industrial Research with communication aids. I have been working as a consultant at Falck Products in Risor, developing the communication device Falck 3310/20. I have also been doing some consultant works for Datahjaelp in Copenhagen, Denmark. In 1989 I initiated a Nordic conference; Computers for aphasics. In 1989 ,I had a job as a speech therapist at Sunnaas Rehabilitation Center, a national center, working with head-injured, aphasics and traffic-hurt people. Now I am part-time on a scholarship at Nise and part-time at Bredtvet Center for Speech-Therapy, an institution that also serves the whole country. In both these jobs, I' m working with research about communication devices and their users - my doctoral project. My thesis at Nise was about how a communication aid could work as a speech-prosthesis for a person with ALS. This thesis will be published as a book from the Norwegian Computer Society.

Special interests:
- Communication devices with speech.

FOULDS, RICHARD, Associate professor, Director

A.I. DuPont Institute
P.O.Box 269
Wilmington, Delaware 19899
USA

Phone (302) 651-6830
Fax (302) 651-4019

Background in Research in AAC and interests
Developed a number of early communication aids, Director of the Tufts University Rehabilitation Engineering Center (focusing on AAC devices), Director of University of Delaware's Rehabilitation Engineering Center on AAC. Fulbright scholar at Institute for rehabilitation research in Hoensbroek, Holland. Former ISAAC board member, current president of RESNA.

Special interests:
- Human/computer interaction
- Lexical prediction
- Speech synthesis
- Technology

FRANKLIN, BARBARA, Professor in special education

Department of Special Education
San Fransisco State University
1600 Holloway Ave
San Francisco, CA 94132
USA

Phone (415) 494-6935
Fax (415) 338-7019

Background in Research in AAC and interests

I have been actively involved in tactile sensory aid research for the past ten years. I was a member of a team that developed a 16-channel electrotactile aid, the Tacticon, and participated in both the allocation of the frequency band widths and the field testing of the device with children with hearing impairment. I recently completed a three-year study (86-89) to conduct the first systematic investigation using tactile aids with children with dual sensory impairments and I have been refunded (89-92) to validate my results with infants and preschoolers. I have also been involved in research related to personal FM systems. I conducted a study in 1987 using personal FM systems with preschoolers with hearing impairment, and recently completed a study (1990) using Phonic Ears Easy Listener with children with Attention Deficit Disorder. The two tactile studies have been funded by the U.S Department of Education and the FM studies by the San Francisco State University Research Assigned Time Program.

Special interests:
- Sensory aids, including tactile aids, for children with hearing impairment and dual sensory impairments
- AAC for children with severe handicaps

FRIED-OKEN, MELANIE, Ph.D.

Rehabilitation Institue of Oregon
1040 NW 22nd Avenue, N500
Portland, OR 97210
USA

Phone (503) 229-7266

Background in Research in AAC and interests

Clinical coordinator of an augmentative communication service that evaluates and treats adults with severe communication disabilities. Team leader for SLP, OT, PT, social work; we are a center based model in an adult rehabilitation center (inpatient and outpatient services). Researcher in augmentative communication.

Special interests:
- AAC for adults with acquired severe communication disablities
- Vocabularly selection for the initial lexicon of nonspeaking children
- Language development in children with severe expressive communication disabilities
- Language development in nonambulatory, speaking children
- Assistive technology for adults with degenerative diseases.

FRIEDRICH, SHULA, Speech pathologist

MILBAT
Tel-Hashomer
Israel 52621

Phone 03-5303739

Background in Research in AAC and interests

Coordinator of the Communication and Computer Department in MILBAT. In my work, I am in charge of the students from the school of speech pathology in their work in MILBAT and suggesting and leading research work of the students at the engineering "Technien" in Haifa.

Special interests:
- Research and development of technical aids in AAC
- Speech technology.

GARDNER-BONNEAU, DARYLE, Ph. D., Senior scientist

CTA Incorporated
English Creek Center, Suite 204
McKee City, N J 08232
USA

Phone 609-646-4510
Fax: 609-646-4508

Background in Research in AAC and interests

I have worked in the area of voice technology application development for some time, both in rehabilitation and non-rehabilitation settings. My research has involved both text-to-speech systems and voice recognition technology. My interests lie in the human factor issues in these technology areas. My most recent work has been the evaluation of worlds strategy as on icon-based systems, from a human factors point of view, and included research resulting in recommendations for design changes of the Touchtalker Key board and the Words Strategy software.

Special interests:
- Multi-modal communication interfaces.
- Development of interfaces for voice recognition/synthesis devices for those who are non-speaking or speech-impaired.
- General interest in technology developments and research in linguistics, phonetics, algorithm development and equipment design.

GRANLUND, MATS, Ph.D. Student, Researcher

ALA Research Foundation
Sibyliegatan 7
S-114 51 Stockholm
Sweden

Phone 46 8 660 82 84

Background in Research in AAC and interests

Interested in Cerebral palsy, mental retardation, visual impairment, deaf/blindness and autism.

Special interests:
- Client assessment
- Cognitive development
- Human factors Issues
- Instructional techniques
- Interaction
- Language development
- Program evaluation
- Service delivery models
- Sign/Symbol systems

GRANSTRÖM, BJÖRN, Professor in speech communication

Dept of Speech Communication and Music Acoustics
Royal Institute of Technolgoy
Box 70014
S-100 44 Stockholm
Sweden

Phone 46 8 7907847
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Background in Research in AAC and interests

The fundamental research on speech production models, pursued in the Department of Speech Communication and Music Acoustics, has lead to a multi-lingual text-to-speech system, commercialized by Infovox AB. The techonology is integrated in several products in the AAC area. Most devices rely on text input. Ohter possibilities are also explored, like the Blissymbol communication system.

Special interests:

The research within the department is multi-disciplinary in nature. The main concentration is on speech communication research with a strong component devoted to the problems of communication disabilities and handicap. Much of that research is carried out in close cooperation with other academic faculties, rehabilitation centres and organizations of handicapped persons.

Voice disorders is an active area of research in cooperation with researchers from the medical faculty. Speech technology such as speech recognition has been developed and tried by persons with severe mobility impairments in a system for communication and environment control. Speech synthesis for the non-vocal using linguistic techniques for increasing the communication capabilities are investigated. Dyslexia and aphasia training methods are developed in other projects.

In the main text-to-speech project the focus has been on improved prosodic models and new strategies for segmental synthesis. A new synthesis model is being developed that will increase the possibilities of modelling different speaker characteristics and speaking styles.

GROVE, NICOLA, Speech teraphist

NHS Barnet Health Authortiy
86, Bedford Road
London N2 9DA
England

Phone 081-883-3416

Background in Research in AAC and interests

Research information officer with Makaton vocabulary development project 1978-1988. Funded research 1986-1988 (Leverhulme Foundation) "An exploration of the communication skills of Makaton Students", St George's Hospital Medical School.

Special interests:

- Functional use of signs and symbols by individuals with cognitive disabilities
- Linguistic development with signs and symbols and speech
- Intelligibility of augmentative signing: issues of sign perception and production.

GUTTMAN, KARIN, Ph.D. Student, Special teacher

Bräcke Östergård
Box 21062
S-400 71 Göteborg
Sweden

Phone 46 31-502606
Fax 46 31-536985

Background in Research in AAC and interests
I have made a study of the pupils we have taught alternative communication during a ten years period at Bräcke Östergård. I have found out their medical background, intelligence, if they communicate well or not. I' m interested in case studies among these pupils. I want to see how they communicate when they have left our school, videotape and analyse.

HAYNES, CARL, Ph.D. Student

Purdue Universtity
Special Education, SCC-E
West Lafayette, IN 47906
USA

Phone 317 494-0528

Background in Research in AAC and interests
Infants and young children with severe disabilities and use of technology with children with severe disabilities.

HEDELIN, LISBETH, Ph.D., Research assistant

Göteborg Universtiy
Department of Psychology
Box 14158
S-400 20 Göteborg
Sweden

Phone 46 31-631658
Fax 46 31-634628

Background in Research in AAC and interests
Ongoing project: Conceptions of linguistic and alternative communication among communicatively handicapped children (cerebral palsy, 11-17 years of age).

Special interests:
- Developmental psychology
- Communication
- Theories of mind.

HEIM, MARGRIET, M.A, Psycholinguist

Institute for General Linguistics
University of Amsterdam
Spuistraat 210
1012 VT Amsterdam
The Netherland

Phone 31 20 5253851
Fax 31 20 5253052

Background in Research in AAC and interests

1987: MA thesis: observational study of the remedial communication training with nonspeaking children in a Dutch rehabilitation centre. 1988-89: Pilot study resulting in an analysis model of interaction patterns of nonspeaking physically disabled children and important adults in their daily lives. 1990: Start of a follow-up research project into the effects of a special intervention program for very young CP-children at risk for speech development.

Special interests:
- Child language development
- Communication disorders and communication modes
- Introduction of graphic symbols and interaction styles and strategies
- Developmental research and longitudinal research

HIGGINBOTHAM, JEFF, Assistant Professor, Director

SUNY (State University of New York) at Buffalo
Dept of Communication Disorders
and Sciences
Buffalo, N Y 14260
USA

Phone 716 636-3400
Fax 716 636-2893

Background in Research in AAC and interests

Director of Communication and Assistive Device Laboratory.

Primary focus on effect of AAC technologies on conversational discourse.
Other interests include: technology design, microcomputer access and research methodologies.

HJELMQUIST, ERLAND, Associate Professor

Deptartment of Psychology
Göteborg University
Box 141 58
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Sweden

Phone 46 31 631657
Fax 46 31 634628

Background in Research in AAC and interests

Studies of comprehension of speech synthesis; experimental work, and studies in applied contexts concerning blind peoples' reading. Studies of bliss communication; cognitive characteristics and characteristics of its use in interaction, in the home and at school.

Special interests:
Communication and cognition; Adult and developmental, normal and deviant, technology in a wide sense

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HOAG, LINDA, Assistant Professor

Kansas State University
Speech and Hearing Center
Leasure Hall
Manhattan, Kansas 66506
USA

Phone 913-532 6819

Background in Research in AAC and interests
Steve Calculator, Jan Bedrosian and I are currently conducting a series of investigations regarding preception of communicative competence in AAC users.

My other AAC research interests include issues in interaction and language development.

HUNNICUTT, SHERI, Ph.D., Speech researcher

Dept of Speech Communication and Music Acoustics
KTH
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Sweden

Phone 46 8 790-7874
Fax 46 8 790-7854

Background in Research in AAC and interests
Linguistic research in text-to speech systems and a symbol-to-speech system, and word prediction beginning 1971.

Special interests:
- Word prediction using syntax and semantics
- Linguistic aspects of speech synthesis and speech recognition systems
- Aiding linguistic development through use of prediction and synthesis.

JACOBSON, JOAN, Professor in speech patholgoy

St. Cloud State University
B 232 Education Bldg, 720 4th Ave, So
St Cloud, Minn. 56301
USA

Phone 612-255-4172

Background in Research in AAC and interests
Graduate student with Dr Cruikshank, Syracuse University, 1946-1951. I am directing research project in learning to read with Touch Talker.

Special interests:
- Single subject research as research I am helping with Touch Talker.
- Effectiveness of intervention with severely and profoundly retarded.
- Research with companion with severely and profoundly retarded.

JAROMA, MARJATTA, M.D, Ass professor in phoniatrics

Kuopio University Central Hospital
Department of Phoniatrics, ENT-Clinic
70210 Kuopio
Finland

Phone 71-172840
Fax 71- 225690

Background in Research in AAC and interests
Sign language, graphic symbol systems in mentally retarded children and adults as well as children with specific language disorder and learning disabilities.

Special interests:
Early beginning of AAC in children with specific language disorders.

JENSEN, MOGENS HYGUM, Lecturer, Psychologist

Danmarks Laererhojskole
Royal Danish Postgraduate College
for educational studies)
171, Skolebanken
DK-6705 Esbjerg
Denmark

Phone 75141722
Fax 75143168

Background in Research in AAC and interests
My main efforts have been put into developmental work parellel with my clinical work in the following fields; persons with motor impairments, multiply handicapped infants and adults, nonvocal mentally retarded persons. I'm currently gathering data on adult mentally retarded persons who develop speech in their late twenties/thirties/forties, but lack knowledge of the possible existence of such research.

Special interests:
- Graphic symbol systems
- Speech onset by so far nonvocal adult mentally retarded persons: (systematical descriptions hereof as well as of the educational methods used)
- Aphasia and AAC

JOHANSSON, IRÉNE, Professor in phoniatrics

Klöverndsvägen 5
S-663 00 Skoghall
Sweden

Phone 46 54-516073

Background in Research in AAC and interests
Professor at Department of Linguistic, University of Umeå. Research projekt "Tidig språkstimulering av mongoloida barn"(Early language intervention in children with Down syndrome), 1981-89.

Special interests:
- Language development
- Mental retardation
- Sign language.

KAUL, SUDHA, Director, special educator

Spastics Society of E. India
P 35/1Taratolla Road
Calcutta, 700058
India

Phone 777177/714177

Background in Research in AAC and interests
Director of research and training. Involved in research in child language acquisition in hindi. At present involved in a research project on hindi language acquisition of normal children aged 18 months - 4 years.

Special interests:
- Language development and AAC
- Cognition and AAC - use of AAC in the developmentally delayed children and adults
- Profoundly disabled and AAC
- Technical aids in developing countries

KRAAT, ARLENE, Assistant Professor

Augmentative Communication Program
Queens College, City University of New York
Speech and Hearing Center
65-30 Kissena Blvd
Flushing, New York 11367
USA

Phone (718) 520-7358
Fax (718) 520-5124

Background in Research in AAC and interests
Independent research:
- Nature of communicative interaction in AAC dyads
- Evaluation of technical features of communication devices - speech synthesis, rate enhancement, devices
- Conceptual/theoretical papers and critiques relative to AAC research

Special interests:
Development and reacquisition of communication and language in adults and children with physical and/or language impairments. Also interested in all applied/basic areas.

KRAVITZ, ELLEN, Speech language pathologist

Nonspeech Communication Program
W.E. Fernald State School
Box 9108
Belmont, M A 02178-9108
USA

Phone 617-894-3600
Ext 2352 or 2285

Background in Research in AAC and interests
Coordinator of nonspeech communication program. Conducting research with individuals with severe developmental delays in the context of clinical intervention.

Special interests:
- Use of voice output communication aids with individuals with severe developmental delays
- Establishing diagnostic techniques that determine whether an individual with profound mental retardation will be able to use a symbolic (as opposed to pre-symbolic) communication system
- Exploring the interpretation of graphic symbols by individuals with severe developmental delays

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LAGE, DOROTHEA, Ph.D. Student, Research assistant

Institut fur Sonderpädagogik
Hirschgngraben 48
CH-8001 ZURICH
Switzerland

Telephone 2573121
Fax 2528789

Background in Research in AAC and interests
Coworker in a research project supported by "Schweizerischen Nationalfond": "Technical communication aids for disabled with cerebral palsy". Participant in "Introduction to Augmentative and Alternative communication", AAC-Center, University of Nebraska.

Special interests:
- Interaction and communication wtih severe handicapped persons
- Communicative competence: persons with multiple, severe cerebral palsy handicaps
- Single case studies

LIGHT, JANICE, Assistant Professor

Department of Communication Disorders
Pennsylvania State University
Moore Building
University Park, PA 16802
USA

Phone 814-863-2013
Fax 814-865-3315

Background in Research in AAC and interests
Involved in a wide variety of research activities in AAC field including interaction research, literacy and communication competence. Also involved in education and personnel preparation activities and clinical service.

Special interests:
- Communicative interaction
- Communicative competence
- Facilitator instruction
- Literacy
- Vocabulary
- Telecommunication
- Cognitive issues
- Encoding techniques /AAC technology
- Social skills

LINDSAY, PETER, Professor

O.I.S.E
252, Bloor Street W
6 th Floor
Toronto, M5S IW5
Canada

Background in Research in AAC and interests
Information not available

LINELL, PER, Professor

Department of communication studies
University of Linköping
S-581 83 Linköping
Sweden

Phone 46-13-282010
Fax 46-13-133630

Background in Research in AAC and interests
- Analysis of spoken interaction
- Institutional discourse
- Differences between spoken and written language
- Communicative handicaps as social construction

LLOYD, LYLE L, Professor

Purdue University
1717 Sheridan Road
West Lafayette, IN 47906,
USA

Phone 317-494-7333

Background in Research in AAC and interests
Professor of Special education, Professor of Audiology and Speech Sciences, Asst. Director of the Divison of sponsored programs.

My first clinical use of AAC was the use of manually signing with mentally retarded individuals in the early 60' s. Since then my AAC interests have broadened to include both aided and unaided approaches. For the past 14 years my major activities have been research and teaching. In 1983 we started the first federally funded doctoral and postdoctoral AAC program with an AAC research emphasis.

Special interests:
AAC symbols (both aided and unaided) is my primary research interest. Also interested in other AAC research topics. Most of my research uses quantitative methods, but I have used qualitative methods. In addition to AAC research I have published research papers on topics such as audiologic assessment, visual speech perception (speech reading) and language abilities with mentally retarded, hearing impaired, and non disabled individuals.

LUNDMAN, MARGITA, Deputy Head of Research & Development Department

The Swedish Handicap Institute
Box 510
S-162 15 Vällingby
Sweden

Phone 46 8 620 17 00
Fax 46 8 739 21 52

Background in Research in AAC and interests
My background is psychology, and I have been coordinator of research and development related to AAC at the Swedish Handicap Institute since 1976.

My own research experience in the field of augmentative communication concerns mainly the use of electronic mail and computer conferencing systems by AAC users

Special interests:
Various aspects of communication i.e.
- Interaction research
- AAC devices
- Computer mediated communication

LUNDÄLV, MATS, Teacher, Project manager

DART
Brücke Östergård
Box 21062
S-40071 Göteborg
Sweden

Phone 46-31-502500
Fax 46-31-536985

Background in Research in AAC and interests
Design and development of software for alternative communication and special education ("MAC-Apple Telecom", "Plocka"-programs) COMSPEC project concerning the design of future modular. AAC and access systems (Nordic-Brittish Project)

Special interests:
Mainly: the development towards modular AAC and ACCESS systems that are highly flexible (multifunctional and tailorable).

MacKINNON, ELISABETH, Team leader AC service

Thames Valley Childrens' Centre
779, Base Line Road, East
London, Ontario
Canada

Phone (519) 685-8683
Fax (519) 685-8699

Background in Research in AAC and interests
Have just begun first externally funded project regarding use of electronic mail services by augmentative communication users. I have also begun a colloborative project to develop facilitator training modules.

Special interests:
- Use of electronicmail
- Development of customized mounting systems and evaluation protocols of these both clinical and technical.

MATHIASSEN, NIELS-ERIK, Software specialist

DATCH
Graham Bells vej 1 A
DK-8200 Århus N
Denmark

Phone 45 86 162700
Fax 45 86 106130

Background in Research in AAC and interests
DATCH encourages research and development. The center acts as a catalyst to new research projects and help them getting started. The center is able to make basic knowledge available, give advice on potential, co-operation partners, coordinate project team members and provide the necessary settings.

McCOY, KATHLEEN, Assistant Professor

University of Delaware /AI duPont Institute
Applied Science & Engineering Laboratories
P.O.Box 269
1600 Rockland Rd
Wilmington, DE 19899
USA

Phone (302) 651-6830
Fax (302) 651-6895

Background in Research in AAC and interests
Information not available

McGREGOR, ALAN, Research assistant

Microcomputer Centre
University of Dundee
Dundee, DD1 4HN
Scotland

Phone 44 382 23181 Ext 4711
Fax 44 382 23435

Background in Research in AAC and interests
I am a non-speaker, and have experience using Bliss, word boards, and the VOIS 135. Currently I am working part-time with the research team at Dundee University as part of the project to develop a system for helping with reusable conversational texts. My specific task is to help design, and then test out a prototype system based on a hypertext structure. I am also involved as a consultant and tester of other prototypes under development.

Special interests:
- Helping to devise an improved communication system for non-speakers. My ideal system would be operated by a wrist panel, would speak from a label-speaker and would be easy to use.
- Hypercard programming.

McNAUGHTON, DAVID, M.S. Student, Research assistant

Pennsylvania State University
229, Woodland Drive,
State College
Pennsylvania, 16803
USA

Phone: 814-867-4190

Background in Research in AAC and interests
Research assistant on a research project which developed an Assessment Protocol for examining the communication skills of severely handicapped adults and their facilitators. Prepared (for presentation or publication) single case or small group studies on: facilitator training, the spelling skills of AAC adults, the use of AAC by a child with acquired aphasia and a seizure disorder, acceleration techniques in written communication.

Special interests:
- Acquisition of literacy skills
- Evaluation of spelling support technology
- Acceleration techniques for written communication
- Intelligibility of voice synthesizers (importance on familiarity and contexts)
- AAC and childhood aphasics
- Facilitator training.

McNAUGHTON, SHIRLEY, C.M, M.Ed., Consultant in AAC

5444 Yonge Street, Ste 405A
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Canada

Phone 416-225-5748
Fax 416-225-5748
Attn Shirley McNaughton

Background in Research in AAC and interests

Project Officer : The formative evaluation of the Ontario Crippled Children's Centre Symbol Communication Program, funded under contract by the Ministry of Education, Ontario 1974-1978
Project Officer: Evaluation of Blissymbolic Communication Utilizing the Blisscom and Blissterm, research project supported by the Conn Smythe Research Foundation, 1979-1981.
Co-Director: Blisspen Project funded by the Ontario Ministry of Education Innovative Lessonware Project, 1982-1984
Director: Blissbook Software Project, funded by the Ontario Ministry of Education, 1985-1987
Consultant: Blisscom Project, conducted by IDON Corporation under contract with the Department os Supply and Services and the Department of Communications, Government of Canada, 1986-1987
Director: Dectalk Applied to Blissbook Software Project funded by Ontario Ministry of Education. 1987
Consultant BlissTel Project, conducted by IDON Corpiration, under contract with the Department of Supply and Services and the Department of Communications, Government of Canada, 1989-present
Developer: Blissymbol Component-Minspeak-Words Strategy, software, for Prentke-Romich Corporation and Semantic Compaction Systems, 1988-present
Co-developer, StoryBliss, software, for Blissymbolics, Communication International, 1989-1990

Special interests:
- Graphic representation systems
- Cognitive and language development
- Effect of instructional approach upon learning
- Technology development

MINEO, BETH, Associate scientist

Applied Science and Engineering Laboratories
AI duPont Institute
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Wilmington, DE 19707
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Fax (302) 651-6895

Background in Research in AAC and interests

My AAC-related research has focused on the development of cognitive and linguistic abilities and their relationship to AAC applications. My primary area of investigation involves the perception, understanding, and use of graphic representations. I have also been involved in the development of several new augmentative communication technologies.

Special interests:
My research interests relate to the cognitive and linguistic requirements posed by various AAC approaches. I am interested in graphics, design of user interfaces, and the cognitive load inherent in various approaches. I am also interested in the effect that AAC interventions have on language development. Populations of particular interest to me include young children and individuals with cognitive limitations.

MIRENDA, PAT, Assistant Professor

Douglas College
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New Westminster, BC V3L 5B2
Canada

Phone (604) 527-5167
Fax (604) 527-5155

Background in Research in AAC and interests
Instructor - Douglas College. Ass. professor at University of Nebraska- Lincoln (on a one year leave of absence).

Special interests:
- Case studies - severe handicaps
- Speech synthesis intelligibility and attitude research
- Symbol transparency research
- Instructional techniques - severe handicaps
- Autism and AAC

NEWELL, ALAN, Professor

Microcomputer Centre
Dept Mathematics & Computer Science
University of Dundee
Dundee DD1 4HN
Scotland
United Kingdom

Phone 0382 23181 ext 4145
Fax 0382 23435

Background in Research in AAC and interests
Professor and Director of Microcomputer Science. As an academic researcher within a technologically based Department, leading an interdisciplinary team investigating human-computer interaction with particular emphasis on the needs of the disabled. The team has developed a number of communication systems including the Talking Brooch, the Palantype speech transcription system, and television subtitling system for the deaf and, more recently, PAL, a predictive and adaptive lexicon and CHAT, a conversational prosthesis.

Special interests:
Technological developments in communication systems for the speeech, writing and language impaired with particular interest in conversational systems for the non-vocal and writing systems for those with special learning difficulties.

NILSSON, KARIN BRITTA, Psychologist, Research scientist

Center for Industrial Research
Box 124
Blindern
N-0314 Oslo 3
Norway

Phone 47 2-452010
Fax 47 2-452040

Background in Research in AAC and interests
My main work in AAC is in evaluating the functional aspects of different computerized communication aids. To investigate the intellectual, sensoric and motor abilities which are required to be able to use the aid.

Recently I have started a project, where the subject is prelinguistic development from approximately 6 months of age. The sample is children with probable later speech disabilities. The project aims investigate which theoretical and methodological concerns are important to improve a later aided communication.

NIR, MICHAL, Speech and language communication clinician

Kibbutz Amir
Galil Elyon
Israel 12140

Phone 972 6 954375

Background in Research in AAC and interests
Clinician at the Child Development Center, Kryat Shmona. No background in research in AAC. Hope to have an affiliation in the future which will enable research.

Special interests:
- Applied research
- AAC applications with different populations
- Clinical aspects

OLSSON, CECILIA, Special education teacher, Research assistent

ALA Foundation
Sibyllegatan 7, 1tr
S-114 51 Stockholm
Sweden

Phone 46 8 660 82 84

Background in Research in AAC and interests
Since 1983 part-time research (part-time special education teacher), primarily focused on:
- Profoundly retarded and their individual and environmental conditions for communication
- In-service training
- Symbol systems

PARNES, PENNY, Director ACS, President of ISAAC

The Hugh MacMillan Rehabilitation Centre
Augmentative Communication Service
350 Rumsey Road
Toronto, Ontario, M4G 1R8
Canada

Phone 416-424-3805
Fax 416-425-6591

Background in Research in AAC and interests
Co-ordinator, principle investigator and student supervisor of numerous projects. Projects have been both clinical and technical in nature and have ranged from rather simple, single case designs to complex protocol development. My main experience has been in identification of research issues, grant preparation and administration.

Special interests:
All aspects of augmentative communication with a special emphasis on issues related to clinical practice, to technical development and to computer access.

POOCK, GARY, Professor

Naval Postgraduate School
Code OR/PK
Monterey, CA 93943
USA

Phone 408-646-2636
Fax 408-646-2595

Background in Research in AAC and interests
Speech recognition of dysarthric speech. Information theory and statistics in AAC. Further interests in quality of AAC services, measures of performance/effectiveness of AAC services and AAC devices.

POON, PATRICK, Eletronics/software engineer, Consultant

12, Scott gardens
Heston
Middx, TWS 9JX
United Kingdom

Phone 081 570 3778

Background in Research in AAC and interests

Technical consultant in software and hardware for people with disabilities. Consultant to Bräcke Östergård (DART), RPH-RH (Göteborg) and ACE Centre (Oxford).

- Headinjury project to develop relevant software (AAC Centre, Oxford)
- Text-based communication and programs (MAC-Apple, Kings College, London)
- Computer aided learning programs for children with physical disability
- PLOCKA: Authoring and manipulation of programs for preschool physically disabled children

Special interests:

- Software development for people with Head Injuries
- Content free computer aided learning programs
- Medular design of AAC devices

POTTER, ROGER, Head of Clinical Engineering

Medical Physics Department
St. Georges Hospital
Long Leys Road
Lincoln, LN1 1EF
England
United Kingdom

Phone 44 522 51252
Fax 44 522 530698

Background in Research in AAC and interests

I have managed the following projects:

- Investigation of eye control of computers - evaluation of possibilities leading to development of production model of eye switch.
- Exploration of the use of microtechnology in the home by the severely disabled person , involving asessment of long use of eye switch, use of synthetic speech with environmental keyboard emulation.

Special interests:

- Use of synthetic speech on the public telephone system.
- Evaluation and development of asessment techniques for physical disability
- Assessment of mattresses for pressure sore management

PREISLER, GUNILLA, Ph.D.

Department of Psychology
Stockholm University
S-106 91 Stockholm
Sweden

Phone 46 8162007

Background in Research in AAC and interests
Responsible for research about the development of communication in children with functional disabilities at the Department of Psychology. Ph.D. thesis about "deaf children in communication". Since 1982 I have been conducting a longitudinal study about early patterns of interaction between blind infants and their parents. Have also been conducting a longitudinal study about the development of communication in deaf infants.

Special interests :
- Communication
- Mother-infant interaction
- Longitudinal studies
- Deaf and blind infants
- Sign language

PULLI, TUULA, Spec. speech therapist

Finnish Association on mental retardation
Laivarannantie 9 AS 3
40900 Säynätsalo
Finland

Phone 941 741912

Background in Research in AAC and interests
Conducting the project of AAC-communication for the Finnish Association on Mental Retardation.

- Single case studies on dysphasias and mental retardation. Overview on theoretical background on the concept of developmental dysphasia (ongoing)
- Explorations on service delivery and real life solutions on using AAC in social contexts (ongoing)
- Applied signs for dyspractic patients/MR-patients
- Comparing different solutions on pictorial symbol settings
- AAC producing oral speech/support in audition on speech
- Service delivery, methodology in motivating AAC

QUIST, RAYMOND, Professor

Department Communication Disorders
SOE 410
Indiana State University
Terre Haute, IN 47809
USA

Phone 812-231-2804

Background in Research in AAC and interests
Chair and professor of Communication Disorders. Postdoctoral research at Purdue University.

Special interests:
- Graphic symbols
- Speech syntheses

RAGHAVENDRA, PARIMALA, Ph.D. Student

Purdue University
Dept of Audiology and Speech sciences
West Lafayette, IN 47907
USA

Phone 317 494 6423

Background in Research in AAC and interests

I have conducted The follwing studies:

- A spinach with V on it" What three year olds see in standard and enhanced Blissymbols. Published in JSHD, 1990 (With Macalyne Fristoe)
- Standard and Enhanced Blissymbols: Responses by childrens from India 3. Comprehension of symetric speech using a sentence verification paradigm. (with Gregor Allen)
- Currently working on my dissertation entitled "The Effects of enhancements on learning and using Blissymbols by normal three year olds children".

Special interests:

- AAC with preschool and schoolgoing students
- Effect of early AAC intervention on language development
- Systematic study of enhancements in learning and using Blissymbols with various age groups and population
- Effect of use of voice output communication devices on speech and language development.

REMINGTON, BOB, Reader in psychology

Department of Psychology
University of Southhampton
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England, S09 5NH
United Kingdom

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Fax 703-593936

Background in Research in AAC and interests

Teaching simple communication skills to children with a mental handicap using sign or symbol systems. Specially interested in the experimental analysis of behavior, applied behavior analysis and psychology learning.

ROSENGREN, ELISABET, Speech pathologist

Dept of Speech Communication
Royal Institute of Technology
Box 700 14
S-100 44 Stockholm
Sweden

Phone 46 8 7907562
Fax 46 8 7907854

Background in Research in AAC and interests

Communication aids with synthetic speech since 1986.

Special interests:

- Methodological issues
- Speech technology
- Synthetic speech
- Speech recognition

RYGAARD, KAREN, Occupational therapist, Psychology student

Livjaegergade 42
2100 Köbenhavn Ö
Denmark

Phone 31 299222
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Background in Research in AAC and interests
In interdisciplinary teams developed equipment for extending communicative competence such as a mouthstick, a mouthforceps, electronic toys, electro-magnetic drawing- and playing machine. During my psychology study written papers on "Face-to-face communication - One cannot NOT communicate", "The right word - a semantic dictionary for people with aphasia", "Words - words - words - communicaiton in spite of wordfinding difficulties" (with Bliss), and at the moment "Why imagine people with aphasia augmenting their communicative competence with new technology?".

Special interests:
Extending functional communicative competence with persons with brain damage by using computers as one tool. May 1990-September 1991 member of a multidisciplinary team (biologist, programmer, occupational therapist, neuropsychologist, speech pathologist, medical doctor) focusing on editing a Mac-program to extend functional communicative competence with persons with aphasia. Our basis shall be the patients' natural environment. and the tools will be combinations of drawings, photos, animations, words etc.

SCHLOSSER, RALF, Ph.D. Student

Purdue University
Dept of Education/Spec Educ
South Campus Courts-E
West Lafayette, IN 47906
USA

Phone 317-494-7341
Fax 317-494-6609

Background in Research in AAC and interests
AAC Research group at Purdue University, AAC Editorial Assistant.

Graphic symbol research: Schlosser, Quist & Lloyd (research in progress): A comparison of the analytic (element) and whole symbol approach in teaching Blissymbols on the learnability of compound Blissymbols. Schlosser & Karlan (research in progress): Generalization of AAC skills with severely disabled individuals: A Meta-Analysis.

Special interests:
- Graphic symbol research with individuals with cognitive disabilities
- Generalization of AAC skills
- Methodological issues (e.g. applying single subject designs to AAC problems uses meta-analytic approaches to integrate research in AAC)
- Parent participation in AAC

SELIGMAN-WINE, JUDY, Speech pathologist

Pre-school Treatment Center
P.O.Box 1567
JERUSALEM
Israel

Phone 972- 2-346078
Fax 972-2-340581

Background in Research in AAC and interests
Director of Speech therapy and AAC services at Preschool Treatment Center, Jerusalem. Working in a developing country - virtually no opportunities for research in this field.

Special interests:
- Clinical applications
- Clinical competence
- Interaction issues
- Applications with different populations
- Case studies.

SMEBYE, HELGE, Special psychologist

The NKS Furutun Centre
Oredalsveien 128
N-1600 Fredriksstad
Norge

Phone 09 317060

Background in Research in AAC and interests
Received a 3-year research grant (1983-86) for carrying out a project on developing better methods for teaching early communication to children with the most severe handicaps in their preschool years.

Special interests:
- Methods for early communication intervention
- Early communication development
- General issues in early intervention
- Children with the most severe and comprehensive handicaps

SOEDE, MATHIJS, Director

Institute for Rehabilitation Research (IRV)
Zandbergsweg 111
6432 CC Hoensbroek
The Netherlands

Phone 31 45 224300

Background in Research in AAC and interests
- Development of communication aids
- Research and Development in interfaces human computer
- Policy studies

Special interests:
- Ergonomics
- Research policy

SORO, EMILI, Teacher

NADIS
Canaries 1
08017 Barcelona
Spain

Phone 417 3679

Background in Research in AAC and interests
Collaborator in some papers about:
- AAC Interaction between adults and ACC users.
- Conversation-initiations in AAC users; evaluation and intervention
- Decision Making Process and Assessment for AAC users.

Special interests:
- Language and communication development by children using AAC systems
- Developmnent of communicative strategies and abilities in adults AAC users
- Methods for observing and analyzing interaction in AAC users in natural environments
- Reading and writing learning process in AAC users
- Assessment and intervention in AAC users.

STEINDAL, KARI, Special teacher, Consultant

The Autism Team of Nordland
P.O.Box 1826
N-8010 BODIN
Norway

Phone 4781-83100/82430
Fax 4781-83272

Background in Research in AAC and interests
Working in the Autism team of Nordland.

SORENSEN, INGELISE, Teacher

Teknologi- og informatikcentret
Ravnsborggade 11
2200 Copenhagen N
Denmark

Phone 45-31395500
Fax 45-31395112

Background in Research in AAC and interests
Consultant in special education in the municipal school of Copenhagen. Development of teachers to use computers in special education.

Special interest:
- The use of new technology in AAC for disabled and nondisabled persons.

TAMBAY, MADHAVI, Senior speech pathologist

Spasitcs Society of Eastern India
P-35/1 Taratolla Road
Calcutta 700 088
India

Phone 714177

Background in Research in AAC and interests
Have been involved in a study titled "The development of a communicative interaction schedule for use with young non-speaking cerebral palsy children and their primary care givers".

Special interests:
- Literacy
- Facilitator training
- Various AAC systems

THORSEN, ERIK, Educational consultant

DATCH
Graham Bells vej 1 a
DK-8200 Aarhus N
Denmark

Phone 45-86-162700
Fax 45-86-106130

Background in Research in AAC and interests
DATCH encourages research and development. The center act as catalyst to new research projects and help them getting started. The center is able to make basic knowledge available, give advice on potentional co-ooperation partners, coordinate project team members, and provide the necessary settings.

TYVAND, STEINAR, M.Sc, Research scientist

Senter for Industriforskning
Box 124, Blindern
N-0314 Oslo 3
Norway

Phone 47 2 45 20 10
Fax 47 2 45 20 40

Background in Research in AAC and interests
Involved in education and information about communication aids. Eight years at the industrial research center. Research and development in computer access for physically and visually handicapped people. Project leader in development and evaluation of Tango Keyboard Emulator. Now head of an interdisciplinary group with technicians and psychologists, concerned with computerbased technical aids.

Special interests:
- User interfaces
- Efficient input systems
- Word prediction
- Keyboard emulators
- Speech technology

WALLER, ANNALU, Ph.D. Student

Microcomputer Centre
Dundee University
Dundee, DD1 4HN
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United Kingdom

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Fax 44-382-23435

Background in Research in AAC and interests
Worked on applied linguistics in AAC. Involved in the development of an assessment and training centre. Currently working on improving conversational systems as part of a research team.

Special interests:
- Linguistics
- Predictive techniques in AAC
- Symbol based systems
- Conversational modelling
- Advocacy

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van BALKOM, HANS, Research coordinator AAC, Clinical linguist

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6432 CC Hoensbroek
The Netherlands

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Fax 31-45 226370

Background in Research in AAC and interests
1. Interaction Research: longitudinal study. Computer assisted programs for grammatical and pragmatic analyses procedures
2. Efficient input systems in AAC (prediction/coding techniques)
3. Graphic symbol communication (characteristics and their clinical implication seen from user' s perspective
4. Assessment and information dissemination
5. Author of Handbook about AAC of motor and multiple handicapped persons (in Dutch)
6. Co-initiator, member of ISAAC-NF executive committee

Special interests:
- Communicative interaction
- Implementation of linguistics in AAC-field
  a) efficient communication techniques (Rate enhancement)
  b) graphic symbol communication (universal linguistic characteristics)
  c) transduction techniques from various language input forms (symbols, signs, speech) to other language output forms. Based on functional grammar and description rules
- Aphasia and AAC (recovery process and AAC techniques)

VANDERHEIDEN, GREGG, Associate Professor, Director

Trace Research and Development Center
S-151 Waisman Center
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Madison, Wiscounsin 53705
USA

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Fax 608-262-8848

Background in Research in AAC and interests
Active researcher in the field of AAC for nineteen years. Doctorate is in "Technology in comunication, rehabilitation, and child development". Principle investigator on over 40 grants and contracts on various aspects of augmentative communication and computer access.

Special interests:
Special interface technologies, interface standards, acceleration techniques, quantifcation in research and evaluation, vocabulary selection (for acceleration and for breadth of communication access).

WELLE DONKER-GIMBRERE, MARGUERITE, Research project leader

Institute for Rehabilitation Research (IRV)
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6432 CC Hoensbroek
Netherlands

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Fax (045) 226370

Background in Research in AAC and interests
Literature research on augmentative communication and field research on use of graphic symbols

Special interests:
- Graphic symbols
- Interaction
- Semiotics
- Language development
- Aphasia

WINTERBERG, ERLAND, Director

DATCH
Graham Bells Vej 1 A
8200 Århus 1 A
Denmark

Background in Research in AAC and interests
Information not available

VINTERGAARD, SÖREN

Fredriksborg Amts Teknologigruppe
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2600 Hilleröd
Denmark

Phone 945 42281512

Background in Research in AAC and interests
Information not available

WOLTOSZ, WALTER, M. A., President

Words + Inc
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Lancaster, Ca 93584
USA

Phone (805)-949-8331
Fax (805)-949-0973

Background in Research in AAC and interests
Master degree in Aeroplane Engineering and Administrative Science. Ten years in research and development of personal-computer based augmentative and alternative communication and computer access systems. Manufacturer of state-of-the-art software and adaptive hardware.

Special interests:
- Design of AAC systems
- Language representation for all populations.

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von TETZCHNER, STEPHEN, Senior research psychologist

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Background in Research in AAC and interests
My main research topics within augmentative communication have been manual sign language among autistic, mentally retarded and dysphatic children, and communication problems among mentally well functioning children and adolescents who are dependent on aided language. I have also worked on "aided" tests for young physically handicapped children. Presently, I am working on telecommunications for people using augmentative communication.

Special interests:
My main research interest is normal and atypical development in general, and language development in particular. I am also interested in telecommunications, and transfer of competence in service delivery.

WORMNAES, SIRI, Lecturer, Assistant professor

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Background in Research in AAC and interests
I am conducting a research project on use of electronic communication aids in daily life.

Special interests:
- Social-verbal competence for AAC users.

YODER, DAVID, Professor

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Background in Research in AAC and interests

Chair, Department of Medical Allied Health Professions. Professor of Speech and Hearing Sciences and Clinical Professor of Special Education and Literacy Studies. Have conducted interaction studies and literacy acquisition studies with AAC users.

Special interests:
- Interaction strategies for effective communication among persons with severe speech and physical impairment
- Literacy Acquisition with AAC users
- Language Acquisition of Persons with severe speech and physical impairment

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ZACHRISSON, GERD, Occupational therapist

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Background in Research in AAC and interests

Since 1976 I have been involved in research in the field of communication aids, combined with clinical work. The last years I have been involved in one of the computer centers as occupational therapist. Most of my research has been about methodological problems, how to make an assessment and choose communication aids, and how to train children to use their technical aids.

Special interests:
- Communication aids
- Computers
- Interaction
- Assessment
- Training.

The First International Symposium on Research in Augmentative and Alternative Communication (AAC) was held in Stockholm in August 1990. The symposium gathered researchers from many different countries and from a variety of disciplines. The proceedings include the papers presented as well as the opening presentations and summaries.
Also included is biographical data on the participants. The symposium and the proceedings reflect the state of AAC research from a worldwide perspective and from the perspective of a number of related fields.

The symposium was arranged by the International Society for Augmentative and Alternative Communication (ISAAC) and the Swedish Handicap Institute.

The Swedish Handicap Institute

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