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CONFERENCE ON RESEARCH FOR PUBLIC SCHOOL SPEECH AND HEARING PERSONNEL.

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THE ACTIVITIES OF A CONFERENCE TO STIMULATE AND FACILITATE THE STUDY OF SPEECH AND HEARING PROBLEMS WERE REPORTED. SPEECH AND HEARING PERSONNEL (N=40) ATTENDED THE 4-DAY CONFERENCE. LECTURES ON METHODS OF RESEARCH, SPECIFIC QUESTIONS FOR RESEARCH, LOGISTIC AND TACTICAL PROCEDURES, AND RESEARCH DESIGN PRESENTATIONS WERE GIVEN BY SIX SPECIALISTS IN THE FIELD. THE GUIDELINES INCLUDED THE ISOLATION AND DISCUSSION OF CRUCIAL NEEDS FACED BY PUBLIC SCHOOL ENVIRONMENTS, AND THE DISCUSSION OF EFFECTIVE TECHNIQUES ON THE PROBLEMS IDENTIFIED. A SERIES OF CONCLUSIONS WERE FORMULATED FOR THE MORE PRESSING NEEDS THAT EXIST IN PRESENT-DAY, PUBLIC SCHOOL SPEECH AND HEARING PROGRAMS. THESE NEEDS WERE INFORMATION DISSEMINATION OF CURRENT RESEARCH PROJECTS, MEASUREMENT INSTRUMENTS FOR DATA ANALYSIS, AND FOLLOWUP MEETINGS AT BOTH REGIONAL AND NATIONAL LEVELS. (RS)

Conference On Research

For

Public School Speech and Hearing Personnel

ASHA

American Speech and Hearing Association
9030 Old Georgetown Road
Washington, D. C. 20014

1966

CONFERENCE ON RESEARCH

FOR

PUBLIC SCHOOL SPEECH AND HEARING PERSONNEL

Project No. 32-18-7055-5029

Committee on Research
Principal Investigator

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9030 Old Georgetown Road
Washington, D. C. 20014

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The project reported herein was supported by The U. S. Department of Health, Education, and Welfare, Office of Education, Division of Handicapped Children and Youth.

CONFERENCE ON RESEARCH

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PUBLIC SCHOOL SPEECH AND HEARING PERSONNEL

New Orleans, Louisiana

January 19-22, 1966

Prepared by Conference Editor

Charles Speaks

American Speech and Hearing Association
9030 Old Georgetown Road
Washington, D. C. 20014

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FOREWORD

The Conference on Research for Public School Speech and Hearing Personnel was a first and most clearly a successful attempt to hold a meeting at a national level that had as its objective the initiation of active cooperation between clinicians and researchers in the area of speech and hearing.

The objectives of the conference were to stimulate and facilitate systematic, comprehensive and competent investigations into speech and hearing problems found in public school settings. A major issue of the conference was the role of the public school clinician in research and how this person in cooperation with other investigators can become involved in fruitful observation and study of children with speech, hearing, and language problems.

The procedure of the conference involved a four-day meeting attended by key speech and hearing persons from public school settings and eminent researchers from speech, hearing, language, and related disciplines. Fifty-two individuals were present at the conference. This included 40 invited participants, members of the planning committee, conference lecturers, and the U. S. Office of Education special representative.

In soliciting nominations for participants, directors of university and college training programs, state directors of

speech and hearing, and where there was not a state director, state supervisors of special education were contacted. The interest and response of those individuals was overwhelming and the result was a list of about 160 potential participants and many good suggestions for conference issues and procedures. From these nominees, 40 highly qualified participants were selected by members of the planning committee.

During the conference the reactions of the participants to the papers given by the lecturers and to the activities of the conference were highly favorable. Many participants were of the opinion that the meeting represented an excellent beginning relative to problems of research in public school speech and hearing settings.

It was the desire and hope of the planning committee that not only would the conference be of value to those in attendance, but also that the resultant publication would be of considerable value to many other persons in speech and hearing in providing guidelines for research.

Initial interest and planning for the conference and submission of the demonstration proposal to the U. S. Office of Education was due to the efforts by the Committee on Research of the American Speech and Hearing Association and the Executive Secretary of the Association, Kenneth Johnson. Members of the Committee on Research during this early period included D. C. Spriestersbach, John Black, James Jerger, Robert Peters, Dorothy Sherman, Hayes Newby, and Nancy Wood.

The actual planning for the conference and the conducting of the conference was done by the conference planning committee consisting of Helen Knight, Margaret Powers, Charles Speaks, Frank Wilson, Robert Peters, and Michael Marge, Ex Officio. Ira Ventry and William Castle served as successive coordinators with respect to the project.

The conference demonstrated the continuing interest of the American Speech and Hearing Association in problems of public school speech and hearing personnel, and also the interest, as evidenced by funding, of the U. S. Office of Education in the area.

Special acknowledgements are due Michael Marge of the U. S. Office of Education for his continued interest and efforts with respect to the success of the conference and thanks are due Lou Rushing who did much of the secretarial and other detailed work of the conference including typing of the final manuscript, and to Mildred Giles and Julia Davis who assisted in the actual conduct of the conference. These contributions are acknowledged with gratitude.

Robert Peters, Chairman
Committee on Research
American Speech and Hearing
Association

Chapter I

INTRODUCTION

Speech and hearing therapists who teach in the public schools frequently are faced with a challenging responsibility. Their mission is to modify the speech and language behavior of children who present diverse speech and hearing problems. The therapist wishes to select some set of remedial procedures that holds the most promise for achieving this goal. Unfortunately, the diverse nature of the problems, coupled with an urgent need to achieve improvement, often may lead the clinician to select procedures that reflect in only a limited way an acquaintance with the current body of knowledge concerning both normal and abnormal speech behavior. Experimental findings somehow must be translated into useable clinical procedures. This process, if it is to become effective, requires communication between those concerned with the accumulation of basic knowledge in a discipline and those involved with the more applied aspects of the discipline.

Effective coordination and cooperation between public school therapists and persons competent in research can result in systematic, intensive studies of children with speech and hearing disorders that can lead to applications of existing knowledge to these disorders and to a better understanding of

the procedures by which the deviant behavior can be modified.

The unique knowledge and skills of both the clinician and the scientist are required in such a cooperative endeavor. The therapist has at her command many clinical observations, albeit not always formalized, that may be crucial to the development of systematic and worthwhile investigations. The scientist, on the other hand, is familiar with the basic speech, hearing, and language processes and with methods of design, measurement, and analysis that can be applied fruitfully to these perplexing problems. The critical need then is to determine how best to implement an effective plan that would provide a basic framework for the clinician and the scientist to coordinate their efforts for a frontal assault on the problem.

It was for these reasons that a working conference was proposed in which professional public school speech and hearing personnel would meet with persons competent in research in the behavioral sciences. The objective of the conference was to stimulate and facilitate systematic and comprehensive investigation of speech and hearing problems found in public school settings. To a large degree, the concern of the conference was the role of the public school clinician in research. Two guidelines for this initial conference were formulated by the planning committee: (1) to isolate and discuss some of the more crucial research needs in speech, hearing, and language pathology that are faced

routinely in public school environments, and (2) to discuss effective means of implementing a coordinated attack on these problem areas that would involve both clinicians and persons that perhaps are more skilled with research techniques.

With these concepts in mind, a five-man planning committee was appointed by the Committee on Research of the American Speech and Hearing Association to formulate an effective conference format. The procedure of the conference involved a four-day meeting attended by key speech and hearing personnel from public school settings and eminent researchers from speech, hearing, and related disciplines.

The day-by-day program included both formal lectures and structured, but relatively informal discussion sections with the participants. The committee attempted to provide a maximum opportunity for the participants to react to and expand upon issues that arose throughout the conference. The principle topics under consideration included: research needs in speech, hearing, and language; methods for measurement, design, and data collection and processing; available sources for consultation; and research orientation, management, and specific logistical problems unique to the public schools. The daily schedule appears in Appendix A.

Six lectures were selected to provide formal presentations in the above mentioned areas. These presentations have been incorporated with these proceedings.

Forty speech and hearing therapists were selected as participants. This number seemed sufficiently large to

provide a reasonable representation of geographical areas and institutional affiliations, but small enough that the participants could become an effective working unit. The planning committee attempted to select as participants those persons who had demonstrated qualities of leadership, who were involved with the public school speech and hearing programs in one of a variety of capacities, and who would make substantial contributions to the discussions. A listing of the 40 participants who were selected appears in Appendix B.

Chapter II

ORIENTATION TO SCIENTIFIC INQUIRY

Robert Peters

University of Southern Mississippi

INTRODUCTION

Man has long assumed that nature has an orderly and rational structure that can be discovered and explained. The methods for understanding nature have included the chance observation of events, trial and error procedures, and logical processes of scientific inquiry. Discovery by trial and error dates at least as far back as the Stone Age. Although logical procedures were employed to gain new knowledge prior to the time of the Greeks, the Greeks brought the use of deductive logic (reasoning from the general to the specific) to full development about 600 B. C. The Greeks applied philosophical and mathematical logic, for example Euclidean Geometry, to a wide variety of problems. In the sixteenth century systematic experimentation was added to the deductive method to provide the essential structure of science as we know it today.

The Romans, who followed the Greeks, did not contribute particularly to the advancement of science and were not interested in seeking new knowledge. They were concerned,

however, in the practical application of existing knowledge and were efficient in applying existing knowledge to problems of their day. In a sense, this was true in Europe up to the time of the Renaissance because the European scholars were, for the most part, convinced that all the important knowledge had been discovered by past authorities and that learning involved citing and referring to the work of these authorities.

In part, religion was involved because it tended to provide a meaning and purpose relative to aspects of the world and provided explanations for phenomenon that otherwise would be questioned and studied. Those individuals who did perform experimentation during this period were highly suspect and thought to be performing black magic.

Science as we know it today dates essentially from the time of Galileo in the Seventeenth Century. Galileo conducted a number of observations and experiments. One of his most famous was that of dropping objects of the same material of different sizes and finding that they fall at the same rate of speed. Such objects when dropped from the same height, reached the ground at the same instant. Aspects of science that began about the time of Galileo include the use of mathematical hypotheses to study nature, the development and employment of experimental methods and systems for the collection of data, the accumulation of scientific information, and the open publication of scientific data.

Science developed more fully under Newton, who was born in 1642, the year that Galileo died. Newton, the inventor of calculus, proposed laws concerning gravitation and motion and provided the Newtonian Law concerning motion. According to Newton, the bases of science were observation and experimentation from which mathematical deductions could be made. These deductions could then be checked using the results of further experimentation. The importance of this procedure and these concepts of Newton were that science was then freed from the influences of metaphysics or theology and essentially represented a closed system within itself.

During this same period Frances Bacon, who died in 1626, challenged the procedure of referring to authorities in the past for facts and knowledge and was instrumental in changing scientific philosophies in a way to bring about more actual observation and experimentation. Bacon commented that in science one should observe, measure, explain, and then verify.

By the time of the Nineteenth Century there was a general notion about science that questions about nature could be posed; pertinent evidence collected; explanatory hypotheses deduced; hypotheses tested experimentally and accepted, rejected, or modified according to the results (Life Science Library Book, The Scientist, p. 52). This procedure as outlined above is remarkably similar to present day philosophies about science and research activities.

When definitions of science today are examined, the similarities can be observed. Bronowski, for example, defines science as the organization of our knowledge in a way that commands more of the hidden potential of nature (Science and Human Values, p. 7). Underwood, in a discussion of methods of science, describes science as that which achieves a description of science and an understanding of nature (Psychological Research, p. 1). He defines description as the defining, cataloging, or classifying of events, objects, or phenomena that define nature, and a statement of the empirical relations associated with these objects or phenomena. Understanding is described as the reduction to the smallest possible number of laws that would account for various specific facts. The descriptive part of science, according to Underwood, is concerned with research, and understanding and is usually achieved through theory.

This historical information about science and man's activities in this area have been discussed in order to demonstrate that man has always sought knowledge; that he has developed ways for seeking knowledge; and that more efficient scientific methods continue to evolve in this quest. Today science affects all aspects of our lives in addition to our involvement with it relative to the discipline of speech and hearing. The use of knowledge obtained in a scientific manner is as important in clinical speech and hearing as it is in other areas of knowledge. In fact, there is an obligation

for individuals such as ourselves in speech and hearing to have and make use of the very best knowledge available in the practice of our profession. If we as speech, hearing, and language therapists are concerned with administering to the needs of individuals in these areas, it behooves us to use the very best knowledge available in our work.

It is true that in many sciences, and particularly in the behavioral sciences, that there is a rather sizeable gap between research findings and the actual application of principles and theories to practice. Good research and the application of it to practical problems are necessary. Unless there is continuous and systematic evaluation to gain new knowledge and the use of this knowledge, there is a danger that individuals involved professionally in speech and hearing will continue to use those techniques and procedures that have been successful with isolated cases in the past and since the procedures seem to work, continue to use these rather than basing therapeutic actions on good theory and knowledge that is available in the field. Both the gaining of new knowledge and its application involves a cooperative effort between individuals in universities and other settings, and those engaged in the actual practice of therapy, whether in school settings or in other kinds of rehabilitative environments.

An historical aspect of science of interest is that individuals in their work have tended to reflect economic, social, cultural, and political needs of their time. For example, Newton was concerned with astronomy because navigation

was a practical problem during his lifetime; Faraday was concerned with electricity because sources of power were needed; and Wiener was involved in problems of communication and control mechanisms during his time because these were problems of interest and urgency.

The fact that men of science in the past, not only the ones cited as the most outstanding, have applied themselves to the needs of their times is relevant for individuals in speech and hearing. If research is done, it probably will be done by those individuals intimately concerned and aware of problems in the area. In a culture such as ours where an obligation is assumed for handicapped individuals, research in speech and hearing is also reflective of a broader concern of society for its fellow members. Since we are concerned with the effectiveness of therapy, it may seem that much of the research in speech and hearing would be classified as applied rather than pure inasmuch as problems requiring practical solutions are frequently those investigated.

The distinction between pure and applied research, however, may not be valid. Bronowski does not distinguish between pure and applied research and it would seem important to remember that research in essence is question asking (Science and Human Values, p. 7). It may be that some of the research in speech and hearing does not have potential for generalizations beyond the immediate question answered. On the other hand, research

in speech and hearing may provide answers regarding language behavior that extends well beyond its immediate application. I doubt if individuals working in speech and hearing should be particularly concerned whether or not their research is pure or applied since there is not a clear-cut boundary between these two kinds of activities.

SCIENTIFIC CONCEPTS

There are certain concepts helpful for understanding aspects of scientific inquiry. Some of these include: determinism, hypothesis testing, deductive and inductive logic, generalization, and scientific explanation. Determinism refers to the assumption that there is an orderliness with respect to nature as opposed to regarding nature as being chaotic and spontaneous. Every phenomenon and natural event is assumed to have a cause; and it is assumed that if it were possible to reconstruct all aspects or all variables of an event, then the phenomenon could be caused to reoccur. Although the concept of determinism is not always stated, it is a fundamental, underlying notion of science and has been inherent in the philosophies of science as far back as the Greeks and earlier. The concept of determinism is that there are a finite number of events that bear upon the occurrence of a phenomenon. Nature would certainly be difficult to understand if all things in nature related to all others. When a scientist isolates variables and tests relations among these variables to see

if they relate to a phenomenon under study, his activities are related to determinism.

As was indicated before, science involves the testing of hypotheses. Hypothesis testing forms the link between theory and experimentation. Hypotheses are posed; they are either accepted, rejected, or modified in view of the experimental findings; the theory is re-examined and investigations continue in this manner.

Bekesy (Experiments in Hearing, p. 5) comments on the role of question-asking relative to hypothesis testing and research in general. He enumerated several kinds of questions: the unimportant question, the premature question, the strategic question, the stimulating question, and the embarrassing question. He indicated that the embarrassing question is the kind that is asked at meetings. The strategic question is the one of greatest value, because it gets at the important variables. In the area of speech and hearing, as well as other areas, the formulating of strategic questions is of prime importance and probably one of the most difficult aspects of research.

From the time of the Seventeenth Century, inductive and deductive logic have been intimately related in scientific activities. Indeed, it may have been the understanding of the respective roles of these kinds of logic that has enabled science to progress to the extent that it has progressed. The Greeks, as you will recall, employed deductive logic. Deductive logic begins with a premise or theory or idea. From this premise, possible consequences, relations, or

interactions among variables relative to particular phenomenon are developed. Inductive logic is generalization from the specific to the particular.

New information is arrived at only through inductive logic since it employs observation and experimentation. The way in which major progress is made, however, is in terms of theories developed through deductive logic. Deductive logic is sometimes referred to by scientists as the C domain; the C standing for concepts. Working in the C domain, scientists develop theories and then explore the consequences of these theories. Inductive logic can be thought of as being associated with observable data in nature; and deductive logic with the construct or concept system. A theory is a complete conceptual system with various kinds of explanatory and meaningful connections between the various concepts or constructs. One way to conceive of the C domain or concept system is to think about a group of ideas that are related to each other and serve to explain a particular phenomenon or phenomena of nature. In some cases, we may have construct systems that have limited connections to observables of nature; and in other cases, we may have to provide through measurement a number of connections between the observable data and the conceptual system. Obviously, the more connections there are, the better is our theory based on the conceptual system.

Another aspect of science closely related to inductive and deductive logic is scientific explanation, the way in

which understanding is achieved. Bronowski describes explanation as the way in which we gather and understand events (Science and Human Values). The use of analogies enables one to perceive similarities between events, and the unfamiliar is then understood in terms of a familiar phenomenon.

Weaver described two main types of explanations ("Scientific Explanation", Science, pp. 1297-98). The first one is more common and consists of restating or describing the unfamiliar in terms of the familiar. For example, electro-magnetic waves propagating from a radio transmitter can be understood using the analogy of dropping a pebble in a body of water and observing the spread of ripples. The understanding that radio waves propagating in all directions and getting weaker as the distance from the source is increased, can be seen in the analogy using water; and an individual arrives at one level of understanding electro-magnetic waves.

The second type of explanation proposed by Weaver does not describe phenomenon in terms of the familiar, but involves a series of premises, usually mathematical, that can serve to describe and further the understanding of the phenomenon. It would seem that the two kinds of explanations are not incompatible, but rather, that both are useful and the second is more concerned with logical description and prediction of the phenomenon.

These comments are by way of emphasizing that while certain understanding may be achieved by familiar analogies, if we

are to fully understand aspects of speech, hearing, and language, it will be necessary to employ formal logic systems such as mathematics for our description and explanation.

THE SCIENTIST

Historically, the term, scientist, was probably first used about 1840 by a Cambridge philosopher named William Whewell (Life Science Library Book, The Scientist, p. 29). He indicated that there was a need to describe the cultivator of science and said, "I would be inclined to call him a scientist." Before that time, people engaged in scientific activity usually were labeled with respect to the kind of work they were involved in, for example, astronomers, mathematicians, botanists and so forth.

In a very broad sense, everyone who is involved in scientific work, including laboratory technicians, data collectors, theorists, philosophers, and others, are considered scientists. When scientists are considered in this way, there are perhaps six million people in the world involved in this kind of activity at the present time. Of this six million, there are several hundred thousand who hold the doctoral degree. It is thus obvious that there are many and varied echelons involved in research and that these various individuals are necessary. Too often, perhaps, a scientist is thought of as only the one who is involved in top-level research.

There are stereo-typed ideas as to the characteristics of scientists. Only a few decades ago the scientist was regarded as a rather odd sort of fellow. In fact, a survey as late as 1958 sampling adults' think about scientist, indicated that this prejudice was not as strong as it had been because only forty percent of the responses upheld the notion that scientists are apt to be odd or peculiar. McGeorge Bundy, in an address to the American Association for the Advancement of Science, said that scientists are people, a fact that is frequently forgotten but is verifiable experimentally (Life Science Library, The Scientist, p. 31).

When the characteristics of a scientist are examined, at least the productive ones, it is found that he is often narrow, pre-occupied with his own ideas, unsystematic in his work and methods, and in his reading of the literature. It seems sometimes that he is productive because he is illogical and because he is willing to follow his hunches rather than the implications of existing knowledge and methods. Another common notion about the scientist is that he is an organized, open-minded individual who is responsive to opposing arguments (American Psychologist, 1959).

In an editorial in Science (p. 371, 1964) Abelson wrote that one of the most astonishing characteristics of the scientist is that some of them are plain old-fashioned bigots. Their zeal has a fanatical, egocentrical quality characterized by distinct intolerance of anyone or any values not associated with their special area of work. Abelson continues that while

this may be learned in graduate school, the individual who avoids the bigotry may receive important bonuses because if he is tolerant and able to admit qualities in others, the world can be a fine teacher and the scientist can enjoy the continuous process of self-renewal. The bigoted and narrow scientist also is likely to be concerned with an area so small that his work becomes trivial and his productivity limited.

Individuals engaged in scientific activity tend to have feelings of comparative failure (Science, March 1964, pp.1012-14) probably because they often take as their model individuals who have achieved highly and compare their own activities to these achievers. This also may be the reason why many capable people, for example in speech and hearing, may not become involved in research activities, because there is this fear of failure and the likely unfavorable comparison to those who have accomplished much.

The training of the scientist is of considerable interest. This topic was examined several years ago in a conference sponsored by the American Psychological Association (Graduate Education in Psychology). Also studied were the characteristics of the psychologists who are highly productive. The results indicated that this individual tended to be disorganized and illogical. Their primary concern was in terms of how to train an individual to become a scientist, and their conclusions were that there was no formal study procedure either relative to basic knowledge or to statistical methods that appeared to

be fruitful. The best way for a psychologist to be trained was in actual experience. The report stressed that when a professor takes a graduate student on as an assistant, he then has an obligation to train him for research. The training of researchers then would seem to be dependent upon contact and exposure with competent individuals.

When various types of scientists, for example in speech and hearing, are considered, it should be recognized that there is a need not only for those in experimental activities, but also for individuals who function to integrate knowledge. Not an individual who collects new knowledge, but one who examines existing knowledge, organizes it, theorizes, and puts the knowledge in a kind of structure that can become useful to others.

SCIENTIFIC KNOWLEDGE AND INNOVATION

In all areas of science there are existing bodies of knowledge, theories, and laws that have evolved over a long period of time. Scientific activity involves the development of new ideas and concepts. In successful scientific activity there is probably a balance between the status quo condition of established theories and the innovation of new ideas. This balance probably results in ambiguity, tensions, and problems for individuals engaged in scientific activities because on the one hand, they need to be cognizant of knowledge and on the other hand, they need to be the inventor

and explorer. Perhaps the balance between the two, knowledge and innovation, results in successful research.

Sometimes more attention has been given in the scientific literature to innovations than has been given to the deep dependence of research upon established theories, procedures, beliefs, and concepts. In the area of speech and hearing, as in other disciplines, it would seem that there is a need to be aware of basic knowledge and also the willingness to explore new ideas and new concepts that may lead to fruitful results.

Sometimes it seems that the scientist is reluctant to exploit the breakdown of a prevailing theory and even attempts to patch it, redraft it, remodify it, and in general, make it work. In some instances, writings in the areas of speech and hearing probably serve to entrench accepted theories by extending their applications or indicating a variety of phenomena that tend to support these theories. The kinds of scientific discoveries and writings that change our beliefs about the nature of things are probably the ones that advance science the most.

In this sense, dogma seems to be an intricate part of research and some scientists appear to be more committed to dogma than they are to search after truth. Some scientists seem to know before their research is completed what their outcomes will be, and it is for this reason that unexpected results are characteristically rejected often by very capable

and creative scientists. It has been suggested that scientific truths do not convince opponents of a particular theory but rather, the opponents gradually die off and a new generation is familiar with the truth from the start.

In the area of speech and hearing there are probably theories and concepts of language behavior that could not stand the test of experimental evidence. Unbiased research is one way to cope with this problem.

MEASUREMENT

Measurement was previously referred to as that aspect of science that provides a link between theory and observables of nature and the way in which hypotheses are tested by experimentation. In speech and hearing, as in other disciplines, measurement is usually regarded as the assignment of a system of numbers to the properties of events in such a way that the numbers abstract information about phenomena. It is assumed that there is a relation between the numbers used and the event or phenomenon. This is referred to as an isomorphic relation, meaning that there is a meaningfulness between the structure of the phenomenon and the structure of the mathematical system. This is the most crucial aspect of measurement because if the numbers do bear a meaningful relation to an event, then the numbers can be manipulated to discover, evaluate, and study relations. There are many advantages to using numbers in science. One of these is that it enables an individual to describe an event in such a way that can be

communicated to others. Another advantage is that if there is an isomorphic relationship between the number system and a phenomenon, then the manipulations of addition, subtraction, multiplication, and division can be performed on the numbers to study and increase the understanding of the phenomenon.

Numbers have various properties that make them appropriate to be used to manipulate and discover the relationships among variables. Some of these properties are identity, rank order, and additivity. By way of demonstrating that numbers can have meaning with respect to events in nature, identity means that either A equals B, or A and B are not equal. If A equals B, then B equals A; in other words, there is a symetrical relation; and if both A and C are equal to B, then A and C must be equal, an indication of transivity. Rank order likewise specifies the relation among numbers; that is, if two numbers are not equal, then one of them must be larger than, greater than, or different in some way than the other number. Examples of the use of rank order in speech and hearing are more or less stuttering or severity of articulation. The concept of additivity means that the operation of addition applied to a set of numbers will yield consistent results; that is, the addition of zero leaves a number invariant, the order in which numbers are added does not matter, numbers of equal value may be substituted for one another, and the order of combinations does not affect the results of addition. These properties of numbers were mentioned to emphasize that

in experimentation in speech and hearing when we do assign numbers to some aspect of behavior, our manipulation is that of the numbers, and our ability to make predictions about the behavior is only as good as the relation of the numbers to the behavior.

In behavioral sciences there are several levels of measurement. Four of these have been described by Stevens (Handbook of Experimental Psychology, pp. 26-30). These include the nominal scale, the lowest form of measurement, where numbers are used to represent a class or category, for example, stutterers or non-stutterers. With respect to statistical operations that can be performed with the nominal scale, the frequency of occurrences is the most common; in other words, how many individuals fall in particular categories.

The second level of measurement is the ordinal scale and numbers with respect to an ordinal scale represent rank ordering. The items on an ordinal scale are different from each other in a specific direction but information is not available as to the distance between items. Statistics that can be applied to the ordinal scale includes medians, percentiles, nonparametric tests of significance, and rank order correlations.

The next level of measurement is the interval scale. It has the additional property of equal-distance units. A limitation of the interval scale is that it does not have a zero point. Means, standard deviations, product moment correlations, and other statistics of this kind can be applied to interval scale measurements.

The last level of measurement described by Stevens is the ratio scale and this scale is distinguished from the others in that it possesses a genuine zero point. All statistical operations are possible with a ratio scale and all operations of mathematics can be applied.

PROBLEMS IN RESEARCH

Some problems that relate to research in speech and hearing, although not unique to this area, include reliability and validity of measures, isolation of variables, randomization, the confounding of variables, the application of statistics, and the need for thorough examination of data.

Reliability refers to the consistency of measures, that is, the reproducibility of values with respect to the aspect of behavior under study. The design of an experiment should include provisions for examining reproducibility of measures obtained in different testing sessions from the same individuals. Since equipment is frequently employed in speech and hearing research, some individuals assume fallaciously that measures obtained in this manner are less fallible than if equipment was not employed. Reliability is expressed in terms of correlation. Although a high coefficient of correlation is desired, an actual reliability value can only be interpreted in terms of the thing that is being measured, the testing situation, and other pertinent factors.

Validity is concerned with what is being measured and the goodness of prediction that can be made from the measures. Sometimes validity is defined in terms of correlation of measures with other kinds of tests that treat the same aspect of behavior. Sometimes "face" validity, the logicalness of the method of measurement, is employed. The factor of predictability is probably the most important, however, and test measures that predict future aspects of behavior well are certainly the most valid. Isolation of variables is an aspect of research closely related to validity. If those variables that relate meaningfully to a phenomenon are successfully isolated and measured, then good prediction can be made about the phenomenon.

In speech and hearing reasearch a frequent question is whether or not two groups of individuals have been drawn from the same population. Statistical tests employed to evaluate this hypothesis will not be valid if biases were introduced through the assignment of individuals to experimental groups; for example, using children from one classroom for one treatment and children from another classroom for another treatment results in confounding of whatever biases might be present with respect to a particular classroom. The better procedure is to assign children randomly to treatment groups and by so doing, minimize the likelihood of biased results. The use of matching procedures may also result in biases, particularly if measures such as age, intelligence and other school records

are used. It may be that these kinds of measures do not relate at all to the speech and hearing measures that are used in an experiment.

It is difficult in many studies, particularly ones that are concerned with effects of treatment variables over a long period of time, to be able to partition without confounding those factors that are affecting behavior. The confounding of extraneous environmental factors with experimental factors is perhaps the most common difficulty in speech and hearing research. This is particularly true in studies that are concerned with the effects of therapy.

The assignment of numbers to aspects of phenomenon was previously discussed, and it was indicated that it was desirable to have a good isomorphic relationship between the aspect of behavior under study and the system of numbers. The particular statistic employed to test data depends to a considerable extent upon the level and kind of measure obtained. Some applications of statistical tests were mentioned in the discussions of nominal, ordinal, interval, and ratio measures and will not be discussed further here. It is important when statistics are employed to test hypotheses that it is realized that there are both the likely errors of rejecting a hypothesis that is in fact true, and accepting a hypothesis that is in fact false. Again, the nature of the experiment, its purpose, and the kinds of predictions to be made should determine confidence levels for rejecting hypotheses. It is also important

that experimenters in speech and hearing, when carrying through a design of a particular study, also learn to examine data in detail for information that may provide hunches about the behavior under question.

MODELS AND THEORIES

As was previously indicated, science has progressed through a blending of deductive and inductive logic; the testing of theories and models by experimentation to provide for new knowledge. It would seem that in speech and hearing we need at least two classes of models and theories. One class would be concerned with how, in general, one goes about research, and the other class with how to deal with specific knowledge in the area.

Concerning the first class, Thrall, Coombs, and Davis (Decision Processes, p. 20) have provided a generalized model useful in this regard. The phenomenon under study is referred to as the real world, and it shows how theoretical abstractions can be evaluated within a logic system such as mathematics to provide conclusions that lead to theoretical interpretations. Another aspect of the model shows how experimental measures can lead to statistical interpretation and these can be compared to both the theoretical interpretation and the existing knowledge to arrive at new conclusions. The virtue of this kind

of model is that it provides a way for an experimenter to systematize his thinking and work as he develcps theories and conducts experiments.

The other class of models or theories relates directly to knowledge in the area of speech and hearing. Although a number can be suggested, the information theory model that by analogy compares the human speech and hearing system to a sourse, a transmitter, a channel, a receiver, and a destination is particularly valuable for studying both normal and anomalous speech and hearing. Variations on this model include the addition of sidetone circuitry, afferent and efferent neural networks, and receptor systems to provide for better explanations of speech and hearing phenomenon. We are primarily interested in speech and hearing, regardless of the model employed, to answer questions as to how the ability develops, what are its characteristics, and how it can be modified.

In summary, science was reviewed historically in order to demonstrate that science is not new and that science is a legitimate part of all academic and professional activity. Underlying assumptions related to inductive and deductive logic, determinism, and hypotheses testing were discussed to show the universality of scientific concepts. Characteristics of the scientist and some specific problems of research were reviewed as they related to speech and hearing; and finally, the role of models and of systematic work for scientific

activity was discussed. The profession of speech and hearing is dependent upon a continuing growth of knowledge for effective therapy, and by the same token, the observations and insights of practitioners of speech and hearing are necessary for the formulating of theories and experimentation.

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Chapter III

RESEARCH NEEDS IN THE PRACTICE OF SPEECH PATHOLOGY, LANGUAGE PATHOLOGY, AND AUDIOLOGY IN THE SCHOOLS

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I was very pleased -- and also very humble -- at having been invited to speak to you on this subject. After receiving this invitation, I hesitated for some time as to whether I should or should not accept. My first hesitancy was concerned with my ability to meet the needs of this talk. I discussed my competency in this respect with several of my colleagues, and their answers were unanimous. Each agreed that I was not competent. Many suggested, however, that since in a real sense no one person could be competent to talk about the total research needs in this field, perhaps I should go ahead.

My other hesitancy was concerned with which hat I should wear if I did talk to this group. I wear several hats, which are germane to the present topic. In one hat, I am a college professor and director of a university training program. In a second hat, I am chairman of a large, multidisciplinary research committee at The National Institutes of Health. In a third hat, I am the Executive Vice President of ASHA, in which office I have had the opportunity to serve as a member

of the ASHA Schools Affairs Committee. These hats overlap, and I have wondered in which capacity I have been invited and in which capacity I should try to speak. I shall, therefore, leave to your imagination which hat (or hats) I actually wear today.

Let me now turn to my early thoughts concerning the talk itself. I began -- as one might expect -- by examining some problems in defining terms. Quite easily -- with the subject that I have been assigned -- one could define terms for the full hour and one half. I abandoned this retreat -- I think that you will be relieved to know -- and wish to give you only two brief statements or definitions. First, I have inserted -- without, it is true, the consent of the planning committee -- one word into the title of this talk. I have inserted the word <u>practice</u>. What I propose to talk to you about is research needs in the <u>practice of</u>. I think that this modification makes a considerable difference in the orientation of the talk. Second, with respect to defining research, there are, of course, many definitions already extant. But I selected no definition until I had finished the preparation of this talk. And then I wrote a definition that would cover what I am going to say. That definition may be somewhat loose; it may even be a wee bit offensive to some researchers; but I think that in this context it makes sense. So, may I define research as: <u>Those procedures through which the kinds of information needed by this profession to define and implement its mission are gained</u>.

I see research -- as so defined -- as essentially a question and answer procedure. But the questions are not casual, and the answers are not flip. Rather, the questions are carefully framed and the answers are meticulously developed. One of the major problems that speech pathology and audiology faces in the practice of its profession is that -- to date -- many of the people most capable of providing answers have not asked the right questions. Today, I plan to take the very great liberty of trying to suggest some of the right questions.

Finally, with respect to organizing a talk around this type of definition, may I tell you of three or four organizational approaches which I considered, but which I rejected for purposes of this talk. First, I rejected the possibility of organizing this talk around the basic clinical entities. Thus, I would have had research needs in the schools of speech pathology, subdivided into such headings as cerebral palsy and cleft palate; of language, subdivided; of audiology, subdivided. This is essentially the type of organization followed in the ASHA research monograph of 1959, and is a worthwhile, scholarly approach. I was fearful that this organizational concept would prove inadequate for this talk, however, in that it tends to be redundant; that is, it is difficult not to examine the same kinds of needs for each of the entities; it tends also, by imposing such structure on the actual subject matter, to limit what you can talk about. I particularly wished to avoid these kinds of problems. So, although I prepared my initial manuscript along these lines, I ultimately rejected the notion of organizing by clinical entity.

A second principle of organization -- which I also rejected -- was concerned with dichotomy of basic and applied research. This dichotomy has a long -- if sometimes dubious -- standing in the research literature. I rejected this approach for several reasons. First, I am not certain that this is a valid dichotomy. Second, if it is valid, one faces the fact that that which is basic today may become practical tomorrow, thus potentially dating one's decisions. Third, this dichotomy implies a set of value judgments, and I wished to avoid any organization based on what is good and what is bad research.

A third organizational approach that I carefully considered but ultimately rejected was based on the dichotomy of the researchable versus the non-researchable. One of the handcuffs that American research scholarship has worn -- and for the most part worn proudly, particularly in recent years, and particularly in the social sciences -- is the dedicated refusal to do research that could not be done cleanly. It has refused to swim muddy waters. Here is a big difference in American and European scholarship. We will only study what we can study well, whether it is worth studying or not; the European scholar will only study what needs to be studied, whether it can be studied well or not.

This dichotomy leads us, then, into tremendous problems. I have avoided some of these by choosing not to organize this talk around what is and what is not researchable. Perhaps I am suggesting that if, as a field, we need particular answers, the researcher must not answer automatically that it cannot

be done well. Rather he must seek some way of seeing why the water is muddy. As Dean Spriestersbach is wont to say on the privacy of the Iowa campus, although it is dangerous for the researcher to get into muddy waters, still, if he really wades in up to his waist or shoulders, and stays there, he may at least see in what direction the the stream is flowing.

Finally, I have avoided the dichotomy of multidisciplinary versus unidisciplinary approaches. I don't believe this to be a useful dichotomy. Moreover, it is perfectly clear that our needs are not only both multidisciplinary and unidisciplinary, but at times becomes painfully omnidisciplinary.

I have then, adapted a plan of organization which is based around these five questions: What do we do? Who does it? Where do we do it? How do we communicate among ourselves? How do we justify our behavior?

So, with some apology to the ultra-scholarly, may I hope that you will find this a meaningful approach to our subject.

Let me begin, then, with my first research area, Clinical Functions. There may be better words. Perhaps you perfer therapeutic functions; teaching functions; remedial functions; habilitative functions; I don't know which term is best. I shall use clinical functions, and trust that you will substitute for yourself whatever words make the best sense to you.

The first clinical function operationally is the finding and/or screening function. May I suggest that the basic problem we face here is the formulation of a clean-cut definition of the clinical limits of our profession. Our screening goals

must reflect what we conceive to be our professional goals. Perhaps our first need, then, is to define the limits, that is the clinical or practicing limits, of speech pathology and audiology. Some of you may feel that this has been done. I do not. I believe that we have many professional areas of grey at the present time.

Let me move from what I conceive to be a relatively certain area to what I conceive to be a relatively uncertain area in order to demonstrate the need for definition in this field. First, an area that I think most of us would include as falling clearly within the confines of our professional interests would be represented by the articulatory problems of a ten year old post-operative cleft palate child. I think there would be almost no question but what our profession would deal with at least the articulatory aspects of this boy's problems. No other profession, I think, would make serious claim to this aspect of the problem. Let me now suggest a clinical area that is, although a little less certain, still generally considered within our province. This area can be represented by a fourteen year old stutterer. Another profession may make some claim to this problem, but basically this would be considered to be within our province. Let me suggest a less well delimited area, that of language problems of five, six, seven, and eight year olds. Let me further load the argument by adding to this language disability a reading problem. Is the clinicial problem then still within our field or is it not? Now if I suggest learning disabilities generally, perhaps I

begin to describe a condition not completely within the confines of our field. Finally, to suggest a condition that may be completely out of our field, and yet may occasionally be dealt with by one of us, I call your attention to tongue thrust without concomitant speech problems. Is tongue thrust, as just specified, within our field, or is it more properly managed by some other profession? This then is why I say we need definitions, that we must define our clinical goals before we can screen. Neither as individuals, nor, to my knowledge, as a profession, have we set these limits. If tongue thrust is part of our goals, then we had better screen for it. If it isn't part of our goals, then we had better not.

I would suggest to you three principles in defining these goals. One principle would be to overlook no major group that we are properly trained to serve. A second principle would be to include no group that we are not properly trained to serve. A third principle, which I offer most cautiously, is to seek to reconcile our goals with those of other professions.

My first suggestion, then, for a series of real questions that we need to answer, are: What are the clinical limits of this profession? How can we determine these? How can we define them operationally?

Assuming that these questions can be answered, a second series of questions relates to the clinical implementation of these goals. The second series of questions is the easier to research; the first, the more important.

In the past, in the schools, we have relied essentially on a traditional, individual type of screening procedure. I think we do this reasonably well in articulation, for example, and I want to discuss it for a moment. But then I would like to introduce a relatively new concept of screening that I think it imperative that our researchers investigate.

Now what I have referred to as the traditional, individual type of screening, is aimed, first of all, at finding the individual child who has a particular problem. Usually this screening is fairly specific. It's for hearing; it's for articulation; or it's for voice. It's aimed at a specific factor in an individual. And, essentially it's aimed at something that has occurred. That is, you are looking for a child who has already acquired or achieved a defect. You are looking for something that can be cured. I submit -- and this states it rather harshly -- that our traditional screening process may be described as individual, specific, aimed at what has happened, and leading to cure or treatment.

The schools have relied on two essential techniques of finding. One is referral; the other, the traditional survey. Despite some very excellent research in techniques of the survey with respect to such questions as when they should be done, what they should include, and who should do them, there is still a great need for practical survey research. For example, the effect of depth of survey on cost, on reliability, and on validity is not known. In addition, new techniques

need to be explored in other than such usual fields as articulation, hearing, voice, and fluency. So I think that even with the traditional type of survey we have some very worthwhile problems fo. practical research.

But in the second type of screening procedure, I think that speech pathology and audiology are operating almost in virgin territory. I am referring to the high <u>risk group type</u> of screening. Let me define the high risk concept in a little more detail. The high risk screening concept is different from the individual screening concept in that, first of all, it is looking for a population or a group rather than for individuals. It is usually looking for background factors rather than for specific disability. Thus, if the area of concern is language, a high risk survey may not measure language, but will look at the background factors relevant to the emergence of language. Thus, instead of being aimed at the past, at an achieved defect, it is looking at the future to a possible disability. Its aim then becomes prevention rather than treatment. Thus the high risk survey, as opposed to the traditional individual is oriented toward the group rather than the individual, background rather than defect, future rather than past, prevention rather than cure.

We are seeing a great deal of the high risk concept in the field of language disorders, for example. Much of this work, however, is not being done by people trained specifically in speech pathology and audiology. It is being done by the special educator, and particularly by the cultural deprivation

specialist, who is able to isolate groups of children, who at ages one, two, three, and four -- even before the complete emergence of language -- for whom it becomes possible to predict language difficulty. The techniques of high risk survey, high risk treatment are reasonably well known in other clinical areas. Clearly we need, and need immediately, research on high risk techniques in our own field. Perhaps the best guide we have at the moment, in our own field, may be, oddly enough, in stuttering. Here the concept of high risk has had rather high development, although not necessarily under that particular name. In summarizing research needs in screening procedures, then, I would hope, first, for refinement of our present screening procedures, and, second, for the development of what I have termed high risk procedures.

Let me move to the second clinical function, which I have arbitrarily labeled Evaluation. Some of you may prefer diagnosis. My first item under evaluation, I have chosen, again somewhat arbitrarily, to call Description, description of the difficulty. I would like to suggest to you that this description ought to be made under at least two categories. One category is that of degree and kind; the second, that of significance to the individual.

The term degree and kind is best defined by example. In articulation, it refers to the number of error sounds and the kinds of problems associated with these error sounds. You may say, and with some justice, that as a field we do this kind of evaluation very well already and that we don't need

further research. I hope that you don't actually think this way! If you do, we disagree. Let me call your attention to certain difficulties in the way we handle even these very elementary procedures. Most of us, I think, in evaluation, in descriptive evaluation, are unable to make the basic and important distinction between performance and competence. Essentially, what we measure in evaluation is performance. Basically we as yet lack the techniques to measure competence -- that is, ability to perform. I regard this as a very basic distinction, for I sincerely believe that one can learn only what he is able to do. And thus it is at least as important to measure competence as to measure performance. May I make this more specific. Again, to draw from the area of articulation, competence requires that an individual possess the oral-sensory control for articulation. Thus work by Bosma, Ringel, Grossman, Shelton and McDonald, for example, in sensory feedback from the mouth is a basic type of information that is needed to evaluate competence. Further investigations along these lines are imperatively needed. On the motor side, one can't teach a child to close his palate if he doesn't have the neural control or muscle tissue necessary to move the palate. As clinicians we try to make this judgment, but only recently have such experimental -- and ultimately clinical -- techniques been adequate to make this kind of prediction possible. So desperately, I think, in terms of evaluation, do we need research in measures of competence, sensory, motor and integrative for the performance under question.

In addition to description of degree and kind, we need also description of significance. Too often the research has overlooked, I think, the significance of the deviation to the individual and to his group. If one reads our journals, and related journals with this in mind, I think he will be appalled by the lack of evidence -- not lack of statements -- we have with respect to the significance of the articulatory defect, or of the dysphonia, or of the hearing loss to the individual. Some attempts have been made, of course. We have had the SAI in hearing. Gilmore has studied the effects of laryngectomy on employability. Kleffner and Gallagher have concerned themselves with the implications of the child of a speech defect. But basically, as a field, we do not have good data on which to answer these kinds of questions. What does it matter to a fourth grader who has a nasal voice? How important is it to a 25 year old man in his employment situtation if he stutters? These are what I mean by significance to the individual. Now I know that it's easier to measure a decibel than the effect of a smile from the boss. But we need these kinds of effects just as much as we need measures of signal to noise ratio.

Let me move then, although still in evaluation, from description to etiology. I am not, although I was weaned on Robert West's classic, The Rehabilitation of Speech, an ultimate cause individual. I think that most ultimate causes exist only in textbooks. Seeking the ultimate cause is a good diagnostic exercise, but practically I think that it has no real being. I have stressed my attitude toward this, because

what I am about to say may suggest to you the validity of ultimate causation, and I would not want you to lean in that direction. I have probably spent more time selecting my next two headings than on any two headings in this talk. I have not known what to call these etiological factors. And I have failed to find strong approval for any pair that I have come up with. Yet may I suggest that one type of etiological factor may be termed biomedical; the other, behavioral. I hope that you will accept these terms as being of some help in categorizing etiology.

By biomedical, I would suggest the type of cause that is presently organic or which was physiogenic. That is, it would have a physical basis either in the past or in the present. Cleft palate would be an example. By behavioral I have in mind a cause which would grow primarily out of the post-natal environmental experiences of the individual. I believe this distinction to be important because etiology may affect therapy. It is for this reason that I wish to stress a third category: mixed. Biomedical; behavioral; and mixed! And this third category, mixed, is probably the most frequent of all.

Now, our professional concepts of where the different clinical entities of our field actually fit vary from time to time. One of the advantages or reaching your declining years while still in some possession of your faculties is that you look back and relive some of the changes that have happened. I have seen cleft palate, for example, at least as I have read

the literature and as I have been taught, move from something that was almost entirely hereditary to something that is only in part hereditary. The number of drugs that have been shown to act as teratogenic agents in the production of cleft palate in the mouse is now legion. No obvious chemical similarity characterizes these drugs. Their common effect on the pregnant mouse has been described as stress. Thus Rosenzweig can hypothesize that stress may be a crucial factor in the etiology of cleft palate. Which would bring us back full circle to the old wives' tales of a mother's fright causing cleft palate.

I have also seen M-R go from something that was, in the classical sense, biomedical. But, on a recent site visit with a group sophisticated in mental retardation, I found that the concept of M-R as organic en toto is now being rigorously challenged. A present trend is to stress cultural influences except in extreme clinical cases.

Look at stuttering. Now you will have to look at it, of course, from the standpoint from which you look at it. In the viewpoints from which I have watched stutterers, I have gone from basically organic -- which reflects one teacher -- to basically psychological, which reflects one university -- to now some suggestion that perhaps it's biological again. So we need ongoing research as to etiological factors of our disorders. A grave danger to our field or to individual clinicians would be to catalog any one of these as neatly settled. We need more information. Finally, in evaluation, in addition to research in description and etiology,

we need research in predictive techniques. In medicine, diagnosis as a term frequently implies a statement about the course of the disorder. In evaluation, as we use the term, this prediction about the course of the disorder ought also to be true. I would like to suggest to you that we need to be able to make two kinds of predictions. First, what will happen with therapy and second, and perhaps more important, what will happen without therapy. We may have an odd dilemma in our field. It almost seems that in those areas where we are most successful therapeutically, we are least able to predict what will happen without therapy. I am referring particularly to functional articulation.

But we do have some starts in prediction. Perhaps the best known of these starts is Schuell's predictive test in aphasia. This is the type of research that we need generally in order to predict the course of communicative problems.

Speech and hearing services cost money. Even in a great society, but particularly a great society that is at war, the cost of services becomes important. Personnel limitations may also continue to restrict our services. If we serve A we can't serve B. To the extent then that our services must be selective, to that extent must we be able to predict those children who will mature in speech and language without our professional assistance. I would suppose that if you were suddenly to shake me in the middle of the night and ask "What is the most immediate need of our field?" I would reply, "Some way to pick, at grade one, the child who will outgrow

with no consequences his articulatory deviations." Then I would go back to sleep. Unfortunately, our research in this area has continued to sleep. Only recently has an awakening begun to evidence itself.

The third clinical function that I have indicated is that of therapy. I would like to suggest at least two basic kinds of therapy. One is a biomedical type of therapy; the other is behavioral. In addition, I would recognize two subdivisions under the behavioral type of therapy. One of these I have called psyche-centered, in which the focus is on the speech problem rather than on the adjustment. My usage of the term focus does not imply a strict <u>limitation to</u> but rather a <u>concentration on</u>.

Let me go back to biomedical forms of therapy which, although not practiced by us but by the physician, are of great significance to our field. Two basic types are: surgical and medical.

The need for the evaluation of surgical techniques as they relate to speech and hearing is obvious to anyone who has worked seriously in the field of cleft palate. Let me give you one example of a typical surgical problem for which, many surgeons agree, there exist no true normative data. This is the problem of the cleft palate child whose speech is moderately effective and who has adenoidal tissue -- and colds. So here he is, then, eight, nine, or ten years old, with speech that isn't bad but isn't perfect, with lots of colds, and with a hearing loss that seems to fluctuate with

these colds. So the surgeon, guided, perhaps, by a cleft palate team, is confronted with this decision: To leave the adenoid tissue and help the hearing or to remove the tissue and hurt the speech. And how does the surgeon participate in this decision? Basically from his own experience with previous cases he must decide. No clear cut data based on uniform records with a large sample are available to him. I am happy to report that Dr. Hughson King of Miami, Florida is undertaking a normative study of children with this type of problem. Dr. King and his group are trying to ask every type of question in order to provide rationale for answering this question: Shall I leave the tissue? Or shall I remove it? This is an example of the kind of research that is needed in surgical therapy.

In drug therapy many situations that relate to our field are equally obscure. At the moment, not too many of the problems in speech pathology and audiology -- at least as narrowly defined -- have responded dramatically to drug therapy. One area may prove to be that of language impairment. With respect to language disorders, many neurologists are coming to believe that with proper diagnosis and case selection, the administration of anticonvulsant drugs may prove extremely helpful. Thus appropriate medication may increase the actual learning potential of many children. Here, then, may be medication that is not too expensive, that has only a few side effects, and that can alter the learning process. But

the neurologist or pediatric neurologist who contemplates the administration of this medication is -- in one respect at least -- like the cleft palate surgeon. He has no data based on a rigidly controlled large sample of children. Obviously needed, then, is research with respect to the effects of this kind of therapy on the language learning ability of many kinds of children.

Now moving over into what is really more our own functioning area, behavioral therapy, I have recognized two types, psyche-centered, with a focus on adjustment, and learning-centered, with a focus on the neuromuscular speech problem. Let me make two comments here. One, we have almost no evidence as to which of these is the more effective with which kind of child. I have never forgotten being the critic at a program in which a group of nationally known speech pathologists discussed the relative advantages of what I have previously termed psyche-centered and learning-centered therapy. Each speaker drew heavily from his own case examples. As I listened first to one and then to another my impressions constantly changed. But the significant thing about this situation is that not one of the discussants actually offered qualified data about the man-hour effectiveness of the course of treatment. I do not for a moment challenge that psychological therapy can be helpful. And I don't for a moment challenge that learning-centered therapy can be helpful. I am simply asking for research that will seek to define which is the better in which instance, how much better it is,

and what training is necessary for each. These are typical clinical comparison type experiments that are very difficult to do cleanly in the experimental sense.

Although many of you may not accept this conclusion, it is my judgment that many of us who have typical ASHA certification are probably learning-centered therapists. This does not mean that we are not interested in rapport and that we do not take certain steps about adjustment. But if I were to go back into the thousand and one therapy situations I have observed over the years, basically the operations I have observed have more often been concerned with the speech or language deviation rather than the adjustment generally. So let me speak to you for a moment, at least in part, as learning-centered therapists. Here we -- the learning-centered therapists -- have a tremendous need for an understanding of the basic processes. Too long and too often, learning-centered therapists have taught by ear alone. This teaching by ear alone -- this doing therapy by ear alone -- can be remarkably effective. But it can be even more effective if augmented by knowledge of the basic processes of oral communication and of learning itself. Thus work being done by Palmer with respect to the oral contacts of on-going speech, by Spriestersbach and his group as to what constitutes perceptual cues in the production of cleft palate speech, and by the Subtelnys in what is truly important in velopharyngeal activity, is but a sample of the data needed by the learning-centered therapist. The learning-centered therapist,

the therapist who is going to help people in the direct modification of the communicative act, must understand the act itself. So, indifferent as I may have seemed at times this morning to traditional, classic research, may I point out that we have great need yet for more and better of this kind of information. Equally needed, of course, is further research on the learning process.

A second problem in therapy is that of who should receive the therapy and how should he receive it; that is, the <u>who</u> and <u>how</u> of therapy. The first question that I should like to call to your attention is whether therapy should be administered to a total population or to a selected population. If this worries you, let me employ a different word, <u>help</u>, given to a total population or to a selected population. We have two areas to recognize here, and we need research in both. First, what if the population about which we are concerned is essentially a normal population. For example, consider a total elementary school population in an average community. In this instance, which is more effective, total stimulation to the group or stimulation to a selected few? We have, it is true, a few comparative studies. But nothing definitive has yet been done to enable the planner of a program to decide if he should give group stimulation in kindergarten, in first grade, or second grade, or whether his speech dollar is better spent with selected cases and again, if with selected cases, at what age this should be done. Clearly we need research relative to those issues.

The second area concerns a different type of population, that to which I have earlier referred as the high risk population. If you have isolated -- and this is now happening, particularly in our urban areas -- if you have isolated a school which is essentially a high risk population, now what is better: to work with the total school population or to work with the more deviant members. Again, we simply do not have experimental data on which to answer this question. We must make our answers on what seems reasonable and what seems practicable.

Then we have three aditional problems which are, I think, somewhat closely related. First, should one work with a group or with individuals? Many schools have made the decision to work with the group on the basis of expediency. Others have made it on the basis of desirability. But I would suggest to you that few have truly been able to make this decision on the basis of experimental evidence. Second, if you do use group, should the group be homogenous in terms of type of defect or should it be heterogenous? Third, if you do use group, should it also be combined with some individual? These are questions that we can't answer either in general, or in terms of specific ages, or in terms of specific disabilities, or even in terms of specific phases of therapy. Thus it may be that group is wonderful, for example, with eight year olds and poor with ten year olds. It may be that group is perfect for stuttering but poor for language disorders. It may be

that group is fine for teaching auditory discrimination and poor in teaching production. These are the kinds of specifics for which we have small research bases for our answers.

Perhaps it is because I am a college professor that I belabor this last series of points, all of which may be very, very obvious to this group. Yet it seems to me that some of my most embarrassing moments as a speaker occur during informal situations with school people in which they ask what they want to ask -- instead of an "impressive" question. Frequently the things that they want to ask I can't answer as well as they can. Examples are questions about grouping, heterogenous, homogenous, age and other specifics of the therapeutic process.

Now another major problem in therapy, and one, once more, for which we have remarkably little research data, is that concerning the roles, the necessary roles in the speech therapeutic process in the schools. There seems to be consensus that the speech therapist, speech teacher, speech correctionist, whatever her name may be, should play the primary role. What is uncertain, however, is who else should play reasonably active roles. Should the classroom teacher? Should the parents? Should the subprofessional -- a term to which I shall come back in just a moment? Or should some other member of the community play a decisive role?

Many problems exist here. Some of these are personal problems that complicate our lack of data. For example, the speech clinician in the school, functioning essentially

without data on this point and therefore functioning either on advice of others or on their own opinions, is torn. And when you are torn, lack of evidence is particularly unpleasant. What is the tear? First, I sincerely believe that the average school correctionist wants the child to get better. And I'm sure that you will agree with me here. But you may not agree with me in my second suggestion, which is that the school correctionist also wants to play an important role in this process. The desire to play an important role may affect, to some extent, any desire to make full use of others. I won't push this very far; I'm afraid to. But I do want to call it to your attention. We want the child to get better, but we also want to have our fair share in this role and we want our fair share to be recognized. I think this attitude, then, has complicated the use of the classroom teacher. It may also have complicated the use of the parent.

Fortunately, we have some research on the use of the parent and the classroom teacher. Dr. Sommers, who works in a school environment, has seen the need for such research. But with all respect to Dr. Sommers, I think it safe to say that we need more. This is an area that he has just scratched -- although scratched very beautifully. And we need further scratching, and I hope that I am dropping some itching powder today that will result in just such further scratching. The parent, you see, has a double role, I should say, a double potential role in therapy. First, the parent may play a role

of a kind of assistant therapist. Or the parent may be included in the therapy as an etiological factor. At the moment, we have little evidence of the effectiveness of either kind of interaction.

The third group that I have mentioned I have called by a term that I do not like. I have called them the subprofessional. But I suspect that this is going to be the generic term for this group. Again, depending upon your backgrounds, you will vary in your familiarity with this term. As plans for the great society have been studied in Washington, an increasing awareness has developed that the organized professions -- with some particular reference here to medicine and to dentistry -- but with some reference also to speech pathology and audiology -- as they now function will not be able to meet the total needs of our society. I have come to accept this as fact. I think this is true for the forseeable future. I think there are not enough dentists and will not be. I think that there are not enough physicians and will not be. I think there are not enough speech pathologists and audiologists and will not be.

How can such situations be remedied? I think the professions would like to remedy this situation by recruiting additional members. Let's get more us, the same kind, just like us, and we'll meet these needs. But students of this problem in the Department of Health, Education, and Welfare fear that this solution is not practicable. We can't train

enough dentists, physicians, and speech pathologists and audiologists to meet the need. What then can be done? One answer, unattractive to many of us, is to turn the problem over to some other group. A more attractive solution may be to develop a sub-profession within the major professions. Dentistry and medicine have already done this to a considerable degree. Some of you may have enjoyed the services of a chairside dental assistant who multiplies the hands and the time of the dentist. The physician already depnds on many sub-professions -- in the sense that the term is being used here. As you know, if you have been hospitalized recently, many, many of the services performed for you were not performed by a physician. They were performed by individuals with other and usually lesser training. In our field we have to date not actually developed the subprofessional. An occasional state may have used other personnel -- as nurses -- for certain types of hearing testing, or as in Wisconsin, parents have been employed for certain types of screening, but as a profession we have not trained on a national basis any kind of subprofessional who would participate in or work with us and do certain of our tasks for us. This concept is just beginning to be explored in this field. In general, this idea in this field has not had a very favorable reception at first exposure. But many of us, as we have seen the need, and as we have looked at the consequences of not going in this direction, have come to look with more favor on it.

Needed, then, is a very practical kind of information gathering, for example, what could subprofessionals in speech pathology, language, and audiology do, how should they be trained, how should they be labeled, what precautions must society take to protect itself from this type of training. Here is a role that we have had virtually no experience with, which I think we shall have to face up to, and I hope that we can face up to it at least partly on the basis of research and not entirely on the basis of our best opinions.

There are other individuals who potentially play roles in this field, but these that I have mentioned constitute the major ones. The classroom teacher, the parent, and the new sbuprofessional, and in all of these we need positive research with respect to possible roles, relative effectiveness, and necessary safeguards and limitations.

A fourth item of research concern in therapy -- not restricting the term to any particular clinican entity such as cleft palate, or cerebral palsy, or hearing loss but therapy generally -- is programming. I have put programming in this list of items with considerable reluctance, first, because it is so new, and second, because the relationship of program learning to the specific individual with the defect as opposed to the normal population has not yet been well explored. Actually, in terms of research needs, this newness may make programming even a more timely subject.

Why is there a need for investigation of programmed instruction, of programmed therapy? I think that this need

can be summarized on two bases: one is that the overwhelming demand for our services, which cannot be met by the number of speech pathologists and audiologists available today, may be partially solved by programmed instruction. I am, of course, here anticipating the results of research to come by assuming that programming will multiply our coverage. In the second place -- although here I will wait until some answers are in, I believe it to be probable that therapy will be done more effectively with programming in selected circumstances. Research is certainly needed to demonstrate this. We've already made some starts. I presume that the work of Schiefelbusch and that of Garrett is perhaps representative of what is being done.

But just research on programming, particularly research on the relatively normal -- is not enough. What is specifically needed is research on programmed instruction with particular disorders and in particular phases of therapy. Let me give an example to indicate the type of thing that I'm concerned with. At the moment, in articulatory therapy, whether with presumed functional articulation or with -- let us say -- a cleft palate child -- we are able to program auditory discrimination. This is relatively easy to handle by straight instrumental techniques. We are having greater difficulty, however, in programming production instrumentally. It may develop that research on instrumental programming will demonstrate that this technique will work very well in certain phases of our clinical activities, for example,

auditory training, and less effectively with other phases -- as for example, production. In production, the problem has been to devise completely instrumental techniques for making the judgment of correctness or incorrectness. You can program judgments with respect to a series of stimuli that you have recorded, but it is difficult to program judgments with respect to the unpredictable stimuli that a child has produced.

If we decide to investigate programming, we must decide on what; that is, on what disorders, on what phases, on what ages. We must also decide how we are going to do this. Are we going to do it instrumentally or non-instrumentally? I raise this question of instrumentation -- which is not, I think, of as basic importance as the first -- to remind you that programming can be done non-instrumentally, that programming need not involve, although it frequently does, elaborate instrumentation. If you are interested in instrumental techniques, the work at Parsons, which is truly remarkable, should be called to your attention. Here, using modifications of instrumentation devised actually for other fields, children who have been clinically defined as mentally retarded are learning both to respond to stimuli and to produce stimuli on the basis of automated reinforcement. So we have evidence already that automated testing and therapy is possible. What we need is detailed exploration.

The next area of research that I should like to touch on in therapy is that of reward and punishment. Again, I think that this is a problem that cuts across the clinical

entities. Traditionally in our work, as in most learning fields, we have minimized punishment and emphasized reward. This emphasis probably goes back to Thorndike's continued research on the relative effectiveness of punishment and reward. His interpretation of this research was perhaps biased in the direction of the effectiveness of reward.

Today, more consideration is being given to the possible effectiveness of punishment. Forgetting what many of us may, somewhat casually, it is true, have assumed to be settled -- that is, that we should use reward exclusively -- let us look at the problem. One specific that a therapist may face is that of reducing the occurrence of an activity. This may be a tic, it may be an articulatory habit, it may be an "uh, uh", it may be a variety of things. How does one reduce an activity? Classic learning theory offers two basic approaches. One is not to provide positive reinformcement to an act -- to let it die. And this extinction can be a long, slow process for a well learned activity. The other is to provide negative reinformcement -- or punishment. What we need, then, is research not for learning generally, and particularly not just for rats who are learning or unlearning to push pellet levers -- what we need is research on human beings of ages 5, 6, 7, and 8 as to the relative effectiveness of reward and punishment in modifying communicative behavior. I recognize that any use of punishment must be carefully restrained if we are going to keep the individual in the therapeutic situation. But the complete avoidance of punishment may be

an error. With research, one may be able to document for this field that which I am prepared to infer from learning theory generally -- that negative reinforcement is a legitimate -- if not fully understood -- teaching technique.

A second aspect of reward and punishment is the prospect of modifying the value system of an individual so that something which is now not reinforcing to a particular child can become reinforcing. The feasibility of this is well established in theory and has been demonstrated in other fields. Let me give you an example which will, I think, make my point better than will abstract description. In a study of cultural deprivation, it has been found that certain children have no interest whatsoever in reading. Even those who do read a little, apparently derive no satisfaction from this reading. In this subculture, the ability to read, then, has no value. So the children fail to read.

It has been demonstrated very conclusively that one may hire these children -- either in coin of the realm, or in tokens, or in actual objects -- to take reading instruction and to teach them to read. It is clear that these children are not reading for what they may get from the reading itself; they are reading for the coin, for the token, or for the electric guitar that they may receive if they read enough pages. But during this process an amazing change occurs. As they go through this process for their original reward system, their reading skills increase to the point that reading in and of itself becomes a reward. By changing the reward

system, that is, by making the act of reading itself rewarding, the problem is modified and the child carries on in reading. Reading is now important to him.

I know, of course, that no one of us has ever, ever had a problem in motivating a child. But some of our colleagues may. It is to them that I am speaking here. Instead of assuming that the child wants to do that which you are trying to get him to do, consider the very real possibility that he doesn't. In these instances, the best long range solution may be to modify the value system. The best examples that we now have of such value system modification come from outside our field. What we need, then, is research in modification of the value systems relevant to communicative activity. I believe that this can be done in speech and hearing, but I don't believe that we have enough evidence yet to write operational guidelines. I think that we need such data desperately. As a personal aside, may I suggest that changed value system would perhaps solve at the etiological level a significant number of the problems in our fields.

Finally, as the third concern under the general heading of reward and punishment, may I consider percentage of reinforcement. Let us assume a reward that is compatible with the value system of a particular child. How often should you use it? The evidence from learning theory generally would suggest that particularly during the shaping of an act, one ought to reinforce heavily, perhaps even approaching a 100% schedule of reinforcement. But, as the communicative habit

is formed, and you wish to stabilize it, the schedule of reinforcement should be reduced significantly, in order to protect the child fro[illegible] non-reinforcement by society of his carefully nurtured act. If he has been rewarded on a 100% schedule by you for the correct use of medial "r" and then faces a society which never overtly rewards him for the same act, the act may drop out because of non-reinforcement or extinction. But if, in the final stages of therapy, you have employed an intermittent schedule of reinforcement, the child will be more prepared to accept his world's lack of reinforcement. The evidence we have from other kinds of learning would suggest that the medial "r" would, under these circumstances, be retained longer. Again then, there is great need for research in the relative effectiveness of different reinforcement schedules in our own field. Too much of what has appeared in our literature is actually inference from other types of learning.

The timing of the reward may be considered from another standpoint. Psychological literature today is filled with examples of how acts can be shaped -- particularly acts of animals -- by rewards administered at appropriate moments during an activity. This is the operant conditioning of Skinner. This is a fascinating concept; its application to our field is actually being tested today at the Parson's project. By inference, we have many reasons to believe that operant conditioning may be very effective in modifying communicative behavior. At the moment, however, we have

remarkably little experimental data with respect either, first, how and when to do this or second, how effective it is. In addition then, to studying reward and punishment, we clearly need a great deal of work with respect to shaping techniques in problems of speech, language, and hearing. If one can teach a pigeon to dance, to bow its head, or to jump through any selected hoop, one ought to be able to teach a child to use the word "apple". But we need evidence of the relative effectiveness of these techniques.

I wish to introduce now -- but still under the general heading of therapy -- a consideration of scheduling problems within the school situation. Because of your familiarity with these problems, I shall deal only briefly with them. May I call to your attention some very obvious, and, for the moment, somewhat unanswerable questions. One would be the number of times a child should be seen per unit of time, say a week. That is, should he be seen once, twice, thrice a week, or should he be seen daily? For how long a period should he receive instruction, for twenty minutes, for ten, or would an hour be still better? Should this time be concentrated in the first half of the school year, or in the first and second fourths of the school year, or should it be spread evenly over the school year? Should these scheduling plans vary with age and should they also vary with the disorder? On the basis of the evidence of published research available to us today, we lack experimental data on which to base these decisions. Here is another area for needed research.

The next major item that I should like to mention is concerned with dismissal techniques. This is a problem that our textbooks, our teachers, and perhaps even our practicing clinicians minimize. Probably this tendency to minimize dismissal grows out of the basic American belief in the ideal. So I think that whether we realize it or not, most clinicians in most situations are functioning on the implicit assumption that dismissal will occur when normalcy is achieved. Whether phrased specifically or not, this assumption seems to pervade therapy. Normalcy is the goal; dismissal, a kind of epilog.

Unfortunately, as we know, but cannot quantify, normalcy is not always possible. Thus many children may be kept in therapy beyond the point of any practical return. I should like to spell out some of the consequences of such protracted therapy in order to build a need for a type of research in which I have so far found little interest. First, keeping a child in therapy beyond a point of change is, of course, frustrating to the child. He knows, typically, that he has ceased to improve. It may be equally frustrating to the therapist. It is also expensive to the community. Not only are time and space being consumed, but the child is missing out on other experiences. It also reduces the number of children that can be served. In addition, I suspect that non-productive therapy also hurts the status of our profession.

This I suspect, but cannot document. For I think the child who in three years, or four years, makes no change, but who is constantly receiving help in special programs,

summer clinics, and in routine speech therapy, creates the impression that speech therapy is a field that does not always accomplish very much. The need is for research in establishing the maximal correction that is practical for a particular child. We must know how to say, in the case of velar insufficiency, for example: "I have carried him now as far as he is able to go. I must dismiss him now or refer him for other management." This is research that we need.

I would like to direct your attention next to the personnel problem in speech pathology and audiology. As a profession, we have done remarkably little in personnel research. As I see it, we have first of all a recruitment problem. Many have shared this concern, of course. Unfortunately, our past concerns with recruiting have tended to emphasize numbers. The theme has been: "Let's recruit." ASHA has contributed to this activity, and, in conjunction with the American Hearing Society, will continue to do so. This is clearly a legitimate activity. I urge research that will investigate techniques for recruiting more individuals into this field. But we also need research on the selective process, on the kinds of people that ought to come into this field.

First, I am convinced that everybody will not make a good speech and hearing therapist. I expect that most of you will agree. But I will go further; and here you may not agree. I am now inclined to believe that within our total profession we have careers that appeal to different

types of individuals. I believe that we have some therapists who do better with children than with adults. I believe that some people do better in therapy than in research. And I think that there are a few maladjusted people who do better in administration than in either. But these are just opinions. What research would we cite to isolate the characteristics that would predict the specialty into which an individual ought to go if he is recruited into this field at all? We need research in selective procedures, so that in our recruiting we get the types we need as well as the numbers.

A second problem that we have in personnel research concerns the kinds of people that we should train after we have recruited them. What kind of training should we offer? Many of us do not realize how much difference of opinion exists now as to the type of therapist we should train. If tomorrow I could wave my wand and make uniform all the training programs over this country, I don't know whether I would wave it so that there would be three training programs generally, that is, speech pathology, language pathology, and audiology, or whether I would wave my wand in another direction and produce one correctionist competent in all three fields.

What kinds of clinical specialization -- increased diversification with three certificates or increased unification with one certificate -- do we need?

A second type of personnel research relates to the subprofessional. I have referred to this category before. Do we need this type of person at all? If we do, should we

train h. in our present kind of training program? Should he be trained in special programs? Should he be regarded as an incompletely trained therapist whose long range goal is to become completely trained? Or should we regard him as an individual with limited professional goals, goals which are terminal at the subprofessional level? I won't spell these questions and their lack of answers out in any further detail. These are training questions. And I hope that you will accept that these are questions that the training institutions are not, as yet, prepared to answer.

Then I should like to deal with a personnel problem that tends to make us feel uncomfortable. At one time I had dropped this problem from my original manuscript. But last night I screwed up my courage and decided to put it back in. I am referring to the need for research in the morale factors of public school speech and hearing therapists. I have been astounded -- as I have attended the open meetings held in various sections of the country by the ASHA Schools Affairs Committee -- at the statements made by the school people themselves about their own morale. In particular, I have been astounded by what they have chosen to say when the situation encouraged a completely frank, informal type of reaction. What I am about to say now does not, be it understood, represent my estimate, may not represent the general truth, but does represent a reiteration of what some school people themselves have said. It is a reiteration of what some say they feel about themselves. Many say that they

are second class citizens. I have tried to explore this, to understand what they mean by this phrase, and to grasp why they say it at all. Oddly enough, I discovered that there were at least two ways in which they seem to experience this uncomfortable reaction. First, some reported themselves as feeling second class within the profession itself. A varying complex of factors such as academic degrees, salaries, prestige, publications, and journals gave some foundation to what is, I trust, a most unfortunate illusion. I have heard these statements before and I must concede some measure of agreement with the facts that are adduced if not with the conclusions.

But the second development came as a complete surprise to me. Not a few school therapists referred to themselves as second class with respect to other teachers. And when I would explore this, I would frequently find that this feeling was sometimes based on what I would have regarded as assets. Among reasons cited were the fact that they did not belong to a particular school; that they did not have a particular home; that they were an outsider or visitor in a particular school. In addition, some were disturbed by not having an adequate room in which to work, or by having to go out and drive in all kinds of weather, or by having to make home calls. My intent here is neither to document nor discredit the validity of this reaction. But I do want to call your attention to the fact that it exists. A vital area for research is what is the morale of the school therapist. Why is it what it is? And what can we do to improve it? For the

therapist, whether in the schools or in some other environment, is on the firing line so far as our profession is concerned. If morale here is poor, the profession itself is in danger!

Other personnel problems relate to the number of therapists that we need. A realistic estimate can be made only in terms of prevalence studies and in terms of the kinds of plans we make to meet these prevalence figures. Do we use programming? Do we use subprofessionals? Do we use group instruction? To date we have simply not carried our research far enough to answer these questions.

A final personnel problem that I would like to mention -- and only mention -- is the retraining concept. As I see our field, one of its most wasteful elements is the brief professional life of the typical therapist. Mrs. Gretchen Phair has said that in the schools of Wisconsin, the female therapist has an average professional life of less than two years. This is a rather short return for what has been four years and is now becoming five years as a minimum of professional instruction. Clearly, then, a practical problem facing us is that of bringing these people back into the field but with adequate training. Nothing could be more dangerous than bringing them back ten to fifteen years behind the times. But if we can bring them back, updated and refurbished, this could meet a tremendous need.

Next I would like to say just a word on physical environment and the need for research concerning the actual physical place in which the school speech correctionist works. The

working area has turned out to be a chronic problem with school therapists over the country. And what disturbs me is that I think we have set our sights, at best, to solve this problem on the basis of what I will call the adequacy concept. Let me define the adequacy concept, as I am using the term. The adequacy concept would build speech therapy rooms around information that any good general school architect could give you. This means that many new speech therapy rooms will be built in terms of adequate size, adequate privacy, adequate ventilation, adequate lighting, and perhaps even adequate access, if the planner has actually had some experience with the handicapped. But to settle for a merely adequate room at our present state of knowledge would be a tremendous mistake. If we are going to build specialized rooms in our new schools, let's do research, and do it rapidly, to develop rooms that will involve a facilitation concept, rooms that will not be just adequate for therapy but that will actually facilitate therapy. The audiologist has made a start in this direction. He is now able to specify the kind of room he needs. The language people may not always agree among themselves, but they have been able to specify the kinds of rooms that they need, whether this simply involves a miminum of decoration, or goes to the Cruickshank "cubicles." But speech therapists, as a group, have not really evolved any specifications of this type. I would suggest that if we are actually going to build speech rooms, that we do research into what kinds of rooms will actually help our therapy and not simply constitute a non-handicap to what we attempt to do.

The next major item with which I wish to deal is the problem of communication among ourselves. This may be the most important communication problem in the field of communicative disorders. Although I cannot deal at length with it, I feel that I must call to your attention the fact that we have at least three kinds of communication problems in this field. First, we have interpersonal communication problems. These can be between members of our own profession, where frequently we substitute jargon for meaning and pretend that we have communicated. These can also be interdisciplinary. Especially needed is research in the techniques of management that facilitate interdisciplinary communication. As a weary site visitor, I would say that one of the chronic problems to be found in many elaborate clinical situations is the communication problem. Not only is the problem chronic, but the lack of solution is also frequently chronic. Research with respect to organization and communication processes is vitally needed.

A second kind of communication problem concerns our handling of clinical data. The traditional method of handling clinical data is the folder, with the case history, the various examination forms, correspondence, referrals, and perhaps a summary. With all that can be asked, and with the number of children that are being seen, this technique of handling data is, I think, virtually outmoded. We must move -- as a field -- to a more automated form of data retrieval. But how? Data retrieval systems have some very

real obstacles, perhaps, even dangers. For example, such a system may force too early standardization or it may force the asking of a question that may be premature or needless. Nevertheless, it has the major advantage of being able to bring back, over large N's, the information that is needed. Active research is needed today in the techniques of data retrieval and of data banks, if the field of speech and hearing is not to lag behind other fields.

I won't develop our third communication problem, that of utilization of the literature. Data retrieval systems for bibliographical materials are in being and, without further stimulus from this group, will be, I think, expanded to the point that they meet our needs. The bibliographical center in human communication now being established at The John Hopkins University is an example of this type of progress. The time is not too removed when, if you want a summary of recent work in voice disorders of teen age children, a "librarian" will press a button and the print-out will come back to you.

My last point is, potentially, an offensive point. I am concerned here with the need for research on the justification of our profession. This does not mean that I personally have serious doubts with respect to its justification. I don't. But I am personally appalled by our own inability to document our case. If you doubt me, I would simply ask any of you to put yourself in the hypothetical role of being

asked to justify tomorrow, on a dollar and cents basis, the program that you represent before a group of your citizens, and to do this in terms of the pbulished literature and not in terms of colorful examples and interesting anecdotes. We must document the differences that we know to exist between a community with speech therapy in its schools and a community in which such services are not offered. In terms of rational growth as a profession, this may be the most important of our research needs. For I think we have at least made starts on the other needs that I have called to your attention. But, on this last issue, we actually have not begun to fight. But as we continue to compete for people, for money, and for time, our lack of readily available data is going to count against us.

In conclusion, I hope that it is now obvious which hat I have worn during this presentation. I have tried to speak not as a university professor, and not as the chairman of a governmental research committee, but rather, I hope as a member of the School Affairs Committee of the American Speech and Hearing Association. I hope that it is also obvious that most of the areas of research that I have mentioned have been based on questions asked of me, rather than on the basis of answers supplied by our researchers. In short, I have started from the viewpoint of the people who want to know, rather than from the viewpoint of the people who think they do know. I hope that you have found this presentation helpful.

Chapter IV

THE TACTICS OF SCIENTIFIC RESEARCH

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INTRODUCTION

Scientific research in human behavior is essentially a process of carefully planned, controlled observation that is designed to provide answers to certain kinds of questions. The tactics of scientific research is concerned with the formulation of questions and the planning of the procedures for obtaining the observations that will be likely to help in answering those questions.

We should bear in mind at the outset, however, that even though we can talk abstractly about the tactics of scientific research, when we get down to cases we find that there is no magical key to successful scientific work,--no set of simple, tried and true rules that we can follow to assure grinding out the answer to our problem. Take almost any scientist who has made some sort of epochal discovery such as penicillin or nuclear fission, and ask him how he made that discovery. He will probably mumble something to the effect that it took

luck, hard work, and patience, but he would not be able to give you a set of rules that would enable you to make a similar discovery. There is no substitute, in scientific work, for a thorough background knowledge of the discipline in which you are working, nor is there any substitute for some sort of unusual perceptiveness or creativity that accompanies most successful scientific work.

Nevertheless, I do not wish to discourage those who hope to do useful scientific research. It is possible to learn some of the basic tactics of scientific research, and armed with this knowledge, you may enhance the likelihood that if you have the requisite scholarship in your discipline and if you have the necessary degree of creativity and insight, you may do useful and even ground-breaking scientific research.

My approach to teaching the tactics of scientific research depends upon getting a good grasp of basic types of research and the kinds of questions that can be attached with each of these types. In fact, each of these types of research has its own special procedures, its own special brands of statistical operations, and its own special ways of interpreting data. Thus, if you understand these types of research, you not only will be able to choose the type of research that fits the kinds of questions you are asking, but you will also be guided to use the kinds of research procedures and statistical operations that suit that type of research. I hope my presentation will give you at least a degree of understanding

of these types of research that will enable you to look at articles, say, in the Journal of Speech and Hearing Research and classify them into the four types I shall now describe.

The four types are: Measurement research; descriptive survey and status research; correlation research; and finally, treatment research.

MEASUREMENT RESEARCH

First let's look at measurement research. You remember the recipe for rabbit stew, the recipe that starts, "First catch your rabbit." It's much the same in research, but instead of rabbits, we have to catch variables. If you are going to do any research at all, first set up your variables. All research in the behavioral sciences (and I suppose this is true also in the physical sciences) begins with variables, that is, with measures of the things, events, and persons that are going to be studied. This is because these things, events, and persons vary along one or more dimensions of interest and concern to us, and it is first necessary to have good measures of these variations. Some of the variations are qualitative, and in this case, measurement is essentially a matter of classification. We can classify people, for example, in terms of variables such as sex, ethnic origin, and occupation. For some purposes, people also are classified in terms of certain disorders--in the speech research area we could classify people into certain groupings such as dysarthria, stuttering, etc.

These classifications are not always cut-and-dried; sometimes it takes an expert, or even a panel of experts, to make the classifications. But most of the variables that are used in research are quantitative; at least, they are expressed quantitatively, because the underlying variation is regarded as existing on a scale with various amounts or degrees. Sometimes the variation is discrete; this is true with scales such as number of siblings (0, 1, 2, 3, ...you name it), because siblings come as whole units, not as fractional units. Even a scale such as number right on a test is really a discrete scale, not a continuous one. Many, in fact most, quantitative scales are continuous, however, because the measurements can be regarded as involving an infite number of small steps on a scale. This is true, for example, of height and weight--there are an infinite number of possible measurements between 5 feet and 5 feet 1 inch, say, if we wanted to be that precise.

Notice that when we say we measure something, that something can be either one of two kinds of things. For example, we can either measure a child, or we can measure, say, height. Like the word teach, the verb measure can take two kinds of objects. (Remember the old saw about how "we do not teach subjects, we teach children".) It is better to distinguish these two kinds of things and say that we measure things with respect to particular attributes. Thus, we measure a child with respect to his height, or with respect to his speaking fluency. Under the category of things measured, we can have

other types of things: we can measure an automobile with respect to its speed, a schoolroom with respect to its reverberation time, or speech performance (on a particular occasion) with respect to its persuasiveness, say.

It is these attributes with respect to which we measure things that is the concern of measurement research. For not all attributes are easily measured. It is easy enough to measure the height or weight of a child, the length of an automobile, or even the time taken by a speech, because these are all physical measurements for which quite standard procedures of measurement already exist. For many other types of measurements, it is difficult to prescribe a standard procedure of measurement, or even to specify with sufficient precision what is measured, and to specify whether a given measurement procedure is really valid, i.e., really a measure of the sort of variation that one hopes one is measuring. For example, does an intelligence test really measure "intelligence?" Does a measure of speech rate really measure speech rate? We can ask similar questions for a great many of the measurements we use in our work. It is the business of measurement research to inquire into the accuracy and validity of these measures and try to produce more satisfactory measuring procedures. For the essence of measurement is that it consists of a specific, defined procedure or operation; a procedure that must be carried out exactly the same way (at least in all critical respects) every time it is applied to

measure something. There is both the problem of deciding what is the best procedure by which to take measurements, and the problem of how precise the measurements are once they are obtained. And there are some other problems that I won't do more than mention--the problem of the type of scale, and of the equality of the units for measurement, for example.

As I have said, not everything is easy to measure. And even things that <u>look</u> easy to measure prove to have many more problems than one might imagine. For example, I have recently become interested in the question of how to measure rate of speech. This would appear to be a very easy thing to measure--just by counting the number of words and dividing by the number of minutes, so as to yield a measure in terms of <u>words per minute</u>. It is not at all as simple as this, however. In the first place, words vary in length, and different passages vary in the average length of their words. If you ask a person to read aloud a passage, say, from Ernest Hemingway, that has about 1.2 syllables per word on the average, he will read it at quite a different rate (words per minute) than if he were to read, say, a passage from Henry James's writings, averaging about 1.75 syllables per word. Tentatively, we might conclude that speech rate should be measured in <u>syllables</u> per minute; but even syllables vary in length. Particularly if one were interested in comparing speech rates across languages, it would be better to have a more uniform unit, perhaps the phoneme. However, it can be shown that different

amounts of time are required even for phonemes, on the average, in different languages. I have not yet been able to find a way of measuring speech rate that will give comparable results across different kinds of speech material or across different languages. If we stay within English, I can say on the basis of a certain amount of research that the measure "syllables per minute" gives more consistent and reliable information than "words per minute," and I suggest that we abandon forever the practice of reporting speech rates in words per minute.

But there are other problems besides the units of measurement. Even when two speeches are being read at precisely the same speed, in terms of syllables per minute, you can obtain very different effects. One speech may be spoken with relatively small pauses between words or between phrases; the other with relatively long pauses between words and between phrases, so that the words themselves are spoken very rapidly and in short bursts, machine-gun fashion so to speak.

Furthermore, if you are trying to measure an individual's typical speaking rate, you have to define what tasks or performances you are going to use in order to sample his speaking rates. Reading a passage aloud obviously will be done at a rate that differs, generally, from spontaneous speech. And even when the task remains constant, there naturally will be a certain amount of variation due to uncontrolled factors--what are ordinarily called "errors of measurement." Measurement research investigates all these matters and, ideally, eventually

comes up with standardized procedures for measurement that have known properties as far as "validity" and "reliability" are concerned. The better standardized psychological tests exemplify standardized procedures of this sort--they are meant to be administered in precisely the same way every time, and if care is taken one can have a specified amount of faith in the results.

There is one type of measurement research of which I am particularly fond--and that is so-called factor-analytic research, which seeks to isolate what are the basic dimensions in which some class of things vary. Usually we are concerned with the basic dimensions in which people vary in their behavior, or more particularly, in their abilities and traits. Factor-analytic research requires a good deal of sophistication in statistics, and it generally involves the use of high-speed electronic computers. It is not the sort of research that would ordinarily be attempted by a researcher in a school system if he is not adequately trained or if he does not have access to computing facilities. I bring it to your attention, however, as a very valuable research technique for certain purposes, and certainly anyone can learn enough about the technique to read research reports with some understanding. A recent example of factor-analytic research in the speech field was the factor analysis of aphasic symptoms that I did in cooperation with Hildred Schuell and James Jenkins, published in the Journal of Speech and Hearing Research in

December 1962. It established that aphasic symptoms could be classified behaviorally into four or five main types, or in other words, that aphasic performances vary fundamentally in only four or five basic dimensions (at least, the particular aphasic performances that were studied--we cannot exclude the possibility that a more extensive and more finely differentiated sample of performances would reveal further basic dimensions).

DESCRIPTIVE SURVEY STUDIES

Let us pass on to the next basic type of research--the descriptive survey or status study. This type of research assumes that one already has some satisfactory measuring techniques--one or more. It is principally concerned with applying these measuring techniques to some appropriate samples of things to which they can be applied, and interpreting the results. In other words, the descriptive survey or status study is concerned with describing a defined sample with respect to one or more measurements. Let us take a simple case. Suppose we have developed a satisfactory way of measuring speech rate. And suppose we have asked the question, what is the typical speaking rate of educated speakers of English? Probably we would also want to ask a paralle_ question: what variation in speaking rates can be observed? That is, besides the average speaking rate we would also want some indication of the range of speaking

rates--some indication of how fast some people are likely to talk, and how slowly some other people are likely to talk.

Answering questions such as these involves not only having a satisfactory measuring procedure, but also defining the population of things to which our measures are to be applied as "educated speakers of English." This is a pretty big population if we define "educated" fairly broadly (some hundreds of millions of people). Ideally, we should draw a sample of this population--a random sample would be best. In practice, we would have to draw what has sometimes been called an "accidental sample"--for instance, all the speakers of English to be found in the high schools of a certain Amer: an city. Or if our resources are fairly limited, we might simply draw a random sample of students in the tenth grade of a particular high school, on the assumption that such students are in some degree fairly representative of educated speakers of English.

Having drawn our sample, we would apply our measurement procedures to the members of this sample. The outcome would be a set of measurements or <u>values</u>; one for each member of the sample. At this point we would probably be interested in making some kind of summarization of the measures, and this would involve some simple statistical operations. The simplest of these operations would be to make what is usually called a frequency distribution of the values--a tabulation showing systematically how many cases we have of each value. It

would be a good idea to make a graphical representation of this distribution by plotting frequency against value. Figure 1, for example, is a graphical frequency distribution of such speech rate measurements that I collected some years ago on a group of 130 college students. Now actually, these measures are the number of seconds to read a certain passage with 177 words or 297 syllables (1.68 syllables per word). However, to get the measures in terms of syllables per minute, it would be necessary to translate them by dividing the number of seconds into 60 times the number of syllables, with the result that the measurements now distribute themselves as shown in Figure 2.

These figures show in a simple way the distribution of the measures. One might want to go further and develop some statistics to summarize the data. For the most practical purposes, a mean and a standard deviation would give, respectively, a measure of the central tendency and the range of variation of the data. Such statistics are best computed when the distributions are approximately of a normal bell-shaped character. It is of interest that the distribution is more normal when the measurements are of rate, that is, number of items per minute, than it is when the distribution is based on the reciprocal of rate measurements, that is, number of seconds to perform a certain amount. Therefore, it is more legitimate to compute the mean and standard deviation on the basis of the lower distribution curve, and the resulting statistics are: mean = 289 syllables per minute, standard deviation = 32 syllables per minute.

I would like to mention an error in statistics that has occurred over and over again in speech research literature. The error is to compute the arithmetic average or mean on the basis of measurements of time per unit of performance, and then to translate this mean into a measure of rate, that is, performances per unit of time. This procedure produces an erroneous result. For example, if we compute the mean number of seconds to read 297 syllables on the basis of the distribution curve in Figure 1, we get a mean of 62.46 seconds, corresponding to 285 syllables per minute, a figure rather different from the mean of 289 syllables per minute when computed correctly, that is, from the distribution curve in Figure 2.

What I have given you is the simplest possible prototype of a descriptive survey or status study. Well, perhaps not the simplest. We could have made it even simpler by reproting some two-valued qualitative variable like sex--in which case an adequate statistic would be simply the percentage of the sample that were men.

Of course, a descriptive survey study can be much more elaborate--it can cover thousands of cases and include tabulations on a number of different variables. In the area of speech research, I should imagine that there would be many opportunities for descriptive surveys. For example, one could describe the speech status of a schoolful of children--tabulating the number of children with certain classes of

speech defects, or computing the average speech ratings of the children on one or more scales of excellence.

A special type of survey study is the developmental study--the kind of study that surveys a given population at different ages to note the average amount of growth. Developmental surveys are either cross-sectional or longitudinal. The cross-sectional study is usually done at a given point in time; it surveys each of a number of groups, each at a different age. For example, one might survey, that is, measure and report the characteristics of, children in the 2nd, 4th, and 6th grades of a given school. The longitudinal study has more value, however; it would measure the children in the 2nd grade and then follow them through school until they reach, say, the 6th grade. The advantage of the longitudinal study is that a more accurate report of individual trends in growth can be obtained. One might never discover, for example, from a cross-sectional study that many children actually <u>decrease</u> in measured ability as they advance in age.

In educational research circles there has been a certain disdain for the survey study. There is some justice in this, because after you do a survey study you merely have some statistics to which the likely response might be, "So what?" Nevertheless, I feel that in many contexts, descriptive survey studies are of prime importance simply because they can give an accurate impression of <u>how things really are</u>. A few years ago there was a hue and cry about how Johnny couldn't read.

But nobody had any really good statistics about how well Johnny could read, and if such statistics had been available, there would have been a more realistic, and probably less pessimistic appraisal of the situation. Perhaps the same could be said about various issues in speech education. Survey studies can either reveal gaps and deficiencies of which we are unaware, or they can point up bright spots that might otherwise be missed. And in either case, they can be guides for action.

CORRELATIONAL STUDIES

The third type of research is the correlational study. Again, this type of study presumes that one has sound and adequate measuring devices or methods of classifying data. It is fundamentally concerned, in fact, with the correlations between variables, and tries to utilize such correlations for various purposes--either for interpreting the data to suggest possible causal relations, or as a basis for systems of prediction.

A simple illustration of a correlational study would be one in which just two variables are involved. For example, suppose we were interested in the correlation between speaking rate and sex--do women, on the average, speak faster than men? I have no reliable data on this point, and if I did perhaps I wouldn't reveal them. All that I want to do here is to illustrate in this way what a simple correlational study

would be. As you see, the correlational study is really a simple extension of the descriptive survey study--the main difference being that it studies the relation between pairs of variables, or even among groups of variables. There are various ways of measuring these relations, the simplest and most often used being the so-called Pearsonian correlation coefficient. This latter ranges from +1.00, reflecting a perfect linear relation between two variables, through .00, reflecting no linear relation, to -1.00, reflecting a perfect negative relation. The latter refers to a situation where the high values of the first distribution are uniformly associated with the low values of another. But there are other measures of relation; some of them will show a significant relation even where the Pearsonian coefficient is zero. The study of these relations through correlational statistics is a subtle and demanding art, particularly where a great number of variables are to be studied simultaneously. For such situations we have a number of so-called multivariate techniques such as multiple correlation and factor analysis (mentioned earlier, but used here in a slightly different way as far as interpretation is concerned).

Whenever two variables show any significant relation, the question is, why? There are various possible interpretations. One of the variables may possibly be found to have a causal influence on the other; or it may be that both variables are

reflecting simultaneously the influence of a third variable. There is no way to tell, just from the correlational statistics alone. Rather, these relations merely are suggestive and must be followed up with experimental studies--and these constitute the fourth type of educational research, about which I will speak in a moment. To take our simple example: suppose we found a significant relation between sex and speech rate. Obviously, speech rate cannot cause sex, but sex might possibly cause speech rate, in the sense that various biological and physiological phenomena associated with sex might facilitate or inhibit speech rate. Or it might be the case that both sex and speech rate reflect the operation of some third variable--methods of upbringing, let us say. It might be theorized that girls have a closer relationship with their mothers than boys, in which case the greater amount of early contact with an adult might be responsible for a finding that girls speak faster than boys (if this were the finding -- remember this is only hypothetical). This would be a hypothesis suggested by the finding, and it would be necessary to follow up this hypothesis by more detailed studies of the influence of early contact with an adult upon speech rate. In other words, one would track down the possible relationships with other variables.

In the behavioral sciences, few correlations are really very high, a fact that suggests that any one phenomenon has a multiplicity of causes. The game is to try to isolate exactly what causes are most critical. For example, you are

all familiar with the history of research on stuttering, where many different types of variables have been investigated, at one time or another, in order to try to discover what are the most important factors in this kind of behavior. It is a phenomenon that is difficult to study in any way other than by correlational studies because it is apparently something that only nature can produce; by that I mean that we do not really know how to produce stuttering in children in whom it might otherwise be absent, and even if we did, we would hesitate to take whatever steps would be necessary to produce it, mainly because of ethical and humanitarian considerations. All we can do is to investigate relations in order to try to guess what combination of treatments would prevent stuttering from occurring in the first place. And incidentally, it occurs to me to suggest that research in stuttering should try harder to investigate what measures might be taken of very young children that will predict the occurrence of stuttering.

For one rather special type of correlational study is the predictive study. Characteristically, the predictive study investigates correlations between measures that can be taken at one given point of time and measures that are given at a later point of time. Such predictive studies are illustrated by the numerous studies of the prediction of college success from measures taken in high school or earlier. We have discovered what kinds of measures will predict college success--mainly, certain kinds of intelligence or "scholastic

aptitude" tests, and grades in high school. In much of my own research, I have been concerned with whether it is possible to predict eventual success in the study of a foreign language from measures that can be taken prior to the individual's actual starting to study a foreign language; the answer here is that success in FL study can usually be predicted with high accuracy.

The predictive study should find an important place in speech research. For example, one might develop a battery of tests that would predict how profitable it would be for a child to undergo a given program of speech therapy. In effect the measures would be both diagnostic and predictive.

EXPERIMENTAL TREATMENT STUDIES

Finally, we come to the experimental study, which as I suggest is the fourth major type of study in behavioral science research. Where does this study fit in the tactics of scientific research? The experimental study is primarily of use when one is trying to investigate and evaluate the effect of certain treatments or conditions on selected groups in the population.

The true experiment is one that is "controlled," that is, the experiment has been designed in such a way that any results of the experiment (positive or negative) can, with high probability, be traced back or ascribed to the specific influences of one or more factors (or their interactions) that have been

built into the design. Sometimes teachers "try out" a new method or procedure of teaching and call this an "experiment." Or a therapist will try a new method of treatment, without controls. These are not true experiments because the effects of the try-out cannot be traced unequivocally to the influence of the new procedure; they may equally well be the effects of uncontrolled factors such as the ability of the students, the increased effort or "push" put into the teaching or therapy, or even the time of day when the treatments are administered.

In a true experiment, it is useful to distinguish three types of variables that are involved:

(1) the independent variables are the variables whose effects are being investigated. They are either treatment variables, or selection variables. A treatment variable has to do with variation in treatment of the subjects, such as the difference between a new method of teaching and a more conventional method, the difference between teaching in the morning and teaching in the afternoon, the difference between one order of presentation of material and another, etc. A selection variable has to do with variation in the groups of students or learners selected for the experiment, such as the difference between high-ability students and low-ability students, or the difference between older students and younger students. Sometimes a particular variable can be handled either as a treatment variable or as a selection variable;

for example, when motivation is used as a treatment variable, one manipulates the incentives that are set for different groups--one group, say, being offered a reward for high achievement, and another group being offered no such reward. When motivation is used as a selection variable, however, one simply selects two or more groups with different degrees of measured motivation or interest with respect to something deemed relevant to the experiment, e. g. interest in improving public speaking ability. A single experiment may have one or more independent variables, of either the treatment or the selection type. Each variable, however, must have at least two <u>levels</u>; that is, there must be at least two contrasting treatments, or at least two different groups selected, and each of the treatments or groups is called a "level" of the corresponding treatment or selection variable. Often the two levels of treatment are called, respectively, the "experimental group" or the "control group," when a particular treatment is present in the former group and absent in the latter.

(2) The <u>dependent</u> variables are measures of the effects being investigated. For example, in an experiment on the effect of two methods of teaching (an independent variable), a dependent variable would be some measure of learning such as performance on a test of listening comprehension, or gain from a pre-test (given prior to the teaching) to a post-test (given after the teaching) of that ability. A given experiment may involve one or more dependent variables; usually, there

are only a small number, and the effects on each are studied separately. An experiment concerning methods of speech therapy could utilize as dependent variables (1) a test of pronunciation accuracy, and (2) a measure of personality change, in order to see whether the variation in therapeutic method affects the one variable more than the other.

(3) Control variables are variables whose effects are "controlled," either by certain procedures of selection or by statistical means. In other words, the effects are held "constant" or equal, on the average, across the levels of independent variables. In theory, all possible variables that might conceivably have effects upon the dependent variables (other than the independent variables themselves) should be "controlled" or held constant across levels of the independent variables. Some variables can reasonably be expected to have such effects; for example, intellectual ability, age, and prior training of learners. One procedure for "controlling" such variables is to attempt to "match" experimental groups with respect to them; for example, in setting up two or more experimental groups, one assigns pupils to them so that in each group there is a pupil of a given degree of intellectual ability, age, and prior training. However, a much easier procedure, and one that is generally more defensible from the point of view of the statistical assumptions that are entailed, is simply to assign pupils to different experimental groups according to a completely random process, e. g. by

throwing coins or dice or by using a table of random numbers. This can be assumed to have the effect of controlling all conceivable relevant variables other than the independent variables themselves.

Sometimes it is impossible to assign pupils to experimental groups randomly, as when one must conduct experiments with already "intact" groups that have been selected or set up by somebody other than the investigator. (The problem arises only when a particular experimental treatment must be applied uniformly to all members of an intact group; it does not arise when the investigator can single out members of an intact group and apply different experimental treatments to them at will, in which case random assignment procedures can be used.) In the case that one must apply treatments uniformly to already intact groups, appropriate control measures must be applied to all members of the experimental groups so that statistical procedures can be used to control these variables.

Campbell and Stanley (pp. 171-246 in Gage, N. L. [Ed.] Handbook of Research on Teaching, Chicago, Rand McNally, 1963) have classified possible experimental designs. One of the simplest of their "true experimental designs" is the "pre-test--post-test control group design," and this has many applications.

It can be designed as follows:

Individuals assigned randomly to these groups:	Experimental group	Pre-test	Experimental treatment	Post-Test
	Control group	Pre-test	No Experimental treatment (control treatment)	Post-test

Time --→

This is the kind of design I would recommend be used for many experiments in which one is investigating the effect of particular treatments or influences.

The statistical analysis of such experiments seeks simply to find whether there is any significant difference between the effects in the two groups. If the two groups are not significantly different on the pre-test, one can simply compare them on the post-test measurements. Otherwise, it is advisable to compare the respective amounts of gain or change between the pre-test and the post-test.

There are, of course, many more complicated designs -- particularly those in which it is possible to assess the combined effects of several treatment or selection variables simultaneously; sometimes these are the most interesting types of experiments, because they may reveal what are called interactions: the effect of one variable is dependent upon the value

of the other variable. The classic case is the interaction between two drugs: given singly, each one might be highly beneficial, but given together, they might kill you. The statistical method that is usually advisable for the analysis of these complex experiments is called analysis of variance.

APPLICATION TO TACTICS OF RESEARCH

This completes my brief exposition of the four basic types of research studies in the behavioral sciences. I hope that the relevance of this typology to the tactics of scientific research has become evident. For fundamentally, all scientific problems can be reduced to one or more of these types of research. More specifically, we can distinguish four basic types of scientific problems:

(1) How to observe and measure phenomena (measurement research);

(2) To describe existing phenomena in terms of scientifically established variables (descriptive survey research);

(3) To investigate and interpret relations among variables (correlational research); and

(4) To investigate causal influences of certain types of phenomena upon other phenomena (experimental treatment research).

In surveying the problems of any field, such as speech research, one should be able to sort them out according to the above categories. This would be the first step toward making the problems more amenable to study by scientific methods.

For details as to the carrying out of scientific studies, I must refer you to the bibliography on educational research methods that is appended below.

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Chapter V

SPECIFIC APPLICATIONS OF TACTICS TO SPEECH, HEARING, AND LANGUAGE

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BACKGROUND

During the last decade, researchers have lunged with vigor and unadulterated enthusiasn into literally thousands of studies concerned with the communication disorders of young children. There have been studies related to prevention measures, early detection needs, treatment possibilities, therapeutic approaches, educational methods, habilitative procedures, and rehabilitative techniques. Numerous studies have dealt with complex or exotic problem areas such as, the differential diagnosis of aphasia, autism, mental retardation, auditory imperception, dyslexia, dysgraphia, cerebral palsy, and various other syndromes, sequelae, diseases, disorders, and disabilities. Children with communication disorders have been studied from various vantage points, including: the physiologic, psychologic, neurologic, pediatric, otologic, sociologic, psychiatric, audiologic, educational, and linguistic viewpoints. New theories and points of view have been developed

about the speech and language learning processes, and there has been an increased number of studies concerned with: concept formation, cognitive processes, effects of sensory impairment on speech and language learning, variations in perception, extinction phenomena, retention of auditory sequences, behavioral symptomatology, memory patterns and the effects of environmental influences on speech and language development. Studies of young children with communication disorders have been housed in all types of facilities: clinics, hospitals, schools, centers, private institutions, public institutions, camps, and special classes. In essence, then, human communication--how it develops; what can influence or interrupt its development; what can be done to ameliorate or significantly reduce communication disorders of young children--has been studied by more scientists, from more varied professional disciplines than perhaps any other aspect of child development. Yet, considering all of the studies that have been undertaken, and all of the parameters of communication that have been explored, it is unfortunate that there are still so many gaps in our knowledge about how the human communication system works. It is apparent that more information is needed if we are to proceed with confidence in the therapeutic and educational planning necessary for children with communication disorders.

Realistically, neither the gaps in our scientific knowledge nor our need for more clinical information can be related to a lack of interest in research activities or a limited dissemination

of research findings. To the contrary, it is possible that too much research has been undertaken in some cases, and perhaps findings from some studies have been disseminated too widely. In a sense our need for more information about communication processes and communication disorders lies deeply rooted in the "pressure of the times," for during the last decade, a greater emphasis has been placed on the importance of education, and as a part of that emphasis an unrelenting stress on the need for children to communicate ideas more clearly and at an earlier age than ever before. Today, more people--laymen and professionals alike--are aware of the debilitating effects of a communication disorder. More scientific disciplines--some not directly related to the behavioral sciences--recognize the study of communication disorders as a scientific field that has strict requirements for professional preparation. More time and energy--more Federal and State funds--more university curricula and more hospital staff appointments have been allocated to the study of communication disorders during the last ten years, than possibly all of the foregoing years of professional concern put together.

PROBLEM AREAS

Because of this increased interest in communication and its resulting accelerated research activities, the need for a more realistic look at the application of research tactics becomes apparent.

First, a large portion of the research concerned with the communication problems of young children has been carried out through single, unrelated, isolated studies that have not allowed for comprehensive attacks on pressing educational and clinical problems. The problem connected with studies such as these is that usually one-shot studies cannot assure the validity or reliability of findings. Consequently, we run the risk of having clinical and educational consumers accept as fact, findings that have not been properly tested. In addition, studies carried out in isolation frequently result in both time and money-wasting activities where research efforts are duplicated to such an extent that practically identical studies may be carried out simultaneously by several researchers, without knowledge of the other research undertakings and therefore, without interchange of ideas or coordination of findings.

Second, there is insufficient participation in research by specialists who are involved in day-to-day therapeutic or educational procedures. Actually, the major portion of the studies concerned with communication disorders of school-aged children have been designed and carried out by basic scientists. We are indeed fortunate to have these scientists interested in the study of these problems. But, as is to be expected from basic research, the results obtained from these studies have not always been applicable to specific, isolated school situations. Because some of this information has not been immediately useful and because some of these reports have not

been clearly understood by potential consumers, some speech and hearing specialists have become abusively critical of all research activities concerned with young children and they have questioned the value of undertaking any research in a school setting. Still other speech and hearing clinicians have shied away from participating in research themselves, either because of feelings of research inadequacy, or in some cases, because of feelings of sheer frustration when called upon to design research proposals. In spite of these attitudes, the majority of speech and hearing personnel in the schools apparently realize that if well-designed applied research projects are to be launched--in fact if many of the important questions about communication disorders of school-aged children are to be answered--both the clinicians who are directly concerned with communication disorders on a near-term basis, and the educators who are directly concerned with these problems on a long-term basis, must assume a much more dynamic role in research undertakings.

Third, there is limited information available about parent-child relationships, parent aspirations, and parent attitudes toward the communication disorders of school-aged children. Since children spend most of their time with their parents and within the confines of their own home, information about the home environment is crucial to the evaluation of communication disorders. Frequently, research projects carried out within a school setting have avoided the inclusion of

parent interviews under the guise of labeling such interviews as possible invasions of privacy. Parents, however, constitute the community to which the school is primarily responsible, and it would seem that the cooperation of parents in the exploration of the communication processes, both in terms of children with adequate communication as well as those with communication disorders would be more easily obtained, if the parents understood the importance of research to the education of all children.

Fourth, and most important to the subsequent discussion, there is a need for public school speech and hearing specialists to evaluate realistically their own personal role in research activities. Most speech and hearing clinicians in the schools have definite ideas about what should be studied, what information is needed and how, if data were available, they could incorporate this information into the procedures they employ every day. Too often, however, clinicians and therapists are reluctant to undertake research themselves. The reasons given are legion, the most popular of which are: insufficient time and lack of administrative approval. But, there are other more basic reasons: inadequate research experience is one; lack of confidence with statistical procedures is another; feelings of inadequacy in the preparation of research designs is still another. Yet, these hesitancies and these feelings of inadequacy, are not peculiar to this group by any means. In fact, it would be safe to wager that there are few if any

dyed-in-the-wool "researchers" who do not feel significantly less than adequate in at least one of these areas. Perhaps it is because we have glorified the term research to such an extent that we have arrived at an unrealistic image of what research is. Too often we view the researcher as someone super-human, remarkably brilliant, laboriously exact, and totally objective. A number of years ago, a "researcher" was considered to be an unusual breed. Classically, he wore horn-rimmed glasses; he wore unpressed clothes; he was always surrounded by stacks of data sheets; he was seemingly unaware of his environment; he made little or no money; he was involved usually in some rare study like the discovery of a positive use for the bubonic plague; and he spent most of his waking moments--usually 22 out of each 24 hours--recording such exciting things as the reaction of one test tube to another.

During the last 10 years, however, the classic image of the "researcher" has changed markedly. Currently, a large number of well-paid, well-dressed, outgoing professional people are engaged exclusively in research activities at universities, clinics, hospitals, centers, schools, and other facilities that lend themselves to research investigations. Part of this change in the image of the "researcher", as well as the expansion of research interests, has been caused by the Federal spotlight that has highlighted the necessity of finding answers to the pressing educational, and health problems of the nation. Part of the change has been due to the increased

requirements imposed by universities for demonstrations of research competence as graduate curricula have been upgraded and expanded. Part of the change has been stimulated by the demands of the general public to find answers to nationally significant social and welfare problems. During the last decade, therefore, research has become a way of life that, by nature of the emphasis placed upon it, has appeared to be a new and seemingly sudden development in academic and professional circles.

Realistically, research methodology is not new to any of us. Since research is a systematic method of accumulating information that can be put to objective tests, it should be clear that all of us engage in research methodology every day of our lives. For some of us who live in metropolitan areas, it takes considerable research to find the easiest and quickest way to our offices. For speech and hearing clinicians in the schools, research methodology is employed in order to know what children should be scheduled for therapy, or how much time should be allotted to each therapy session, or how long a particular child may be expected to benefit from specialized help. Even the preparation of lesson plans requires a mode of operation that should, if it is to be successful, follow the same lines of development that are applicable to the design of research proposals. In brief, the development of a research proposal follows a logical set of procedures that are not unlike the procedures used to make judgements or

decisions in everyday activities. It is reasonable to believe, therefore, that if research methodology is approached from a logical and practical standpoint, it should be neither mysterious nor difficult to understand. Further, it is reasonable to believe that with this viewpoint, it should not be difficult to develop a system whereby research tactics can be applied specifically to whatever investigation is planned.

SPECIFIC APPLICATIONS OF TACTICS

The term tactics, as it applies to research activities, refers to the development of a method or a procedure to accomplish a specific end. In order to develop a research "mode de operende" the potential investigator must assess a number of factors at the outset. He must evaluate the research environment he has selected in order to determine the kinds of research which might be carried out appropriately in that setting. He must consider how he intends to develop his experimental design. He must analyze the research role he intends to assume in terms of his personal interests, his professional competence, and his other professional commitments.

The Research Setting:

In the application of tactics to research activities in the public schools, our first question might be: "What is unique about research activities carried out in a public school environment and how does this uniqueness dictate certain limitations to research undertakings?"

One point to be considered at the outset is that school administrators do not always look with favor on research activities taking place during school hours. This is particularly true when the investigators are not part of the permanent school personnel. The reasons given for what may appear to be an uncooperative attitude or a lack of interest in research methodology are based upon some very practical considerations. One major factor is that public schools have as their primary responsibility the education of children and participation in research projects may cause these children to miss valuable classroom experiences. This of course, points up a need for carefully designed research projects that can be carried out with as little interruption to routine school procedures as possible, and the need to inform school administrators of the details of research activities so that plans for the execution of studies can be carried out with minimum disruption to primary school functions. Actually, the successful implementation of research in a school setting is not measurably different from the successful implementation of research activities in any setting. What may negatively be referred to as "red tape," in reality, is necessary for the protection of the total organization and is not designed as an impeding factor to a specific undertaking.

Another point that should be noted in considering the public schools as a likely setting for research activities, is that the relative value of implementing research activities

in the schools also has been questioned frequently, probably because of some of the poorly planned studies that have been carried out in the past. Unfortunately, many research undertakings in the schools have been known to disrupt classroom activities to such an extent that they have frustrated classroom teachers, irritated school administrators, and infuriated parents of the children involved.

Still another complaint has been that investigators frequently have failed to make research findings available to the schools and, it is reasoned, that for the time and energy spent, little value was received by permanent school personnel. Research carried out in public school settings should rightfully have as a primary purpose the sharing of information with specialists and educators, particularly if suggestions or recommendations for the improvement of clinical or educational methodologies and procedures are an end-product of the study. In fact, when information is not made available to those who have participated in the research procedures, their continued participation in such activities would seem questionable.

There are other factors that should be considered when selecting the public schools as a focal point for research, and the investigator who hopes to house his project in a school setting must be prepared for them. In general, however, these differences could be grouped around one major point: the primary responsibility of the public school system is

the education of children enrolled, and research in the schools must be undertaken within the realistic confines of that responsibility.

The Research Design:

Our second question might be: "How are research tactics applied to the preparation of experimental designs?" It is no accident that most funding agencies, both private and public, require that research proposals follow a specific outline so that information about proposed projects will be available for evaluation prior to possible funding. In essence, the requirements for the preparation of an experimental design describes the problem to be investigated along fairly specific dimensions whether or not the project seeks funding. These topical areas usually include: a statement of the problem, the purpose of the study, the methodologies to be employed, the proposed treatment of findings, the significance of the research to be undertaken, and the proposed plans for disseminating the results of the study.

It is not the intention of this discussion to consider these subsumed areas in an exhaustive manner, but it seems pertinent to refer to a few of the more obvious problems connected with the preparation and planning of an experimental design.

The statement of the problem should be exactly what it purports to be: it should reflect concisely and clearly the nature of the problem to be explored. Frequently, this is much

more difficult to do than it might be expected, for investigators sometimes find that although they think they have a researchable idea, or a unique experience or some special point of view that lends itself to exploration, it is impossible for them to state clearly what the problem is. This may suggest that the problem is too large in scope, or that it has multiple facets, each of which must be explored separately, or, it may indicate, in some cases, that the investigator simply does not know what it is he wants to investigate. Unless an investigator can state the problem clearly, the difficulties encountered in the subsequent description of the experiment are multiplied, particularly that aspect of the design which discusses how the project will be carried out.

The purpose of the study also must be clear, concise, and appropriate to the problem to be investigated, or the entire design will lack sufficient reason for execution. Actually, the purpose of the research goes hand in hand with the statement of the problem and when weakness of design is apparent in one, it is equally apparent in the other.

Difficulties stating the objectives of the study may be encountered for different reasons. At times the researcher may be able to state the problem and the purpose clearly, but his objectives either may be too grandiose or too limited to make the undertaking of the study advisable. Realistic goals and objectives--those which the investigator can expect to

reach with a fair amount of confidence--represent a key factor in assessing whether or not the study can be carried out successfully.

Selection of the methodology to be employed probably represents the most creative part of any research design. Usually, investigators select those procedures and methodologies with which they feel secure and confident. As a result, researchers may find themselves in "methodology ruts," where they attempt to explore every problem that interests them by using the same procedures and techniques. Obviously, the methodology employed in a study must be appropriate to the problem to be investigated. It should be apparent, therefore, that while the solving of a particular research problem may be of interest to a potential investigator, he may not be equipped to design the study without obtaining additional training himself or without seeking assistance from someone who is capable of designing the project, and who is capable of supervising its execution.

Selection of statistical measures to assess findings which result from a study must be planned prior to the accumulation of data. Frequently, statisticians are consulted after all data have been recorded. It is impossible at that time, or at least unwise, to select a statistical design to assess the value of the findings from a series of test runs, for which no research questions were asked at the outset.

Probably the aspect of research design that receives the least consideration, but which should require considerable throught, is the description of the <u>significance</u> of the research to be undertaken. In this section of the proposal it is the responsibility of the person preparing the research design to specify, why it is important for this study to be undertaken. Hopefully, it is this section of the research proposal which will serve to eliminate the growing numbers of studies which have little or no reason for being executed.

<u>Dissemination</u> of results represents a type of promisory note to share the results of the study with others who may be interested. This means that the principal investigator and others concerned with the execution of the study should prepare a report of their research activities in such a way that it would be possible for others to replicate the study or to question any aspect of its design.

These procedural steps taken one by one should lead to the development of a research design in a logical sequence, and in the process of developing that design, the individual investigator must select those tactics that are uniquely applicable to the problem he intends to investigate.

<u>The Role of the Investigator</u>:

The third question we might ask in the application of research tactics concerns the role of the investigator. "Who should and who should not be involved in research activities?" Obviously, everyone is not professionally, mentally, or

emotionally suited to be involved directly with research procedures, just as each of us is not personally suited to the teaching or clinical aspects of our profession. Yet, it seems somewhat strange that while professional people can say with ease, "I don't like to teach," or "I don't want to teach," and also without difficulty can say, "I don't like clinical work," or "I don't want to do clinical work," there appears to be considerable reluctance for most professional people to admit that they "don't like research" or "don't want to do research." It is as if, by voicing a lack of interest in research activities, they have admitted a gross inadequacy in themselves that might cause them to be held in less esteem by their associates.

Perhaps this strange, but common, reaction is related to the fact that research has become an important facet of academic pursuit, and that many unseasoned researchers think of the research process as a glamorous and vaguely mysterious activity. But, you and I know that with few exceptions the world of research is not one of daily excitement where investigators with over-developed frontal lobes engage in coded conversations about secret and earth-shaking information that will change the destiny of man. Instead, research is most often a repetitious, rigorous, demanding, frustrating, frequently unproductive and a many times boring activity that requires an uncluttered statement of purpose and objectives, appropriate planning, and untold perseverance.

Rather than considering participation in research activities as a kind of status symbol, it would appear to be much more beneficial if we were to suggest to the beginning researcher that he decide whether or not he is tempermentally suited to engage in research functions. In making this judgment it may be well to point out that certain facets of the role of the researcher must be acknowledged: the potential researcher must have significant questions that he believes should be answered; he must be dedicated to the investigation of the problem sufficiently to spend considerable time for long periods in the exploration of the research questions he has posed, and he must be willing to subject his theories to objective tests--even those in which he may have considerable emotional investment--and, following this assessment, he must be willing to admit that his theory is unsound.

In the final analysis, the application of tactics to research on speech, language, and hearing is not measurably different from research tactics applied to the study of other behavioral facets, and the selection of research tactics is dictated usually by several factors: an evaluation of the selected research setting in terms of its natural limitations; the development of the research design in terms of the problem to be solved; the soul-searching assessment by the potential investigator of his competencies to carry out the project effectively. Consequently, the question should not be, "Should research be carried out in the public schools?", but rather,

"Does a particular school lend itself effectively to the study of a particular problem?", and the question should not be, "Should public school personnel be involved in research activities?" but rather, "Does a particular specialist have a researchable problem that he is competent to explore effectively?" In seeking answers to these questions, it should be clear that there is no slide rule formula nor cookbook recipe that can tell us how and when to apply research tactics because, in reality, the application of tactics is what research is all about. Most important, in order to do research effectively, it must be assumed that the researcher has searched in the first place.

Chapter VI

LOGISTICS OF RESEARCH FROM THE VIEWPOINT OF SCHOOL RESEARCH ADMINISTRATION

Clyde Baer

Kansas City School District

In 1914 Mr. George Melcher came to the Kansas City scools to establish a new department that was called the Bureau of Research and Efficiency. During the years previous, research departments had been established in some four major cities. During 1914 four other cities in addition to Kansas City established research departments, so that by the year 1914 some nine city school systems had established departments of research. From these beginnings during the second decade of this century the practice has spread. Today many times the original nine cities in 1914 have research functions, with the greatest number having been added within the last ten years.

In 1964, 50 years after the Bureau of Research and Efficiency was established in Kansas City, the American Association of School Administrators and the Research Division of the National Education Association, through the Educational Research Service, conducted a study that has been reported under the title of "Research Units in Local School Systems". Designed

to analyze the structure, responsibilities, and policies of research units, this ERS circular is the most complete reports I have found on the subject. The circular reports an analysis of 108 usable returns to a questionnaire inquiry. While the figure of 108 is not all inclusive, it does give some basis for defining the dimension of the research effort as it is being exercised in school systems.

As I have looked back at Mr. Melcher's early reports, it is apparent that he was concerned with questions such as class size, (case load in the context of this meeting), pupil progress in school, problems related to promotion or non-promotion, teacher characteristics, and similar questions that would likely strike a responsive chord in the heart of almost any school administrator today. From 1928 to 1940 Mr. Melcher served as Superintendent of Schools. During his earlier years and in his years as Superintendent, he established an atmosphere that was sympathetic to research and evaluation inquiry. Our recently retired assistant superintendent in charge of instruction had served formerly as director of research. Our Superintendent served as director of research before assuming the office of superintendent. I tell you these things only to point up that these circumstances have combined to produce an atmosphere and spirit of inquiry compatible with research-type activities. It is from this background and this kind of setting that I offer my remarks today.

In general, the function of a department of research within the school system should be to provide research information relevant to optimum functioning of the total program of the school system. In the execution of this function lies the role of research in a school system. At least three types of research are involved: experimental studies, surveys, and the collection and analysis of statistics descriptive of the school system. These kinds of data should contribute to the bases for making judgments about the efficacy of experimental programs and, through survey and statistics, provide assistance in planning and development for the school system as a whole.

When school systems were asked to define the major responsibilities of the research unit, they tended to give high priority to the functions listed as follows: conducting surveys for other departments within the system, conducting surveys originating in the research unit, conducting experimental studies for other departments in the system, and conducting experimental studies originating in the research unit. In addition to these kinds of functions they reported frequently that the research deparment also was charged with responsibility for a testing program and, as I suppose a sign of the times, one of the other functions with high rank in per cent of time spent dealt with completing surveys and questionnaires from other sources.

Now how does such a department operate? What kinds of characteristics can we define that will reflect this operation? To begin, I would like to mention the position of a school system. Any experimental research activity is dependent upon the availability of subjects. In the school system we have a captive population that can be viewed as a living laboratory in which experimentation may be conducted. But it is necessary that a school system not forget its responsibility to be sensitive to the major goals of education and hence, protective of pupil instructional time. At the same time there is a concurrent responsibility for the school district to participate in the development and application of new and perhaps more effective procedures in the educational effort. Somewhere there must be a middle ground and this probably resolves into the participation of the school district in cooperative research efforts on a selective basis.

For illustrative purposes, the major operations of a research department can be classified under two general headings. One would be the kinds of research operations that are conducted wholly within the school system. The second kind would be those research efforts that involve cooperation between the school district and some outside agency.

The research director operates with several different hats within the school system. One is to conduct experimental studies, and I will have more to say about this in a moment. Another is to serve in a consultative capacity to other

departments, individuals, and organizations within the system. A third kind of responsibility of the research director is to collect, analyze, and report basic statistical information relevant to the operation of the district. Still another function is to serve on committees, commissions, etc., so that he may exercise his responsibility in the decision-making process.

Under the heading of cooperative research, the research director serves as a liaison with individuals and agencies outside the school district who may wish to conduct studies using the facilities of the school system. It should be his responsibility to meet with such individuals to discuss questions such as the relevancy of the request to the general interest of the school district, the development of a research design, the selection of sample, and other type questions that would need to be resolved. On the basis of these discussions and his judgment he should approve, or recommend approval, of those requests that he feels satisfy these criteria. He then should provide for necessary arrangements to collect data. In carrying out this function he should have a policy for cooperative research under which he may operate. In Kansas City is has been our general policy for some years to attempt to cooperate with doctoral candidates whenever feasible and with masters candidates when they are our own employees. Because of the great number of masters candidates and of people doing term papers and such who desire access to

information or pupil time, we have had to adhere rather rigidly to this policy.

We do attempt to try to cooperate with the professional staff of other agencies, such as the universities and colleges or other type public institutions, when their requests seem to have bearing on the solution of problems in the school district or to the contribution of the body of knowledge in general. With this policy we are probably not far removed from the general practice of most school systems in the country. Most school systems report that they do participate in some kind of cooperative research, but the preponderance was that such cooperation is limited largely to the type of work or studies that will be of definite benefit to the school systems. In general, local school systems cooperate with their own staff members and institutions of higher learning.

At this point I would like to bring you some illustrations of how the department with which I am most familiar works.

First comes the appraisal of the questions that may be important to the school district, with some examination of how research efforts may be applied in the solution of these problems. Frequently these are questions or problems generated by the departments charged most directly with responsibility for the instructional program. Sometimes they represent questions about trying new procedures or techniques; other times they deal with the attempt to evaluate some on-going program, or they may be the kinds of questions for which only descriptive information needs to be collected.

For the kind of question dealing with the evaluation of experimental programs, I would like to mention some of the studies in which we have been involved.

A few years ago there was much flurry about special programs for mentally superior children. You will recall that there was, and still is, major division of opinion among educators as to whether mentally superior children should have some special program. We attempted to approach this question through the establishment of experimental classes under different types of organizations and in different settings so that we would have some research evidence on which to make decisions about such a program in Kansas City. The outcome was that after a three-year study of the performance of children in such classes as compared with children who had the same major characteristics but who were not in such classes, we decided to go ahead with the formal adoption of the program. It then passed from the experimental to the adopted phase. In another area, we were concerned about what happened to educable mentally retarded children in our secondary school program. In this connection we conducted a type of research in which we attempted to follow a population of children in the school system as of a given year, to discover what happened to them and what variables seemed to be assocaited with continued school attendance for these children. In another context, the Department of Research cooperated with the Department of Health and Physical Education to revise the norms for the self-testing activities

used regularly in the elementary schools as part of the program in health and physical education. In this study the role of the department was to serve in a consultative capacity and to, in this case, carry out the necessary statistical manipulations. Last year we finished the fourth year of an experiment with the non-graded primary. In this study the role of the Research Department was to carry the major function in the development of the evaluation plan, to see to the collection of data related to evaluation, to analyze such data, and to report the findings. Also last year there was an expression of interest in evaluating the program in televised Spanish instruction in the elementary school. As a consequence, a test was developed that was administered to several thousand pupils in grades three, four, five, six and seven, in an attempt to discover how effective the televised Spanish lessons had been. This is a major study that should have substantial consequences for the program. In still another area, we finished last year the second year of a program in compensatory education. The role of the department in this connection was to develop a plan for maintaining a systematic collection of data regarding pupil achievement and to make appropriate comparisons. All of these we classify under the general heading of experimental studies.

In the area dealing with development, in which surveys and statistics are important, I will illustrate our work from another point of view. Last spring we took on the job of

plotting pupil residence for a series of schools in the central city to establish base data about the concentrations of pupil population and the schools the pupils attended. This grew out of the need to make some recommendations about school sites. Another kind of operation in this area has to do with the making of enrollment projections. The utilization of the physical plant becomes important here, too. Not long ago the department was asked to devise a plan to show how much it would cost to bus all pupils who live more than a mile from school.

Under the heading of cooperative research we have studies that range all the way from large scale foundation-supported studies to individual non-supported studies. I might mention here the project we've had as a Work-Study program in cooperation with the Ford Foundation, the Youth Development Project funded largely through the NIMH, the program in providing specialized counseling for physically handicapped pupils in the secondary school who have a potential vocational handicap, with the Jewish Vocational Service, funded by the Office of Vocational Rehabilitation, and the Exercise Ability Study being conducted in cooperation with the University of Kansas Medical Center. These are all major studies for which funding is being made. Then we have the kinds of studies being done by candidates for graduate degrees in which we have worked out arrangements with nearby universities to conduct cooperative research. We have helped authors study test items, we have

helped physicians study handedness, we have helped specialists in speech study such things as cluttering and reinforcement schedules as they may be applied in the correction of speech sounds, and similar type studies.

With this picture of how a research department operates, then the question might well be asked as to where a research department should be within the administrative organization of a school system. The preponderance of practice seems to reflect a feeling that the research office should be attached directly to the office of the superintendent as a staff office, preferably at the cabinet level. In this setting there is no divisional affiliation that might have a tendency to restrict inter-divisional operation. I suppose I should pause to mention at this time that we have a general type of organization that provides for assistant superintendents in charge of major divisions such as instruction, administrative services, buildings and grounds, business, etc. The research department should have complete freedom to report findings without respect to divisional loyalties.

Another point that should be made in this connection has to do with the role of the research director in decision making. This question may be viewed in several ways. I offer two that may be regarded as polarities of a continuum. One would occur when the research director is viewed primarily as a technician who supplies various kinds of bench line data. A second view is that the research director should assume an active voting

role. Probably this question should be viewed in the context of the qualifications of the director of research and also of the kinds of duties that he is called upon to perform.

Let's look at some qualifications of research directors. From time to time I have come across expressions of concern, either verbally or in printed form, about the kinds of training that a director of research in the school system should have. Frequently these seem to boil down to a statement of the kinds of courses he should take and the competencies he should show in basic statistics. However, another way to consider this is to view research as a way of thinking about educational problems. In this focus the research director should be concerned with the identification of major questions and problems, and should have the necessary competencies to apply research procedures in their solution. Another point of view is to regard research as primarily a technical operation. In this sense somebody else usually has the idea and may consult the research person for help in developing the technical procedures and for the application of technical skill, frequently statistical. A third point of view is to regard research as the product of expertness in a given discipline. This would be the case when a person has familarized himself with the literature of a given speciality to the point that he is particularly expert in that field and is concerned about researching questions related to that area.

Probably the school system research director is likely to function most frequently under the first two. He should be sufficiently knowledgeable to generate his own ideas and he should also be able to assist others in developing testable hypotheses, devising a research design to test those hypotheses, and analyzing the data to extract their meaning. Certainly he will be confronted with a great variety of demands.

Not long ago I sat on a committee to draft a prospectus for an application, under Title IV of the Elementary and Secondary Education Act, for a regional educational laboratory. As we worked at it, it evolved that we should pitch the prospectus under the general tenet that the research studies done in the past few years have produced relevant findings, but that these findings have not been applied generally in classroom teaching. The long lag between experimental findings and classroom application is certainly a well-known condition and we might well look briefly at some of the factors that seem to be involved in problems of dissemination and application.

The first of these factors deals with the matter of attitudes on the part of some teachers and other educators toward research. I seem to encounter frequently such expressions as "research is something that is done in a laboratory that is unrelated to classroom teaching", or that "I wouldn't understand it if I read it because of that jargon or those statistics used in reporting". Another feeling encountered sometimes is that "research simply can't deal with intangibles like the

effect of pupil/teacher relationship, growth in democratic understandings, character development, etc.". A fourth point is that sometimes situations are encountered where there seems to be a feeling that a pretty good job is being done anyway so why go to all that trouble. In one form or another these probably all combine to present a major attitudinal barrier. A second kind of barrier rests with the institution itself. I am sure there have been many teachers who have come to their classroom with the hope of applying research evidence that they may have heard about in summer school, but soon find themselves confronted with inflexible schedules, no money for equipment or materials, can't change organization, rooms too crowded, and similar type circumstances. In these instances we have built-in institutional barriers that prevent the application of research results.

I wish that I could offer some sure-fire method to provide for the dissemination and application of research findings. Of one thing I am convinced. That throughout there must be the development of meaningfulness for the individual teacher. Without this it is the old story of leading the horse to water. But how to achieve this individual meaningfulness is the crux of the question. Certainly one step would be to encourage reading among the staff by making professional journals, monographs, etc. available readily and in an inviting setting. Another is to be alert for alert teachers and encourage them to develop applications within their own classrooms. For

school administrators this means making it possible to change some of those institutional barriers or to provide the necessary funds to buy equipment or materials. A third is to look at how it might be possible to establish demonstrations or experimental centers for the purpose of fostering in-service education.

One of the major problems in the application of basic research is the form in which it is reported. This probably contributes more to the lack of meaningfullness for individual teachers than any other single component. Frequently research findings, as they are reported in the literature, are not applicable directly in the classroom. There is a requirement that some engineering be done in order to convert the basic raw form into a usable form. It is not clear where the responsibility for making such conversion should lie. One point of view is that the teacher should be able to read the research and see how it may be applied in working with the children in her classroom. Another point of view is that the teacher should not be the one to do this, but rather the researcher himself or some intermediate-stage person who will study the research data and then formulate a theoretical plan--an innovation. The next step is to package the innovation so that it is feasible to use in the classroom. This may be something like a programmed course. It might be an audio-visual production. It might be a textbook, or whatever. But it must be packaged in some way so that it is usable. The next step is to test the package in actual classroom settings. And last,

to disseminate the results. Frequently dissemination becomes a commercial venture where the prime example might be the textbook. The one thing that does seem clear about this operation is that there needs to be some conversion of basic research findings for actual classroom use.

One of the areas about which some comment should probably be offered has to do with the funding of research. I would like to endorse the position that the school district has some responsibility for providing its own funds. The size of these funds, or whether it ought to be a certain percentage of the budget, or whatever other formula might be applied, is something that would need to be developed for each school system individually. Right now you are all aware that there are substantial funds available through Federal legislation and through the activities of various foundations to support research. There is much in the literature about this these days and there are available published descriptions of the kinds of activities the various foundations have seen fit to support.

Occasionally one may encounter some expression of opinion about what is referred to as evaluative research as contrasted with basic research or program development. This point has real relevance for a school district considering a research operation. The research director in a school system is interested in the district as a whole. He wants to know such things as how research findings may be applied in many different

groupings of pupils and in various settings, as applied by teachers who differ widely in training, experience and personal characteristics. Does this new thing work better than what is being done, is it more effective for some kinds of pupils than for others, and similar type questions. Frequently it is a matter of supervising the collection of data and making comparisons. This represents a considerable contrast to the type of program where the researcher designs the experiment, constructs the materials, and uses them in the actual experiment whether it be teaching a class, testing them on some particular variable, or whatever the circumstance might be. I suspect it is a rare director of research who has the time to conduct this type of experiment. If this type of research is contemplated then the school system should expect to staff the department sufficiently that individuals may be freed for conducting this type of research. One way around this is through the development of research efforts that may be funded from outside agencies in which case there would be a project director or principal investigator whose full time might be devoted to the conduct of the research. I do not wish to be in a position of saying that one kind of research is more important than another. I mention this only to help clarify and sharpen the role in which the research director operates most frequently in a public school setting.

Earlier I mentioned that I had been part of a committee to develop an application for a regional educational laboratory.

This concept contains exciting elements, in that it may be a fore-runner of what will become a massive alliance for research. In the past there have been rather isolated instances of school systems cooperating for research purposes, but these have been the rarity rather than the practice. It may be now that we will see more cooperative efforts where the resources of several school systems may be joined to attack common problems. Another dimension of this alliance is between the schools and colleges. Earlier I have cited examples of cooperative research as one of the aspects of such alliance, but there are other facets of such an alliance that may be even more interesting. The spread of internships in educational research may be one aspect of such alliance. Another example might be the spread of joint appointments where an individual may function both as a member of the staff of the school system and as a member of the staff of a university. The inservice training function is another part of the alliance. There has been increasing evidence of a willingness on the part of both school system personnel and institutions of higher learning to cooperate in the development of specialized courses tailored to meet specific needs of school systems. There has been also evidence of activities such as research clinics to offer short term intensive work in research design and interpretation.

Probably no paper of this kind would be complete without some attention being given to the major problems in school system research.

The most pressing problem today lies in the need for the clear definition of specific educational objectives. As you know, the Elementary and Secondary Education Act provides that activities conducted under Title I must carry a provision for evaluation, and that the evaluation is required to include objective data. You know also that in education we have had a long history of generalities--from the "whole child" through "the individual able to function adequately in modern democracy". Now this is fine and it sounds wonderful and I don't disagree with these ideas, but as stated they do not provide a basis for evaluation. When a research design is being developed, such generalities do little to help define criterion variables--evidences that should be examined in order to tell whether change has occurred. We must find a way to translate these general goals into objectives stated in behavioral terms. It's well and good to say that by the end of the elementary school program most pupils should have mastered the fundamentals of arithmetic, presumably meaning that among other things they should be able to add and multiply, subtract and divide, manipulate zeroes, and perform other basic operations. However, in order to translate such statements into testable hypotheses it is necessary to make several definitions. Let's use the process of addition for purposes of illustration. At least two dimensions are involved, speed and power, where speed is defined as the ability to compute accurately a given number of problems within a certain time and power represents the

ability to apply the addition process in various situations with the values to be added stated in different forms. With whole numbers, definitions of behavior would need to include such elements as the number of columns, the number of places in the numbers to be added, how the problem is written (vertically or sequentially, as 307+5+29) and how many problems must be done correctly in the time allowed. Comparable definitions would need to be developed for the addition of other value forms such as fractions, decimals and units of measure including pounds and ounces, inches and feet, hours and minutes, and others. In addition to computational skills such as these, it would behoove the researcher to define equally definite behavior in problem solving. The problem becomes frightfully more complicated when attempts are made to delineate evidences of change, or describe status, in more subjective dimensions as "growth in democratic understanding". This is not meant to be an argument for the development of objectives on a national scale. Each school system should define its own objectives in terms of local need, practice and philosophy--but they should be stated. Until specific objectives are stated in behavioral terms, there is little basis for the development of adequate criterion variables arising from concensus among the individuals involved.

The next most pressing problem is in the area of measurement. What instruments and procedures can be employed to know when change has occurred and the nature of the change? Perhaps you

know the story about the researcher and the grasshopper. This research involved conditioning a grasshopper to respond to verbal command. After extensive experimentation the researcher reached the point where he felt ready to demonstrate his accomplishment. Summoning a friend to the laboratory, he placed the grasshopper on a table, and in a loud voice, commanded the grasshopper to jump. The grasshopper jumped. Unwilling to be satisfied with this achievement, he proceeded to test the parameters of intervention. Removing one leg from the grasshopper, he placed it on the table and again commanded it to jump. Again the grasshopper jumped. Not so far or as vigorously, but it did jump. With the second and third legs removed the grasshopper still attempted to respond, but no matter how it struggled only a little jump was achieved. Removing the remaining leg, the researcher placed the grasshopper on the table and commanded it to jump. It didn't. Turning to his friend the researcher announced, "See what I have demonstrated. When you remove all the legs of a grasshopper it loses its hearing". Sometimes the unwary researcher may reach a conclusion of similar quality about the nature of educational change. Last night the story told here earlier about the man who lost his wallet was told to me. It seems pertinent here. Even though the wallet had been lost in a dark area, the man was searching in a lighted area because it was easier to see. Sometimes we have been prone to look in the lighted areas for research questions and problems. We have tended to look for

those things that are more readily accessible, probably because the wallet is concealed in an area so comprehensive and so complex that few have been able to conceptualize an approach to its study. In the area of measurement we need to be able to answer questions not only like what changes have occurred in academic achievement--we can answer these relatively well with standardized tests in reading, arithmetic and other academic areas--but also attempt to measure changes in attitudes and value systems. We don't do nearly as well in these areas. We don't really know very much about measuring achievement motivation and the forces that influence its development. Again, we hear a great deal today about self-concept. I doubt that any of us would argue that how the individual perceives himself in his environment is not relevant to his performance, in school or anywhere else. But until the dimension or dimensions of self-concept to be studied are delineated, the problem is so gross that it is practically meaningless. In the area of compensatory education we have an illustration that shows the application of these problems with objectives and measurement. There probably isn't much disagreement about the need for language development among many of the children that are designated as culturally disadvantaged or educationally and socially deprived. We all know about this. We have discussed the need with great vigor. But we probably wouldn't find such general agreement about the sepcifics--the needs and objectives that would serve as a foundation for building a

program in language development that would be effective. Would we talk, for instance, about articulatory efficiency? I don't know if that is an acceptable term among speech people or not, but what I have in mind is the precision of the production of speech sounds. Is this a satisfactory criterion? Probably most would agree, but at what level? Every sound? All the time? Would we be dealing with the number of words in the child's verbal vocabulary? Certainly we know that in order to communicate effectively in a variety of situations we should possess a rather large verbal vocabulary. Can we use a count of the number of words used or understood (how evidenced?) as the criterion? How about communicatory effectiveness? Is there any doubt that communication can be achieved with a single word? And I suppose that word could be lisped and still be communicative. Would communicatory effectiveness be a valid criterion for deciding that a language development program had been effective? What do we really mean when we say there is a need for language development in a compensatory education program.

A third problem area lies in the relationship of content and process in the practice of instruction. More and more I see situations where pupils appear unable to transfer learning. When they come into the secondary school, most have been taught basic processes in arithmetic, they have been taught composition, they have been taught to read, they have had good instruction generally, but yet they are unable frequently to transfer to

other situations the learnings they have been taught. Also there is the question of the role of non-verbal communication. Is there any reason that a look used to silence might not also be used to reward. I think this reasonable and I am confident that many teachers employ this technique. A good many years ago a trend was established that gave major emphasis to curriculum content. This occurred back in the early part of this century with the consequence that later developments seemed to be more concerned with <u>what</u> is taught to the neglect of <u>how</u> it is taught. Today we hear the voices of critics who decry the inability of pupils to reason logically, think critically, and perform creatively. To the extend that there is support for their criticism, I believe we may be reaping the consequences of too much attention to the "what" of the curriculum. Certainly it would be foolish to argue that content is not important, but I do wish to emphasize that it is but one component of a very complex operation.

Ladies and gentlemen, in the pursuit of solutions and the devisement of more effective procedures, I offer to you the hand of comradeship.

Chapter VII

LOGISTICS OF RESEARCH FROM THE VIEWPOINT OF THE SPEECH PATHOLOGIST

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INTRODUCTION

At least three general categories of questions can be subsumed under research logistics: To what kinds of questions, broadly speaking, are answers desired? What kinds of approaches or techniques will elicit answers to those questions? What priorities should be established among various research problems? Although in the military and in industry, matters of finance usually are the responsibility of a finance department and not of logistical support, nonetheless, decisions about approach or techniques and priorities are not independent of availability of financial resources. Certain aspects of the allocation of resources, therefore, seem pertinent to a discussion of this topic.

I do not know whether the use that may be made of new knowledge resulting from research is properly a logistical consideration. Nevertheless, it is an eminently practical

concern. There is not much point in collecting data and drawing conclusions unless something happens as the result of these endeavors, unless there is some consequence to these activities, unless some observable or measurable change in behavior occurs relevant to this new knowledge. Otherwise, the situation is analogous to conducting an expensive identification audiometry program and then filing the results away in a locked file, which does happen occasionally. I propose, therefore, to consider in this discussion some ways of conducting research that, hopefully, might maximize use of information derived from research activities.

SOME LOGISTIC PROBLEMS IN DETERMINING THE EFFECT OF TREATMENT

One of the unresolved issues in therapy programs in schools is the age or grade level at which a child should receive assistance with his speech. The issue of early or delayed therapy pertains primarily to children with articulatory deviations. The significance of this question is readily illustrated by results of a survey reported by Bingham and others (1961, pp. 35-36). Articulatory problems comprise an average of 81% of the caseload of school clinicians. About 75% of school clinicians work primarily with children in kindergarten and the first and second grades. The heavy concentration of early speech therapy coupled with the evidence that the major portion of children in caseloads have articulatory deviations

is a source of concern to many individuals, particularly since articulatory patterns of young children change with age without formal assistance. Whether the skills of speech clinicians and the funds that subsidize therapy programs are being judiciously used is polemic.

In order to arrive at an objective answer to the effects of treatment as opposed to no treatment or delayed treatment, the articulatory skills of children receiving treatment need to be compared with the articulatory skills of children who have not received treatment. Age, or grade level, would be the independent variable.

At first glance, it appears as though this problem might be approached in two different ways. One approach would be to survey populations in schools where speech therapy is provided and in schools where it is not provided. An alternate approach would be to conduct an experiment in which some children receive therapy, but other children do not. These two approaches serve admirably to identify some serious problems in conducting research in schools.

The Survey Approach:

Examined in detail, a survey has inherent limitations for the purpose of resolving the issue of the appropriate time for treatment of articulatory deviations. A prime consideration is that the assumption of random samples from the same parent population prior to treatment cannot be met. This

assumption is necessary in order to conclude that an obtained difference is actually due to the two conditions under study, namely, treatment and no treatment. It is also a necessary assumption in order to be certain that a finding of no difference reflects the ineffectiveness of treatment rather than some other difference in the population that has obscured the real effects of treatment.

The mobility of families as well as the availability of service from nonschool agencies present complications. Some of the children in schools not providing therapy may have obtained speech services elsewhere. Others may not have received treatment because of insufficient staffing, case-identification practices, and so forth. The time required to identify unequivocally the speech-service background of each child is so great that the cost becomes prohibitive.

The lack of uniform practices with respect to a large number of factors related to treatment effectiveness obscures the meaning of treatment in a survey. It is necessary to be able to specify clearly what is meant by treatment in order to produce meaningful results.

Surveys of school populations invariably pose another kind of sampling problem. Usually, the best that can be achieved is a study of school systems that are willing to cooperate. Considering the implications of such a study, an unbiased sample of schools might be difficult to obtain.

Engaging a team of investigators with appropriate background and experience is a significant problem in a study employing

the survey method. Extensive travel and relatively short-term employment rarely are attractive to highly skilled, experienced clinicians.

While the weaknesses of a survey for resolving the issue of whether early treatment for articulatory deviations is needless could be elaborated in much greater detail, the above considerations illustrate some major limitations that would be reflected in the quality of the information produced as well as some of the conditions that contribute to the expense of this kind of study.

The Experimental Approach:

While an experimental study would not have the weakness inherent in a survey, it produces, nonetheless, another set of problems that are equally vexing. This same set of problems is likely to occur for studies that involve other kinds of questions about methods of treatment in the school environment.

Both treated and untreated groups would be drawn at random from the same parent population in an experimental study. Both groups would be maintained in the same school environment during the course of study, so that other kinds of learning experience would be equivalent. Important factors pertaining to treatment effectiveness could be controlled. Among these factors are type of therapy, frequency of therapy sessions, number of therapy sessions, period of time covered by therapy, group size, age or grade level at the time therapy begins, criteria for assignment to therapy, criteria for dismissal

from therapy, caseload of clinicians, dissemination of information to parents and teachers, and treatment from other agencies.

The frequency of treatment would have to be controlled as well as the age or grade level at which therapy is begun in order to be able to specify the conditions under which treatment was found to be or not be more, less, or equally effective as no treatment. If a very large study were contemplated, these two factors could become experimental variables also.

One of the major criticisms of research dealing with teaching methods is that the so-called Hawthorne effect is often overlooked. The individual who knows he is a part of an experiment or study may respond differently or change his behavior on this basis alone. Some kinds of medical research employ a placebo or doubleblind treatment in order to control the artifacts of the experimental situation. The treatment situation that requires children to be taken from the classroom for special training constitutes a deviation from normal routine and is, thus, a form of special attention. Some researchers consider it necessary to control the possible effects of any kind of special attention by establishing control groups that are maintained under the same conditions as the treatment groups. These control groups are told they are receiving treatment, but actually engage in some different activity.

The importance of this kind of control can be illustrated rather dramatically by an experiment with rats. Suppose you wanted to determine the effects of prolonged exposure of rats to a magnetic field and selected a white-cell count of the experimental aninals' blood as the criterion measure. You might assume that you simply would choose some rats, expose them to the magnetic field for the specified length of time, obtain blood samples, analyze them, and formulate your conclusions by comparing the results with the normal white-cell count for rats. What actually happened in this particular experiment was that the white-cell count of the experimental animals increased significantly, but the same change occurred for the control animals maintained under identical cage conditions. In short, confinement, rather than the magnetic field produced the result. Had the experimenter failed to follow a rigorous procedure that might appear to be superfluous, he would have arrived at a spurious conclusion.

Since it rarely is possible to predict the consequences of deviations from the routine experienced by the untreated control group, it is important to establish a second control group who experience the same deviations from normal routine as the treated group except for the actual treatment itself. This requirement, if research is to be rigorous, poses great difficulties in the school environment.

Establishing the Experimental Population. The logistic problems of screening populations for speech deviations is too

well known to speech clinicians to warrant an extended discussion here. Several considerations should be pointed out, however.

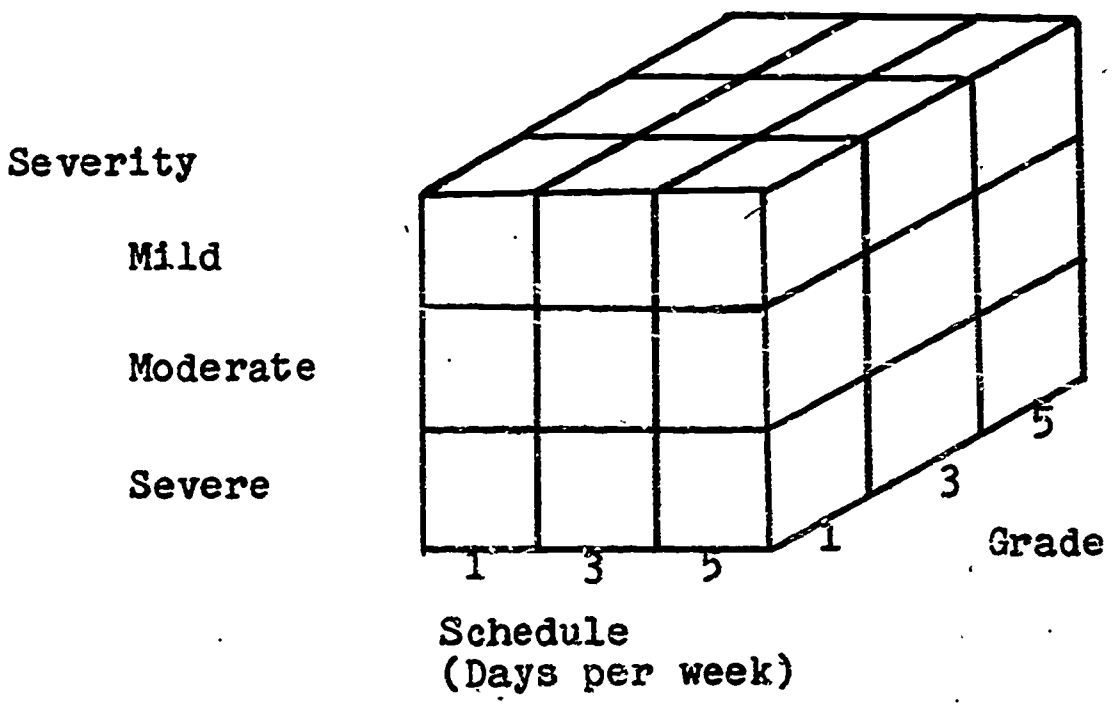
For research purposes, the reliability of the screening needs to be established, whereas in normal practice it is usually assumed. If a large experimental population is required, a very large number of children must be screened, since only about one out of every 25 to 50 children will qualify. Detailed testing of potential subjects is necessary to eliminate those who do not meet the qualifications established for the study and for description of the speech status at the beginning of the study. Here, again, reliability is a problem, since judgments about speech deviations vary rather markedly.

In general, both screening and diagnostic testing are more time consuming than in routine practice, yet the experimental population must be established quickly. The lag between the time of the examination and the time that treatment is begun should be minimal and reasonably constant for all subjects. If a considerable lag time exists between the examination and treatment, or if the lag time varies from subject to subject, either speech status at the time treatment begins becomes equivocal or the same experimental conditions have not obtained for all subjects.

A large team usually is necessary in order to accomplish screening and testing within a time span that allows control over these factors. As team size increases, reliability and agreement among testers decrease. A small amount of training and careful instructions will usually bring reliability and

agreement among examiners to a satisfactory level; however, this procedure also requires additional time.

Attrition. Any study involving school children that extends over a fairly long period of time has the problem of starting out with a population sufficiently large that normal attrition will not reduce the experimental group to the point of making the desired statistical tests impossible. In order to illustrate this kind of problem, let us suppose an experiment that includes the following variables: three different schedules, three levels of severity of articulatory disorders, and three grade levels. Group therapy is to be given with group size set at four. Groups may drop to three but not below that number. The design for making comparisons would be laid out as follows:



The drawing contains 27 cells. At the outset, each cell might contain three groups of four children each. Thus, the cell population would be three groups or 12 children depending on whether the cell variance is to be based on measures derived from groups or individuals. The total experimental population would be 81 groups or 324 children. If attrition in the school population is 5%, it is possible to lose 16 children in the course of a year. Since the individual cell population is 12, this amount of attrition could eliminate one cell completely, or it could reduce two or three cells to the point that they are no longer useful for comparisons. It is not at all likely that attrition would distribute itself evenly over the experimental population.

The requirement for small groups exacerbates the problem of attrition. Given an attrition of 16 subjects, it is possible for eight groups to be reduced to two subjects each, thereby destroying one of the conditions of the experiment. Should this contingency arise, eight groups would have to be eliminated. Here, again, one or more cells might be completely eliminated.

Another realistic problem of this nature arises in any study that involves kindergraten children. In many communities, quite a few children are sent to kindergarten in public schools and then transferred to parochial schools for their education thereafter. This factor must be taken into consideration in establishing the size of the kindergarten population that would produce an N sufficiently large to allow the final comparisons desired. Since a major issue is whether kindergarten

children should receive therapy for articulatory disorders and since it is necessary to follow the course of articulatory development over an extended period of time, the excessive attrition due to the subsequent shift of kindergarten children to parochial schools is a major difficulty.

The need to take attrition into account is one of a number of factors that makes the kind of research that would resolve some of the questions about how frequently therapy should be given, for what level of severity, and for what age or grade level exceedingly expensive. It is inefficient, and therefore expensive, to begin with a much larger population than is necessary for the comparisons desired at the conclusion of the study. Nevertheless, the instability of school populations dictates establishing populations large enough to take it into account.

Random Assignment to Treatment and Control Categories. Another difficulty in this kind of research is the random assignment of children to the various groups. The children in the study must necessarily be treated in the particular schools in which they are enrolled; the untreated controls must also be drawn at random from these same schools. Unless the samples are so drawn, school differences will be confounded with treatment and control variables in which case differences between treatment and control groups could be due to differences between schools rather than to treatment. Similarly, if treatment and control groups are found not to differ, real differences may have been obscured by the differences between schools.

We now encounter what I have come to regard as the "cage problem" in school-conducted research. The matter of assigning children at random to the various treatment and control groups is not a simple one, since the children are confined to schools.

1. First, the children would be identified by grade level and severity of articulatory deviation.
2. The number of children in each of the grades under study for each level of severity would be determined for each building. For example, it would be determined that School A contains 6 children with mild deviations, 8 with moderate deviations, and 5 with severe deviations in grade one. The same determination would be made for grades three and five, since those are the grades specified in the example.
3. Once the number of children in each building has been specified in this way, it becomes possible to determine the number of groups for each of the treatment categories (schedule, by severity, by grade) that could be accommodated by that school on the basis of multiples of four. Remainders would reflect the possible number of children for assignment to the untreated control group.
4. Since the example contains 27 cells with three groups each or a total of 81 treatment groups, these treatment groups would be assigned at random to each of the schools. By chance, School A of our example

might draw only one treatment group specified as grade one, moderate, scheduled five times weekly, even though it has the potential for two groups, since it has eight children in grade one with moderate deviations. Four of these children would, therefore, be assigned to the untreated control group.

5. Within each school, children would be assigned at random to the treatment groups that had in turn been randomly assigned to the school.

Though a procedure such as that described above may appear to be unduly laborious and cumbersome, it is necessary in order to avoid confounding treatment and control conditions with schools. Even so, this procedure is not a true random assignment of subjects to the experimental conditions. Six children in a particular grade by severity category in one school do not have the same chance of being assigned to a treatment group as eight children (or any other number that is an integral multiple of four) in a particular grade by severity category.

Assignment of Clinicians to Groups. Still another kind of problem exists. For rigidly controlled research, it is not safe to assign a given clinician to more than one treatment schedule or to more than one level of severity. This restriction minimizes the possibility that a clinician's bias might affect the results. The clinician might come to prefer one schedule as opposed to another and inadvertently do a better job with the groups in the preferred schedule. The clinician might prefer working with one level of severity as

opposed to another and, again, might bias results by the same inadvertency. This problem is particularly cogent were a clinician to be assigned, by chance, to three or four groups of children with mild problems on a five-times-weekly schedule and a similar number of groups with severe deviations on a one-time-weekly schedule. If the clinician is uncomfortable with such a schedule, he might attempt to compensate for the inequity by expending more effort in his work with the groups scheduled once weekly, without being aware of doing so.

Unfortunately, controlling clinician bias creates an additional problem. Conceivably, a single school might be assigned treatment groups in each of the schedule, severity, and grade categories. Even if grade level were overlooked, nine different clinicians would be required to serve a single building if clinician bias is to be controlled. To the extent that being identified as part of the faculty of a school facilitates or affects therapy results, a distortion would be introduced, since assigning multiple clinicians to a given school is not a common practice. Furthermore, clinician time would be used rather inefficiently since a good deal of travel from school to school would be involved.

A study that attempts to determine the effects of therapy and to specify the conditions under which the effects obtained must be a very large study in order to account for potential attrition in the study population and to control clinicians bias as well. The relatively large number of clinicians required does, however, have a distinct advantage. Sometimes studies

of the therapeutic results are conducted by one or two clinicians. It is very hazardous to generalize results to other clinicians. Therapy effectiveness is a function of an array of variables, one of which certainly is the clinician himself. Variation among clinicians is not eliminated simply because the same methods are used. Unless a sampling of clinicians is a condition of the experiments, results may be virtually useless beyond the one or two individuals who participated in the study.

Control of the Effects of the Experimental Situation. Next is the problem of controlling the effects of the special attention that the children in the treatment groups receive. In order to demonstrate clearly that whatever changes occur in the children's articulatory behavior are due to therapy rather than to the therapy situation itself (being taken regularly from the classroom and engaging in activities with two or three other children and an adult), it is necessary to set up control groups that experience the same situation as the treatment groups except that they would not receive therapy.

Several problems are attendant upon this kind of experimental control. First is the problem of who would provide this special attention. If a nonclinician provides this treatment, it will be evident sooner or later that this person is not a clinician. The teachers will know that the children are not receiving therapy, which would vitiate, in part, the purpose of the special-attention treatment. Once teachers learn what the

situation is, it is a short step from there to parents finding out about it; then, real trouble is likely to ensue. Not many, if any, parents would be willing to have children miss an hour to two-and-a-half hours weekly from class to receive "speech therapy" from someone who is not a speech clinician, nor are teachers likely to go along with it. Teachers are understandably resistive to children missing classroom instruction, since their teaching ability is usually evaluated on the basis of the academic achievement of their pupils. They feel that absence from class interferes with the child's progress, a most reasonable attitude.

If a clinician gives this form of treatment, another set of problems develop. Most clinicians would have trouble switching from therapy to no therapy in the event of assignment of a special-attention treatment. Were a clinician to spend full time with special-attention groups, he would probably feel that he was not making appropriate professional growth. More importantly, he would be apt to feel that his clinical competence and professional reputation were being threatened.

Supervisors and administrators would also be threatened. Assuming that this kind of situation has relatively little effect, a large number of children receiving "therapy", but not benefiting from it, would have these consequences: If the groups came from the same classrooms as the children receiving therapy, the overall value of therapy would be questioned on the basis that a considerable number of children do not seem

to profit from it. If special-attention treatment were given by one clinician and therapy by another one, teachers would soon be critical of the clinician whose work was not producing results, since an essential part of this form of control is that everyone except the person administering it must believe that it is regular therapy. Complaints would be made to parents and administrators.

The problem cannot be solved by working in schools where therapy is not available, since type of treatment would be confounded with schools. Severe criticism of the value of therapy would be another hazard under these circumstances. If the school has not had therapy previously, it would be next to impossible to eventually implement a therapy program, because of inferred lack of effectiveness. Teachers would argue that the money spent on a therapy program should be used instead to augment their own salaries or reduce classroom size. Parents would oppose such an expenditure on the basis of this experience with what they assumed to be therapy.

Untreated Control Groups. It is necessary, of course, to maintain untreated control groups; otherwise, the results obtained could not be shown to be better than the changes that might occur due to vicarious learning. Even if a demonstrable difference among schedules resulted, the argument that the best schedule produces no better results than no treatment at all would still have some degree of validity, since a major issue is whether time alone eliminates most articulatory deviations.

In schools with a legal mandate to provide special services, failure to provide the service could bring about litigation. In situations where there are too few clinicians to give service to all children with speech deviations, the untreated controls with mild deviations might be managed easily enough under the guise of placing them on a waiting list until they could be included in the treatment program. Not so with the untreated controls with severe deviations. Teachers and parents alike would begin to question the criteria for case selection. While a few parents might be sufficiently uninterested to be willing to allow the child to forego treatment, children selected on the basis of parental attitude would introduce a biasing factor. An untreated control group does not serve its purpose unless it is randomly selected from the same population from which the treated groups are also drawn.

The attrition in an untreated control group is likely to be extremely high. If the school is unable or unwilling to furnish service, parents of some children will seek it elsewhere, particularly if the speech deviation is severe.

Estimated Cost. The cost of a study of this magnitude conducted over a period of a year would be roughly $175,000. The cost includes the amount of service for speech screening and other such tests or observations necessary to adequately describe the population under study. The need to establish the population in a very short period of time means a very large team, since only one out of 20 or 30 children screened

would qualify. Reliability of procedures would have to be established, and participants would need a period of orientation. Additional personnel would be needed as well as extra travel time in order to fulfill the experimental conditions.

Summary and Conclusions:

Two of the most critical issues in school speech therapy programs continue to be the age at which children with articulatory disorders should receive therapy and the frequency with which it should be given. A survey of treated and untreated school populations or an experimental study are the most immediately apparent methods for resolving these issues.

With a survey, only one aspect of the problem could be studied, namely the effect of treatment as opposed to no treatment. Furthermore, so many important variables cannot be controlled with a survey that it must be disregarded as an appropriate technique for obtaining the desired information.

An experimental study could produce the desired information with the added advantage that the control of treatment frequency, which is a critical shortcoming in a survey, makes it possible to make major inroads on questions of scheduling. An experimental study is not without significant difficulties when attrition, control groups, and randomization are examined in detail.

The discussion of logistic problems illustrates the difficulties inherent in any attempt to obtain this long-needed information so significant to economical use of children's

and clinicians' time and, consequently, to the financial support of speech therapy programs. It seems likely that these problems constitute the reason that some such study has not yet been undertaken.

As a result of these considerations, some new or different approach to these and other problems seems necessary. Given some kind of central coordination, possibly a very large number of clinicians could each contribute only a small amount of data. For example, 100 clinicians might each have one group of four children treated under some specified experimental condition. Usually, schools can accommodate some deviation in normal routine that affects only one or two small groups. Most sampling problems might be resolved in this way.

Through coordination, then, it might be possible to study scheduling and case selection problems, both of which are significant to school programs. An experimental method could be used, which is the method of choice for such a study. The cost would be relatively small, since only the expense of coordination would be involved. Finally, individuals who participate in a research study are likely to use the results of a study by virtue of personal involvement. Hopefully, an increased number of clinicians would become interested in problem solving through research procedures.

As a consequence of examining possible ways in which research might be coordinated, the concept of a research center for school clinicians evolved. Further study showed

that such a center had a potential for usefulness and services beyond the particular problems that originally suggested it. The elaborated concept of a research center is, therefore, discussed in the following section of this paper.

A RESEARCH CENTER FOR SCHOOL CLINICIANS

School clinicians treat more clients than clinicians in almost any other setting. Yet, many of these clinicians feel that research is not producing as many answers to important questions as they desire. Some feel that much of our research holds little value for the practicing clinician. They suggest that the kinds of areas in speech, hearing, and language that need comprehensive investigation are as follows:

1. Case identification
2. Case selection (including diagnostic procedures)
3. Age at initiating therapy
4. Frequency of treatment
5. Length of therapy period
6. Group size
7. Nature of grouping (homogeneous versus heterogeneous)
8. Dismissal criteria
9. Methods

Two kinds of methods studies are needed. The effects of therapy based on various theories need more study as well as particular operations within a given method. Data from an unpublished questionnaire study by Ronald Sommers illustrate the latter need. His questionnaire was addressed to school

clinicians and requested that they rank five aspects of articulation therapy according to difficulty. Of the 176 respondents, 134 ranked carry-over of new sounds into spontaneous speech as most difficult. The least difficult areas were teaching production of defective sounds and teaching ear-training on defective sounds. Obviously, the area most needing further study is that of habituating new articulatory patterns rather than ear training or correct sound production.

Two observations about this listing of problem areas are appropriate here. First, with the exception of case finding, all of the areas require response to treatment as a part of any research design that would elicit data from which more efficient procedures may be inferred. Second, five of these areas were identified as needing research, either urgently or moderately, by clinicians and supervisors as reported in Monograph 8 (Pronovost and others, 1961, p. 117). Frequency of therapy received the highest priority from clinicians and supervisors alike. Third, with the exception of case identification, these problems are not school problems per se. The need for more and better information applies equally to all settings in which children receive speech or hearing services or both. Why, then, should school clinicians become involved in research when the setting in which they work makes it difficult for them to do so?

The following state is contained in "Research: Current Status and Needs" authored by Pronovost and his committee (Pronovost and others, 1961).

> The logical laboratory for research is the public schools themselves. Too often when research has been concerned with public school children, the school has been used only as a convenient place to meet the children to be studied. Future research needs to be focused on the children as they function in public school situations. The entire school program must receive research consideration. (p. 119).

The following is a detailed statement of reasons for involving school clinicians as opposed to professional researchers:

1. Schools are the only unbiased source of study populations. Populations in nonschool settings are biased by the selective process whereby individuals reach or are admitted to nonschool agencies.
2. Study populations need to be maintained in their normal milieu and to be tested or treated under those conditions that represent normal settings.
3. The school clinician is already in the same setting as the desired study population. He is identified as a part of the school and has automatic entree to it. He is familiar with policies in the schools in which he works and can be held accountable for breaches thereof. It is expensive to place teams of researchers in schools or to move them about to cover a variety of geographic and socio-economic areas. School administrators are necessarily cautious about permitting strangers over whom they have no real control to work in their schools. Relations between school and parents are sometimes tenuous. Sometimes

good relations have been achieved only with considerable effort. Administrators are frequently unwilling to risk incidents that might strain these relations by allowing outsiders access to school populations.

4. Involving school clinicians in research solves many otherwise difficult sampling problems. A large number of clinicians can contribute to a given study. Such a group of clinicians invariably come from a variety of training programs, work in schools with differing policies and practices, represent a range of experience, and serve children from an array of socioeconomic and experiential backgrounds. Research results can be generalized not only to children but to clinicians as well, thus allowing confidence that the results of a study are likely to obtain for most any school program. Without a reasonably large sample of clinicians, it is impossible to determine to what extent widespread use of a particular technique or method would result in findings similar to those from a given study.

5. The school clinician is hired to provide service. Certainly parents and teachers expect service rather than experimentation. Most school administrators concur. Furthermore, some school programs are financed in such a manner that whatever time the clinician devotes to activities not involving direct service

to children is not reimbursible; that is, the time cannot be counted in attendance reporting. By involving a large number of clinicians, each individual would contribute only a small amount of time. The effect on the total amount of service available and the reduction in reimbursement would be so small that the program would not be affected materially. Permission to engage in research usually can be obtained under these circumstances.

6. The know-how of the experienced school clinician is a necessary qualification to assure reasonable confidence that results of a study are applicable to other school clinicians. Graduate students who conduct research are often inexperienced as clinicians. Usually, they conduct their research in a situation for which they have no responsibility for long-term relationships. The experienced researcher is most often found in a laboratory or restricted clinical situation. When he does conduct research in schools, this environment is temporary for him. Exceptions to ordinary practices can be made that would not be feasible or even tolerated on a more permanent basis.

7. The experienced school clinician should be involved in problem identification and in determining appropriate ways of finding solutions for them. Certain restrictions are inevitable in selecting topics for

research by graduate students. The professional researcher may have had previous experience as a school clinician, but previous experience is not the same as ongoing current experience. The fact that the professional researcher chose to leave the the practice of speech and hearing therapy in schools to engage in research has removed him from the set composed of school clinicians. Similarly, the supervisor has removed himself from this set. Problems perceived by supervisors are not necessarily those that are perceived by individuals with the daily responsibility of providing direct service to children. It seems likely that school clinicians will continue to reject the nonschool clinician's statement of problems as well as his proposed solutions to them. Many reasons exist, of course, for this attitude; not all of them are directly related to the research currently being produced. I believe that more progress will be made if the school clinician himself becomes involved in solving his own problems as he sees them. His involvement in identifying problems, formulating solutions, and testing them out through research should maximize the chances that the results will be meaningful to him and subsequently incorporated into his practice.

8. A number of techniques or procedures developed in the laboratory or tested by a very small number of researchers

need to be subjected to field tests before their value for general application and use can be generated. Here, again, the use of a large number of clinicians and the kinds of sampling of children thereby provided are ideal for such field tests.

Even though the climate is favorable, relatively little research has been conducted by school clinicians since the Pronovost report was published in 1961. Again referring to the Pronovost Committee report in Monograph 8 (Pronovost and others, 1961), we find the following statement:

> The National survey has demonstrated beyond question that research activity in the public schools can and must be intensified. Many of the unanswered questions and the unresolved problems revealed by the data of the survey require systematic research to provide answers. (pp. 118-119)

This group further reported that 73% of the 141 supervisors and 62% of the 705 clinicians indicated favorable attitudes in their school systems toward school conducted research, while 18% and 29%, respectively, indicated that the attitude in their school systems was one of indifference. Less than 5% reported unfavorable attitudes. (p. 117)

The reasons that school clinicians ordinarily do not engage in research are obvious enough. The demands of the service function for which they are employed are inimical to research. Furthermore, the proportion of school clinicians sufficiently trained in research procedures to undertake it independently is small. The following list enumerates a few of the difficulties that are encountered by school clinicians who desire to undertake research:

1. Developing and writing a substantial research plan is time consuming and must be accomplished after working hours.
2. Secretarial assistance, not often available to the clinician, is necessary.
3. Consultative services are usually not available. Neither funds nor time for consultation are available since most grants are made on the basis of a plan submitted.
4. Sampling problems are nearly insurmountable. In order to have a reasonable sample of clinicians and children, it would be necessary to enlist the cooperation of other clinicians, which requires considerable time. Even so, the individual would be limited to those clinicians in his immediate vicinity.
5. The amount of time required for testing or other procedures necessary to establish a criterion measure is so great for a population large enough to warrant generalization that the service function is likely to be interrupted beyond reasonable limits and a significant amount of reimbursement for the program may be lost.
6. Data require tabulation and analysis. Suitable equipment to facilitate this work is not always available.
7. A report must be written, a laborious and time-consuming job. Results must be disseminated, a matter of some expense.

The magnitude of these logistic difficulties demonstrates the need for developing a research center for school clinicians. Such a center, when fully developed, could perform the following services:

A. Research Activities - Center Initiated

1. Exercise ongoing surveillance of research needs pertinent to the practice of speech and hearing therapy in schools by maintaining an up-to-date analysis of reported research and research-in-progress.

2. Develop a program of interaction with school clinicians mediated primarily through the national and state speech and hearing associations in order to obtain first-hand knowledge of clinicians' reactions to current issues pertaining to the services they offer and research needs as seen by the clinicians themselves.

3. Design significant studies in those areas identified from the above activities.

4. Implement the studies selected by

   a. enlisting the cooperation of an appropriate number of participating clinicians and samples of children;

   b. underwriting the cost of such materials, supplies, and equipment as may be required for the studies, but which are not available in schools; and

c. providing qualified personnel for testing and so forth for those studies requiring more testing or evaluation time than the school clinician can contribute.

5. Maintain supervision over the studies as needed to insure uniformity of procedures.

6. Receive, tabulate, and analyze data that are fed into the center from these studies.

7. Prepare reports of research and disseminate them.

B. Research Activities - Consultative

1. Receive requests from school clinicians for assistance in developing studies that they wish to initiate.

2. Design research as requested using whatever consultative services from other fields as may be necessary.

3. Upon request, provide the same services to these clinicians that are available for agency-initiated research.

4. Replicate these studies when appropriate.

C. Information Storage and Retrieval

1. Abstract data that pertain to the practice of speech and hearing therapy in schools from research activities in speech pathology, audiology, linquistics, and related fields.

2. Classify and store these data for immediate retrieval so that all available information on a given topic or variable would be acessible without delay.
3. Maintain an up-to-date analysis of pertinent research movement based on stored data and research-in-progress.
4. Prepare and disseminate a yearly or semiyearly synthesis and critique of research movement.

The importance of an information storage system should not be overlooked. Researchers who do not have university or college libraries available to them are at a serious disadvantage when they need to review the literature pertinent to a given topic. Neither the individual's professional library nor the professional library of a school is likely to contain the tremendous number of publications in a variety of fields that contain information pertinent to our interests. Even the researcher who has a college library readily available to him is faced with a time-consuming job of searching out the information he needs. Abstracts do not contain sufficient information to permit evaluation of the research. What is needed is a printout of the research report itself in a format that is complete enough for evaluation.

An additional area of service that might be undertaken by such a center is that of maintaining or facilitating certain

types of surveys. The surveys might be concerned with school speech and hearing programs in areas such as program organization, methods and related practices, caseloads, working conditions, credential requirements, supply and demand for clinicians, salaries, and so forth. This kind of research does not solve problems; it merely indicates the status quo. It does, however, help to identify problem areas.

The problems selected for study, at least at the outset, would be those that (a) have ongoing treatment as a necessary component of the procedure, (b) require a very large sample of children, or (c) necessitate a large sample of clinicians. Case selection, scheduling, group size, group composition, age at initiation of therapy, and prognosticative and dismissal criteria are among such problems. These problems also are among the ones already identified by school clinicians as requiring solutions (Pronovost and others, 1961).

Results of research that would be immediately applicable in school practice should receive priority. The requirements for immediate practicability restrict whatever procedures are used to those that are available or feasible in the school environment. For example, while certain kinds of scaling techniques are certainly important for advancing knowledge about speech disorders, they are not often practical for the school clinician. Techniques that require tape recordings are impractical because school environments seldom provide adequate conditions for obtaining them. Really portable high-fidelity instruments are hard to come by. If the

technique requires a panel of listeners, it is impractical, as it requires the time of additional clinicians.

DEVELOPMENT OF A MODEL FOR A RESEARCH CENTER

While a research center such as the described above appears to have the potential for enlisting the cooperation of school clinicians, it remains to be demonstrated whether interest and cooperation would be forthcoming were such a center established. A series of studies need to be undertaken in order to develop and simultaneously test a model from which such a research center could be planned. Two such studies are under way at the present time, and a third has been approved by the administrators of the school district in which it will be conducted.

The Sacramento-Yolo County Study

As a first step in the development and testing of a model, the following questions were posed:

1. Can meaningful research be designed within the framework of the restrictions of the school environment and the service function of the school clinician?
2. Will school administrators approve research plans developed by an outside agent and allow clinicians in their schools to participate?
3. Are school clinicians interested in research to the extent that they will volunteer to participate?
4. What reasons do school clinicians have for not wishing to participate?

5. Are clinicians who volunteer able to conform to the requirements set by the study? What is the nature of the information returned when they are asked for socioeconomic information about their clients? Will they send in routine attendance reports regularly and adequately filled in?
6. Will clinicians who volunteer continue to completion of study? For those who do not continue, what are their reasons for having dropped out?
7. What kinds of problems develop in the course of research pursued in this fashion?
8. What is the attrition in the subject population due to moving, parents requesting that the child be dropped from therapy, receiving service from other agencies, and so forth.
9. Can solutions to these problems be evolved?

In order to obtain some answers to these questions the following procedure was employed:

1. A prospectus of a study was prepared and discussed with supervisors from two county offices, directors of special services in three large school districts, and an assistant superintendent and the director of research in one other large school district. Permission to pursue the study was granted in all cases.
2. Meetings with the clinicians in the four districts and two county offices were arranged, and the research

was discussed with each of these groups separately. Clinicians who wished to participate contacted the study coordinator directly to make the arrangements necessary to begin the study.

3. In order to minimize the interference with the service function and consequent loss of program reimbursement (a critical consideration in this locality), the amount of additional time required of the participating clinicians was kept at two to five hours for the entire study even though the study will cover a period of one year.

It is not the purpose of this particular study to develop significant conclusions about the speech behavior of the children in the sample. Nevertheless, some tentative conclusions may be drawn in the event that the major purpose of the study is resolved positively, namely, that school clinicians can participate successfully in a research study under these conditions.

Case selection was not controlled, but depended on whatever criteria the clinician ordinarily used. Once the caseload was established, the clinician was asked to identify those children who had [s] or [r] errors (errors on [r], [ ], and [ ] were not differentiated) and then to select those children that he would be willing to have work on [s] or [r] exclusively until that sound was corrected. The next step was for the clinician to determine whether suitable groups could be arranged and therapy provided on the schedule specified.

Group size could vary to a maximum of four, and the therapy schedule was to be 30 minutes twice weekly.

While this procedure does not guarantee the desired sample, it will determine whether using clinicians as the sampling unit is likely to produce a heterogeneous sample of children when such a sample is desired. It has the further advantage of limiting the sample to only those children for whom there is reasonable expectation that this particular approach to treatment might be employed under normal conditions.

Since early therapy is a controversial issue, this study is addressed to a comparison of the remission of [s] and [r] errors at various age or grade levels. Stimulability and inconsistency were selected for study as prognosticative measures for remission of these errors. Inconsistency was also selected for study as a potential criterion for dismissal from therapy. Three other variables could also be studied to determine whether they would qualify the results obtained when remission by age or grade levels is compared. These variables are (a) socioeconomic background, (b) amount of previous therapy, and (c) number of other articulatory errors.

A total of 24 clinicians indicated a desire to participate in the study. In three districts, all clinicians volunteered. In three other districts, 29%, 37%, and 67% volunteered. Two additional clinicians in districts having only one clinician also wished to participate and were, therefore, included.

The study coordinator and a research assistant had no difficulty in administering a battery of tests requiring a

half hour per child to the 151 children in the study. All arrangements for the testing were made by the clinician with the school principals involved. One clinician has dropped out of the study because it was necessary to reschedule the schools being served. Thus, one group of three children has been lost. Five other children have moved; the population is now composed of 22 clinicians and 143 children.

Clinicians turn in monthly attendance reports, and thus far, cooperation has been good. Originally, the requirement for turning in an attendance report was for the purpose of determining the extent to which clinicians could or would conform to this requirement. As it turns out, these reports are the source of some rather surprising data as they show the actual number of clock hours of therapy that a child receives when seen twice weekly for a specified length of time. Children, of course, miss therapy because of illness. We have also asked the clinician to indicate when therapy sessions have been cancelled and to indicate reasons for the cancellation. In this area, at least, substitute clinicians are not used when the clinician is absent due to illness. Therapy is sometimes cancelled in order to conduct parent interviews. Even more interesting is the number of times that therapy is cancelled because the child's class has gone on a field trip, or is involved in a special classroom activity of one kind or another. Though the study has not yet run its course, one can tentatively conclude that the number of weekly sessions

for which a child is scheduled multiplied by the number of weeks schools are in session is not indicative of the actual amount of therapy he receives.

The Nevada City Schools Study:

A second pilot study will be completed during January and February, in the Nevada City Schools. This study has a much different emphasis. Its major purposes are (1) to explore the delegation of a research project to a speech clinician in a community not in the immediate vicinity, (2) to explore classroom-teacher participation in a research study, (3) to establish the reliability of a technique for assessing a possible consequence to speech deviations.

Twenty-seven classroom teachers have ranked the children in their classes (kindergarten through eight grade) on three variables: participation in classroom discussion, leadership, and creativity. Rankings will be repeated two weeks later, again using three variables: academic aptitude, participation in classroom discussion, and creativity. A third trial is scheduled (unknown to the teachers) that will take place at the time the study coordinator is scheduled to meet with the teachers to explain the purpose of the project and the results of the reliability study.

If the technique of ranking children by amount of participation in classroom discussion proves reliable, it will be used in another study to determine whether children with speech differences participate less than other children.

The Rio Linda Study:

A third study has been approved but not yet started for the Rio Linda School District. The purpose of this study is to determine the speech characteristics of children diagnosed as educationally handicapped. In terms of examining problems associated with school research, this study is oriented to the difficulties encountered in using school records that have not been set up for research purposes to define a population of children with special problems.

Consultative Service:

Two requests for assistance with research projects already underway have been received at the present time. Further exploration of these requests will begin to define the nature of consultative services needed to facilitate or assist clinicians who are engaged in research activities.

SUMMARY

The present project is concerned with the development of a research center that would either initiate research in schools by enlisting the cooperation of school clinicians or assist clinicians in whatever ways are needed to develop and complete studies of their own choosing. Two projects are underway at the present time, and a third is being started. These projects have been initiated by the center to explore the feasibility of and problems encountered with conducting research by soliciting cooperation of clinicians not actively

engaged in research. The consultative aspects of a research center are being initiated through responding to requests received from clinicians who have already started projects. Two requests have been received to date, but the nature of services needed have not yet been defined.

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Chapter VIII

SUMMARY AND RECOMMENDATIONS

The purpose of the Conference on Research for Public School Speech and Hearing Personnel was to stimulate and facilitate systematic, comprehensive, and competent investigations into speech and hearing problems by public school speech and hearing persons. The four day conference was attended by forty speech and hearing persons drawn largely from public schools and related settings. Lectures were given by six authorities in speech, hearing, or related disciplines. The lectures covered methods of research, specific questions for research in speech and hearing, logistic and tactical procedures, and the actual working through of designs appropriate to investigations in the areas of speech, hearing, and language. The guidelines for the conference were (1) to isolate and discuss some of the more crucial needs in speech, hearing, and language that are faced routinely in public school environments and (2) discuss effective means of implementing a coordinated attack on these problems that would involve both clinicians and persons skilled in research techniques.

The group discussions and the lectures led to formulation of a series of conclusions and recommendations pertinent to research in speech and hearing in public school settings.

Although problems with implementation of a research program are anticipated, meaningful research is both possible and desirable within the framework of the public schools. Some of the more applied of these research needs in particular could be investigated by practicing clinicians. This statement does not imply that basic research should not be incorporated into the research programs of public school systems. However, it does seem apparent that regardless of the nature of the research, the clinician could profit from the assistance of and collaboration with more research-oriented persons in the formulation of research designs to be integrated into the on-going clinical program of the school.

A central agency, regional or otherwise, might be organized to provide leadership and guidance in assisting with the design of research projects, and in otherwise facilitate the necessary investigations. Local school districts could utilize state department personnel to a greater extent. Furthermore, state organizations might be particularly well-suited to serve as a vehicle for better cooperation among the various groups within a state.

The participants formulated a list of some of the more pressing needs that exist within the public school speech and hearing programs.

1. Dissemination of Information. More information is needed about current research projects that are being conducted in public school environments. A repository of

researchable ideas and research reports of experimental findings is needed. Advantages of such a repository and the dissemination of information include increased likelihood of uniformity of nomenclature, a realization that speech and hearing problems are germane to all school-age children and not unique to public school settings, and that cooperation among persons examining similar aspects of speech, hearing, and language can result.

2. Measuring Instruments. The relevance of behavioral responses of children, the influence of the clinician, the measurement tools employed, and methods selected for data analysis were emphasized by the participants in their group discussions. Of particular importance was the notion that meaningful measures of speech, hearing, and language behavior should be reproducible, i.e., different clinicians or investigators should be able to obtain similar kinds of measures or that the same children on successive occasions should yield comparable data.

If we are to realize these goals, it is apparent that more refined measuring instruments must be developed. For example, identification of those children who should receive therapy and prediction of the likely results of the therapy await the development of standardized measuring instruments and the formulation of basic investigations under carefully controlled conditions that examine the efficiency of various remedial procedures.

3. Follow-up Recommendations. The participants were unanimous in their suggestion concerning the value of a conference of this nature and expressed the opinion that subsequent meetings should be planned at both the regional and national levels. It would be helpful if the participants were selected about equally from university research personnel in speech pathology and audiology and public school personnel in these same fields. In this way, the opportunity would be created for university personnel to become more aware of the kinds of problems that exist in public school settings and of the unique problems of doing research in these settings. Another suggestion was that short-term institutes, perhaps of several weeks duration, might be planned in which selected public school personnel could be given the kind of intensive instruction necessary to carry out investigations applicable to clinical problems.

Throughout the discussions, the point was emphasized by the participants that the public school clinician probably would be able to accomplish little in the way of independent research, but that the collaborative effort of the clinician, of people actively engaged in research in the area, and also the availability of facilities for the collection and reduction of data are required.

A report of this nature cannot reflect a true measure of the contributions, learning, and the interaction among participants that took place. Perhaps one of the most valuable aspects of the conference was the session devoted to the

participants "thinking through" a selected design problem of a relatively simple nature. This task seemed to provide a desirable point of contrast with both the lectures and informal discussions that had proceeded. Much of the emphasis during the early parts of the conference was concerned with research projects of considerable magnitude, often requiring large groups of children and consideration of a complex experimental design. Yet, perhaps the most important ingredient of scientific inquiry is observation. Carefully obtained observations can lead to statements of tentative hypotheses, the careful chronicling of behavioral responses, and subsequent modification of the original hypotheses. It is in this sense that the clinician can take the initiative toward establishing some form of research program that ultimately can be refined or expanded upon through the kinds of collaborative efforts discussed so frequently during the conference.

Appendix A

CONFERENCE SCHEDULE

Wednesday, January 19

8:30 - 9:00 a.m.	Introduction and Orientation
9:00 - 10:30 a.m.	John Irwin, Speaker "Research Needs in Speech, Hearing, and Language"
10:30 - 11:00 a.m.	Break
11:00 - 12:30	Robert Peters, Speaker "Orientation to Scientific Inquiry"
12:30 - 2:30 p.m.	Lunch
2:30 - 4:00 p.m.	Discussion Groups No. 1
4:15 - 5:30 p.m.	General Assembly for Discussion Leader Report, Speaker Reactions, General Questions.

Thursday, January 20

8:30 - 10:00 a.m.	John Carroll, Speaker "Tactics of Scientific Research"
10:00 - 10:30 a.m.	Break
10:30 - 12:00	Nancy Wood, Speaker "Specific Applications of Tactics to Speech, Hearing, and Language"
12:00 - 2:00 p.m.	Lunch
2:00 - 3:30 p.m.	Discussion Groups No. 2
3:30 - 5:00 p.m.	General Assembly

Friday, January 21

8:30 - 10:00 a.m.	Clyde Baer, Speaker "Logistics of Research from the Viewpoint of School Research Administration"
10:00 - 10:30 a.m.	Break
10:30 - 12:00	Maryjane Rees, Speaker "Logistics of Research from the Viewpoint of the Speech Pathologist"
12:00 - 2:00 p.m.	Lunch
2:00 - 3:30 p.m.) 3:45 - 5:00 p.m.)	Logistics Groups

Saturday, January 22

8:30 - 12:00	General Assembly Review and Summary of Topics Adjournment

Appendix B

ROSTER OF PARTICIPANTS

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