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ABSTRACT

Recent studies on schema theory and other concepts related to reading comprehension are discussed in this paper. Noting that the psycholinguistic model of reading views reading as a process of predicting meaning based on the reader's prior knowledge of language, the paper describes recent research that has led to a definition of reading comprehension that considers linguistic competencies, syntactic and semantic knowledge, and factors related to the printed page and to the reading environment. It then examines the characteristics of schemata, which represent generic concepts that are stored in memory, and explains how schema theory provides the concepts for explaining how readers interact with texts to interpret and comprehend. It provides examples to show how readers call upon schemata in reading and points out that in schema theory bottom up and top down processing of input occur simultaneously. Finally, the paper shows how schema theory points up the importance of such instructional methods as assisting students to relate new concepts to those already known, assisting them in setting up the dominant structure for comprehending a text, developing vocabulary concepts, and developing effective question/answer relationships. (GT)

A Review of Research on Schema Theory and Its Implications for Reading Instruction in Secondary Reading

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After several decades of debating about phonics instruction, how much, when, and by what method of instruction, research and debates in reading have taken a new emphasis particularly in the past five years. Reading comprehension is finally being given the interest it has for so long deserved.

The traditional definition of comprehension, at least as it was interpreted by the authors and writers of basal readers and literature anthologies, resulted in the teaching of comprehension by "separately defined" reading comprehension skills, and could be called a Skills Model. Skills, separately taught in a logical and sequential order, was supposed to result in reading comprehension of textual material.

Instruction in comprehension usually consisted of asking students questions about what they had read; these questions usually generated, at best, along a taxonomic mode, frequently ? Bloom's Taxonomy of the Cognitive Domain.

About ten years ago a newer model of reading, the Psycholinguistic Model, began to assert that contrary to this view of reading as a sequence of skills which could be taught, reading was in actuality a process of predicting meaning based on the reader's knowledge of oral language syntax and semantics and phonological cues. In other words based on the reader's store of information about how language worked, (based on oral language) a reader already possessed some knowledge about how words were ordered and what kinds of meaning words possessed in certain contexts.

The great debates of late have argued for the efficacy of either one of these models, though at least some persons, (including myself) have perceived that both of these models have merit in terms

of instruction. Before discussing the newest model of reading comprehension, Schema Theory, I will first define the changes new research has made in the definition of reading comprehension. While parts of this definition may sound familiar, the emphasis has shifted, so that now the skills model theorists recognize the need for skills instruction in context (Otto), and psycholinguists recognize a greater need for readers to utilize grapho-phonemic knowledge as well as semantic and syntactic.

READING COMPREHENSION

Reading comprehension results from an interaction between the reader and the text, and by extension with the author of the text. At the highest level, the reader understands a passage both in terms of its impact on the reader and the meaning which the author intended by extracting meaning, implicit and explicit, from the written text using visual, linguistic, and conceptual information processing systems. (Adams and Collins)

Thus there are a set of preexisting conditions which influence the reader, and what he or she brings to the reading situation, as well as shaping the way in which comprehension takes place. At the most primitive level, the reader must perceive the figures on the paper to be read, not only as a sequence of letters, but as words which may have a variety of meanings depending on context. Thus the reader's language and concept development will effect reading comprehension. Other reader characteristics effecting comprehension are general knowledge and experience background, interests, motivation and purpose for reading, personal attitudes and beliefs, reading ability, including automaticity, (or the

ability to identify a word automatically) and linguistic knowledge and flexibility.

Some of these factors are included in Pearson's and Johnson's psycholinguistic view of factors influencing reading comprehension. They specify inside and outside the head factors. Included in their view of inside the head factors influencing reading comprehension they mention interest, motivation, and reading ability while explaining in depth the linguistic competence a reader uses in reading comprehension. These linguistic competencies include phonological knowledge which includes sound-symbol correspondences, as well as the readers knowledge of pitch (intonation), stress (emphasis), and juncture (I scream; ice cream).

The second area of linguistic competency is the syntactic knowledge the reader employs in comprehension. Readers, as well as listeners, are receivers of language. In both cases the competent listener or the reader is able to predict from a fairly limited range of words, the function of a word relative to the other words in a sentence. The reader is able to do this through his or her oral language knowledge.

As well as a syntactic tie to oral language, reading has a semantic relation as well. The reader employs semantic information, or knowledge of what words can mean and how they are related to one another, in order to predict the meaning of a word in context. This prediction, or reduction of uncertainty, (Smith, 1975) enables the reader to eliminate unlikely alternatives from a given context.

Thus in the psycholinguistic model the reader utilizes all three systems in order to predict and comprehend using the semantic and syntactic to predict and verifying through the phonological or grapho-phomenic input. (Pearson, 1978)

Outside the head factors which influence reading comprehension are those related to the printed page, the qualities of the reading environment and the school environment. (Pearson and Johnson, 1978) The page or written message is specified in several parts: the words, their frequency and abstractness; sentences, their length and complexity; and beyond sentences including discourse analysis involving relationships between sentences, between paragraphs, identifiable story structures, and the way in which material is organized. Pearson and Johnson emphasize that comprehension at the longer discourse level is more difficult than at the proposition, clause or sentence level, because of the necessity of making inferences from sentences which are textually further apart.

The following definition of comprehension from Pearson and Johnson reflects not only a psycholinguistic perspective but the most research influence on comprehension from the fields of cognitive psychology and research on artificial intelligence stemming from computer simulation of mental processes:

> Comprehension involves 1) processing the text information, 2) matching it against the prototypic script for such events, 3) integrating textual and scriptal (our coined word) information, thus producing a complete knowledge structure for the event described in the text. p. 46

This interface of disciplines - linguistics, cognitive psychology and artificial intelligence has resulted in a new perspective on reading, and the emergence of a new discipline,

Cognitive Science. (Rummelhart and Ortony).

SCHEMA THEORY

Pearson and Johnson's use of the word, "script," reflects the influence of this new discipline. They have defined "script" as a special label for experience which is stored in our knowledge system. This system for storing and retrieving knowledge in memory is also called schema theory. Schemata, (the plural form) according to Rummelhart and Ortony, represent generic concepts which are stored in memory. These generic concepts include concepts underlying objects, situations, events, actions, and sequences of actions. These objects etc. are not atomic, but contain the network of interrelations with other constituent concepts. In other words, the way in which a particular concept is stored is not by remembering that isolated event in its totality down to its most basic components, but by identifying those aspects of the event related to other concepts already stored. In effect we make corrections between the information in the text and what we already know. Thus schemata represent stereotypes of concepts. A particular schema would be analogous to play with interal structure corresponding to the script of the play. (Rummelhart and Ortony) So a schema represents generalized knowledge about a sequence of events and, like a play has a cast of characters and a sequence of scenes, a schema has its parts and sequences of events. Rummelhart explains:

> Imagine that we have within our memories, schemata ... for every more or less standardized sequence of events that we know about. In this case, comprehension consists of finding a schema that fits the situation (or story) we are trying to understand and discovering, who, if anyone, in the story corresponds to the required characters. (p. 165)

The underlying assumption of schema theory is that the written text does not in itself convey the meaning, but interacts with the previously acquired knowledge of the reader in retrieving or reconstructing meaning. The goal of schema theory is to map this interaction between textual information and the reader's schema, specifying how knowledge is shaped and stored. (Adams and Collins)

Schemata have four essential characteristics. 1) They have variables or slots, 2) they can embed within one another, 3) they represent generic concepts which vary in their levels of abstraction, and 4) they represent knowledge rather than definitions. (Rummelhart and Ortony)

Using the play analogy, the variables in a schema tell us what kind of persons can conceivably fit or be bound to a certain role based on the context and situation of the play or schema. When we do not have sufficient information as to the exact fit we can assign default values based on inferences, or make good guesses which are closer to the average than on one or the other extreme of the range of variables. When are able to assign or bind a variable based on the situation, memory or default, the schema is said to have been instantiated, the first step in comprehension. (Rummelhart and Ortony)

For example, words do not have a single meaning, but have many possible meanings from which the reader must determine when encountering that word in a given context. When the reader infers the meaning of the word from context, and the slot has been filled with a particular case or meaning, instantiation has occurred. We must fill the slots in order to interpret the message.

We comprehend the message in a text when we are able to call up the appropriate schema which allows us to place the information in the text into the appropriate slots--fitting it into an interpretation which allows us to see the text in a certain way. What we store is the interpretation of the text which we then call up to make inferences about author's purpose, specific characters, and so on in other similar texts.

Anderson and others conducted a series of experiments to investigate whether general terms, words, or concepts were more effective in recalling sentences, than an inferred instantiation of the term. An example sentence which was presented to the subjects was "The woman was outstanding in the theater." The results of the experiment indicated that a particular term, "actress," was a better cue for the recall of the sentence than the word, "woman," even though "woman" had appeared in the sentence and "actress" had not. Consistent with schema theory, the experimenters theorized that the subjects had instantiated the word "actress" since it provided the most coherent interpretation of the message. (Anderson and others, March, 1976)

In other words, the schema contain slots, or places for each component, and encoding is a matter of filling slots in the schema with aspects of the object or event. These slots are often filled by inference. (Anderson, July, 1977)

The second essential characteristic of schemata is that they can be embedded within one another. (Embedded schemata are called sub-schemata.) The structure of a schema is understood in terms of its relationships with other schema, so that the schema used to

understand a particular text will contain sub-schemata or embedded schemata in a hierarchical form. The position of embedded schemata in this hierarchy is often related to its index of importance so that the schema could be said to "give" such information its importance by instantiating higher order slots based on significant text information. Schema are more likely to contain concepts for reconstructing or retrieving important rather than unimportant elements. (Anderson, July, 1977).

The third and fourth characteristics of schemata are that they can be at all levels of abstraction and they represent knowledge rather than definitions. Schema can range in a hierarchy from the most encyclopedic, symbolic, and conceptual to the most atomistic.

Schema theory provides us with the concepts and vocabulary to make predictions what takes place during reading. According to this theory when we read we select the appropriate schema and variables or slots which fill the particular cases so that we can "account for" the material to be comprehended, and then verify that those schemata do indeed account for it. (Rummelhart and Ortony, p. 111)

Generalized schema allow us to learn or make sense of a wide array of information or very abstract ideas, and these generalized schema can be modified or adapted as we learn new information. (Abstracted knowledge based on memories of concepts are called generic knowledge.) This idea is very closely related to the Piagetian concepts of assimilation and accommodation. Assimilation takes place when new knowledge is integrated into a preexisting knowledge base. Accommodation occurs when the knowledge base, or schema is changed in order to fit in new information.

We can also construct very specific schema to account for situations or events which occur frequently allowing us to process this information faster and easier by helping us focus on a pattern of elements which occur in the stored schema and in the text. (Stored memories of particular directly or indirectly experienced events are called episodic memories.)

For example if we are reading a story about two people going to a movie, we can retrieve from our knowledge bank our schema for going to a movie which includes things like buying a ticket, taking our seat, and the movie coming on. We might also call up embedded or sub-schemata such as stopping at the refreshment stand and watching the coming attractions. We can call up a complete scenario based on our past experiences of going to the movies which will influence our comprehension of the story about going to a movie. Based on our movie schema we could make inferences, or predictions about what usually occurs when people go to the movies. We may have a slot for buying something at the refreshment stand which could include variables such as drink, candy, or popcorn, though our default value for this slot would probably be popcorn - the most predictable item.

In one experiment subjects read either a story about two people eating in a restaurant or shopping in a supermarket. The same food items were mentioned in both stories. Those subjects who read the restaurant story were better able to recall the foods which were most likely to be part of a restaurant schema and were more likely to remember who had ordered the food. In other words, when reading a story about eating in a restaurant it is more important to notice

who orders what, than when the same people are buying those items in a supermarket. This study offers some empirical support for schema theory. (Anderson, et. al., March, 1977)

PROCESSING INPUT

The traditional skills model view of reading is a bottom up or data driven processing model. In this view of reading, letters are perceived in a left to right sequence until a word is perceived as a whole, meaning is obtained and related to other words in the sentence, and thus activating the dominant schema and its particular concepts.

The older psycholinguistic model is primarily a top down or conceptually driven model where the emphasis is on prediction of meaning. Ultimately it is the concepts which generate a search for the data or words to confirm these predictions. (Goodman, 1967)

In schema theory, bottom up and top down processing of input or information occur simultaneously and at all levels of abstraction which allow the perceptual elements of word recognition and higher order schemata to coalesce into a theory providing for the conceptualization of interrelations between levels of processing. (Adams and Collins)

Rummelhart and Ortony summarize the essence of this processing by stating that "information (including both the "stimulus" and the context) enters the system and directly suggests certain plausible candidate schemata to account for it." (p. 130) Thus a possible schema needs to find good bindings for its variables, some evidence for its sub-schemata, and a dominating schema which to some extent offers a good fit.

Reiterating, schema theory provides the concepts and the theory for explaining how the reader interacts with the text to interpret and comprehend. This interpretation is influenced by the reader's background, personal history, knowledge and beliefs which are brought to bear in constructing schemata to provide the interpretative framework for comprehending discourse to the extent that a reader may perceive only one interpretation for a text to the exclusion of other possible interpretations. (Anderson, July, 1976)

Anderson and others conducted an experiment with college students from two different disciplines. Each group was asked to read two passages each of which was sufficiently ambiguous so that it could be interpreted in two different ways. Scores on multiple choice and other tests indicated that there was a striking relationship between their interpretation and their professional discipline. Most subjects were unaware that more than one interpretation was possible for each of the passages. The experimenters stated that the results indicated that high level schemata influenced the interpretation of these passages.

Schema serve as the basis for making inferences or reading between the lines and for making predictions based on observation of only part of the input. Schema also serve as the vehicles for searching memory for previously read material and reconstructing meaning.

IMPLICATIONS FOR INSTRUCTION

Returning for a moment to a definition of reading comprehension, we can see that schema theory has placed new emphasis on

various parts of older definitions, particularly the importance of the preexisting knowledge and schema of the reader, the purposes set for reading, the type of instruction and questions asked before and after reading textual material.

While we have always deplored the teacher who instructed students to "read from pages 91 to 124," the importance of motivating and building interest as well as pre-assessing the knowledge or schematic base of the reader is now dramatically more important in light of schema theory. If we are to help students to construct a framework for understanding discourse, or in Ausubel's terms (1963) aid the student in finding the appropriate "ideational scaffolding," we must assist students in relating new concepts to similar ones already known to them. Not only must we help students to search for experiences and concepts similar to those which occur in the texts they are to read, but we must help them become more aware of their personal attitudes and beliefs which can shape their interpretation of a text giving meaning unlike that which the author intended.

At a very general level, schema rely very heavily on predictable or stereotypic values for inference. The more fully developed the schema is, the more likely it is to resist change even in the face of evidence to the contrary. Anderson (1977) states that large scale schema change is possible, but will likely be resisted. Large scale schema change then is closely akin to a dialectical process, and socratic teaching which emphasizes questions dealing with counter-examples and contradictions is an effective method to facilitate this process.

Wyer's (1977) analysis of attitudes and beliefs on information acquisition supports this resistance to major cognitive reorganization based on new information. The reader then resists such major schematic change since it not only effects a particular schema but requires reexamination of all related sub-schemata. Such a change would be analogous to changing religions, political ideology, or one's view of women.

Thus in facilitating comprehension, the teacher must aid students in calling upon an existing schema to infer meaning, and when the existing schema is inappropriate to integrate the information in the text, how to modify this schema or shift gears to another more appropriate schema.

While teachers' guides have usually provided some purpose for students' reading, the merit of actually doing this becomes more obvious. It seems rather self evident that if we want students to comprehend a text in a particular way, that we should assist them in setting up the dominant structure for doing so. It should also be apparent that we cannot presume that students have schemata for all the possible purposes for reading, and need instruction which first provides those models or exemplars so that students can develop schemata which can be used as the basis for inferring when faced with the purpose in another context.

Vocabulary development should become more than introducing words, looking up definitions in the dictionary and using the words in sentences. Even with as simple a word as "dog" teachers can begin to develop related concepts. My dog, Shanti, is a specific example of a dog. He is also a German Shephard, belonging

to this class of dogs as opposed to being a dachshund, though both breeds are examples of different classes of dogs. Both of these breeds or classes of dogs share properties of things attributed to dogs like barking and having teeth. The concept of dog can be understood to be a class example of the higher order class of animal of which cats, and even gerbils are other class examples. Thus vocabulary development becomes more than learning "a" meaning for a word; it becomes (or at least should become) concept development. While we may begin at a concrete level, we should extend the word to its functional meaning, and then to an abstract level which would include all the possible meanings for the word.

Since Socrates (if not before) teachers have recognized the importance and value of questioning. To a more or less extent reading materials, as well as Barrett's Taxonomy of Reading Comprehension have attempted to define and generate questions at a variety of comprehension levels. These levels have referred to the literal, inferential, critical or evaluative, and appreciation levels among others. Anyone who has developed questions using Barrett's Taxonomy of Reading Comprehension soon realizes some problems. The structure of a comprehension taxonomy presupposes that higher order understandings are based or the acquisition of lower order knowledge. Yet students might be able to answer so-called higher order or evaluative questions about a text without recalling some literal facts in the story. In addition students might be asked a higher order question and respond with a low level response.

Pearson and Johnson have proposed a new taxonomy of questioning which appears to be based on schema theory. (1978) Their taxonomy

consists of only three levels or types of questions 1) those questions which are textually explicit and have an obvious answer right on the page; 2) questions which are textually implicit and have an answer on the page, but the answer is not quite so obvious; and 3) scriptually implicit, or more broadly, schematically implicit, where the reader needs to use his or her script or schema to come up with the right answer.

They are not classifying questions in this taxonomy, but the relations between questions and responses. In this manner they define a question-answer relationship as textually explicit if both the question and answer are derived from the text and the relationship between the question and answer was explicitly cued from the language of the text. They call this "reading on the lines." (p. 163)

A question-answer relationship is defined as textually implicit if both the question and answer are derived from the text, but there is no logical or grammatical cue tying them together. They call this "reading between the lines." (p. 163)

An interesting point is made with reference to understanding the main idea of a paragraph or longer selection. They argue against recognition or recall of main ideas at the literal level on Barrett's taxonomy, asserting that unless the author has explicitly stated that "the main idea is...", answering such a question would necessarily involve an inference.

They define a question-answer relationship as scriptually implicit if the reader has responded to a question inferring from information based on prior knowledge or existing scripts with similar concepts and not from what is on the page. They call this

"reading beyond the lines." (p. 164)

Comprehending textual material is a holistic process; and while teaching skills will still be part of helping student comprehend, the overlapping nature of these skills should be more apparent.

Hopefully the most significant result of recent research on comprehension would be to see the demise of the practice of teaching skills in isolation. Anyone who has worked with remedial readers has witnessed that some of them are unable to transfer the knowledge of skills developed in isolation into context while reading.

Another practice, the "Guess what I'm thinking" question needs to be joyously buried. Rather than students trying to figure out what is in the teacher's head, the teacher should be trying to assess what is in the student's head so that new material can be related to what is already known. For example, one teacher in a very small rural junior high school was having students read The Outsiders, a very popular book with students nowdays. However the students in this community had very little knowledge of inner city teenage problems, let along gang wars. Yet when it was discovered that many of the students had seen West Side Story on television, they were able to comprehend The Outsiders fairly easily even though the reading level was beyond what some of them could usually handle.

While the emphasis of this paper has been to examine the cognitive aspect of comprehending reading material, it is necessary to mention, however minimally, the affective dimension of reading. In the process of comprehending and learning from written material, students need to be rewarded for taking risks and speculating about

meaning as well as relating how a passage may have a specific meaning for them. The classroom environment needs to be a supportive one if students are to risk being wrong in the sense that another interpretation may be better supported by the evidence in the text. When students are asked to give their evidence, or tap the process by which they came to their interpretation, we may begin to help students to develop these processes instead of telling them their answers are wrong, period. In the process of comprehending and learning, learning how to learn, students may begin to enjoy reading for its own sake.

Bibliography

Adams, M.J. and Al Collins, "A Schema-Theoretic View of Reading," Technical Report No. 32, Center for the Study of Reading, University of Illinois, April 1977.

Anderson, Richard C., "The Notion of Schemata and the Educational Enterprise: General Discussion of the Conference," Schooling and the Acquisition of Knowledge, R. Anderson, R. Spiro, and W. Montague (eds.), Lawrence Erlbaum Associates, Hillsdale, N.J., 1977.

Anderson, Richard C., and others, "Instantiation of General Terms," Technical Report No. 10, Center for the Study of Reading, University of Illinois, March 1976.

Anderson, Richard C., and others, "Frameworks for Comprehending Discourse," Technical Report No. 12, Center for the Study of Reading, University of Illinois, July 1976.

Anderson, R., R. Spiro, and M. Anderson, "Schemata as Scaffolding for the Representation of Information in Connected Discourse," Technical Report No. 24, Center for the Study of Reading, University of Illinois, March 1977.

Anderson, Richard C., "Schema-Directed Processes in Language Comprehension," Technical Report No. 50, Center for the Study of Reading, University of Illinois, July 1977.

Hittleman, Daniel, Developmental Reading: A Psycholinguistic Perspective, Rand McNally College Publishing Company, Chicago, IL, 1978.

Ortony, Andrew, "Why Metaphors are Necessary and Not Just Nice," Educational Theory, Winter 1975, 25, pp. 45-53.

Pearson, P. David, "Some Practical Applications of a Psycholinguistic Model of Reading," What Research Has to Say about Reading Instruction, S. Jay Samuels, ed. International Reading Association, 1978, pp. 84, 97.

Pearson, P. David and Dale D. Johnson, Teaching Reading Comprehension, Holt, Rinehart and Winston, New York, 1978.

Robinson, H. Alan, Teaching Reading and Study Strategies; The Content Areas, Second Edition, Allyn and Bacon, Boston, MA, 1978.

Rumelhart, David E., Introduction to Human Information Processing, John Wiley and Sons, New York, 1977.

Rumelhart, David E. and Andrew Ortony, "The Representation of Knowledge in Memory," Schooling and the Acquisition of Knowledge, Anderson, Spiro, and Montague, (eds.) Lawrence Erlbaum Associates, Hillsdale, N.J., 1977.

Bibliography

Adams, M. J. and Al Collins, "A Schema-Theoretic View of Reading," Technical Report No. 32, Center for the Study of Reading, University of Illinois, April 1977.

Anderson, Richard C., "The Notion of Schemata and the Educational Enterprise; General Discussion of the Conference," Schooling and the Acquisition of Knowledge, R. Anderson, R. Spiro, and W. Montague (eds.), Lawrence Erlbaum Associates, Hillsdale, N.J., 1977.

Anderson, Richard C., and others, "Instantiation of General Terms," Technical Report No. 10, Center for the Study of Reading, University of Illinois, March 1976.

Anderson, Richard C., and others, "Frameworks for Comprehending Discourse," Technical Report No. 12, Center for the Study of Reading, University of Illinois, July 1976.

Anderson, R., R. Spiro, and M. Anderson, "Schemata as Scaffolding for the Representation of Information in Connected Discourse," Technical Report No. 24, Center for the Study of Reading, University of Illinois, March 1977.

Anderson, Richard C., "Schema-Directed Processes in Language Comprehension," Technical Report No. 50, Center for the Study of Reading, University of Illinois, July 1977.

Hittleman, Daniel, Developmental Reading: A Psycholinguistic Perspective, Rand McNally College Publishing Company, Chicago, IL, 1978.

Ortony, Andrew, "Why Metaphors are Necessary and Not Just Nice," Educational Theory, Winter 1975, 25, pp. 45-53.

Pearson, P. David, "Some Practical Applications of a Psycholinguistic Model of Reading," What Research Has to Say about Reading Instruction, S. Jay Samuels, ed. International Reading Association, 1978, pp. 84, 97.

Robinson, H. Alan, Teaching Reading and Study Strategies; The Content Areas, Second Edition, Allyn and Bacon, Boston, MA, 1978.

Rumelhart, David E., Introduction to Human Information Processing, John Wiley and Sons, New York, 1977.

Rumelhart, David E. and Andrew Ortony, "The Representation of Knowledge in Memory," Schooling and the Acquisition of Knowledge, Anderson, Spiro, and Montague, (eds.) Lawrence Erlbaum Associates, Hillsdale, NJ, 1977.

The tests between grades show that differences between adjacent grades are sometimes, but not always, significant with both pronunciation measures and listening comprehension. Differences between grades that are one grade or more apart are always significant. In other words, the age trend is established with a high degree of certainty.

Children from cities acquired better pronunciation than children from the countryside, with both evaluation methods. Children from one dialectal area proved to achieve a significantly better pronunciation as measured with the more detailed method, but not with the over-all rating.

In disagreement with the Penfield and Roberts (1959) notion that there is no relationship between pronunciation and other language variables or cognitive variables, intercorrelations between pronunciation, general intelligence and listening comprehension are positive. The correlation between pronunciation (method 1) and general intelligence is substantial (.40). The correlations between listening comprehension and pronunciation 1 and 2 are .47 and .54, respectively or, in other words, substantial. In contrast, the correlation between general intelligence and listening comprehension is .23 only.

These results are by and large in harmony with those of Ekstrand (1976 a) who found that pronunciation intercorrelates substantially with other language tests and moderately with an R-factor test, and that listening comprehension correlates moderately with the R-factor intelligence test.

DISCUSSION

Age, L 2 acquisition and learning set

The idea of an optimal age for L 2 acquisition in the age range tested must be rejected. This finding is in agreement with Ekstrand (1976 b) who found an almost linear relation between age and language variables in the age range 8-17 for a very large group of immigrant pupils when plotting test results against thirds of year of birth. Foreign language acquisition ability seems to follow a similar course of development as that of the intellectual development in general.

The correlations obtained in this study, as well as those reported by Ekstrand (1976 a, 1977 a) between second language variables and intelligence are in the range .20 - .50. This range is the same as for correlations between L 1 and L 2 variables (Ekstrand, 1977 a; Skutnabb-Kangas & Toukomaa, 1976).

It is obvious from these findings, and also from those of Ekstrand (1976 b), that learning becomes more efficient with age. This conclusion is corroborated in a number of other L 2 learning studies, accounted for in Ekstrand (1976 b), but in which the age variable has not been used in such a finely graded and continuous way as in the present study or in Ekstrand (1976 b).

The present study, however, cannot be taken as evidence that the formation of learning sets does not facilitate later language learning. The type of study which compares early learners with learners without early experience after some time of simultaneous teaching would yield some evidence on this point. Ekstrand (1964) compared pupils with various amount of early training in grades 1-4 with pupils without such training after one year of regular English teaching in grade 5. Only small differences between the two groups were found, in agreement with a number of other studies, reviewed in Ekstrand (1976) which show that early training gives little advantage in later learning, or that the advantages disappear after some time.

The existing evidence, however, is not completely conclusive. In the first place, some contradictory results do exist, although such results as a rule come from less well designed and controlled studies or from anecdotal evidence. In the second place, the later teaching should build on and make use of the early training if it is to be of any value. Such a follow-up situation presupposes that the later teaching methods, materials and so on be adjusted to the pupils' previous experience. Such a continuous program is impossible in the experimental situation, however. The teachers in the late phase of the study must not know which pupils are experimental and which ones are controls. I once, in a small municipal unit, noticed strong signs of compensatory efforts from teachers who knew that their pupils were used as controls and wanted to show that their pupils could be as good as any. But also in the strict experimental situation where the experimental and the control pupils are mixed in the later phase, teachers' normal diagnostic set and their compensatory action may swamp the experimental variance. Keeping these research difficulties in mind, most studies seem to point to no differences between experimental and control pupils.

Thus, the existing empirical didactic evidence so far does not seem to support the notion of the value of the formation of learning sets. These data, moreover, gain strong support in basic studies of learning. Zimmerman and Torrey (1965) review in detail a Harlow experiment which clearly shows

that the formation of learning sets becomes more efficient with age.

Learning set and transfer

For a technical discussion of the formation of learning sets the reader is referred to Miles (1965), where the effects of qualitative and quantitative variations in reinforcement, problem length and number of other variables are discussed in terms of experimental data. Two results only from Miles' study will be mentioned here. The first is the stability of learning sets. After initial variability, learning set performance is very stable. Reliability coefficients for the performance on different days and for adjacent blocks of problems range from .80 to .96 and seems to be well over .90 in the final stage of set formation. Retention stability is also impressive. After about two months, no loss in performance was found in one experiment. In other experiments, about 90 % correct responses were obtained after 7 months of no training. All these experiments were performed with monkeys.

The second result to be mentioned is the fact that stimulus similarity seems to play a similar role in problem-solving as in simple stimulus-response conditioning. Miles (ibid.) reviews experiments that show that sets are formed more efficiently if problems have similar components in common. The greater the similarity, the more efficient becomes the formation. Monkeys use more than one stimulus attribute in the solution of problems. They also generalize color discriminations more readily than size or form discrimination.

Gluck and Harlow (1971) and Harlow et al. (1971) stress the theoretical and practical importance of not confusing the formation of learning sets with simple transfer effects of learning. An important issue in early foreign language learning experiments, therefore, is whether language learning involves problem-solving or just simple conditioning effects. It is obvious that both processes are involved. Clark (1976) points out that referential communication involves a good deal of problem solving, as it is often not quite clear what the referent is. Glucksberg (1967) has shown that referential communication develops as a function of age. It is also clear, even from a crude analysis, that the choice of words, expressions, forms and syntactical constructions in linguistic communication involves a good deal of categorization, discrimination and other kinds of problem-solving. It seems, therefore, that linguistic performance involves classical and instrumental conditioning and transfer effects as well as

problem-solving and other cognitive processes which might involve the formation of sets and transfer effects.

Recent experiments have shown that the formation of learning sets improve the cognitive capacity in a very tangible way. For instance, Rydberg and Arnberg (1976) used touch as an indicator of attention in problem-solving. In a series of learning-set studies, they found that adults can solve problems even if they attend to four dimensions in the same trial. Young children can attend to one dimension only, but after training even 6-year-olds can attend to four dimensions in the same trial. Thus, training in problem-solving of a rather limited nature (8 problems) may drastically improve the learning set.

Friberg (1975), using the same kind of apparatus as Rydberg and Arnberg, obtained marked transfer effects in conceptual training of mentally retarded subjects. Transfer was obtained in conservation of quantity, choice among "everyday situations" (pictures) and perceptual discrimination of a comparatively complex nature. This kind of transfer is rather impressive, as it was quite unexpected by the experimentators and the tasks are so different. The transfer seems to be related to the problem-solving strategies, rather than to similarity between components of the problems. Somehow the subjects seem to learn how to adjust their selective attention to new situations according to the varying requirements of the different problems. This in turn suggests processes on rather high a level of abstraction.

Such findings suggest that the training effects of language learning may be concerned with various abilities such as selective listening, speech motor training; visual perception, concept formation and associative learning with transfer effects to other domains of cognitive activities than second language learning. Likewise, second language learning may draw upon a number of seemingly unrelated cognitive functions. Such a state of conditions might explain why the course of development swamps the effects of early language training and at the same time resolve the apparent conflict between the belief in the importance of early stimulation and the negative findings of early L 2 training. Such propositions transfer the interest to two domains: possible effects of L 2 learning on the general cognitive development, and the problem of deprived versus enriched environments. In other words, even though early second language learning does not have marked effects in later language learning, it may still contribute to the general development of the individual and thus not be so useless as the negative results with regard to language learning indicate.

The effects of deprived and enriched early environments

A great number of studies on animals have yielded marked differential effects in the direction of positive effects of enriched environments. Gluck and Harlow (1971) discuss experimental conditions and review a number of experiments with animals. Enriched environments consists of ample space; extra stimuli such as geometrical objects of varying size, shape and color, apparatus for climbing and other activities, and access to several age mates. Deprived conditions consist of restricted space and no access to age mates or stimulus objects or apparatus. With dogs, enriched conditions have usually been to rear the dogs as household pets.

A large number of studies with rodents typically yield positive results for the enriched condition. The experimental designs, however, have as a rule allowed and even made probable the interpretation that the cause of improvement has been a transfer of specific response elements rather than a general facilitation of learning such as the formation of a learning set. However, a few experiments seem to have demonstrated general facilitatory effects. A number of studies have indicated that certain periods of age have been critical for producing the positive effects of the enriched environment, but as subjects always have been tested at the same age, the age of early experience has been confounded with the time between treatment and testing. Furthermore, effects have as a rule been found in certain tasks but not in others. Handling has proved to be an enriched condition which produces positive effects.

Experiments with dogs have usually yielded obscure results and the studies reviewed by Gluck and Harlow (1971) were all severely criticized by the reviewers. Apart from the usual confounding of transfer with formation of learning sets, some of the test tasks have been sensitive to stress influences, a condition often characterizing isolated dogs.

Research with monkeys has been extensive. Part of the research, however, has been carried out with imported animals and their pre-history therefore has not been completely known. Some experiments have resulted in slower action and other perseverative tendencies, but again, these results do not necessarily indicate altered intellectual capacity.

A number of explanations of the negative results of deprived conditions have been advanced. Gluck and Harlow (op.cit.) refer to the work of Riesen in 1966, demonstrating that deprivation of a sensory system (dark rearing) can result in atrophy or degeneration of this system, relieving the animal of neural substrata that may lie under particular sets of behaviors. Re-

lated research by Rosenzweig and coworkers has demonstrated that an enriched environment accounts for a large portion of increments in rats' brain growth and chemical activity as compared to deprived animals. It may be hypothesized that neural systems may be more or less developed at birth and that the external environment must contribute critical stimuli to complete neural maturation.

The Hebb (1949) view postulates that the organism early in life learns how to organize perceptual and motor responses. Failure of the rearing environment to provide critical experiences for such learning may permanently decrease basic perceptual-motor, emotional, social and information-processing responses. In summary, we find three kinds of experimentally supported theories: the atrophy, the underdevelopment and the learning deficit theory.

The perhaps most extensive experiments with early social deprivation are those performed at the Wisconsin Primate Research Center, as summarized by Harlow et al. (1971). Social deprivation was preferred to sensory and motor restrictions because of the dangers of atrophy or underdevelopment of the nervous system as discussed above. To cut an extensive summary and discussion of results short, no demonstrable impairment of learning set formation could be demonstrated:

"The results of these experiments raise serious doubts that differences in early, preadolescent environments leave any long-term effect on learning or intellectual capacilities. On only one measure was a group of environmentally enriched monkeys superior to monkeys raised in either moderately deprived or extremely deprived conditions, and on the other measures the enriched monkeys were frequently inferior to those suffering extreme social deprivation." (p. 146)

"It is our belief that the previous experimenters were wrong in assuming that social deprivation debased subsequent learning ability. As of the present time the only conclusion that we can draw is that early environments greatly alter emotional and personality variables but have little or no effect on learning or intellectual variables." (p. 147)

Harlow et al. (ibid.) severely criticize some of the research on early environment (p. 146):

"There now exists a wealth of intellectually poverty-stricken literature which shows that any knowledgeable experimentator who wishes to demonstrate that mammals raised in enriched environments are intellectually superior to those raised in deprived environments can achieve this goal. By conforming to simple fundamental laws of human stupidity this is easily achieved by some investigators using simple experimental designs and by others using experimental designs that they conceive to be recondite. The cheerless thought is that the experiments were created by human beings themselves reared in enriched environments, proving only that enriched environments alone are not adequate to facilitate thinking."

Now, these harsh words may have been a little hasty. In the first place, restricting the deprived conditions to the social domain only seriously limits the generalizability of the research. The argument for doing so is not convincing. There are nuances between complete sensory deprivation with risk for neural degeneration and no deprivation. An intermediate level of restriction might have been chosen in order to introduce cognitive deprivation as an independent variable related to the criterion variables. In spite of numerous claims of the opposite, most empirical studies seem to show no or very slight relationships between cognitive and affective variables (Ekstrand, 1976). Only in extreme situations of traumatic experience, prolonged conflict or strong stress arousing the autonomic nervous system are cognitive variables lastingly affected by emotional response. In particular, in depressive states, perceptual and cognitive functioning is usually adequate (Zimmer & Foy, 1963), according to their review of the clinical literature. Therefore, social deprivation alone does not seem to be a sufficient condition in order to test the effects of a deprived environment on cognitive functions.

Furthermore, shortly after the publication of the quoted conclusions and the quoted criticism, Harlow had to admit that a deprived environment can produce effects on learning in monkeys (Harlow, Harlow & Suomi, 1971). The differences between deprived an enriched monkeys appeared on the most complex problem-oddity-learning set (.001 level of significance). As Harlow et al. (op.cit.) assert, the reason for this sudden difference in learning capacity (there was no progressive increase in differences with increasing complexity of tasks) is by no means clear. The finding does add another item to the general picture of the relation between the affective and the cognitive domain. Within a wide range, the two domains seem to be unrelated. Moderate emotional disturbance does not seem to affect cognitive functioning, nor does cognitive achievements seem to alter the emotional state. Outside this range, the impact from one domain to the other appears suddenly and as a rule drastically (Smythies, 1970; Pavlov, 1960). This seems to be true for man and a number of other species.

A number of compensatory educational programs in the U.S.A., including "Head Start", "More Effective School" and "Follow Through", have largely been failures (OECD, 1971). The interpretation of these findings is that the problem is just not that certain groups get low results in school as a consequence of a deprived or restricted environment. The problem has deep socio-economic roots.

There is at least one compensatory program which has succeeded, however, the "Milwaukee Project" in Wisconsin. The starting point was the fact that about 80 % of the mentally retarded (below IQ 75) in the U.S.A. do not present demonstrable pathology in the structure or the functioning of the nervous system (Heber et al., 1972). A survey study revealed that maternal intelligence is decisive for the development of intelligence in the child. If the mother has an IQ below 80, about 80 % of the children also fall below this value, i.e. they are a high risk group.

An experiment was started with 20 control and 20 experimental children with an intensive compensatory program, including maternal reHabilitation in the experimental group. The control group was exposed to no other treatment than the test administration at certain intervals. Within the general frame of a day care center, the experimental children received an individualized training aiming at development in the content areas of perceptual-motor training, language, reading, mathematics and problem-solving and socio-emotional factors. Extensive teacher training was provided before and during the program, which lasted from infancy to the age of six (Heber et al., 1972).

At the age of about two, the intelligence curves stabilized. The mean IQ for the experimental children fluctuated around 120, while the controls levelled out at about IQ 95. Both these values are unexpectedly high. The upper value may be explained by the enriched environment, as may in fact the lower. Neither the children nor the mothers were unaffected by the testing program and the interest in the children's development. The differences between groups remain after about three years of regular schooling, after the end of the intervention program (Garber, 1977, personal communication).

The main differences between the Milwaukee project and Head Start and all other compensatory programs seems to be that the Milwaukee approach is virtually one that creates learning sets, while the other approaches more or less consciously seem to build on a transfer thinking. As Garber and Heber (1974) put it:

A major part of our concern for the cognitive development of children was to minimize, the technique of simply identifying and providing children with those facts which are the supposed elements for success in school. We wanted the children to be able to act spontaneously whenever the situation changed, so we emphasized thinking creatively as well as providing the child with a basic age-related repertoire of responses". (p. 7)

From the basic research on animals and the applied research on children with enriched environments, two working hypotheses seem to emerge with

respect to language teaching. The first is that the instruction in a second language must more consciously be aimed at creating learning sets. In other words, the children must learn how to use the words and phrases they learn in various practical situations. Second language teaching typically aims at creating transfer, i.e. to teach the children to pronounce, read and spell correctly, to learn to speak and write grammatically correct. The class situation effectively prevents practical exercises.

The second conclusion is that language is content and not only form. In other words, language is used to express the thoughts, i.e. the cognitive processes of the individual. If these processes do not develop, language obviously cannot develop either. Therefore, it would from the enrichment research on animals cited above seem as if children should be subjected to a learning set development strategy in all respects of their cognitive development. Again, the school situation, including second language teaching, typically focuses on basic learning, to some extent on transfer effects and hardly at all on training in problem-solving and the application of the pupils' knowledge and problem-solving capacities in new situations.

A close connection between native language development and cognitive development was achieved in the Milwaukee project. The two major emphases of this project was (1) cognition and (2) language (Garber & Heber, 1974). Cognitive and language training took part simultaneously and in so close contact with each other that the two emphases were actually part of each other. The personnel was chosen so as to be "language facile and affectionate" (op.cit., p. 6). In this setting, the children were subjected to an extensive program designed to develop general cognitive and perceptual skills.

Today, evidence is piling up supporting the notion of a complex interrelationship between cognition and language (Ekstrand, 1977). Particularly relevant is research on early learning in infants and especially on the interaction between mothers and children. It has been demonstrated that the parents, and in particular the mothers, are the main mediators between the child and the environment. The teaching strategies of the mothers affect and mould the educability of the children (Hartman & Haavind, 1976). The mothers' mode of instruction and their ability to adjust their instruction according to the children's performance on a construction task strongly affected the children's development of problem-solving ability (Middleton

& Wood, 1976). A similar adjustment of mothers' speech to their babies, reflecting their children's growing ability to function as conversational partners, has been demonstrated for two mothers with babies between 3 and 18 months by Snow (1976 a).

The role of the cognitive processes in the development of speech has been demonstrated by Clark (1976), pointing out that linguistic processes involve a good deal of problem-solving, in that the listener must infer the referents of many words, and by Glucksberg (1967) who has demonstrated that referential communication develops with age. Bruner (1976 b) also, in his studies of the transition from the pre-linguistic to linguistic modes of communication during the first two years of life, concludes that communication involves problem-solving and that communication is a means to achieve and end. Lorenz (1974) and Hebb (1949) have both pointed out that language to a very great extent consists of spatial analogues. Thus, it becomes almost self-evident that "the child's knowledge of language is deeply dependent upon a prior mastery of concepts about the world to which language will refer" (Bruner, 1976 a, p. 266). This was also demonstrated by Halpern and Aviezer (1976), who showed that object permanence as defined by Piaget appears before the appearance of linguistic structures such as verb-related constructions (agent-action, action-object). Such findings make the idea of Chomsky, Lenneberg and McNeil that linguistic rules are innate and develop independently of intelligence appear to be an extreme position (Halpern & Aviezer, 1976, pp. 1, 13.)

Some early research on the effects of deprived environment on language and cognition is of interest in this context. McCarthy (1954) has reviewed research on the effects of institutionalization and is struck by the observations of how early language deficits are manifested, already in the amount of crying, and how lasting they are. Early research also reveals the SES effects that are so much emphasized today. Interestingly, McCarthy (op.cit.) finds that traveling and other events that broaden the child's experiences are followed by an increase in vocabulary. This is an agreement with Kantor's (1965) findings that moving once or twice during childhood is associated with increased cotnitive capacities, while excessive moving as well as being stationary may have detrimental effects. There is also an association between the early language manifestations in children and general intelligence. For instance, there is a correlation of -.41 between onset of speech and later IQ. Jones (1954) has reviewed early research on environmental factors and cognitive development and discusses the well-known findings by Gordon (1923), Husén (1951), and others, showing clearly

the environmental effects of isolation, schooling and other social factors on intelligence measures.

Also pertinent in this context is the question whether early second language training is harmful or not. Malmberg (1971, 1977) has repeatedly argued that such training is harmful if started "before the native language is established". In view of the fact that native language development seems to go on throughout life (Diller, 1971, p. 29), this starting point seems a bit difficult to establish. Also other authors have raised the question of the possible harmfulness in early learning (Green, 1977) in general.

Borger and Seaborne (1966) review all the classical research on, for instance, tadpoles who were allowed to swim or not, children who have been allowed to crawl in staircases and not, the swaddling of Hopi and East European children, and so forth. All these studies reveal no harmful effects of early training or restriction, but show that differences vanish with time. More recently, however, Pikler (1971) has suggested some harmful effects of too early training of walking in infants.

Little research seems to have been carried out on the interaction effects of early L 2 training. No harmful effects were reported from the extensive experiments of the Swedish Board of Education during the late fifties and the sixties. In fact, positive social and emotional effects were reported when the audio-visual course was introduced into special classes. Donoghue (1965) reviews research on the effects of the early FLES experiments on the general academic achievement and found no harmful effects. Johnson et al. (1961) in one study finds no serious effects on academic achievement and Lopato (1962) makes a similar observation. Geigle (1957) also draws the same conclusion in agreement with Potts (1967) and Smith (1967).

Malmberg (1971) argues that his apprehensions concerning early L 2 training are particularly strong in the case of pupils in special classes. This suspicion is partly borne out in the research on early English teaching in Denmark (Florander & Jansen, 1969). Special class children with early English teaching were clearly inferior in written tests in Danish to special class pupils without such training, and no other explanations could be found. The authors conclude that "harmful effects cannot be excluded" (p. 52). No such effects could be traced in pupils in ordinary classes.

However, it would seem that the Danish experiences are due to a less suitable didactic approach. While no formal studies of harmful effects were carried out in the Swedish experiments in special classes, the communica-

tions between the teachers and the local supervisors and them and the Board of Education were so intense that any negative consequences would have been heard of. The explanation that I would advance is that the Swedish method of instruction was completely oral-aural, while this was not so in the Danish experiments. A slight change in procedure would probably eliminate the risks for interference in writing the native language in special class pupils.

Previous research on "harmful effects" does not seem to be completely conclusive. The critics of early L 2 teaching should specify in which variables such effects might be expected and by what mechanisms the effects would come about. The negative effects should be weighed against the positive effects and if possible eliminated by an appropriate choice of method. In fact, the positive effects in the Swedish experiments were so pronounced that it was decided that the curriculum in the comprehensive school should basically be the same for pupils in regular and special classes.

For pupils in the type 2 situation, i.e. immigrant pupils, another mechanism might operate. The acquisition of a foreign language seems to take longer time and the deterioration of the native language is a faster process (Toukomaa, 1975). Thus, there might be a more or less prolonged period of retarded language development. While the mechanisms for language acquisition and deterioration should be further studied and diagnostic methods developed, for instance along the new and interesting lines of the research of Stankowski (1977, personal communication), it could be surmised that didactic measures taken to improve the cognitive development should prove helpful in speeding up the acquisition of the new language and prevent the deterioration of the old. Such attempts have recently been launched, for instance by Heron and Kroeger (1974).

Further evidence for the cognitive nature of language

The spatial analogies in language have attracted the attention of many scientists. For instance, Hebb (1949, p. 118) writes:

"Consider again the role of analogy in human thought, and the figures of speech that betray it even in scientific work. The pons and island and aqueduct of cerebral anatomy; the wave of sound and cycle of sunspots in physics and meteorology; the rise of the blood-sugar level, and the limen of stimulation in physiology - all these are as enlightening, concerning the nature of learning and intelligence ... Such figures of speech are at the very least an aid to memory; even when it has a totally new reference, the familiar term is more easily recalled than a neulogism. Using it is therefore more than an economy of language. The underlying analogy with

something already known is an economy of thought as well, an economy of effort in learning and understanding."

Also Lorenz (1974, p. 167) has made similar observations and quotes Porzig:

"Language translates all conditions of a non-imagery nature to spatial conditions. And it is not only one language or language group which does so, but all, without exceptions. This peculiarity belongs to the invariant features of human language. Time relations are constantly expressed in a spatial way: before or after Christmas, within two years. Concerning mental processes we do not only speak of outside and inside, but also of 'above and below' the threshold of conscience, of the subconscious, of figure and ground, of deep and layers of the mind. Space pervasively serves as a model for non-visual relations: besides working, he also teaches, love was bigger than ambition, behind these measures the intention was hidden - it is quite unnecessary here to pile up examples, as one can gather any number from every instance of oral or written language. --- It is not only found in the prepositions, which all originally denotate spatial conditions, but in verbs and nouns as well."

Strømnes in a series of studies (1973, 1974 a, b, c, d, 1976) maintains that people of different cultures perceive the physical world in different ways, and that language reflects such perceptual and conceptual differences. For instance, different ways of patterning cloth, of describing ice-hockey games, of erecting buildings reflect cultural differences between Sweden and Finland. These differences are reflected in the languages, which belong to different language families. Also other researchers, such as Moeser and Bregman (1973), who have shown that early syntax learning should be mediated through an understanding of the reference field, tend to relate linguistic and spatial variables. Nyman (1926) has demonstrated the pervasive and enduring influence of spatial analogies in philosophical scientific work.

Effects of L 2 learning on cognition

We would, a priori, expect general cognitive factors to be of greater importance for L 1 and L 2 learning than vice versa, simply because language constitutes one of many sets of variables involved in cognitive development. However, also empirical evidence contributes to this conclusion, such as recent findings about concept formation being developed before the corresponding linguistic code, problem solving processes involved in language and the great amount of spatial analogies in language. Also neuro-linguistic and neuro-psychological evidence seems to support this view.

The conclusion cited also seems to be borne out by existing research on bilingualism and intelligence. Early studies used to show superiority in intelligence for unilinguals. When nonverbal measures of intelligence were being used, the difference tended to disappear and, in particular when SES

was controlled for, sometimes went in the favour of the bilinguals. Some recent experiments seem to indicate superiority for bilinguals in problem sensitivity and portrait sensitivity (Bain, 1974), in separating words from their meaning (Ianco-Worral, 1972), and in sensitivity for communicative needs (Genesee, Tucker & Lambert, 1975).

However, differences, although significant, are not large. The association between intelligence and bi- or monolingualism, therefore, is not very strong, which would show as low correlations between the dependent and independent variables, were such measures used. Furthermore, as pointed out in the introduction to this report, results from this type of research are obscured by the fact that subjects typically are not assigned at random to the different experimental conditions.

On the basis of the preceeding analysis, we would expect L 2 learning to follow a course similar to that of general cognitive development as shown by Bayley (1955). Provided one employs appropriate methods of instruction and measurement, we hypothesize that it would be possible to improve L 2 teaching, not to the extent that the developmental course is levelled out, but at least to the extent that significant differences in favour of an experiment group will appear, and persist for a long period of time.

In stating that the direction of causality as reflected in the correlation between language and cognition is stronger from cognition to language than vice versa, I do not deny that language contributes to cognition by, for instance, supplying labels and thereby increasing the precision in thinking. Language is a powerful in- and output means to the mind as it were. There are, however, other in- and output systems besides language, e.g. non-verbal systems of communication. There are also other ways of thinking than by language, for instance by imagery. One outstanding example is Nikola Tesla (who has given his name to the SI unit 'tesla' /T/ for magnetic induction). In his memories (Tesla, 1977) he describes his remarkable powers of imagery and says (p. 13):

"When I get an idea, I start at once building it up in my imagination. I change the construction, make improvements and operate the device in my mind. It is absolutely inmaterial to me whether I run my turbine in thought or test it in my shop. I even note if it is out of balance."

In the case of L 2 the direction is so much more obvious as L 2 in most cases is not learnt until the cognitive structure is stabilized.

Summary and synthesis of the discussion

The research reviewed in this section indicates that the hypothesis of an optimum for L 2 learning must be rejected for the age range investigated here. The hypothesis of learning set formation cannot well be tested with the kind of design employed. A follow-up study by Ekstrand (1964) suggests that the effects of the early teaching are small, in spite of the greater amount of teaching which the experimental children have enjoyed. This is in agreement with most other studies, reviewed in a later section. Part of the explanation of the findings reported here is that the ability to form learning sets, not only S-R learning, increases with age. Part of the explanation is also that methods of language instruction do not aim at learning set formation but rather at simple conditioning and transfer effects. In other words, teaching procedures should aim at problem-solving situations, i.e. the application of the language skills in a wide repertoire of situations, without corrections and other kinds of creativity-inhibiting surveillance.

As we know from other research, for instance that of Thorndike et al. (1928), also other domains of learning improve with age. Being in agreement with both learning set theory and developmental psychology, we find ourselves caught in a paradox, viz. because of the findings of the importance of early environment, as clearly indicated by early deprivation studies and more recently by the Milwaukee experiment.

One solution of this paradox might be that some early language experiences may be of a learning set-forming nature. This seems to explain the success of the Milwaukee project in contrast to other recent enrichment programs. Consequently, attempts to measure the effects of early language training should aim at the development of tests of the creative aspects of language and also of the effects of L 2 learning on cognition. This is provided that the teaching methods can be developed in the direction suggested. In harmony with the learning set theory, much of the psycholinguistic research on native language functions today is focused on the creative aspects of language, which seems very adequate.

The association between L 2 and cognitive factors indicated in much experimental research is clearly demonstrated in the present study. Even the rather specific L 2 variables of pronunciation and listening comprehension show a small but definite relationship with general intelligence in the terms of Guilford's (1956) verbal interpretations of correlation coefficients.

The design employed has turned out not to be appropriate for testing the hypothesis of the formation of language learning sets. It does, however, test the hypothesis of an early optimum. No such optimum is found in the age range tested. The failure of most studies to demonstrate lasting and substantial effects of an early start on L 2 learning, which is discussed in detail in connection with the next paper, suggests that learning set formation is not achieved. The findings of the Milwaukee project, in harmony with results from basic research, suggest that such formation is possible. Such a conclusion is also supported by the results of Rydberg and Arnberg (1976) and of Friberg (1975). There are obvious implications from this discussion for practical teaching procedures.

L 2 learning seems to follow the general developmental course in children, in agreement with the findings of Thorndike et al. (1928) that second languages, mathematics, history and other subjects are learned better with age. While it is not suggested that this course can be completely altered, it is suggested that more appropriate teaching procedures should be able to produce more lasting results from early L 2 teaching, in addition to the obvious need in native and immigrant children in all ages to have one or more foreign languages at their disposal. The "harmful effects" of early L 2 learning seem to be small or non-existent, particularly in comparison with the positive effects.

Part III:

AGE AND LENGTH OF RESIDENCE AS VARIABLES RELATED TO THE ADJUSTMENT OF MIGRANT CHILDREN, WITH SPECIAL REFERENCE TO SECOND LANGUAGE LEARNING

(In: Proceedings of the Fourth International Congress of Applied Linguistics. Stuttgart: HochschulVerlag, 1976.)

PROBLEM

A number of explicitely formulated theories predict an optimum for second language learning in early ages. Penfield and Roberts (1959) advance the plasticity theory, predicting an optimum between 4 and 8. Donoghue (1964) asserts that the ability to imitate audio-orally is better in young children than later in life. Lenneberg (1967) has advanced the critical period theory and the associated resonance and lateralisation theories, all predicting that L 1 and L 2 learning can take place between onset of speech and onset of puberty only. During the critical period second language learning is more or less automatic, while after this period it becomes inefficient and laborious.

A number of research studies yield contradictory results. Those in favor of the optimal age theories are either anecdotal or afflicted with experimental shortcomings, while those yielding opposite results as a rule are of better quality. None of the studies contradicting the theory is designed to reveal with certainty a possible optimum, however. An interval of several years may hide an optimum in spite of the later age showing significantly better learning ability than the younger age. Language measurements must be plotted against a finely graded age continuum and the number of individuals must be large enough to give reliable estimates of every point of the function.

METHOD

By writing to all L.G.A.s in Sweden, all immigrant pupils who in the spring of 1966 were in need of special tuition in Swedish and also given such tuition were identified. Test data and back-ground data were obtained for about 90 % of this population. There are missing data in one or more variables for most pupils for a variety of reasons, but a number of statistical checks failed to reveal systematical tendencies of the missing data. There were six functional language tests, three reading tests and

three intelligence tests and teacher ratings of social, emotional and adjustment.

Further checks in addition to those reported in the paper show that 766 (87.1 %) out of 880 correlations (Cramér's statistic) between missing test data and 40 background variables were between 0 and .19. Out of 1,600 correlations between missing background data and background values, 85.9 % were between 0 and .19. All higher values turned out to be due to "natural reasons", e.g. younger pupils not having intelligence test results, due to lack of suitable tests for this age range. In other words, there seems to be no systematic tendency for missing data apart from reasons already known and which can be made allowances for.

RESULTS

By computing contingency coefficients between a number of background variables, it was found that age is strongly correlated with grade only, Table 5. LOR is strongly related to "Previous knowledge of Swedish" only. Age is uncorrelated with LOR. Age and LOR may thus be studied independently, and there is no need to control the other background variables studied.

The pupils were grouped in 26 groups according to third of year of birth. 1 = born 1949 or earlier, 2 = born January April 1950 (16: 1-4 years at the time of testing), 3 = born May - August, 1950 (15:9 - 16:0), etc. The age group means from the four domains, i.e. adjustment assessments, language, reading and intelligence tests, were plotted against age. Analyses of variance were used to test the significance of the trends.

In the original paper (Ekstrand, 1976 b), the curves for five variables only are given, due to space limitations. Here, curves for the sex language variables, three measures from the third oral reading test, the three intelligence measures and the four teacher assessments are presented in Fig. 1. As is clearly shown, reading skill as well as L 2 learning follows the non-verbal cognitive development. There are ceiling effects in some tests, as they tend to be too easy in higher grades (for discussion, see Manual, Ekstrand, 1974).

The adjustment assessments are unrelated to age. "Progress in school" is negatively and significantly related to age, but the ω^2 value indicating the relation between the independent and the dependent variable is very low. The ω^2 values for language, reading and intelligence tests are all well above the conventional, arbitrary limit of .05 and are in

many cases substantial. Apart from the R and N factor tests (Thurstone classification) and Free Oral Production, all test results are positively and significantly related to age. When ANOVAS for extreme age groups were computed, the R and N factor tests too showed a positive and significant relation to age.

To test the effects of LOR, the pupils were grouped in thirds of year of residence. Group means for the tests were plotted against LOR. ANOVAS were computed. All ω^2 values are very low, except Free Oral Production with a value of .22. Listening Comprehension is just above the .05 criterion and Free Written Production almost reaches it. The adjustment assessments are unrelated to LOR. All language and reading tests are positively and significantly related to LOR (except number of words read, for all the three reading tests). Most of the pupils had a LOR within 2 years.

DISCUSSION

The age effects of this study strongly support those of the previous study. In addition to the theories of an early L 2 optimum, mentioned above, these theories might be added: the two-type learning theories (Anderson, 1960; Ervin & Osgood, 1965; Ellegård, 1971), which all presuppose two different kinds of L 2 learning and also predict an early optimum, and the psycho-dynamic theories (Stengel, 1939; Curran, 1961; Guiora et al., 1972 a, b; Schumann, 1975), predicting difficulties in L 2 learning after puberty because of too strong super-ego control. Rosansky's Piaget based developmental theory should also be mentioned, which states that the restructuring of thought in the formal operations period should be an inhibiting factor for L 2 acquisition (1975). A recent approach is the limbic system theory (Walz, 1976), which places certain language functions, viz. accent and grammar, in the limbic system or, more specifically, the thalamus. That there indeed are lateralized thalamic language functions is borne out by experimental research (Penfield & Roberts, 1959; Ojemann & Ward, 1971). The thalamic functions seem to be developed around the age of four, which leads Walz to the conclusion that a child picks up an accent easier than an adult (p. 105). In fact, all theoretical approaches seem to agree upon an early optimum, also the most recent ones, and to disregard the accumulating contrary evidence.

It must be admitted that the empirical evidence still seems contradictory. In addition to the research reviewed in the present paper, the following studies should be mentioned. Dryer (1956) compared college

freshmen taking French with and without experience of French in elementary school and high school and found the first group to be superior. The evidence is only anecdotal, however. Justman and Nass (1956) performed similar comparisons in high school with pupils taking French and Spanish. The pupils with and without prior experience were matched on sex, age and IQ. Results with the French groups were contradictory and insignificant. Results with the Spanish groups showed a significant difference in favor of the experimental pupils, but this difference did not persist beyond the first semester of instruction. Both studies mentioned confound starting age with the total amount of instruction, which is much larger for the experimental groups.

Ginsberg (1960) claims that pre-school children learn a foreign language "much more rapidly, better and more permanently than children of school age" (p. 24), but the evidence is anecdotal only. Larew (1961) reports a small experiment in pronunciation with only ten children of various age. Results after only four lessons yielded inconsistent results. Grinder, Otomo and Toyota (1962) compared grade 2, 3 and 4 children who had studied Japanese for a year with respect to vocabulary, comprehension and nine articulatory variables, basic to Japanese speech. Higher grade was significantly related to better results in comprehension, silent vowels, t and ts, while a trend appeared for vocabulary and d. In six out of eleven variables, children thus did significantly better in older ages.

Vocolo (1967) reports another comparison of students with and without a FLES experience in French. The controls were matched with the experimental students on intelligence, academic achievement, sex, SES and physical health. In listening, writing and speaking tests the experimental students were significantly superior to the controls, while a tendency to superiority in reading was not significant. This study is a very well-controlled one, but again confounds starting age with amount of instruction. The comparison was made after two years of study, but should have been followed-up to check whether the results were persistent.

Burstall (1970, 1975 a, b) compared students starting with French at two age levels, 8 and 11 years. "Pupils taught French from the age of eight did not show any substantial gains in achievement" (Burstall, 1975 a, p. 195). "When experimental pupils were compared at the age of 13 with control pupils who had been learning French for an equivalent period of time, but were, on average, two years older, the control pupils' performance on each of the French tests were consistently superior to that of

the experimental pupils" (Burstall, 1975 a, p. 21). The tests were reading, speaking, listening and writing tests. It was further found that amount of instruction plays a major role, but that age tends to outweigh the length of the learning period around the age of 16. This experiment does not suffer from the weakness of unequal amounts of instruction. It also speaks against the idea of learning set formation, but was not designed to test this particular theory.

Bratt (1975) claims that L 2 learning is more efficient in early years but gives only anecdotal evidence. Doyé (1975) and Doyé and Lüttge (1975) compared the effects of starting English in grade 3 with start in grade 5. Around 2,000 pupils started in grade 3 and 500 pupils were selected as controls in grade 5. The pupils were equated with respect to intelligence, arithmetic and spelling, as well as SES. In grade 5, the experimental pupils were superior on all tests. In grade 6, the differences have diminished and the experimental pupils were superior on four out of six tests. The results from grade 7 have not yet reached me.

Carroll (1975) found inconsistent results when comparing the effects of age across and within eight countries. In population IV (preuniversity students) time factors were unclear, due to restricted variability. In some countries years of French showed great variability and was found to be a strong predictor of later success in a negative way. This finding is ascribed to the tendency of brighter students to advance faster in school. When variation of starting year for French was studied, most t-values were insignificant, with the exception of Sweden and the U.S.A., where the tendency was strongly positive, i.e. the later the start, the better the results. In general it might be said that the population IV results contradict the hypothesis that early language teaching is advantageous.

In population II (14-year-olds) age is a weak but not significant predictor. In the comparison of grade for starting French, no t-values reach significance. In the U.S.A. a t-value of 2.40 approaches significance in a negative direction and thus supports, to some extent, the early age hypothesis. The cautious over-all conclusion drawn by Carroll, however, is that the data of this study do not support nor contradict the early age hypothesis. The results might, however, be interpreted as supporting those studies which show that the possible advantages with an early start tend to disappear over the years, cf. Durette, 1972.

Lewis and Massad (1975) find in their study of English as a foreign language in ten countries that the amount of instruction is an important

time factor. In countries where English starts very early, such as Sweden, this factor tends to be less important, however. In these countries other factors, such as motivation, interaction with English-speaking people, etc., tend to gain in importance. In population II, grade is a potent positive predictor. In population IV, grade is a negative factor, i.e. younger students tend to be better learners. However, the authors point out that this may be accounted for by selection factors. The older students in the pre-university grade may be repeaters or slow learners. Thus, the finding in Carroll's study (op.cit.) that the brighter students often are young, reappears in this study. In many countries English is the third language and in some cases the population IV students have ceased studying English. In short, the inconsistent age results from the IEA studies seem to stem from the fact that they were not primarily designed to test time factors, at least not age factors.

The earliest systematically collected data seem to be the two studies reported by Thorndike et al. (1928). The first study was a questionnaire which showed that adults above the age of 40 judged second language learning to be more difficult than did adults below the age of 40. This tendency was stronger for speaking than for reading. Thorndike, however, suspected the results to be due to lack of confidence in the own ability rather than a real diminishing of ability. He therefore undertook an empirical study of the learning of Esperanto by individuals, ranging in age from 8 to 57 years. The tests were Vocabulary, Ability to carry out oral and written instructions and Reading Comprehension. Unfortunately, the Ss were distributed in a large number of subgroups of varying time of instruction, age, intelligence and so forth, so no plots can be made. Crude comparisons between childre and adults may, however, be reliably carried out. Adults above 35 showed a massive superiority over children of 8-10. The difference is obscured by the fact that almost all of the adult Ss were college graduate or under-graduate students, but probably holds true nevertheless.

Seliger, Krashen and Ladefoged (1975), using a questionnaire technique, found that the younger immigrants are at the time of arrival, the better is their self-rated accent. Krashen and Seliger (1975) found a similar tendency for the acquisition of a second dialect, using the same method. Unlike Thorndike, they did not check their Q data with experimental techniques, so the results do not seem dependable.

Snow (1975, 1976 b) studied 41 English-speaking children during their

first year in Holland. An extensive test battery was used at three different occasions. The Ss ranged from 3-15 years of age, and were for analysis divided into four age groups. In addition, ten adults were tested with the same battery. In all tests, older Ss performed significantly better than younger ones. The adults performed equal to or slightly inferior to the 12-15-year-olds, but had been exposed to Dutch to a lesser degree.

The last mentioned study on immigrant children support the evidence from my own study. It is particularly interesting, as it covers an age range which starts very early. However, the small number of Ss and the necessary division into four age groups makes it uncertain if the design can reveal the presence or absence of an optimum.

Generally speaking, the age studies may be divided into three groups. The first is studies designed directly to measure L 2 learning ability in different ages, such as Thorndike's, Snow's and my own two studies. The second type is those which compare different starting ages after some time of regular teaching. The type 2 studies all confound age with amount of instruction. Most of the studies belong to this type. A third type compares pupils with different starting ages after an equal amount of instruction. Burstall's, Mylov's, and the EPAL studies belong to this type.

The data from the best designed studies generally support those of the present study, viz. that older individuals learn a second language better than younger ones. Thus most empirical evidence seems to contradict the remarkably unanimous theories. Furthermore, no optimum seems to exist. Toukomaa ascribes the developmental tendency to the pupils' better mastery of L 1. However, as will be discussed in the last paper, general cognitive factors seem to contribute at least as much. Probably, perceptual and psycho-motor factors contribute as well. Thus, the biological, psychological and educational theories should be rejected in favor of a developmental theory.

While few people would think of the idea of postponing the school start until the age of twelve, this is actually suggested by Toukomaa and Skutnabb-Kangas (1977, p. 67) and Malmberg (1977), as far as L 2 learning is concerned. By analogy, one could also recommend the postponement of the study of other subjects, as they are all learned better at older ages than at the time of the school start at five, six or seven, as the case may be.

The argument of those who recommend that second languages should not be

formally studied until the age of 12-13 is not only, however, superiority in learning capacity with increased age. It is also claimed that the native language is not stabilized until then. As pointed out elsewhere in this report, several studies have shown that the correlations between L 1 and L 2 are only moderately strong. Furthermore, there seems to be no proof whatever that twelve is a more suitable age than any other. As suggested by Mikeš (1974) the phonology of the native language(s) seems to be acquired by the age of three, a conclusion that gains strong support by research cited by Menyuk (1971) and by the research done by Jenkins (1972). On the other hand, abstract thinking as defined by the ability to carry out formal operations, which certainly is important for language development, is not fully developed until after twelve (Furth, 1969; Elkind & Flavell, 1969; Andersson, 1973) and is highly individual, depending on the development of general intelligence. As Diller (1971) points out, language development continues throughout life.

A third argument is the "harmfulness" of L 2 learning before twelve. As pointed out above (p. 35), this problem was studied during the FLES era and no such general effects were found. Jansson and Lindén (1974), as part of the EPAL study, investigated the early learning of a third language in immigrant children. They give some preliminary results in Swedish, English and arithmetic for 1,664 children in grade one, 264 of which were immigrant children born in Sweden and 86 were immigrant children born abroad, and the corresponding results for the same children in grade 2. Some results are given in Table 4, along with some results of the grade 3 controls.

Table 4. Some preliminary comparisons between Swedish and immigrant children within an early English project (EPAL). Experimental children (E) are compared with total group.

	Math	Sw_D	Sw_{E_D}	Sw_{RC}	$Sw_{E_{RC}}$	$Engl_{MS}$	$Engl_{ES}$	
					Grade 1			
Sw	4.9	6.0	6.1	6.2	6.2	4.6	4.6	
IN	4.7	5.9	6.0	6.0	5.9	4.8	4.5	
IF	4.0	4.5	4.9	5.6	5.7	4.9	4.1	
					Grade 2			Controls grade 3 Engl
Sw	4.7	4.8	4.9	5.0	4.9	-	-	4.8
IN	4.6	4.6	4.4	4.7	4.3	-	-	5.2
IF	4.2	4.3	4.4	3.6	3.7	-	-	4.6

Sw = Swedish, D = Dictation, RC = Reading Comprehension, E = Experimental, MS = Middle spring semester, ES = End of spring semester, IN = native-born immigrants, IF = foreign-born immigrants

As the report is a preliminary one only, no tests of significance have been given, and not all results have been reported. Test scores in mathematics and Swedish (dictation and reading comprehension) are given for all classes in the study with n:s as reported above. Tests in Swedish for experimental children (Sw_{ED} and Se_{ERC}), and in English have lower n:s (around 365 for Swedish children, 85 for native-born immigrant children and 30 for foreign-born children) as these results are concerned with the 24 experimental classes only.

As can be seen from the Table, differences between Swedish children and native-born immigrant children (on a 9-point standard scale) are small and in most cases negligible. The tendency for foreign-born immigrant children to perform somewhat lower is evident, bud the differences are not large. The immigrant children constitute a heterogenous group. When they are divided into subgroups according to SES, LOR, and nationality of parents, it becomes evident that children with one Swedish parent do somewhat better, as do children of parents with a long length of residence (LOR). The type of marriage (mixed or not) interacts with SES.

The immigrant children, as well as the Swedish children with early English tend to do as well in tests in Swedish as the total group of children. The second language does not appear to have been disturbed by the third, which strongly speaks against the theory of prior languages having to be established before later languages can be learned.

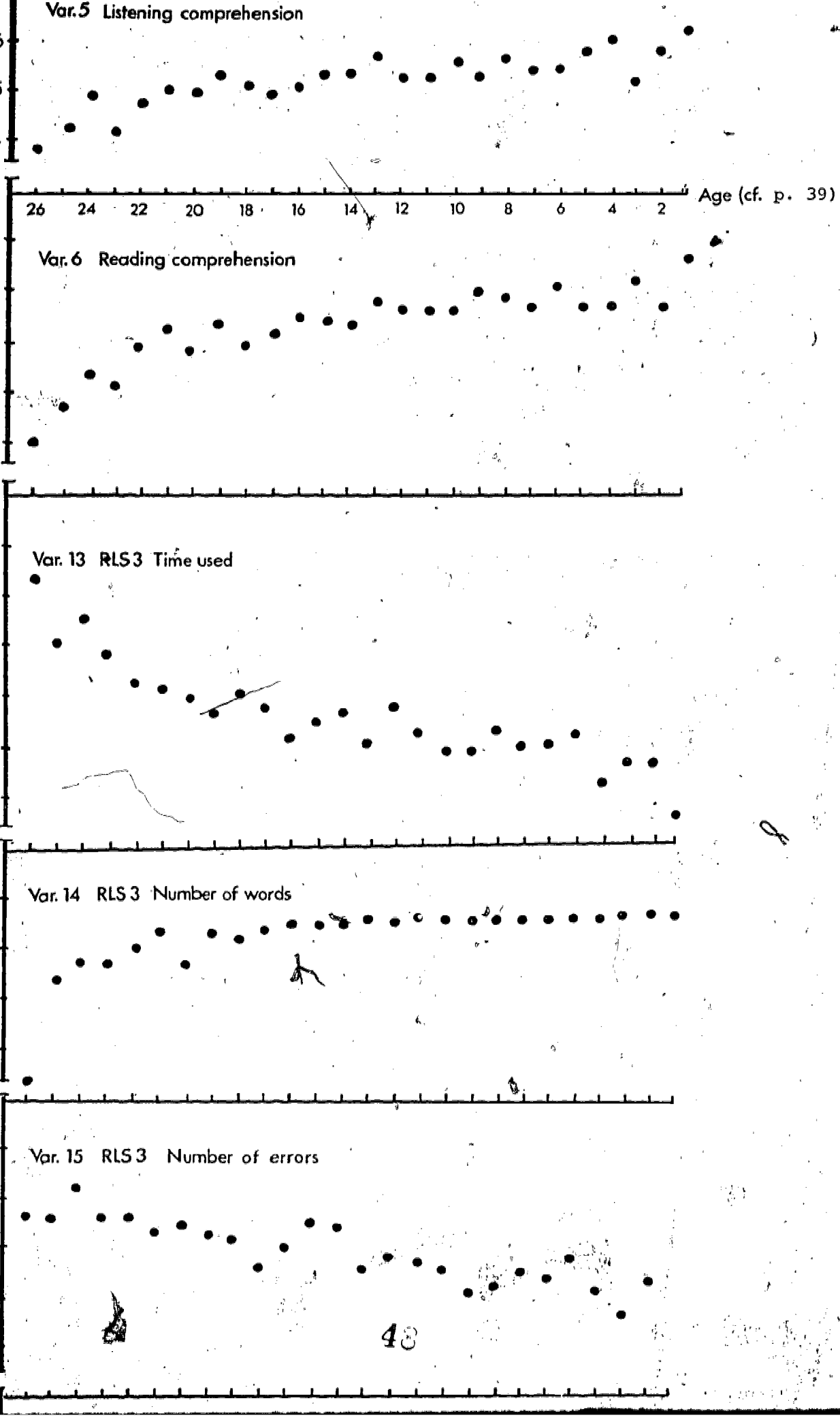
While awaiting further results from the EPAL project, it may be mentioned that Swedish children in grades 1-6 with an early start in English tend to do better in Swedish than control children, that immigrant children in grades 1-6 do as well in English as Swedish children and that immigrant children do worse in Swedish than Swedish children, not surprisingly (Linell, 1977, personal communication). In other words, it seems as the introduction of a second language during the establishing of the first supports the first language, contrary to Malmberg's (1971, p.122-126) very strong claims of the "harmfulness" of early L 2 learning.

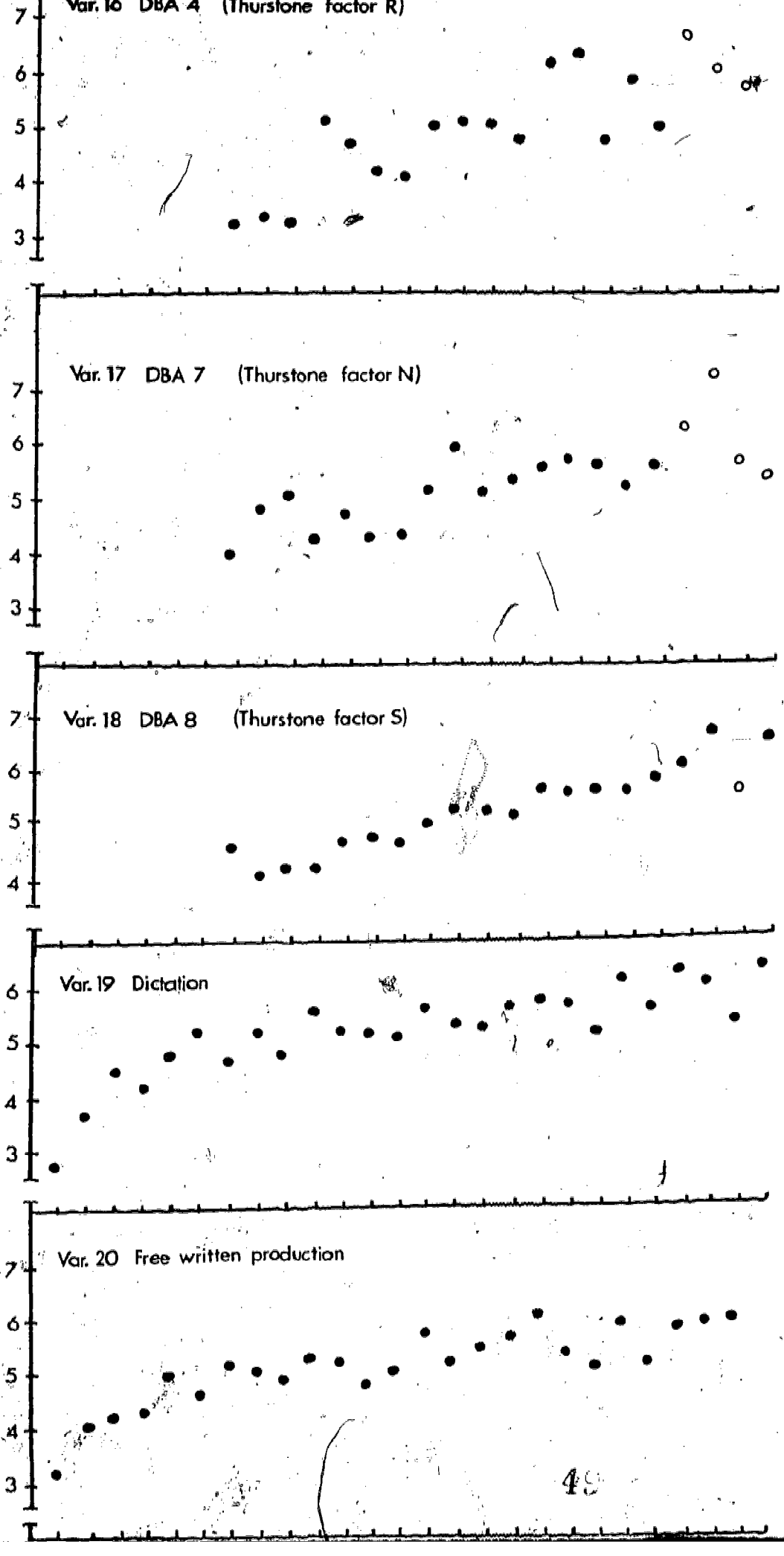
On the other hand, the preliminary results available from the EPAL project seems to fit in very well with the hypothesis of the importance of learning set formation, as discussed in connection with the previous paper (pp. 24-30).

All these data support the interpretation that the most important factor in L 2 learning, as in most other learning, is the general development, particularly the cognitive and perceptual-motor domains.

For practical purposes, the level of development and the language situation in the individual case seem to be the factors to be considered.

Test


Var. 5 Listening comprehension
6
5
4
26 24 22 20 18 16 14 12 10 8 6 4 2
Age (cf. p. 39)
Var. 6 Reading comprehension
7
6
5
4
3
Var. 13 RLS 3 Time used
8
7
6
5
4
3
Var. 14 RLS 3 Number of words
6
5
4
3
Var. 15 RLS 3 Number of errors
7
6
5
4
3


Var. 16 DBA 4 (Thurstone factor R)
Var. 17 DBA 7 (Thurstone factor N)
Var. 18 DBA 8 (Thurstone factor S)
Var. 19 Dictation
Var. 20 Free written production

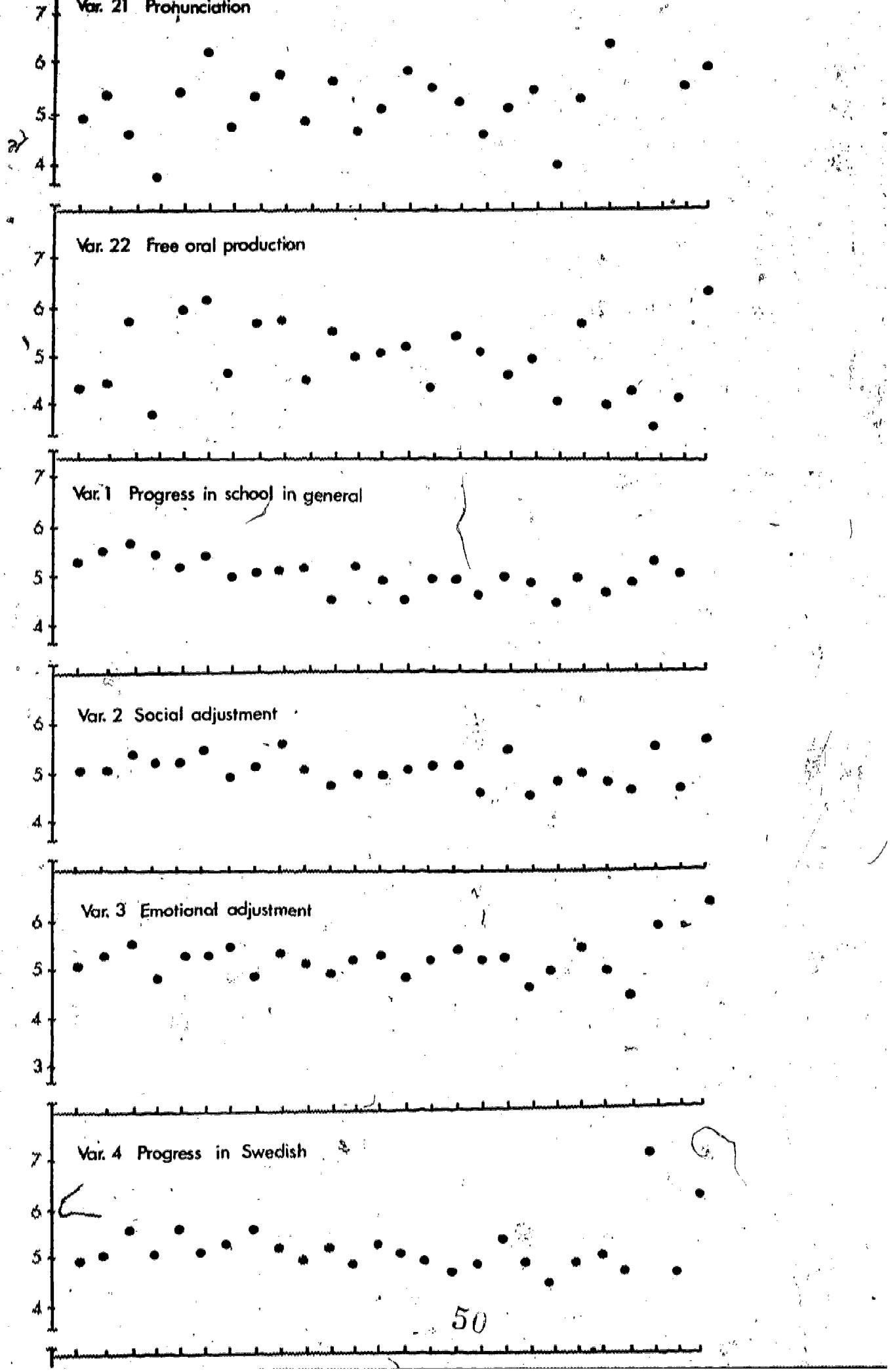

Var. 21 Pronunciation
Var. 22 Free oral production
Var. 1 Progress in school in general
Var. 2 Social adjustment
Var. 3 Emotional adjustment
Var. 4 Progress in Swedish

Table 4, Intercorrelations between background variables.

	1	2	3	4	5	6	7	8	9	10	11	12
1 Age		X^2 15.5 df 12 C .09 NS	X^2 11.7 df 6 C .08 NS	X^2 11.0 df 9 C .08 NS	X^2 13.3 df 12 C .10 NS	X^2 13.2 df 9 C .09 NS	X^2 6.9 df 9 C .08 NS	X^2 25.9 df 9 C .12 xx	X^2 2312.6 df 6 C .73 xxx	X^2 9.3 df 3 C .07 x	X^2 69.2 df 12 C .19 xxx	X^2 56.0 df 9 C .17 xxx
2 National-ity			X^2 160.5 df 8 C .27 xxx	X^2 513.4 df 12 C .46 xxx	X^2 302.9 df 16 C .42 xxx	X^2 105.1 df 12 C .24 xxx	X^2 35.2 df 12 C .17 xxx	X^2 231.9 df 12 C .34 xxx	X^2 8.6 df 8 C .06 NS	X^2 6.6 df 4 C .06 NS	X^2 79.9 df 16 C .20 xxx	X^2 65.9 df 12 C .18 xxx
3 Length of residence				X^2 30.5 df 6 C .13 xxx	X^2 29.3 df 8 C .15 xxx	X^2 3.2 df 6 C .04 NS	X^2 6.7 df 6 C .08 NS	X^2 19.5 df 6 C .11 xx	X^2 13.3 df 4 C .08 xx	X^2 0.9 df 2 C .02 NS	X^2 25.5 df 8 C .12 xx	X^2 648.4 df 6 C .50 xxx
4 Father's occupation in Sweden					X^2 2482.7 df 12 C .81 xxx	X^2 137.0 df 9 C .28 xxx	X^2 75.5 df 9 C .26 NS	X^2 11.7 df 9 C .08 NS	X^2 10.9 df 6 C .08 NS	X^2 6.6 df 3 C .06 NS	X^2 16.7 df 12 C .10 NS	X^2 11.1 df 9 C .08 NS
5 Father's occupation at home						X^2 90.0 df 12 C .26 xxx	X^2 80.5 df 12 C .26 xxx	X^2 20.4 df 12 C .13 NS	X^2 8.2 df 8 C .08 NS	X^2 4.3 df 4 C .06 NS	X^2 27.5 df 16 C .14 x	X^2 14.9 df 12 C .10 NS
6 Mother's occupation in Sweden							X^2 1216.3 df 9 C .72 xxx	X^2 88.3 df 9 C .24 xxx	X^2 12.2 df 6 C .09 NS	X^2 3.9 df 3 C .05 NS	X^2 27.6 df 12 C .13 xx	X^2 31.5 df 9 C .14 xxx
7 Mother's occupation at home								X^2 25.9 df 9 C .16 xx	X^2 5.0 df 6 C .07 NS	X^2 2.3 df 3 C .05 NS	X^2 15.5 df 12 C .12 NS	X^2 12.2 df 9 C .10 NS
8 Number of brothers & sisters									X^2 14.5 df 6 C .09 x	X^2 2.6 df 3 C .04 NS	X^2 23.8 df 12 C .12 x	X^2 8.7 df 9 C .07 NS
9 Grade in 9-year Sw school										X^2 5.4 df 2 C .05 NS	X^2 80.3 df 8 C .20 xxx	X^2 34.4 df 6 C .13 xxx
10 Type of class (spec-ord)											X^2 6.4 df 4 C .06 NS	X^2 .8 df 3 C .02 NS
11 Teaching materials												X^2 63.9 df 12 C .15 xxx
12 [illegible] ge of Swedish												

Part IV:

ADJUSTMENT AMONG IMMIGRANT PUPILS IN SWEDEN

(International Review of Applied Psychology, 1976, 25 (3), 167-188.)

PROBLEM

It has often been argued that there is a higher rate of social and emotional disturbances among immigrant children than among native children. As a rule, this assumed peak is ascribed to the lack of command of the new language (Gelinek, 1974).

METHOD AND RESULTS

Data from the data bank for the population of immigrant children briefly described in the previous study were used for attempts to study the two problems stated above. The same tests and background data as in the previous study thus are employed in the present one. The 2,188 pupils for which data were obtained belong to a population which is estimated to have been around 2,400 pupils in Sweden at the time for the data collection. They represent 36 nationalities and are fairly evenly distributed over grades 1-7 with a smaller number in grades 8 and 9. 62 % of the pupils come from Finland, 16 % from Yugoslavia, 5 % from Greece, 2.6 % from U.S.A., 2 % from Italy respectively Hungary and the rest is distributed over the remaining 30 nations.

The teacher observations were quantified and coded in a five-point scale where 1 is a very bad and 2 is a very good adjustment. The results show average Progress in School ($\bar{X}$ = 2.95), better than average Social Adjustment, defined as getting along with school mates ($\bar{X}$ = 3.5), better than average Emotional Adjustment ($\bar{X}$ = 3.5) and average Progress in Swedish ($\bar{X}$ = 3.2). These data do not seem to support comprehensions of a particularly poor social and emotional adjustment among immigrant pupils. It should, however, be stressed that this approach is a tentative one, that the adjustment assessments are afflicted with many uncertainties and that no Swedish control group was studied.

The intercorrelations between the language tests are .57 on the average, .52 between the adjustment assessments, .33 for the intelligence tests and .73, .75 and .76 for three different evaluations of the three reading tests. These results are all fairly normal and expected.

The average intercorrelation for language by adjustment variables is .19 only, .26 for intelligence by language variables, .11 for intelligence by adjustment variables, .37 for reading by language tests, .12 for reading tests by adjustment variables and .18 for reading by intelligence tests.

DISCUSSION

Several of these averaged correlations are surprisingly low, in particular for the language by adjustment matrix and the intelligence by adjustment matrix. On the basis of the often suggested relationship between language skills and emotional and social adjustment, one would have expected much higher correlations between the tests of these domains. As cognitive variables, such as amount of education, have been shown to explain an appreciable part of the variance of the variable mental health in adults (Lasry & Sigal, 1976), also the intelligence by adjustment matrix average seems unexpectedly low.

A number of checks on possible statistical artifacts and other sources of error were performed, but the results remain the same. A study of other data on the relation between cognitive and affective variables, such as motivation and school achievement, reveals that such studies generally yield low correlations, contrary to what is often believed. In addition to the studies mentioned in the original paper, I might add a few often cited ones, such as Lambert, Gardner, Barik and Tunstall (1963), Gardner and Lambert (1959), Gardner and Lambert (1972), that reveal that very strong claims of the role of motivation in second language learning have been built on surprisingly low associations between those variables. In fact, theoretical concepts, such as the notions of instrumental and integrative motivation, have been built on weak associations and have had to be revised later on.

While it should be remembered that the present study is burdened by a number of imperfections, the main results are consistent with other empirical evidence. Some tentative hypotheses which might serve as a point of departure for further research are listed in the paper.

The indications of a more positive state of adjustment than has been feared are at least partly borne out by some other studies, yielding similar results. These studies too, however, suffer from shortcomings. Comparisons with other studies of the mental health in native children such as that of Jonsson and Kälvesten (1964) and previous studies, reviewed by these authors (op.cit.), suggest that the state of mental health

in native populations seems to be worse than formerly believed. Rutter et al. (1974) studied immigrant and stationary children in London and found rather high percentages of disturbances, according to psychiatric ratings in both groups. The difference was such that there was a tendency to significance only. Takač (1977) compared native with immigrant children and found small but significant differences in favor of native children in all variables.

The fact that the studies of Jonsson and Kälvesten and Rutter et al. both are conducted in large cities suggests that the high rates of emotional disturbance reported in these studies might be an urbanization problem. That such a hypothesis is not unreasonable is shown by the research by Parker, Kleiner and Needelman (1969) who found that, contrary to expectations, adult migrants in the U.S.A. who moved from a big city to another big city showed a higher rate of mental illness than migrants raised in the countryside.

On the whole, it seems that problems of migrant adjustment are far more complex than they may appear at first glance. Other factors than migratory ones might well lie behind problems that are conventionally ascribed to the process of migration. The problems that do appear among immigrant children must, regardless of the causes, be attacked with a much wider spectrum of action than just language teaching.

As a theoretical explanation of the pervasively low correlations between not only language variables and socio-emotional adjustment as reported in the empirical part of this study, but also between various measures of motivation and language, mathematics and other school subjects, I would like to propose the "hypothesis of indirect influences".

It will be recalled that experimental research seems to support the correlational studies (vide supra. p. 28). Pavlov's (1960) experiments with neuroses actually are examples of how severe cognitive conflicts bring about emotional and cognitive disturbances, while Harlow's experiments show how emotional disturbances of a depressive nature may affect higher cognitive functions. The experiments of Harlow and his coworkers seem to contain the seed to a theory which might explain not only some indirect influences of the affective system on the cognitive domain, but also supply a new theory of motivation in the place of the prevailing ideas which in fact have suffered a severe break-down in view of what the data actually say.

Studies of the behaviour of healthy and disturbed monkeys (see for instance the film on Harlow's experiments, "Nature and development of affection") make it appear perfectly obvious that a disturbed monkey turns away

from the environment. Yet most normal cognitive functions remain unimpaired. This is in harmony with results from clinical studies on depression in humans (Zimmer & Foy, 1963), indicating that stimulus reproduction, perceptual acuity and evaluation of reality are all accurate (though slowed down, and interpretation of causality is biased by guilt), while involvement with the physical and social environment is restricted (p.306). In other words, experiences which involve learning and problem-solving, i.e. learning set formation, are restricted.

On the other hand, the monkey child who has access to constant bodily and visual contact with his mother courageously explores the environment, thereby gaining a rich environmental experience. In other words, a confident and active individual creates his own enriched environment, while the depressed individual creates a deprived environment.

In conclusion, emotional stability and a confident personality is created by close and constant contact between parents and child, while isolation and separation (intermittent contact and isolation situations) create anxiety, aggression, lack of self-confidence and depression. While these states only in severe cases have a direct influence on higher cognitive functions, they virtually create individual deprived environments, which in the long run prevent an optimal cognitive development.

It is generally, and implicitly, assumed that motivation is a variable, or set of variables, mainly belonging to the affective domain. Such an assumption is not suggested by existing evidence. I would like to propose that motivation mainly is a cognitive variable. In other words, learning set formation as a result of hard work makes it increasingly easier to perform cognitive operation, which in turn breeds an interest for the tasks that are to be done. It will be recalled that Hebb defined selective attention and expectancy as resultants of set formation (vide supra, p.20).

Attitudes and other affective variables are, according to the hypothesis advanced, consequences of, not prerequisites for learning. Learning and problem-solving may operate as their own reinforcers. Such a theory has implications for the whole range of school activities. As a lecturer in education I have attended a large number of lessons over the years and I have often wondered why so much learning in pupils actually takes place in spite of the poor amount of positive reinforcement given. I have also wondered why pupils in classes where the teacher manages to create a warm and friendly atmosphere do not seem to learn very much more than pupils in "ordinary" classes. Such observations, which are anomalies according to

existing theories of motivation, are easily explained by the hypothesis of indirect influences and the hypothesis of motivation as a primarily cognitive variable. Indirect influences from a warm emotional climate operate over a long period of time and if the environment is not restricted in itself, which a school certainly is. Problem-solving, particularly in the form of practical applications of theoretical knowledge, is a minor part of the daily life in our schools.

On the other hand, the implications should not be carried too far, as I believe that there are very important interactions between didactic situations and personality factors in the pupils.

Part V:

SOCIAL AND INDIVIDUAL FRAME FACTORS IN SECOND LANGUAGE LEARNING: COMPARATIVE ASPECTS

(In: Skutnabb-Kangas, T. (Ed.) Papers from the first Nordic conference on bilingualism. Helsingfors: Universitetet, 1977. Pp. 40-61.)

PROBLEM

A large number of factors are involved in L 2 learning. They may be referred to as being either largely individual or largely social. Such a factor is motivation. It is sometimes argued that immigrant students of the host language are in a completely different motivational situation from native students studying a modern language. Therefore, teaching methods, the learning process and most other variables must be quite different. Such a view has been forwarded by lecturers in methodology in modern languages, publicly as well as privately (certain lecturers, personal communication). Such a view gains support in the claim of Ervin and Osgood, 1965, who claim that L 2 learning in school means just learning another code for similar concepts, a compound language system, while learning L 2 in a bilingual setting means learning different codes for different sets of concepts, a coordinate language system. It is claimed (p. 140) that these systems represent two entirely different kinds of events in the nervous systems. Such an arbitrary classification of L 2 learning situations, however, is wide open to criticism. It does not, for instance, cover the situation of immigrant children. The coordinate system is equal to a diglossia situation, but two languages are rarely so widely separated as the definition suggests.

Such hypotheses can only be tested with comparative research strategies. To my knowledge, no experiments have been designed to carry out quantified comparisons between different kinds of motivational settings. It is possible, however, to make a crude comparison by comparing the outcome of the same frame factors in different experiments. If the outcomes turn out to be similar, the motivational situations cannot be completely different, and at least it would be a first step towards more formalized comparative strategies.

Examples of social frame factors are teacher factors, such as age, sex, competence, personality, creativity, teaching experience, expectations; cultural factors, such as degree of urbanization; school factors, such as

size of class. Examples of individual frame factors are intelligence, SES, language aptitude, native language, sex, age and several others.

Some results from the Swedish large-scale study "English in grade 6" and the UMT project (see Introduction) as well as from other studies indicate that L 1 in spite of opposite claims seems to correlate moderately only with L 2 or correlations in the range .20 - .50. This is the same range as for correlations L 2 - L 3 and for correlations between non-verbal tests of intelligence and L 2. Degree of urbanization seems to play a definite part in that a countryside environment seems to be positive, particularly when intelligence and SES, having lower average values in rural environments, are kept constant. Teacher sex seems to have none or little impact, as somewhat astonishingly teaching method. Pupils' sex in contrast gives significant test differences. Teacher education before teacher training yields no differences, while teacher competence in L 2 yields significant or almost significant differences in several variables, most noticeable with boys. Radio teaching yields some differences, particularly with girls. All the results mentioned come from modern language teaching in native student populations.

METHOD

Again, the earlier described data bank from an immigrant pupil population was used. The background variables collected for that study include many of the frame factors discussed above. The native language problem can be approached with a comparative strategy involving comparisons between a number of native languages instead of the traditional approach with correlational studies of one L 1 and one L 2 at a time. Simple analyses of variance were employed to test the significance of possible differences. The strength of the association between the independent variables (the frame factors) and the dependent variables (the tests) were estimated by means of ω^2 values.

RESULTS

When nationality is used as an L 1 index, adjustment measurements and most reading test measures give non-significant results. The language tests yield significant differences in favor of the Finnish and Spanish pupils, who also do best on the intelligence tests. When language group (related languages according to the linguistic classification) is used as an L 1 index, almost

all variables, except one or two of the reading measures, yield significant differences, but the ω^2 values are very low. With this index, the Slavic and the Germanic groups do best in language and reading tests and also on the intelligence tests.

SES yields small but significant differences to the disadvantage of workers' children, who also do worse on two out of the three intelligence tests. Interestingly, this is true not only for language and reading tests, but also for the adjustment measurements. The ω^2 values are very low, however.

LOR gives significant differences in favor of longer stay, but the ω^2 values are rather low. Previous knowledge of Swedish yields significant differences in all variables, including intelligence and adjustment variables. The fairly high ω^2 values for language tests and reading tests reveal that this background variable is related to language and school adjustment (Progress in School and Progress in Swedish), while there are low ω^2 values for social and emotional adjustment and intelligence.

In summary, the following similarities between the immigrant study reported here and various studies of L 2 learning in the school situation appear to be: sex and age differences, comparatively small but definite L 1 influences, SES differences, certain teacher factor differences, rather small method differences, small but definite cognitive influences, and certain cultural influences, such as the degree of urbanization.

DISCUSSION

The factors studied seem to work much the same way in two different motivational situations. This finding suggests that second language learning basically is brought about by the same mechanisms in all types of situation, in all probability biologically anchored, i.e. in the nervous system. Such a conclusion is strengthened by the observation that individual frame factors seem to produce more clear-cut differences than the social frame factors. Of the social frame factors, those belonging to what might be called cultural factors, such as degree of urbanization and also SES, which has rather arbitrarily been classified as an individual frame factor, seem to be most pervasive. Factors belonging to the teaching situation operate temporarily, as it were, and seem to be able to affect the results to a lesser degree than might be expected. This interpretation might be formulated thus: the pupil is a product of inheritance and more stable environmental factors. When he is put into a learning situation, the result to a large

extent is a function of these factors.

These rather tentative interpretations do not mean that the teaching factors are unimportant. In the first place, some interesting findings do emerge from a study of these factors. Secondly, as they affect the individual only a few hours a day during a limited number of years, it is all the more important that efforts to increase their efficiency per se, without putting pressure on the individual by demanding more from him.

This line of reasoning, withoug being completely conclusive from the survey type of data presented here, does cast some suspicion on the notion of the great dissimilarity of the two bilingual situations, and of the notion that language learning mechanisms are completely different in different situations. In the first place, motivation and other emotional factors do not seem to play such a large part as generally assumed. Secondly, though there might be some motivational pressures on immigrant pupils that do not exist in modern language teaching in native schools, there are also counter-balancing factors, for instance, that the mothers of immigrant children often do not learn the new language to a very great extent. The most likely difference to be expected is the fact that immigrant pupils in the long run are more exposed to a second language and therefore might achieve a more native-like command in the end than pupils learning L 2 in their native schools.

Such a development seems to be a slow process, however, judging from this study and that of Toukomaa, 1975. LOR seems to have small effects, judging from the low ω^2 values. Toukomaa finds that the L 1 is rapidly forgotten, while it takes considerable time to achieve proficiency in the new language. The time for the language shift, i.e. L 2 becomes the better (but not necessarily a good) language is between four and five years. As the majority of the pupils of the present study have been in Sweden for not more than two years, this narrow range of LOR might explain the small effects of this frame factor.

Interestingly, intellectual factors of a non-verbal character seem to play a not negligible part. In the first place, this means that the effects of the various frame factors should be studied by means of analysis of covariance, in order to control for intelligence. This might give somewhat more clear-cut results, though the correlations are not such that dramatic changes should be expected. Such a continuation of my research program is already under work. Secondly, and more interestingly, this finding suggests that general cognitive factors play approximately as large a part as the

native language. In fact, they may play a larger part, as the L 1 - L 2 correlations may be somewhat spurious in the respect that the two variables probably have some cognitive components in common.

An important educational consequence of this finding, which furthermore is supported by basic research results (Clark, 1976; Glucksberg, 1969; Moore, 1973), is that language learning is not enough. Neither teaching in L 2, nor teaching in L 1 ("home language teaching"), which is now en vogue in Sweden and elsewhere, will solve the language learning problem. As Bruner (1976, a, b, c) Halpern and Aviezer (1976), Clark (1976) and others have shown, concept formation and communicative factors other than language develop prior to productive language. In addition to language training in L 1 and L 2, procedures to stimulate and facilitate the general cognitive development should be developed and applied. Such work is underway (see for instance Heron & Kröger, 1974). See also research reviews, discussions and educational suggestions in Ekstrand (1977 b). Confer also discussions regarding the prior papers in this summary, where the importance of cognitive factors is discussed. In particular, the discussion of the pros and cons of early language teaching and the possible importance of learning set formation is relevant in this context.

The relatively weak effects of SES are probably due to the fact that they have been measured with one variable only, father's occupation, in combination with the limited range of occupations. SES need to be assessed with a combined set of measurements. A school psychologist once said to me: "after a certain amount of L 2 teaching, it doesn't matter how much more such teaching you give some of the immigrant kids. They do not progress. It is as if they reach a cognitive limit." The large amount of research on stationary bilingualism seems to contribute to our understanding. The first studies showed that bilinguals were in general inferior in intelligence as compared with the members of the monolinguals of the majority group. When tests of verbal intelligence were abandoned in this research in favor of non-verbal tests, the picture changed. It changed still more, when it was discovered that the bilingual minority often lived in a rural environment, where SES and intelligence levels on the average are lower than in cities. When these factors were controlled, bilinguals were often found to be at least equal and sometimes superior to minolinguals with respect to intelligence (see Skutnabb-Kangas, 1975, and Ekstrand, 1977 b for reviews and references). Wennerström (1967) found that SES was a very important variable for the school progress of immigrant children.

The immigrant children that come to Sweden generally belong to lower SES strata. In other words, part of the language and cognitive development in immigrant children is a social problem, a conclusion shared by Skutnabb-Kangas (1975, p. 86).

As the Milwaukee project (see discussion on pp. 29, 36) shows, it is possible to compensate for a strongly deprived environment by a "total immersion" program. While it is in practice impossible to expose large groups of children to such a program, we may learn some principles from that project and other research that may improve the development of the immigrant children. In doing so, we will in fact also learn something about how to help to compensate the native children for social handicaps.

SOME FINAL WORDS

The five selected papers, presented in this concluding report, are part of a research work in second language acquisition and in immigrant adaptation that has been going on during almost twenty years. Some findings seem to be stable, such as the developmental course of second language learning ability, i.e. the age effects. Other results may be more tentative, such as the lack of correspondence between language and emotional adjustment, though no studies so far have been able to demonstrate strong correlations between cognitive and affective factors.

What the studies do demonstrate is the complexity of the second language learning process and the even greater complexity of migrant adaptation in general. This complexity tends to become hidden in the general debate because some people reduce the argument to contending one single course of action, auch as the "home language teaching" notion. While I would like to argue strongly that home language teaching must continue, I would like to issue a warning against a naive belief in the value of this kind of limited action. What is needed is a broad spectrum of measures, based on careful research, rather than upon optimistic belief in miracle procedures.

The tests in these studies are psychological tests of functional language skills, designed to assess listening, speaking, reading and writing skills. Now there is a strong tendency towards contrastive linguistics based testing procedures.

I would like to point out that it is possible to measure language functions on several levels. There is a physical level, applied for instance in instrumental phonetics with instruments such as sound spectrographs and speech synthesizers, or in reading research such as electronic eye movement observation devices. There is a psychological level, a neuro-physiological and neurological level, an educational level and there is a linguistic level. Hopefully, the measurements on the linguistic level, with error analyses and so forth, will provide increased information about language learning processes. There seems to exist a certain danger, however, that linguistic measurements may be regarded as possible to substitute for all other kinds. It should be observed that linguistic methods do not have that kind of power. They tend to analyze language in great detail, but do not cover all sides of a complex communicative behavior. The different levels of measurement must be regarded as complementary, not exchangeable.

The methods of measurement that we started to develop twenty years ago have continued to function well. The high reliabilities reported in the first paper have remained good in other settings, and satisfactory values have been reached for later developed tests.

The reliability coefficients for some of the language tests used in the last three papers are the following. The Kuder Richardson 20 coefficient for the Listening Comprehension Test is .95 and for the Reading Comprehension Test is .94. The α coefficients, which may be regarded as a lower limit for the reliability rather than the actual reliability, are .97 for the Free Written Production Test, .95 for the Pronunciation Test and .93 for the Free Oral Production Test. Thus it is possible to measure language behavior on a functional, complex psychological level with a high degree of precision. We do not know the reliability of the teacher observations, but the correlations between two independent judgements of the teacher answers were .81 for Progress in school, .77 for Social adjustment, .75 for Emotional adjustment and .77 for Progress in Swedish.

There is not much point in discussing the validity of the tests in detail here. As mentioned before, there do not exist good criteria. In fact, I have tried to use the best measures possible as tests. The question of validity is one of content validity and possibly of construct validity. These kinds of validity cannot be estimated with validity coefficients, but only subjectively assessed. In my opinion, the content validity cannot possibly be higher, as the tests directly reflect the language behavior and the result from this behavior. This opinion I cannot prove statistically, only contend.

REFERENCES

Anderson, T. The optimum age for beginning the study of modern languages. International Review of Education, 1960, 6, 298-306.

Andersson, B. Piaget och högstadiets fysik (3): Är läromedlen anpassade till elevernas nivå? /Piaget and junior high school physics: Are instruction materials adapted to the pupils' level?/ PM från Skolöverstyrelsen, 1973, 10 (10), 9-14.

Asher, J.J. Children's first language as a model for second language learning. Modern Language Journal, 1972, 56, 133-139.

Bailey, N., Madden, C. & Krashen, S.D. Is there a "natural sequence" in adult second language learning? Language Learning, 1974, 24, 235-243.

Bain, B. Toward an integration of Piaget and Vygotsky: Bilingual considerations. Paper presented at the 18th Int. Congress of Applied Psychology, Montreal, 1974.

Bayley, N. On the growth of intelligence. American Psychologist, 1955, 10, 805-818.

Borger, R. & Seaborne, A.E. The psychology of learning. Harmondsworth, Middlesex, England: Penguin Books, 1966.

Bratt, A.M. Erfarenheter av tidig undervisning i främmande språk. ASLA-Information, 1975, 1 (2).

Bruner, J.S. From communication to language - a psychological perspective. Cognition, 1975, 3 (3), 255-287.

Bruner, J.S. Action and language. Paper presented at the 21st Int. Congress of Psychology, Paris, 1976. (a)

Bruner, J.S. A preface to the development of speech. Stencilled. Oxford: University of Oxford, Dept. Experimental Psychology, 1976. (b)

Burstall, C. French in the primary school. The Mere, England: NFER, 1970.

Burstall, C. Primary French in the balance. Educational Research, 1975, 17 (3), 193-198. (a)

Burstall, C. Factors affecting foreign-language learning: A consideration of some recent research findings. Language teaching and linguistics abstracts, 1975, 8 (1), 5-25. (b)

Burstall, C., Jamieson, M., Cohen, S. & Hargreaves, M. Primary French in the balance. Windsor, England: NFER, 1974.

Carroll, J.B. The teaching of French as a foreign language in eight countries. Stockholm: Almqvist & Wiksell International, 1975.

Chun, J.A. Selected processes in second language acquisition. In: Nickel, G. (Ed.) Proceedings of the Fourth International Congress of Applied Linguistics. Stuttgart: HochschulVerlag, 1976. Pp. 179-197.

Clark, H.H. Inferring what is meant. Paper presented at the 21st Int. Congress of Psychology, Paris, 1976.

Conant, J.B. The American high school today. New York: McGraw-Hill, 1959.

Curran, C.A. Counceling skills adapted to the learning of foreign languages. Bulletin of the Meninger Clinic, 1961, 25, 78-93.

Diller, K.C. Generative grammar, structural linguistics, and language teaching. Rowley, Mass.: Newbury House, 1971.

Donoghue, M.R. A rationale for FLES. French Review, 1964, 38, 523-529.

Donoghue, M.R. What research tells us about the effects of FLES. Hispania, 1965, 48 (3), 555-559.

Donoghue, M.R. Foreign languages in the elementary school: Effects and instructional arrangements according to research. ERIC: Resources in Education, ED 031 979, 1969.

Doyé, P. Englischunterricht in der Grundschule. Teoretische Grundlagen. In: Kieslich & Klages (Eds.) Englisch im Primarbereich? (Manuscript, 1975.)

Doyé, P. & Lüttge, D. Der Braunschweiger Schulversuch "Frühbeginn des Englischunterrichts" (FEU). In: Kieslich & Klages (Eds.) Englisch im Primarbereich. (Manuscript, 1975.)

Dryer, M. Grade school French students reach high school. French Review, 1956, 29, 157-161.

Dulay, H.C. & Burt, M.K. Goofing: An indicator of children's second language learning strategies. Language Learning, 1972, 22, 235-252.

Dulay, H.C. & Burt, M.K. Should we teach children syntax? Language Learning, 1973, 23, 245-248.

Dulay, H.C. & Burt, M.K. Natural sequences in child second language acquisition. Language Learning, 1974, 24, 37-53. (a)

Dulay, H.C. & Burt, M.K. Errors and strategies in child second language acquisition. TESOL Quarterly, 1974, 8 (2), 129-136. (b)

Dulay, H.C. & Burt, M.K. A new perspective on the creative construction process in child second language acquisition. Working papers on bilingualism, No. 4, 1974. ERIC: ED 123 877. (c)

Durette, R. A five years FLES report. Modern Language Journal, 1972, 56, 23-24.

Ekstrand, L.H. Engelska i åk 6. Del II. Enkät till lärarna. /English in grade 6. Part II. Questionnaire to the teachers./ Stockholm: National Board of Education, 1962 (stencilled). (a)

Ekstrand, L.H. Engelska i årskurs 6. Del III. Elevdata. /English in grade 6. Part III. Data on the pupils./ Stockholm: Board of Education, 1962 (stencilled). (b)

Ekstrand, L.H. Språkfärdighet och språkmetodik. /Language skills and teaching techniques./ Stockholm: University & Board of Education, 1964 (stencilled).

Ekstrand, L.H. DPI. Diagnostiska prov för invandrarelever. Manual, Del I. /Diagnostic tests for immigrant pupils. Manual, part I./ Stockholm: Skandinaviska Testförlaget, 1974.

Ekstrand, L.H. Adjustment among immigrant pupils in Sweden. Int. Rev. Appl. Psychol., 1976, 25, No. 3. (a)

Ekstrand, L.H. Age and length of residence as variables related to the adjustment of immigrant children, with special reference to second language learning. In: Nickel, G. (Ed.) Proceedings of the Fourth International Congress of Applied Linguistics. Stuttgart: Hochschul-Verlag, 1976. (b)

Ekstrand, L.H. Migrant adaptation - a cross-cultural problem. Educational and Psychological Interactions (Malmö, Sweden: School of Education), No. 59, 1977. (a)

Ekstrand, L.H. Social and individual frame factors in second language learning: comparative aspects. In: Skutnabb-Kangas, T. (Ed.) Papers from the first Nordic conference on bilingualism. Helsingfors: Universitetet, 1977. (b)

Elkind, D. & Glavell, J.H. Studies in cognitive development. New York: Oxford University Press, 1969.

Ellegård, A. Språk, språkvetenskap och språkinlärning. /Language, language science and language learning./ Stockholm: Aldus/Bonniers, 1971.

English in grade 6. See Ekstrand, L.H., 1962, a, b.

Eriksson, K.H. & Ekstrand, L.H. Språkpedagogik och psykofysik. /Language teaching and psycho-physics./ Pedagogisk forskning, 1962, 6 (4), 90-124.

Ervin, S.M. & Osgood, C.E. Second language learning and bilingualism. In: Osgood, C.E. & Sebeok, T.A. Psycholinguistics. Bloomington: Indiana University Press, 1965.

Esposito, P.G. Fifth-year foreign language study. Modern Language Journal, 1967, 51 (4), 193-194.

Fathman, A. The relationship between age and second language productive ability. Language Learning, 1975, 25, 245-266.

Florander, J. & Jansen, M. Skoleforsøg i engelsk 1959-1965. /School experiments in English 1959-1965./ Copenhagen: Danmarks Paedagogiske Institut, 1969 (stencilled).

Friberg, A. Begreppsträning för förståndshandikappade. /Conceptual training in the mentally retarded. Stockholm: University, Dept. Psychology, 1975.

Furth, H.G. Piaget and knowledge. Englewood Cliffs, N.J.: Prentice Hall, 1969.

Garber, H. Personal communication, 1977.

Garber, H. & Heber, R. The Milwaukee Project. Paper presented at the 18th Int. Congress of Applied Psychology, Montreal, 1974.

Gardner, R.C. & Lambert, W.E. Motivational variables in second language acquisition. Canad. J. Psychol., 1959, 13 (4), 266-272.

Gardner, R.C. & Lambert, W.E. Attitudes and motivation in second-language learning. Rowley, Mass.: Random House, 1972.

Garvie, E.M. The Urdu-speaking immigrant's learning of English morphology. A comparison of first language acquisition and second-language learning. Paper presented at the 3rd AILA Congress, Copenhagen, 1973.

Geigle, R.C. Foreign language and basic learning. Elementary School Journal, 1957, 57, 418-419.

Gelinek, I. Migrants' children. International Child Welfare Review, No. 21, 1974, 45-55.

Genesee, F., Tucker, G.R. & Lambert, W.E. Communication skills of bilingual children. Child Development, 1975, 46, 1010-1014.

Ginsberg, V.S. An experiment in teaching pre-school children a foreign language. Soviet Education, 1960, 2 (11), 18-25.

Gluck, J.P. & Harlow, H.F. The effects of deprived and enriched rearing conditions on later learning: A review. In: Jarrad, L.E. (Ed.) Cognitive processes of non-human primates. New York & London: Academic Press, 1971.

Glucksberg, S. What do people say after they have learned how to talk? Studies of the development of referential communication. Merrill-Palmer Quarterly, 1967, 13, 309-316.

Gordon, H. Mental and scholastic tests among retarded children. (Educational Pamphlet, No. 44.) London: Board of Education, 1923.

Gorosch, M. English without a book and without a teacher. Moderna Språk, 1958, 52, 369-372.

Gorosch, M. & Axelsson, C.-A. English without a book. A bilingual experiment in primary schools by audio-visual means. Berlin: Cornelsen Verlag, 1964.

Green, R. Should children be pushed into early learning? Psychology Today, 1977, 9, 32-37.

Grinder, R.E., Otomo, A. & Toyota, W. Comparisons between second-, third-, and fourth-grade children in the audio-lingual learning of Japanese as a second language. The Journal of Educational Research, 1962, 56, (4), 191-197.

Guilford, J.P. Fundamental statistics in psychology and education. New York: McGraw-Hill, 1956.

Guiora, A.Z., Brannon, R.C.L. & Dull, C.Y. Empathy and second language learning. Language Learning, 1972, 22, 111-130. (a)

Guiora, A.Z., Beit-Hallahmi, B., Brannon, R.L.C., Dull, C.Y. & Scovel, T. The effects of experimentally induced changes in ego states on pronunciation ability in a second language: An exploratory study. Comprehensive Psychiatry, 1972, 13, 421-428. (b)

Halpern, E. & Aviezer, O. Psycholinguistic skills and sensory motor development within Piaget's theoretical framework. Paper presented at the 21st Int. Congress of Psychology, Paris, 1976.

Hansen-Bede, L. A child's creation of a second language. Working papers on bilingualism, No. 6, 1975. Ontario Institute for Studies in Education, Toronto. (ERIC: ED 125 257.)

Harlow, H.F. The formation of learning sets. Psychological Review, 1949, 56, 51-56.

Harlow, H.F. The development of learning in the rhesus monkey. American Scientist, 1959, 47, 459-479.

Harlow, H.F., Harlow, K.M., Schiltz, K.A. & Mohr, D.J. The effect of early adverse and enriched environments on the learning ability of rhesus monkeys. In: Jarrard, L.E. (Ed.) Cognitive processes of non-human primates. New York & London: Academic Press, 1971.

Harlow, H.F., Harlow, K.M., Suomi, S.J. From thought to therapy: Lessons from a primate laboratory. American Scientist, 1971, 59 (5), 538-549.

Hartman, E. & Haavind, H. Mothers as teachers and their children as learners. Paper presented at the 21st Int. Congress of Psychology, Paris, 1976.

Hatch, E. Second language learning - Universals? Working papers on bilingualism, No. 3, 1974. Toronto: Ontario Institute for studies in Education. (ERIC: ED 123 870.)

Hebb, D.O. Organization of behavior. New York: Wiley, 1949. Paper back edition. New York: Science Editions, 1961.

Heber, R., Garber, H., Harrington, S., Hoffman, C. & Falender, C. Rehabilitation of families at risk for mental retardation. Madison. Wisc.: University of Wisconsin, Waisman Center, 1972.

Heras, I. & Nelson, K.E. Retention of semantic, syntactic and language information by young children. Psychon. Sci., 1972, 29. (6b).

Heron, A. & Kröger, E. A preliminary study of the effects of training on uneven concrete operational development in Yugoslav migrant children. Melbourne Psychology Reports, No. 7, 1974.

Husén, T. Begåvning och miljö. Stockholm: Gebers, 1951. (a)

Husén, T. The influence of schooling upon IQ. Theoria, 1951, 17, 61-88. (b)

Ianco-Worral, A.D. Bilingualism and cognitive development. Child Development, 1972, 43, 1390-1400.

Jansson, K. & Lindén, Y. Social bakgrund och skolprestationer hos invandrarbarn i Västerås. /Social background and school achievement among immigrant children in Västerås./ University of Uppsala: Department of Education, stencilled, 1974.

Jenkins, J.J. Effect of age, native language and instruction on speech sound discrimination. Washington, D.C.: U.S. Department of health, education and welfare, 1972 (mimeographed). (ERIC: ED 067 964.)

Jerison, H.J. Evolution of the brain and intelligence. New York & London: Academic Press, 1973.

Johnson, C.E., Ellison, F.P. & Flores, J.S. The effect of foreign language instruction on basic learning in elementary school. Modern Language Journal, 1961, 45, 200-202.

Jones, H.E. The environment and mental development. In: Carmichael, L. (Ed.) Manual of child psychology. (2d ed.) New York: Wiley, 1954.

Jonsson, G. & Kälvesten, A.L. 222 Stockholmspojkar. Stockholm: Almqvist & Wiksell, 1964.

Justman, J. & Nass, M. The high school achievement of pupils who were and were not introduced to a foreign language in the elementary school. Modern Language Journal, 1956, 40, 120-123.

Kantor, M.B. Some consequences of residential and social mobility for the adjustment of children. In: Kantor, M.B. (Ed.) Mobility and mental health. Springfield, Ill.: Thomas, 1965.

Kerčmar, J. Personal communication, 1977.

Kolers, P.A. Interlingual facilities of short-term memory. Journal of Verbal Learning and Verbal Behavior, 1965, 5, 314-319.

Kolers, P.A. Experiments in reading. Scientific American, 1972, 227 (1).

Krashen, S. D., Feldman, L. & Fathman, A. Adult performance on the slope test: more evidence for a natural sequence in adult second language acquisition. Language Learning, 1976, 26 (1), 145-151.

Krashen, S. D. & Seliger, H.W. Maturational constraints on second dialect acquisition. Language Sciences, 1975, No. 36, 28-29.

Kunkle, J.F. Now when FLES is dead, what next? Educational Leadership, 1972, 29, 417-419.

Lambert, W.E., Gardner, R.C., Barik, H.C. & Tunstall, K. Attitudinal and cognitive aspects of intensive study of a second language. Journal of Abnormal and Social Psychology, 1963, 66 (4), 358-368.

Larew, L.A. The optimum age of beginning a foreign language. Modern Language Journal, 1961, 45, 203-206.

Lasry, J.C. & Sigal, J.J. Influences sur la santé mentale de la durée de séjour, de l´instruction, du revenue personnel, et de l´age, chez un groupe d´immigrants. Int. Rev. App. Psychol., 25, 1976, 215-222.

Lenneberg, E. Biological foundations of language. New York: Wiley, 1967.

Lewis, E.G. & Massad, C. The teaching of English as a foreign language in ten countries. Stockholm: Almqvist & Wiksell International, 1975.

Linell, L. Personal communication, 1977.

Little, A. & Smith, G. Strategies of compensation: A review of projects for the disadvantaged in the United States. Paris: OECD, 1971.

Lopato, E.W. FLES and academic achievement. French Review, 1962, 36 (63), 499-507.

Lorenz, K. Spegelns baksida. /The back of the mirror./ Stockholm: Norstedt, 1974.

Lûk, A. Personal communication, 1977.

Läroplan för grundskolan. (Lgr 62). /Curriculum for the comprehensive school./ Stockholm: National Board of Education, 1962.

Läroplan för grundskolan. (Lgr 69). /Curriculum for the comprehensive school./ Stockholm: Utbildningsförlaget, 1969.

Macnamara, J. Comparisons between first and second language learning. Working papers on bilingualism, Sep. 1975. (ERIC: ED 125 265.)

Malmberg, B. Språkinlärning. /Language learning./ Stockholm: Aldus/ Bonniers, 1971.

Malmberg, B. Språkundervisningen leder till språkförbistring. /The language teaching produces language confusion./ Sydsvenska Dagbladet, October 13, 1977.

McCarthy, D. Language development in children. In: Carmichael, L. (Ed.) Manual of child psychology. (2d ed.) New York: Wiley, 1954.

Menyuk, P. The acquisition and development of language. New Jersey: Prentice-Hall, 1971.

Middleton, D. & Wood, D. Mothers teaching their children. Social interaction and the development of skills for problem solving. Paper presented at the 21st Int. Congress of Psychology. Paris, 1976.

Mikeš, M. Glasovni rasvoj govora dvojezične dece. /Sound development in the speech of bilingual children./ Novi Sad: Forum, 1974.

Miles, R.C. Discrimination learning sets. In: Schrier, A.M., Harlow, H.F. & Stollnitz, F. (Eds.) Behavior of non-human primates, Volume I. New York & London: Academic Press, 1965.

Moeser, S.D. & Bregman, A.S. Imagery and language acquisition. Journal of Verbal Learning and Verbal Behavior, 1973, 12, 91-98.

Montague, A. & Goleman, D. Don´t be adultish. Psycology Today, 1977, 8, 46-55.

Moore, T.E. Cognitive development and the acquisition of language. New York & London: Academic Press, 1973.

Norinder, Y. Personal communication, 1962.

Nyman, A. Rumsanalogierna inom logiken. /Spatial analogies within logics./ (Lunds Universitets Årsskrift, 22 (4), avd. 1.) Lund: Gleerups, 1926.

OECD report on enrichment programs: see Little & Smith.

Ojemann, G.A. & Ward, A.A. Speech representation in ventrolateral thalamus. Brain, 1971, 94, 669-680.

Oksaar, E. Interference and bilingual interaction. In: Nickel, G. (Ed.) Proceedings of the Fourth International Congress of Applied Linguistics, Stuttgart: HochschulVerlag, 1976.

Olofsson, R. The demographic effect of immigration to Sweden. In: Majava, A. (Ed.) Migration research in Scandinavia. Helsinki: Ministry of Labour, 1973.

Oskarsson, M. The relationship between foreign language proficiency and various psychological variables. In: Proceedings of the Fourth Int. Congress of Applied Linguistics. Stuttgart: HochschulVerlag, 1976.

Parker, S., Kleiner, R.J. & Needelman, B. Migration and mental illness. Soc. Sc. & Med., 1969, 3, 1-9.

Pavlov, I.P. Conditioned reflexes. New York: Dover, 1960.

Penfield, W. & Roberts, L. Speech and brain mechanisms. Princeton: University Press, 1959.

Pikler, E. Learning of motor skills on the basis of self-induced movements. Budapest: National methodological institute for infant care and education, 1971.

PM från Skolöverstyrelsen, 1964, 1 (1).

Potts, M. The effect of second-language instruction on the reading proficiency and general school achievement of primary-grade children. American Educational Research Journal, 1967 (4), 367-373.

Pribram, K.H. Languages of the brain. Englewood Cliffs, N.J.: Prentice-Hall, 1971.

Rado, M. Intra- and interlinguistic contrast: Bilingual education in Australia. Working Papers on Bilingualism, No. 7, 1975. (ERIC: ED 125 256.)

Report of the Royal Commission on Bilingualism and Biculturalism. Ottawa: The Queen's Printer, 1967.

Rosansky, E.J. The critical period for the acquisition of language: Some cognitive developmental considerations. Working Papers on Bilingualism, No. 6, 1975. Toronto: Ontario Institute for Studies in Education. (ERIC: ED 125 256.)

Royal Commission. See: Report of Royal Commission.

Rutter, M., Yule, W., Berger, M., Yule, B., Morton, J. & Bagely, C. Children of West Indian immigrants I. Rates of behavioural deviance and of psychiatric disorder. J. Child Psychology, 1974, 15, 241-262.

Rydberg, S. & Arnberg, P.W. Attending and processing broadened within children's concept learning. J. Experimental Child Psychology, 1976, 22, 161-177.

Schumann, J.H. Affective factors and the problem of age in second language acquisition. Language Learning, 1975, 25 (2), 209-235.

Seliger, H.W., Krashen, S.D. & Ladefoged, P. Maturational constraints in the acquisition of second language accent. Language Sciences, 1975, 36, 20-22.

Skolöverstyrelsen: Forsknings- och utvecklingsarbete i moderna språk. En översikt. /Research and development in modern languages. A survey./ Stockholm: National Board of Education, 1976.

Skutnabb-Kangas, T. Om tvåspråkighet och skolframgång. Åbo, Finland: SLS Forskningsrapporter, No. 20, 1975.

Skutnabb-Kangas, T. & Toukomaa, P. Teaching migrant children's mother tongue and learning the language of the host country in the context of the socio-cultural situation of the migrant family. Research Reports (Tampere, Finland: University, Dept. Sociology and Social Psychology), No. 15, 1976.

SM U 1975, 1976. See Statistiska Meddelanden, Statistical Reports.

Smith, W.H. Linguistic and academic achievement of elementary students studying a foreign language. Dissertation Abstracts, 1967, 27, 3882 A.

Smythies, J.R. Brain mechanisms and behavior. Oxford & Edinburgh: Blackwell Scientific Publications, 1970.

Snow, C.E. The development of conversation between mothers and babies. Pragmatics Microfiche, 1. 6, A 2, 1976. (a)

Snow, C.E. Semantic primacy in first and second language acquisition. Interlanguage Studies Bulletin, 1976, 1 (2). (b)

Snow, C.E. & Hoefnagel-Höhle, M. Age differences in second language acquisition. Paper presented at the 4th Int. Congress of Applied Linguistics, Stuttgart, 1975.

Sobota, M. Personal communication, 1977.

Stankowski, M. Personal communication, 1977.

Stark, T. The economic desirability of migration. Int. Migration Review, 1967, 1 (2), 2-22.

Statistical Reports. Nos. U 1975:42, SM U 1976:44. Stockholm: National Central Bureau of Statistics.

Statistiska Meddelanden, U 1975, U 1976. Stockholm: Statistiska Centralbyrån.

Stengel, E. On learning a new language. Int. J. Psycho-analysis, 1939, 20, 471-479.

Strømnes, F.J. A semiotic theory of imagery processes with experiments on an Indo-European and a Ural-Altaic language: Do speakers of different languages experience different cognitive worlds? Scand. J. Psychol., 1973, 14, 291-304.

Strømnes, F.J. Memory models and language comprehension. Scand. J. Psychol., 1974, 15, 26-32. (a)

Strømnes, F.J. To be is not always to be. Scand. J. Psychol., 1974, 15, 89-98. (b)

Strømnes, F.J. No universality of cognitive structures? Scand. J. Psychol., 1974, 15, 300-309. (c)

Strømnes, F.J. A new physics of inner worlds. Tromsø, Norway: Institute of Social Science, 1976.

Strømnes, F.J. & Nyman, J. Immediate and long-term retention of connected concrete discourse as a function of mnemonic picture-type sequence and context. Scand. J. Psychol., 1974, 15, 197-202.

Takač, M. Invandrarbarns problem. /Problem of immigrant children./ Rapport från invandrarprojektet. Göteborgs skolförvaltning: Skolpsykologbyrån. Undated and unnumbered, probably published in 1974.

Tesla, N. My inventions. Zagreb: Skolska Knijga, 1977.

Thorndike, E.L., Bergman, E.O., Tilton, J.W. & Woodyard, E. Adult learning. New York: MacMillan, 1928.

Toukomaa, P. Om finska invandrarelevers språkutveckling och skolframgång i den svenska grundskolan. /On the language development and school progress of Finnish immigrant pupils in the Swedish comprehensive school./ Paper presented at the Nordic seminar on language politics, Helsingfors, 1975.

Toukomaa, P. & Skutnabb-Kangas, T. The intensive teaching of the mother tongue to migrant children at pre-school age. Research Reports (Tampere, Finland: University, Dept. Sociology and Social Psychology), No. 26, 1977.

Virtič, L. Personal communication, 1977.

Vocolo, J. The effect of foreign language study in the elementary school upon the achievement in the same foreign language in high school. Modern Language Journal, 1967, 51 (8), 463-469.

Walz, H.P. The human brain as the source of linguistic behavior. In: Nickel, G. (Ed.) Proceedings of the Fourth Int. Congress of Applied Linguistics, Stuttgart: HochschulVerlag, 1976.

Wennerström, G. Språklig anpassning och studieframgång hos barn till utländska föräldrar. /Language adjustment and academic achievement in children with foreign parents./ Report Series in Swedish (Stockholm: School of Education), No. 18, 1967.

Zimmer, H. & Foy, J. Depression: Definition and determinants. In: Washburne, N.F. (Ed.) Decisions, values and groups. Interdisciplinary Research Conference. University of New Mexico, Volume 2. New York: Pergamon Press, 1963.

Zimmerman, R.R. & Torrey, C.C. Ontogeny of learning. In: Schrier, A.M., Harlow, H.F. & Stollnitz, F. (Eds.) Behavior of non-human primates. Volume II. New York & London: Academic Press, 1965.

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Abstract card

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Ekstrand, L.H. Bilingual and bicultural adaptation. Studies in the assessment of second language learning and of factors related to bicultural adjustment, with special reference to immigrant children. Educational and Psychological Interactions (Malmö, Sweden: School of Education), No. 66, 1978.

The report summarizes five papers and attempts to put them into a theoretical frame of reference. The first paper deals with metric problems in the assessment of second-language proficiency. The second and third papers deals with optimum age problems in second-language learning within different settings. The fourth paper deals with relations between language learning and socio-emotional adjustment. The fifth paper considers a number of social and individual frame factors for second-language learning.

Indexed:
1. Bilingualism
2. Minority groups
3. Second languages

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