Publisher

B.C. Decker Inc
3228 South Service Road
Burlington, Ontario L7N 3H8

B.C. Decker Inc
320 Walnut Street
Suite 400
Philadelphia, Pennsylvania 19106

Sales and Distribution

United States and Possessions
The C.V. Mosby Company
11830 Westline Industrial Drive
Saint Louis, Missouri 63146

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Info-Med Ltd.
802–3 Ruttonjee House
11 Duddell Street
Central Hong Kong

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The C.V. Mosby Company, Ltd.
5240 Finch Avenue East, Unit No. 1
Scarborough, Ontario M1S 5P2

South Africa
Libriger Book Distributors
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"Die Ou Looiery"
Tannery Road
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United Kingdom, Europe and the Middle East
Blackwell Scientific Publications, Ltd.
Osney Mead, Oxford OX2 OEL, England

Australia and New Zealand
Harcourt Brace Jovanovich Group (Australia) Pty Limited
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Generalization Strategies in the Treatment of Communication Disorders

ISBN 1–55664–069–2

Library of Congress catalog card number: 88–71396

10 9 8 7 6 5 4 3 2 1

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PREFACE

The goal of speech-language remediation is to teach clients communication skills that will be useful for the clients as they go about their daily activities. This goal has been a major problem for speech-language clinicians. The clinician typically teaches a set of speech or language skills within the confines of a clinic. Often, clients fail to exhibit those skills in nonclinic settings. In summary, clients do not commonly generalize skills taught in the clinic to their natural environments. The chapters of this book address this fundamental clinical problem of generalization as it relates to teaching speech and language to people exhibiting communication disorders. Although the content is directed to speech-language pathologists in particular, it also has relevance to teachers, special educators, students, and researchers interested in generalization.

As readers progress through the book they will become aware that the term generalization is used in two distinct ways; as a desired treatment outcome and as a behavioral process. Discussions of both of these content areas are important. Discussions of how to obtain generalization of taught skills to the person's daily activities are important because that is the goal of treatment. Discussions of generalization as a behavioral process are important because, if the principles drawn from the rather extensive literature on generalization as a process are considered, they may lead to procedures that will aid in the goal of getting taught communication skills used in the natural environment. For the teacher and clinician, such considerations are critical to selecting valid procedures for implementation.

The majority of the chapters in the book address generalization in terms of specific communication disorders, i.e., a chapter about generalization in treatment of articulation and phonological disorders, others about treatment of child language disorders, stuttering, aphasia, and autism. Each of these chapters presents conceptual issues related to generalization as a process. Critical research is presented and evaluated. Finally, each chapter includes a set of practical suggestions concerning how to achieve the use of taught communication skills in clients' daily lives.

Preceding the specific disorders chapters are two introductory chapters. In Chapter 1, the issues involved in defining and obtaining generalization in the treatment of communication disorders are presented. Practical suggestions for ways to study and to measure generalization during intervention are found in Chapter 2.

There are numerous areas of agreement across the authors of all chapters. First, there is agreement that the appropriate goal for treatment is demonstration of the taught communication skill in the clients' daily activities. Second, all of the writers believe that important speech and language skills can be taught. Third, all of the authors agree that some sort of inductive training procedure is effective for promoting generalization into new situations. This induction is brought about by a training procedure similar to Stokes and Baer's (1977) Train Multiple Exemplars procedure. This is not to suggest that there is total conceptual agreement across the various authors or that one needs to read only the chapter relating to a particular communication disorder to obtain all of the useful information relevant to that disorder.

There are major issues that separate the authors of the various chapters. For some of the authors, generalization of speech and language skills to natural settings is a matter of teaching the skill across a number of representative contexts in the hope that the skill would then come under the control of the appropriate environmental stimuli. For others, the issue is teaching a rule or the discovery of a rule that is internalized. When this occurs it is assumed that the speaker can apply the rule when appropriate. For these authors, generalization is a function of internal stimuli controlling generalization. Readers will be attracted to the various conceptualizations according to their own theoretical view.

This book is unique in several ways. First, it is devoted entirely to the topic of generalization in the treatment of communication disorders. Second, the book supplies information on methods used to study and measure generalization throughout treatment. Third, the book is unique in that it is an attempt to bring together in a systematic, organized manner the variables identified in the study of gener-

alization in the various specific disorders. The organization results in a preliminary model of generalization that contains principles that can be used in developing and implementing treatment programs across all communication disorders as well as other problem behaviors.

It is hoped that the information in this book has practical value for clinicians and teachers for developing treatments or educational programs for specific problems in clinics and schools. Although each chapter is directed to discussion of a specific communication problem, it is suggested that readers do not restrict their reading to specific chapters devoted to a particular communication disorder that may be of special interest to them. Procedures and variables that have been identified as useful for one problem often have application to others as well. That is, some variables that may be relevant to several disorders may only have been explored in the treatment of one and so be described in only the chapter devoted to that specific disorder. That does not necessarily mean, however, that the variable can only be applied to that particular treatment for that particular problem. It is likely to have greater generality, or at least the possibility for greater generality. Thus, clinicians and teachers are encouraged to read all of the chapters. Undoubtedly, there is overlap, but there are also specific topics that are discussed in only one or two chapters.

It is hoped that the information in this book will result in an increased interest and research in generalization. Ideally, clinicians and teachers give consideration to generalization in the planning stages of developing treatments. The earlier that generalization is considered, the sooner and more extensive the generalization obtained when training starts. As for research, an entire chapter is devoted to descriptions of generalization issues and suggestions for methods that can be used to examine them. In addition, each specific chapter includes descriptions of the procedures used to study generalization in treatment of a specific disorder. All of this information from both sources can be used by students, clinicians, academicians, and researchers to design a variety of methods and measures for obtaining data on generalization throughout a treatment program and across any situation and context. The more data on generalization we obtain, the more we know about how behaviors develop and the more we can do to improve our treatments.

Leija V. McReynolds, Ph.D.
Joseph E. Spradlin, Ph.D.

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Chapter One

GENERALIZATION ISSUES IN THE TREATMENT OF COMMUNICATION DISORDERS

LEIJA V. McREYNOLDS, Ph.D.

A question of prime importance in the treatment of communication disorders is whether generalization of the treated behavior will occur. Although the question is at least as important as questions concerning whether the behavior will be acquired with the treatment administered, it has received less attention in research and in the communication disorders literature.

The lack of attention may be attributed, at least partly, to two beliefs or attitudes on the part of speech-language pathologists. The first is that if a behavior is trained adequately in the clinic, it will automatically generalize to situations in which no training is provided. The second attitude reflects a lack of knowledge concerning how best to obtain generalization and what variables clinicians can manipulate to ensure that generalization will be attained. Clinicians do not plan for generalization because they do not know how to accomplish it. These two factors result in treatment programs that emphasize how to plan for acquisition of a behavior, but not how to achieve generalization of the behavior.

The emphasis on variables and procedures that can facilitate acquisition of appropriate behaviors has resulted in the development of some successful treatments for communication disorders. At the same time, the success in teaching acquisition has revealed the weaknesses in most of the treatments in obtaining generalization of the newly acquired behavior. The client performs well in training, is dismissed, and the newly acquired behavior is not produced outside the clinic. In other words, contrary to expectations, acquisition does not ensure generalization, and this lack of generalization is of serious concern to researchers and clinicians.

The problems in obtaining generalization in treatment have led to a shift in attention by some investigators from research in acquisition to research in generalization and the variables that influence it. More studies are now directed to trying to understand what generalization is all about, and to identifying variables and procedures that appear to influence generalization, hopefully in a facilitative manner.

Although many questions remain to be explored and the data are incomplete, the information base is growing. The chapters in this book were written to present the information available on generalization in the treatment of various communication disorders, and to bring as much order as possible to the information gathered. The goal is to organize the information so that a model of generalization, and principles of generalization, can emerge if they are present.

The chapter sequence is as follows. This first chapter presents an introduction to the topic of generalization and identifies some of the relevant issues needing to be addressed. The second chapter, by Kevin Kearns, discusses methods for studying and for measuring generalization. It also provides information on some of the approaches to understanding generalization and obtaining it in treatment. The third chapter, by Mary Elbert, contains information on some of the variables that promise to be important to generalization in phonological disorders. The chapter on articulation is followed by a chapter on child language in relation to generalization, by Phil Connell. The fifth chapter, by Janis Costello Ingham, reviews factors that influence or are related to generalization in stuttering; and Cynthia Thompson, in chapter six, covers the research in generalization in treatment of aphasia. The current status of generalization in the treatment of autism is covered in chapter seven by Robert Koegel, Lynn Koegel, and Rob O'Neill. And finally, in chapter eight, Joseph Spradlin brings together the information from the preceding chapters in an attempt to determine if a model of generalization in treatment or principles for facilitating generalization have emerged. He looks for order and lawfulness in the variables discussed in treating communication disorders in the hope that some important factors can be discovered and be taken into consideration when planning treatment for any communication disorder.

The rest of this first chapter is devoted to the following topics: how generalization is viewed from theoretical and atheoretical approaches to treatment, and philosophical and practical issues that need to be attended to by researchers and clinicians. The discussion here is somewhat brief, because the authors of the subsequent chapters address the issues in greater detail.

GENERALIZATION DEFINED

The topic of this book is generalization. More specifically, it is about generalization during and after intervention in the treatment of a variety of communication disorders. Generalization is defined in various ways by individuals who come from different views of learning and intervention strategies.

Strictly speaking, generalization can be defined procedurally (Blough, 1966). In experimental research, the procedure is to reinforce responses in the presence of a specific stimulus until responding has stabilized. Then stimuli similar and dissimilar in a particular dimension to

the training stimulus are presented in the presence of extinction, to determine which stimuli will function to evoke the trained response. The result is a generalization gradient in which responses decrease in frequency as the test stimulus moves farther away from the training stimulus in the targeted parameter. When the test stimulus is very dissimilar to the training stimulus, responding stops altogether; it is extinguished. In the laboratory experiment the stimulus can be defined physically, and the parameters composing the stimuli are identified (e.g., the training stimulus is a 1,000 Hz tone presented at 50 dB and the first test tone is an 1,100 Hz tone at 50 dB).

Definitions are not as easy when the stimuli and responses consist of communication behavior in the natural environment. The stimuli that evoke a response are complex and sometimes subtle, so they are not readily identified or defined. Consequently, the procedural and laboratory definition of generalization probably does not capture the human behavioral event accurately. Because of this, the definition of generalization has been modified in intervention and is tested in complex and not always clearly specified contexts. Thus, we find definitions such as, "Generalization is defined as the accurate production and use of trained target sounds in other untrained contexts or environments" (Elbert and Gierut, 1986, p. 121) and "... the generic term 'generalization' has come to be used most commonly to describe the extension of some learning to new instances" (Hughes, 1985, p. 2). Hegde (1985) suggests that "generalization has a stimulus dimension and a response dimension. It is the basis upon which some new learning is demonstrated without additional conditioning" (p. 177). One of the most comprehensive definitions in behavioral terms has been offered by Stokes and Baer (1977): ..."the occurrence of relevant behavior under different, nontraining conditions (i.e., across subjects, settings, people, behaviors, and/or time) without the scheduling of the same events in those conditions as had been scheduled in the training conditions" (p. 350). They offer qualifications to the definition by proposing that generalization occurs "...when no extratraining manipulations are needed... or, when some extratraining manipulations are necessary, but their cost or extent is clearly less than that of the direct intervention" (p. 350). Several authors have taken issue with the qualification, suggesting either that if manipulations are required, the behavior observed cannot be described as generalization (Hegde, 1985) or that generalization needs more than one definition (Hughes, 1985).

Different versions of the above definitions can be found, but essentially, the term *generalization* is used here simply to describe the occurrence of a specific behavior or related behaviors in contexts in which that behavior has never been trained. The term is a description of what is observed; it is not an explanation of it. Definitions are included in the individual chapters in the book as they address the different communication disorders. Therefore, no in-depth discussion of definitions is offered in this introduction.

It should be noted that some other terms are used to describe what is defined as generalization in this discussion. They include *transfer, carry-over, induction, rules, concept formation*, and *spread of effect*. Although the terms have specific meaning for some individuals in the context of their theoretical formulation, others use them interchangeably. Those who accept all the terms interchangeably suggest that all of the terms present a similar concept, that what is occurring in training can be observed in nontraining conditions as well when an individual is treated for a communication disorder. As more cognitive approaches are introduced into views concerning the nature of disorders, they affect our conceptualizations of intervention. Thus, for those who believe in innate structures and rules, the term generalization has less meaning (Johnston, 1983); in fact, it has no meaning. The premise is that once the client has induced a rule in the clinic situation, the rule is applied in all situations, and generalization is not necessarily an issue. In fact, the term is not used. However, it should be noted that generalization and rule acquisition are tested in the same way. That is, procedures are designed to determine if a particular behavior acquired in training will be produced in untrained situations and in the natural environment.

BASES FOR TREATMENT PLANS

Two issues in planning intervention in the hope that it facilitates generalization are often discussed. One issue has more to do with language-impaired and phonologically disordered children; the second issue applies to both children and adults and to various communication disorders. The first issue is concerned with whether target behaviors for treatment should be selected on the basis of normal developmental information obtained from normative studies (Guess, Sailor, and Baer, 1978; Hegde, 1985). Usually the question is raised in regard to acquisition. The issue raised is whether a developmental sequence should be followed in selecting targets in treatment. However, equally relevant in using developmental sequences may be questions concerning characteristics of the generalization behavior observed in intervention and characteristics in normal acquisition. Do the same variables influence generalization in normal acquisition and in intervention? Are the patterns during normal language acquisition similar to, or different from, the patterns observed in intervention as children begin to generalize the behaviors learned in training?

The second issue also has to do with criteria used to select behaviors to be trained in the clinic and the context in which the behavior is to be trained if generalization is to be facilitated. Should functional behaviors or responses be selected and trained, and should they be trained in a natural environment; or, should targets be selected from other sources and be taught in structured clinical environments?

In the first discussion a comparison between normal acquisition patterns and the generalization patterns exhibited by children in intervention is addressed. The purpose is to explore similarities and dissimilarities to determine whether normal acquisition patterns have any

implications for the generalization patterns to be expected in treatment of communication disorders (Ferguson, 1978; Ferguson and Farwell, 1975; Ferguson and Macken, 1983; Vihman and Associates, 1985).

Normal Development As a Standard

For children with language and phonological disorders, target behaviors for treatment have traditionally been selected on the basis of normative developmental data from descriptive studies (Templin, 1957; Leonard, 1982). Since this is the case, one way to examine the selection is to compare the behaviors of normal children with those of impaired children when new forms are first acquired and begin to be produced in new contexts in the normal environment and in intervention.

The behaviors that are compared may be considered to be evidence for generalization, although in normal acquisition the evidence may be difficult to identify. In normal acquisition a child may produce the /k/ correctly for the first time in a word such as "candy." Subsequently, he may be observed to produce it correctly for the first time in the word "kitty." That production may or may not be generalization depending on the events surrounding the /k/ production in "kitty."

On the other hand, the evidence for generalization may be more obvious in intervention. During treatment a phonologically disordered child may be taught to produce /k/ correctly for the first time in a word such as "cat." Subsequently, during a probe for generalization, he may produce the /k/ correctly in the word "car" where it had previously been produced incorrectly. Because the events surrounding that production are known and no consequent events are administered for the correct production, the response is probably correctly labeled generalization. Despite these differences, it may be worthwhile to examine the behaviors in the two populations to determine if they are similar or different. It is particularly intriguing because in general there are considerable differences in the two learning environments for the two populations of children.

In the natural environment during normal acquisition, a specific construction or form is not targeted for teaching. The child appears to be learning a variety of structures simultaneously. In some ways the learning environment appears to offer haphazard opportunities for acquisition. For example, perhaps the first time a child produces /k/ correctly is when he requests "candy." That correct production may be punished when the mother responds to the request with a "no." At another time, the request might be reinforced because the mother gives candy to the child.

In both situations reinforcement may be occurring, but possibly it is stronger in one than in the other. If the request is denied, the response is punished because it is denied, but it is reinforced because the mother understood the request. When candy is offered, the response is reinforced because the request was understood and also because the request was fulfilled. Thus, the consequences of speaking may be quite complex.

Sometimes overt models are offered to the child to imitate with, "say candy," but that is not a consistent procedure in normal acquisition. In fact, it is most customary only in very early stages of language acquisition, when newly produced words are first recognized, and is not always pursued later by the adults in the child's environment. Moreover, the various individuals in the child's surroundings might react quite differently to his productions of "candy." In addition, in between productions of "candy" many other responses occur and are acted upon in the environment. Thus, the word "candy" might be produced only intermittently. Without doubt the environment in which normal language is learned varies considerably from day to day and from item to item. Yet, in this kind of an unstructured milieu the normal child learns to produce /k/ in one or two words and later produces it in all appropriate words.

Contrast this environment with the environment in which a phonologically impaired child usually learns to produce /k/. Prior to training, the impaired child, like the normal child, has either substituted another sound for /k/ or has omitted it in words. When training is initiated, the child is placed in a restricted environment in a therapy room with a table and chairs. The clinician faces the child across the table and usually presents the /k/ alone or in a simple context, asking the child to imitate it. Treatment progresses in carefully structured steps from simple to complex linguistic contexts in which /k/ is the only constant element in each stimulus–response trial. The child's responses are followed frequently by verbal praise and some concrete token when they are correct, and with other consequent events if incorrect. In a ½ hour of training the child may have produced /k/ as many as 100 times with careful monitoring and feedback from the clinician, and with minimal distraction from the task.

The differences between the two learning environments could result in very different patterns of behavior when new forms are acquired and generalized. Yet, there appear to be more similarities than there are differences. One similarity often noted is that both normal and impaired children tend to "overgeneralize" a form they have learned (Ferguson and Macken, 1983). In language the most obvious example is extension of the regular past tense to irregular verbs. For example, after a child learns the past tense for "mend" (mended) he might produce it in such words as "bend" in which it would be inappropriate. Such overgeneralization has been observed in language-impaired children when they are tested in articulation for generalization to appropriate and inappropriate contexts (McLean, 1970).

Another pattern that has been observed in the behaviors of both groups of children is the nonlinear nature of acquisition and generalization. The pattern shows stops and starts, progressions and regressions, asymptotes and spurts, as well as unexpected gaps. Generalization in normal acquisition is never precipitous; one day a behavior is absent, and the next day it is produced consistently and

appropriately in all obligatory contexts. In the same way, generalization is piecemeal, not precipitous, in intervention. It cannot be expected to be different in the two contexts. For example, during normal acquisition a child may produce the form correctly in a specific context on a specific day but produce it incorrectly in the same context the next day. Sometimes the newly acquired correct form is replaced by the old incorrect form, even though the new form has been produced a number of times. New forms are not acquired gradually in a linear fashion, but rather, the child may use the new form in many new contexts on one occasion and then not produce it in any new contexts for a period of time. In other cases the child may produce a new form in an unexpectedly complex context without ever having produced it in contexts that were less complex.

It is the same in language-impaired children (Coggins and Olswang, 1987) and phonologically impaired children (McReynolds, 1987) undergoing treatment. When generalization is tested, the new form may be produced in an erratic manner from one test to another. Children may produce the new form correctly on only one item for several probes and then suddenly produce twice as many correctly. Sometimes, when generalization is tested in what appears to be increasingly complex linguistic contexts and the experimenter expects a gradient of generalization, the gradient does not show up because the child responds correctly in unexpected ways. The general pattern of acquisition in normal development resembles that of generalization in language intervention. Eventually, for both groups of children, all the appropriate forms are produced in appropriate contexts, but the path to that goal is not smooth or linear for either group.

Apparently the unstructured nature of the natural environment is insufficient for some children to acquire language. They require a structured environment directed to teaching the forms missing from their repertoires. Thus, the initial teaching environments for the two populations need to be different. However, when the acquired forms are extended to new contexts or related structures, the patterns for extension are similar. It is possible, then, that clinicians can shift from a highly structured environment to an environment more similar to the normal environment without sacrificing generalization. In fact, such a shift might facilitate generalization.

A puzzling similarity between normal development and generalization in intervention is the variability observed across individual children. Variability has also been documented within children and that variability was discussed in the previous paragraphs. Equally puzzling, however has been the differences observed across children. In normal acquisition the differences are attributed to differences in the strategies children use to acquire language. For example, some children imitate often during acquisition, whereas other children seldom imitate. Some children verbalize a great deal, producing many errors in the process, whereas other children are rather quiet and seldom practice orally. When they finally produce a structure, they may produce it correctly the first time. Some children need to learn a structure in only a few exemplars before they extend it to new contexts; others appear to require many exemplars before a structure is stabilized and used appropriately in new contexts. In normal acquisition then, children exhibit a variety of learning patterns. In general, the differences are attributed to characteristics within the children themselves, not to the environment in which language is learned (Ferguson and Farwell, 1975; Vihman et al, 1985). When similar discrepancies are observed in remediation, they are occasionally attributed to different learning histories among children. An equally likely possibility is that they may simply represent accidental differences in momentary probabilities of stimulus control, because intervention environments contain many stimuli, any one of which may control responding at different times for brief periods. (See Spradlin's discussion of this factor in this volume.) The research indicates that in normal acquisition, part of the variability observed within and across children may be due to a shift from the stimuli controlling the response, a shift in children's attention. On one occasion the child might attend to the frication at the end of the word "fish," so that the final consonant is produced, but on the next occasion the frication in /f/ assumes control of the response so that the child produces the /f/, but not the /sh/. The specific stimulus controlling children's responses from day to day is not identical either within or across children; consequently, variability is observed. In the same way, control of responses in the clinic may shift from one occasion to another so that response variability occurs, and the controlling stimuli differ across children. Because the control may be accidental and fleeting, it is difficult to identify which stimulus of the many that are present is operating on any one occasion. For example, different clinicians may offer varying degrees of stimulus control.

Generalization in intervention that resembles the variability in normal acquisition has been observed across children (McReynolds, 1981). Some children begin to generalize after a structure is learned in only a few exemplars in training, whereas others do not begin to generalize until many exemplars are learned. When generalization is tested in a variety of items, some children produce the trained structure in many of the items; others produce it in only a few items. Often these differences across children are obtained even when they have all reached identical training criterion. That is, the trained structure has the same status in the repertoires of the children when they are tested, in that they have learned the structure to the same degree and are producing it at the same criterion level in the training contexts.

However, the generalization patterns reflect considerable discrepancies across children. The amount of training, as in trials to criterion before generalization begins, also varies considerably across children. Some children reach criterion and begin to generalize in a minimum number of trials, whereas other children require the maximum number offered before generalization occurs.

Explanations for the differences across children are difficult to find. Primarily, as in normal acquisition, it is recognized that children learn differently and generalize differently, but what accounts for the differences is not

clear. Explanations have been sought in variables present in the environment, the contexts in which structures are learned, the procedures used to teach the structures, and the contexts in which generalization is tested. All of these variables contribute a partial explanation, but much still remains a mystery. Although no firm explanations have been forthcoming, the research looks promising.

Because the variability is still an enigma, two approaches to contending with the puzzle have been offered. In one approach the source of the variability is sought within the child. In normal acquisition the source has been suspected to be internal to the child, as mentioned earlier, and this source has been suggested as a way of explaining disordered children's generalization patterns (Elbert, Dinnsen, and Weismer, 1984). In this approach, it is suggested that a conventional assessment examines a child's surface performance only. In such evaluations the children appear to be similar in regard to the errors and inadequacies discovered in the evaluation. Only a more in-depth analysis of the children's repertoires reveals the differences among them, particularly in regard to what they know about the language of their community, that is, their level of competence. These differences in levels of knowledge may account for some of the differences in generalization patterns. For example, children who show a high level of knowledge may show a different pattern of generalization from children with little knowledge. Thus, generalization patterns may reflect what children know about their language before intervention. If so, it behooves the clinician to learn as much as possible about the child's characteristics, the content of his language repertoire, and the status of the specific behaviors to be trained, before developing remediation plans. Again, this approach may help to describe some of the differences found across children, but it still does not explain why the differences occurred in the first place. That is, it does not explain why some children come to treatment with more knowledge of their language than others.

The other approach is to accept the differences without attempting to explain or account for them (Baer, 1981; Costello, 1983). Instead, training is conducted with an eye to generalization from the very beginning of treatment. In this approach, as many of the variables as possible that have been identified or suggested as facilitating generalization are incorporated into the treatment in the planning stages. (These variables are discussed in several of the remaining chapters.) The intent is to use the facilitating variables from the beginning and throughout treatment to increase the probability that generalization will occur for all the children treated (Hughes, 1985). Thus, often the stimuli from the natural environment that are thought to be relevant to generalization are introduced into treatment gradually, as soon as the clinician thinks it feasible. Or, in a gradual manner the client is introduced into the environment outside the clinic.

Regardless of which approach is adopted, generalization within and across children continues to evidence considerable individual variability. That variability is not accounted for by in-depth analysis of children's knowledge or by introducing variables that facilitate generalization early in treatment. Generalization may be facilitated by both, but it is not complete for any child, and children demonstrate variability when tested. Thus, variability within and across children remains an issue in attempting to understand and to predict generalization in intervention.

Theoretical Constructs

Perhaps the second most frequent rationale for selecting targets for training comes from the theoretical framework within which the clinician functions in planning treatment (Johnston, 1983; McReynolds, 1987). However, theories probably dictate interpretations of what the behaviors trained signify, more than the selection of behaviors to be trained. That is, the same behaviors may be selected for training by clinicians who adhere to a behavioral approach as by clinicians who adhere to a cognitive theory or a structural linguistic theory. The behaviors may be the same, but what they represent is open to various interpretations that depend on the theory in which each clinician believes. By the same token, generalization of similar behaviors is tested in similar ways, but what the test results represent is interpreted differently by clinicians who hold different views. For example, if generative theory forms the basis for data interpretation, correct responses on untrained items signify to the clinician that the child is applying a rule that was learned in treatment. If a behavioral framework is the basis for a clinician's interpretation of data, correct responses on untrained items demonstrate stimulus–response generalization or formation of response classes.

Not only do rationales vary, but the targets for treatment also vary as a function of theory. Nevertheless, the actual behaviors taught in intervention may not vary much across theories. For example, in phonology, the target might be establishment of a perceptual-motor skill, learning a distinctive feature contrast, acquiring a phonological rule, eliminating a phonological process, or producing a sound that developmentally should already be in the client's repertoire. However, for all of these theoretical targets, the behavior most likely to be trained is correct articulation of a target sound, and the target sound may be the same sound. This is not to say that the targets could not be different as a function of the theory used to select target sounds, but they often are not. Similarly, theories may dictate the kind of generalization test that is constructed, particularly if a theory has been tested to the extent that it can be used to predict generalization. Not many theories have been evaluated for their usefulness for predicting generalization. Perhaps linguistic and phonological theory have been explored in this way most often, because generalization is a primary component in these theories (McReynolds and Bennett, 1972; Elbert and Gierut, 1986). The theories have been found to be partially successful in predicting generalization. However, what is more customarily tested in generalization, regardless of the theoretical underpinning, is production of the sound in untrained contexts and perhaps production of other sounds that are thought to be related to the target

sound in some way, usually, topographically. In other words, there is not much room for variation in constructing generalization probes.

Thus, targets chosen on the basis of a theory may differ considerably, but usually the same behaviors are trained to reach those various targets. Theories may be effective instruments for predicting generalization, but thus far the data for this effectiveness are scarce. Primarily, though, the issue is not necessarily which behaviors should be trained and tested, but rather what these behaviors, when tested, represent, e.g., generalization, rules, innate mechanisms, or environmental variables.

In sampling client behaviors in the natural environment, the clinician may not employ formal norms obtained from normative studies, but undoubtedly uses informal norms. The informal norm may be derived primarily from observations of the way those without communication problems speak in everyday situations: language forms produced frequently, topics discussed, individuals addressed. The observations may include casual notations of the communication interactions in which the client eventually participates. Such observations give the clinician targets for treatment that help the client to sound "normal." Therefore, although formally obtained normative data are not used to identify behaviors for remediation, informal "norms" often provide useful information for intervention planning.

CLIENT-SPECIFIC TARGETS

Another question often raised is whether the targets for treatment should be chosen directly from each client's behavioral inadequacies or from some general and external base, such as normative data discussed earlier (Hegde, 1985). The question in this case is not one of similarities in patterns during development and intervention, but rather whether group, averaged, or externally derived data should be used to select targets for individuals with disorders that vary from one person to another. One objection to use of group data is that such data are averages and no individual conforms to an average because there are no average clients. In fact, the variability within and across clients makes standards derived from normative studies or any group studies reporting mean data unrealistic for selecting target behaviors for treatment. Clinicians are cautioned not to adhere too closely to norms, not only because they are averages, but also because the norms and sequences are derived from descriptive, not experimental, studies. Thus, there is no evidence that certain behaviors cannot be learned until other behaviors have been acquired. Data do not show that some behaviors are prerequisite to acquisition of behaviors that appear later in the developmental sequence. Therefore, it may be more useful to observe the behaviors in need of treatment and to select the sequence in which they are to be trained on the basis of behavior needed by the client in order to function better, than to follow developmental sequences based on norms.

Another concern is that there are no data suggesting that acquisition or generalization is enhanced if normal developmental sequences are used for selecting targets. In addition, even if data had been obtained, it would be impossible to follow a fixed sequence simply because the studies identifying the sequence have not been conducted. Therefore, such information is not available for all possible target behaviors. Even if it is and if it can be demonstrated that there are some developmental sequences, there is no evidence to indicate that everything is learned in a specific sequential order.

A better rationale for selecting targets and sequences for training may be based on each client's specific problems and needs. For this purpose, standardized tests may be used, but observation of the client's behavior in natural circumstances is preferred. Such observations supply information about the specific behaviors that are impaired in each client and about how much of a detriment the impairment presents in daily exchanges and activities in which the behaviors occur. The point is that spontaneously produced behaviors in natural situations are more representative of the communication behavior of the client in everyday interactions at home, at play, at school, or at work. It is particularly important to obtain measures of the client's behaviors in the settings and situations in which generalization is expected to occur. The more the behaviors trained are the behaviors produced in everyday situations, the greater the probability that generalization will be facilitated in training. To identify these behaviors, standardized tests are inadequate. It is necessary to sample the client's behaviors in the natural environment, or in a situation closely simulating the natural environment, and in situations in which the behaviors occur. Sometimes the suggestions for obtaining measures of all relevant behaviors and in all environmental situations in which generalization is expected to occur are grossly unrealistic from a clinical viewpoint. Such extended observations cannot be practically implemented. Instead, as in planning treatment, it is wholly reasonable to make measurements in just a representative sample of situations to obtain a picture of how well the targeted behavior generalizes. That is to say, in treatment the behavior is trained in a small number of exemplars, not in all possible contexts. Similarly, we should not have to sample all contexts in which generalization is expected in order to confirm that it has occurred in those contexts.

INTERVENTION ENVIRONMENT

The second issue regarding a relationship between the normal, natural environment and the clinical situation in which target behaviors are to be taught centers on how different the two situations should be, both in terms of the target behaviors selected and in terms of the treatment situation if generalization is desired. The questions are whether to choose target behaviors on the basis of those most often appropriate in the natural environment or on some other basis, and whether training should be care-

fully structured or more broadly conceived to reflect the natural environment. This last question is discussed next.

A criticism of the conventional interventions offered is their dissimilarity to the natural environment to which the target behaviors are expected to be extended after treatment is completed (Spradlin and Siegel, 1982). Many differences have been pointed out. For example, the target behavior is elicited through such events as imitation or visual stimuli such as pictures, and the responses to these stimuli are often followed by consequent events that are not used or present in the natural environment (e.g., tokens or candy). They are not often related in a direct way to the response. Rather, they are arbitrary and artificial. For instance, if a child names a picture of a rabbit correctly, the clinician may administer praise and a piece of candy. Neither has a direct or functional relationship to the picture named. In the natural environment the response may be one that is more appropriate to the situation and so is followed by appropriate consequences. For example, if the child requests "milk," it is highly probable that he obtains a glass of milk. Another dissimilarity might be the response trained. For instance, learning to name colors is relevant, but probably there are other behaviors that are more functional and should therefore be trained before colors. When the differences are great between the clinical intervention situation and the natural environment, it is easy to understand why generalization does not occur from one to the other.

To solve this problem of little generalization, suggestions have been made to increase somehow the similarity between the two situations. Suggestions range from introducing stimuli and individuals from the natural environment after the response has been established firmly in the client's repertoire to introducing stimuli from the natural environment at the beginning of treatment, thus planning for generalization at the initiation of treatment. There has also been a suggestion that training should be shifted to the home environment from the clinical environment so that it occurs in the natural environment from the beginning. The suggestions come from a belief that the closer the training environment is to the natural environment, the greater the probability that generalization will occur.

Although it is readily recognized that generalization is not as extensive as hoped when training is restricted to the clinic, there is some unease in moving training to the home environment with parents as trainers. Some of the problems that have been raised are as follows: first, the situation at home has been shown to be ineffective for language learning, as evidenced by the fact that the child has a language problem; second, research has not identified what variables in the home environment and the parent behaviors are responsible for language acquisition; third, we have not yet identified the variables in the environment or within the child that are responsible for the language problems, so we do not know what aspects of the environment need to be modified; and fourth, the complexity of training in the natural environment, particularly speech and language responses that require perceptual skills to identify correct and incorrect responses, may result in a less efficient, more time-consuming effort.

Thus, we may be increasing the complexity and decreasing the efficiency of our treatment programs if we move treatment to the natural environment or attempt to train in all the stimulus conditions in which the behavior occurs outside the clinic. Given that impaired individuals have not learned the behavior in their natural environment, is it efficient to try to simulate, in intervention, the environment in which they failed to learn in the first place? Secondly, it is possible that the training program could be extended considerably if the clinician introduced in treatment all the stimuli, settings, individuals, and situations in which the behavior is expected to occur. One of the premises on which we operate is that all forms of a response in all situations do not have to be trained because generalization does occur. If it did not, our task would be impossible.

Thus, the issue is whether generalization is best facilitated by conducting training in a structured situation that quickly establishes the behavior in the child's repertoire and then shifts to concerns about generalization, or by modifying the natural environment so that treatment can be conducted there. In between are all the other possibilities that bring the natural environment into a closer relationship with the clinic (Baer, 1981). The trend appears to be in the direction of planning for generalization from the initial steps of treatment and introducing stimuli and events from the natural environment into the clinic from the beginning of treatment. However, the data to support any of the proposed procedures are lacking.

A related issue is the context in which treatment should be administered. That is, should it be in a clinic therapy room with minimal distractions and structured procedures or in the natural environment with little structure, in order to enhance occurrence of generalization? The same concerns apply to this issue as apply to the issue of selecting target behaviors that are frequently produced in the natural environment in contrast to behaviors that are developmentally sequenced or lacking in the client's repertoire. We must consider and weigh the advantages and disadvantages of each setting. For example, would the natural environment contain too many distracting stimuli, making treatment a difficult task? Would the treatment have to be so powerful that it could override all the extraneous variables present in the natural environment?

TARGETS FROM CLINICAL RESEARCH

Another alternative to selecting targets on the basis of developmental milestones, or client needs, is choosing targets that have experimentally obtained data for support (Hegde, 1985). That is, selection of targets can be based not only on behaviors that are important for the client in relation to the environment in which he operates, but also on behaviors that have been experimentally identified as relevant, manipulable, and facilitative to generalization.

The clinical research that has identified targets for

selection has been behavioral in orientation. The variables that have been explored experimentally have been derived from several sources, including theoretical ones. Thus, if theory indicates that a number of behaviors are related, the research is designed to evaluate the nature of that relationship. Primarily, the research has been directed at attempting to identify behaviors that are grouped together as members of a larger category usually known as a response class. A good portion of the research in language and phonology was designed to evaluate the validity of structural classes as defined by linguistic theory. For example, linguistic theory (structural) suggests that copula *is* and auxiliary *is* are separate behaviors and that copula *is* develops earlier than auxiliary *is*. Based on the theoretical formulation, then, the clinician would plan to train copula *is* first and auxiliary *is* second and each one separately because they are individual behaviors, and generalization from one to the other would not be expected. However, clinical research indicates that the two may not form separate classes, because if the copula is trained, clients also begin to produce the auxiliary, an indication that the two are members of the same response class. If one is trained, generalization to the other occurs, so it does not have to receive individual training, or only requires minimal training before generalization occurs (Kearns and Salmon, 1984; Hegde, 1980; Hegde and McConn, 1981). Although the research in response classes is still in the early stages, enough data are available to make some choices in language targets on a scientific basis and on the basis of targets that have been shown to have facilitative effects for generalization. However, language is a complex behavior in which many structures are involved. Only a few have been experimentally evaluated, and strong relationships among the structures that have been explored have not always been found. Such research is sorely needed and is continuing.

The notion of response classes, although useful, has thus far not been extended across all communication disorders. In fact, as mentioned, even the research on grammatical structures has been directed primarily at examining responses that have structural (i.e., topographical) similarities, to determine if those similarities function to evoke the same or related responses. That is, we have depended on physical similarities to establish the relationship for defining response classes. (Although, see Costello Ingham's chapter on stuttering in this volume for an example of two topographically *dis*similar responses that covary in treatment.) The dependence on topographical similarity may limit the kinds of variables that are examined. It is possible that researchers are missing more potentially powerful variables because they are not the most obvious ones.

Response classes have also been demonstrated on the basis of functional similarities. For example, if a child was taught to categorize a knife, fork, and teaspoon as tableware, he or she, when presented with a soup spoon or gravy ladle, would label each with the class label although the specific items have never been trained directly. The items have a similar use and therefore can be categorized as members of one class.

The concept of response classes sometimes is elusive. For example, it is possible to develop response classes arbitrarily if functional and topographical similarities have not been identified either theoretically or empirically. One definition of a response class is that it is a group of responses that share antecedent and consequent events and are created by the presentation of the same contingencies. Therein may lie a problem. By programming arbitrarily selected stimuli and by reinforcing particular responses in the presence of the stimuli, an investigator may develop several responses that appear to be members within a class. Testing for generalization to other stimuli, also arbitrarily selected, may reveal that responses are not produced to them because there are no aspects or parameters they share. That is, the response class was arbitrarily formed. On the other hand, the stimuli controlling responses are not always obvious ones. Some research indicates that when such training is administered, the subjects may be responding to stimulus similarities that have not been identified by the experimenter. In that case, generalization may be expected and shaped to stimuli that appear to be topographically or functionally dissimilar. (See Spradlin's discussion of stimulus equivalence in this volume.)

The notion of response classes is discussed in several of the subsequent chapters in this book. Generally it is defined in the same way by the various authors. However, Spradlin presents a somewhat different view of response classes in his chapter, and the discussion is directed partly to the issue presented in the previous paragraph.

GENERALIZATION AS A TERMINAL GOAL

Although generalization is desirable during and after treatment, generalization as the terminal goal in treatment has been questioned (Hegde, 1985). Hegde points out that the generalization obtained in the laboratory and as defined by the procedures used to test it in the laboratory is unsuitable as a treatment goal in the clinic. As described earlier, in the laboratory the subject is taught a discrimination through differential reinforcement. After the response to the training stimulus has been established, generalization to other stimuli is tested, some very similar to the training stimulus and some less similar to it. Responses in the presence of these test stimuli are not reinforced. The farther the test stimulus is from the characteristics of the training stimulus, the fewer the responses. As the test stimuli become less and less similar to the training stimulus, responding ceases entirely; it has not been reinforced and it disappears.

According to Hegde, our goal should be maintenance of the trained response. This goal requires that the behavior continue to be reinforced when it is produced outside of the clinic. Thus, if the laboratory procedural definition of generalization is applied to clinical activities, it is no wonder that the behavior is extinguished, and that little or no generalization is obtained. Or if it is obtained it soon disappears. One possibility for handling the problem is to think of the procedural definition of gener-

alization as a powerful demonstration of generalization, recognizing that the definition is only one of several available. One way to circumvent the problem is to implement procedures proposed for facilitating generalization (Stokes and Baer, 1977; Costello, 1983; Spradlin and Siegel, 1982). Most of the procedures include some form of reinforcement for the target behavior as it is produced in contexts that gradually shift from restricted clinical environments to the client's natural environment. Because reinforcement is a part of the procedures and generalization in a literal sense has involved extinction, it is contended that the procedures are more accurately described as maintenance procedures, not as generalization procedures (Hegde, 1985; Hughes, 1985). Thus, the terminal goal in treatment should not be generalization; it should be maintenance. Because maintenance requires selective reinforcement of the target behavior in some manner, clinicians may test for generalization and use it to initiate maintenance procedures, but the terminal goal in treatment should be maintenance. This is not a denial of generalization; in fact, generalization should be probed and recorded throughout treatment. Responses on the probes would inform the clinician about which responses should be placed on maintenance. Treatment plans, therefore, should include procedures for maintaining the behavior outside the clinical environment by gradually introducing antecedent and consequent events that are present in the natural environment so that the behavior is not extinguished.

The issue poses a number of questions for planning interventions and for theoretical constructs that form the foundation for different approaches to treatment of communication disorders. The most crucial, of course, is whether clinicians should relinquish generalization as the terminal goal and devote more effort to planning contingencies for maintaining the target behavior after it has been acquired in the clinic. If so, several options are available.

Clinicians can formulate treatments that include plans for generalization early in the treatment sequence (Hughes, 1985). For instance, from the beginning of training, the clinician might use contexts in training that resemble contexts from the client's natural environment, or use a variety of exemplars for teaching a target response rather than using a restricted set of training items. In planning for generalization from the start of treatment, the clinician makes plans to introduce gradually into training variables that are present in the client's natural environment. At the completion of training, all relevant variables would have been introduced into the clinic, the target behavior has been produced in the presence of those variables. The shortcomings of that approach have been presented above.

Clinicians can choose other options which have been discussed earlier. For one, they can depend on topographical similarity between the training items and generalization items to evoke the target response if generalization is the goal. For example, in articulation training, it has been shown that children who learn the voicing distinction in pairs such as /s/ and /z/ can produce other voiced pairs such as /t/ and /d/, or /p/ and /b/ correctly without additional direct training on those pairs (McReynolds and Bennett, 1972). Another example would be the articulation generalization that has been obtained from nonsense syllables to words and phrases (Powell and McReynolds, 1969; Elbert and McReynolds, 1978). However, reliance on topographical similarity has limitations. Seldom is generalization as extensive as the topographical similarity would lead one to expect, and sometimes the similarity is not a characteristic that functions to evoke the response. In addition, subjects exhibit considerable individual variability, so it is difficult to predict who will generalize or to what extent. Finally, the topographical similarity may not be powerful enough to facilitate generalization to other environmental settings or to individuals other than the clinician providing the training. Topographical similarity can be one parameter to use for facilitating generalization, but when used alone, it is limited.

If topographical similarity is nonexistent, another parameter that can be used to promote generalization is the notion of response classes (explained earlier). For example, research has established that if children are trained to produce subject noun phrases, they will begin to produce object noun phrases without direct training on that construction (McReynolds and Engmann, 1974). Response classes have been experimentally demonstrated for a number of language constructions, but not all. As previously cautioned, using membership in a response class to predict generalization is sometimes useful, but it can present the same limitations as total reliance on topographical similarity. Generalization is not complete, not always replicable, and considerable across- and within-subject variability is evident.

Another option that can be chosen in planning treatment is not to rely on any of the parameters or procedures described above, but rather to continue training until the target behavior is produced correctly in all clinic and extraclinic contexts. If the clinician views generalization as an irrelevant notion because rules are acquired during training, the assumption is that no particular parameters need to be manipulated. With sufficient exposure and practice, the rule is acquired, and once acquired, is applied in all contexts. Thus, generalization is not an issue within this approach to treatment. Whatever his or her theoretical approach, the clinician is still constrained to select exemplars for exposure and practice in training that promise to provide the most effective opportunity for rule induction. In that selection, parameters need to be considered, whether topographical, physical, functional, or other.

Before rejecting generalization as the terminal goal, it is advantageous to consider two other options. One could, like Hegde (1985), assume that reinforcement is the only stimulus controlling a response. But it is possible that other stimuli are present that evoke the response and control it. Alternatively, one could define generalization less rigidly. Possibly the definition of generalization should not and cannot be limited to the procedural one Hegde offers. As a matter of fact, Hughes (1985) pro-

poses that we distinguish among three different types of generalization. The first is *spontaneous generalization*, which occurs without special planning or additional training. The second type entails a special generalization phase of treatment after an establishment phase, when a probe indicates that the target behavior has not generalized to all the contexts tested. She calls this *posthoc programmed generalization*. The third kind is *preplanned generalization*. In this type, procedures and variables that are thought to facilitate generalization are initiated as soon as treatment starts.

The option chosen by each clinician is partly dependent on the theoretical viewpoint. It also depends on which parameters, if any, are considered important for promoting generalization. Primarily, the issue for the clinician is her or his definition of generalization. If generalization can include some form of reinforcement, then it can be trained during or after clinical activities. If generalization does not include reinforcement, then maintenance may be a better treatment goal. Both generalization and maintenance are included in the terminal goal.

PRACTICAL CONSIDERATIONS

Some of the issues that need to be addressed in research are more mundane than the ones discussed thus far. They are concerned primarily with criteria used to demonstrate that generalization has occurred, and how to use generalization data for deciding to terminate treatment. The issues are presented in the following section, but answers to the issues can only be offered for a few, mainly because research has not been directed to them. In other cases, the answers depend on the behaviors trained.

Number and Variety of Contexts

Often generalization is probed to a select, but hopefully representative, sample of untrained contexts during training. For example, if a language structure such as a locative "in the _____" is trained in a small set of exemplars (e.g., car, room, basket), generalization to another set of exemplars in untrained contexts such as "in the box," "in the bag," and others, is tested. Not all possible contexts are tested for generalization. The question is, how many untrained contexts should be tested in order to allow statements about generalization? Is it sufficient to test production to visual stimuli in the form of pictures, or should the subject produce the form spontaneously in conversation before the behavior can be said to have generalized? Or, in stuttering, should the client perform fluently in public situations as well as in private conditions with friends to be pronounced ready to enter his or her natural environment? Thus, it is necessary to decide not only how many contexts need to be tested, but also, how to select contexts that can be considered representative of the contexts in which the behavior is to occur in the natural environment. In this regard, data suggest that clients often generalize to items and contexts in the restricted environment of the clinic, but they evidence no generalization to spontaneous conversation or in the natural environment (Hughes, 1985). In articulation, for example, a hierarchy has emerged. Children generalize first, and most, to imitated items, then to spontaneously produced words in naming pictures, then to reading, and least, and last, to conversational speech (Rigor, 1980; Elbert, Shelton, and Arndt, 1967; Shelton, Elbert and Arndt, 1967). Therefore, if generalization to picture naming only had been tested, the clinician would not know whether the target response was ever produced in conversational speech. To obtain a realistic assessment of generalization, the appropriate contexts should be included in the testing. No data have been offered to suggest explicitly the number and variety of contexts to be tested, and there probably will not or cannot be a hard and fast rule within or across disorders. However, clinicians need to keep such considerations in mind when planning intervention programs and tests for generalization.

Another decision that has to be made concerns how many settings and which settings have to be used in generalization testing to obtain an accurate picture of the client's generalization. If the client is a child, for example, should generalization be tested in the home, in every room in the home, in the classroom, the playground, and so forth? Should generalization testing be conducted in stores, in the library, at the movies, and at a friend's home? The number of settings in which the target behavior may be required to be produced are too numerous to be included in the generalization testing. What the clinician would like to do is to make predictions about the strength of the generalization across settings. To do that, it is necessary to identify when a sufficient number of representative settings have been used to ensure, with a high probability, that the behavior will be produced in other settings. However, in all instances the clinician has to use practical considerations for selecting contexts in which generalization should be sampled. Every possibility need not be included in the schedule.

Measures of Generalization

Stability and consistency of the target behavior after it has generalized is important for determining that generalization has been attained and that behavior will be maintained. There are experimental data showing that if subjects are probed on the same items from one training session to another (Powell and McReynolds, 1969), generalization performance may change from one probe to another, at least in the early stages of intervention. So, if a subject produces the target response in test items on one occasion, it does not necessarily guarantee that the item will be correctly produced on the next generalization probe. For example, a client with aphasia may be enrolled in treatment to learn to produce noun phrases such as "the big cat" and may be tested on items such as "the big car" and "the big box." It is possible that on the first probe the client would produce "the big car" correctly. The clinician may be tempted to conclude that generalization

has been obtained and that the response is stable. However, the clinician should not make such an assumption. It is equally likely that on the next probe the client will not produce "the big car" correctly. The variability within individuals has been discussed in an earlier section in this chapter. The response may be stable, but the clinician needs to test the consistency of the response before concluding that generalization is stable. To avoid misleading conclusions, it is necessary to establish a consistency criterion for demonstrating stability of generalization performance. In other words, each context in which generalization is tested needs to be tested more than once to establish consistency. Therefore, a minimum of two probes is necessary, but several probes are even better.

Clinical Significance

The decision concerning when generalization is clinically significant is tied to all of the issues discussed in this chapter. Another way to state the issue is to ask, "When is the client's speech and language similar enough to the speech and language of others in the community not to draw attention to itself?" The concern is with social validation, i.e., when others in the community judge the speech to be normal. Therefore, clinical significance is determined by the perceptions of others who are speaking normally. Thus, testing for clinically significant changes would require testing the behavior in nonclinic environments.

Another factor that needs to be taken into consideration is the specific target behavior that is trained and tested. Criteria may need to be different for different behaviors. The amount and kind of generalization needed to establish clinical significance vary across behaviors. Some behaviors occur, or have an opportunity to occur, frequently in a daily situation, whereas other behaviors do not. For example, active constructions in language are more frequently produced than passive constructions in daily communicative situations. Thus, if a 50 percent criterion is imposed on both structures, the criterion may provide misleading information, particularly if the probes consist of spontaneous conversation. How often would one expect to use a passive construction in daily conversation? How often would the criterion be met? Not often, but a zero percent correct does not always mean the subject cannot produce the structure; it may just mean there were no opportunities to do so. Thus, in determining the clinical significance of a behavior change as it transfers to untrained contexts, the factors of frequency and opportunity for occurrence need to be kept in mind.

SUMMARY

A number of philosophical, theoretical, and practical issues have been identified by clinicians and researchers interested in generalization. Most of them are directed at selection of behaviors to be trained and the situation in which the training should take place for optimum facilitation of generalization in treatment of communication disorders. Some answers, or at least plausible suggestions, have emerged from experimental research, but many issues remain to be studied. Nevertheless, a start has been made in identification of relevant variables across most communication disorders. The remaining chapters discuss these variables, particularly in relation to planning effective treatments.

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