On the Relation Between Generalization and Generality

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The astute student of behavioral psychology may have noticed the terms generalization and generality share the same stem word. At first glance this relation may appear simple enough—both have something to do with the "generalness" of environmental control over behavior, generalization referring to a particular behavioral process and generality referring to one kind of characteristic of behavioral data. However, the relation between these two ubiquitous terms is far more complex and subtle than this, and how well we understand this relation has important and pervasive consequences for our science and our technology. The purpose of this discussion is to examine these terms and their relation so as to improve progress toward a more mature science and a more effective technology.

Stimulus generalization and response generalization are related but different *behavioral processes* (Sidman, 1961). Stimulus generalization refers only to the fact that when responses are reinforced only in the presence of one stimulus, they may also occur (although possibly with lesser frequency) to other similar but different stimuli. Response generalization adds that with such a training history, similar but different responses may be evoked by the stimulus previously paired with reinforcement. These brief descriptions are more fully developed in many sources, and their explanation is relatively well understood (Terrace, 1966; Rilling, 1977; and Mackintosh, 1977).

These two effects of differential reinforcement are understandably important in applied sciences. Therapeutic efforts are of little value if their effects are exhibited only under a single set of stimulus conditions or in the presence of a single stimulus, such as the therapist or experimenter. In the interest of both effectiveness as well as efficiency, it is imperative that behavioral changes produced under special training conditions often also occur under non-training circumstances.

This is the goal with which behavior modifiers have long been preoccupied; however, an uncritical use of terminology and a general misunderstanding of behavior processes has led to a serious misinterpretation of the problem. The term generalization is often used as a shorthand for the phrase stimulus generalization or as an incomplete reference to both stimulus and response generalization. These are only minor accuracies, however, compared to the more serious error of using generalization as a catch-all description and explanation of any appropriate change occurring in a non-training setting. This kind of usage is misleading in that it suggests that a single phenomenon is at work when actually a number of different phenomena need to be described, explained, and controlled. The consequences of this problem pervade our understanding of behavioral change in non-training settings and thus our efforts to engineer such changes successfully.

The assumption that obtaining generalization is the essence of the problem is a serious underestimation of the task of behavioral control which must be faced. To the extent that training procedures have established some degree of stimulus control, it is indeed important to so design modification efforts in other settings that the utility of this control over responding is maximized in a therapeutic direction. But even this is an inadequate perspective. It is necessary to design the training procedure *from the beginning* in such a way that stimulus control is created in training settings which will have maximum behavioral influence in non-training settings (Baer, Wolf, and Risley, 1968). For example, in an elementary school setting we might take pains to establish as discriminative stimuli for appropriate behavior other children instead of the homeroom teacher, so that when the child was in other classes we would not lose control of the homeroom teacher but would possibly benefit from the influence of the continued presence of other children setting the occasion for appropriate behavior (Johnston and Johnston, 1972).

However, carefully designing procedures to optimize the contributions of stimulus and response generalization would hardly exhaust our repertoire of tactics for getting the subject to behave in a desirable way in non-training settings. Our successes will be more frequent when we realize that maximizing behavioral influence in such settings requires careful consideration of *all*

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behavioral principles and processes. We are expecting too much from the phenomena of stimulus and response generalization under the conditions of a non-training setting (regardless of how well our training procedures are designed to facilitate generalization) if we think that it is robust enough to maintain or produce desired responding in the face of a different set of environmental stimuli. While this might upon occasion be the case, more often appropriate behavior change in non-training settings will require implementing a somewhat different set of therapeutic conditions, preferably more closely approximating the natural characteristics of the untampered-with environment with less interference from the therapist (e.g., Risley & Wolf, 1967; Risley, 1968). This burden cannot be placed on the back of generalization alone. Behavioral engineers and therapists must consider extending the initial behavior change to other settings as a necessary and integral part of the overall project which must receive the same care and attention in environmental design and arrangement as is given to the setting and behavior of primary interest, though perhaps with the different goal of less artificial sources of control (Baer, *et al.*, 1968).

At this point, however, we are no longer talking only about generalization. Stimulus and response generalization are only two of the many weapons in our arsenal that can be used to extend initial training to other responses and circumstances. All of the other principles of behavior which were used to modify responding in the first place must be a part of the modification efforts under any other conditions of interest. Describing or explaining such changes solely as generalization is incorrect; indeed, the applied literature rarely provides empirical evidence that generalization is the behavioral process at work when changes in target responding are observed in non-training settings. Nor does it seem that the more general term transfer is necessary or adequate; ever since Thorndike (1903) talked about the identical-elements theory of transfer, it has merely been a less popular synonym for generalization. In fact, there does not appear to be a distinct phenomena, effect, or process to describe, and there is a danger in any summary term that disguises the actual principles at work. It is simply that the behavior modifier's job is not finished until the subject is behaving appropriately in all of the desired settings. It is only an apparent misunderstanding of that task that seems to necessitate a distinct characterization. Instead of referring to how generalization or transfer was or was not obtained, we should describe the exact procedures (and their rationale in behavioral principles) by which environmental control was arranged in the necessary settings of interest (primary and secondary) and the results that were forthcoming. Even the traditional distinction between training and non-training settings is somewhat misleading in that it encourages the view that variables are manipulated only up to a certain point, and then the behavior modifier stops and hopes that further changes occur. If behavioral change in some setting is of any interest (even secondary), then perhaps it should not be considered a non-training setting.

This perspective may have stemmed from the dangerous belief that by producing behavioral change the individual has somehow been changed and that it is this changed person who goes into other settings. It must be remembered that we do not change or control the individual's behavior—the environment does. We only control the environment, and its influence on the behavior of the individual must be continuing. At no point does behavior become permanently self-supporting or independent of environmental control (Skinner, 1953). Of course, this is not to deny that eventually no further artificial manipulations may be needed in a project to produce appropriate responding in all desired settings. But to describe that fact as the result of the process of generalization is to ignore the many other processes of environmental control which may contribute to such a result, such as the nature of the response class which was originally selected for modification, or the contingencies of reinforcement which were arranged, or the contingencies for that response class which exist in other settings, or uncontrolled behavioral changes which indirectly result from treatment.

It can also be argued that this whole perspective surrounding generalization is dangerously close to a mentalistic concept masquerading in behavioral raiment. This view of generalization subtlely forces our use of it as a hypothetical, cognitive process, much like retention, for example. The same philosophical/methodological arguments we would quickly raise regarding retention apply exactly to the use of generalization criticized here (Pennypacker, 1978).

Some of these problems of perspective and strategy are epitomized by a recent article by Stokes and Baer (1977). Their paper is mainly addressed to elucidating from the applied

literature a number of general tactics for producing desired responding in "non-training" settings. While these may indeed include useful procedures, the general approach taken in the article exemplifies the problems posed here. For example, they are explicit about their definitional position.

> The notion of generalization developed here is an essentially pragmatic one; it does not closely follow the traditional conceptualizations (Keller and Schoenfeld, 1950; Skinner, 1953). In many ways, this discussion will sidestep much of the controversy concerning terminology. Generalization will be considered to be the occurrence of relevant behavior under different, non-training 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. Thus, generalization may be claimed when no extra training manipulations are needed for extra training changes; or may be claimed when some extra manipulations are necessary, but their cost or extent is clearly less than that of the direct intervention (p. 350).

Thus, generalization is intentionally defined in conflict with its formal and standard use in the field to include behavior changes that certainly are the result of other behavioral processes. This kind of terminological slippage between our science and our technology may have pervasive and enduring consequences that make maintaining symbiotic relations difficult. This usage discourages any understanding of the behavioral processes that *are* at work in training and non-training settings and encourages a technological literature more in a bag-of-tricks style than in a behavior-analytic style. While there is no question that we need to develop procedures for obtaining desired responding in settings of secondary interest with a minimum expenditure of resources, it is important to understand that progress toward this goal will be facilitated by the proper description and an empirical understanding of the variables and processes that are at work in such efforts.

This overdependence on generalization as a means of getting behavioral changes in non-training settings or in explaining such changes if they occur seems at least in part to result from an inadequate understanding of the questions that are actually being raised when we ask how to extend initial changes or how successful changes in non-training settings were produced. *The issue is not so much how to get "generalization" but how to arrange control over different environmental conditions which results in desired influences on behavior. This in turn becomes the larger question of what are the environmental sources of control, and for both the behavior analyst and the behavior modifier this is a question of generality.* When we ask how we are going to get Johnny to behave in the second period class as we have so carefully trained him to do in his homeroom class, we are asking about generality. When we want to know why he did indeed show homeroom treatment effects in the third period class where we did nothing but why he continues to be a disaster in the second class, we are asking about generality. When we use the same procedures with Jane but see no changes in her behavior in the third period class, we will again be asking about generality.

Generality refers to universality or replicability; formally, it may be defined as the characteristic of numerical data or verbal interpretations of data which describes some meaning or relevance (effect) beyond the circumstances of their origin. It must be distinguished from the concern for reliability of effect, which simply raises the question, "If I repeat certain procedures, will I get the same result?" A broad statement of the question raised by generality is, "If I take part or all of the procedures that produced a result and apply them under circumstances that are in some degree different, will I get the same kind of effect?" (Johnston and Pennypacker, in press). This formal definition is still insufficient, however. There are a number of distinguishable emphases in meaning which can be described. These differences concern the kinds of information about generality that are the object of experimental efforts. These meanings are not always easy to delineate clearly, and the usual process of experimentation provides information on a number of dimensions of generality simultaneously, although particular manipulations can be directed at specific dimensions of interest.

To understand these various dimensions of generality, it is helpful to realize that they include dimensions *across* which we investigate the generality of functional relations between variations in a subject's responding and the experimental environment as well as dimensions concerning aspects if the functional relations that we want to clarify the generality *of*. In other words, the difference is between "generality across" versus "generality of," and in any experimental instance, emphasis may be on one type of dimension or the other, if not both. Figure 1 depicts this distinction and the various meanings of generality. Generality across *species* is of obvious importance when the entire spectrum of

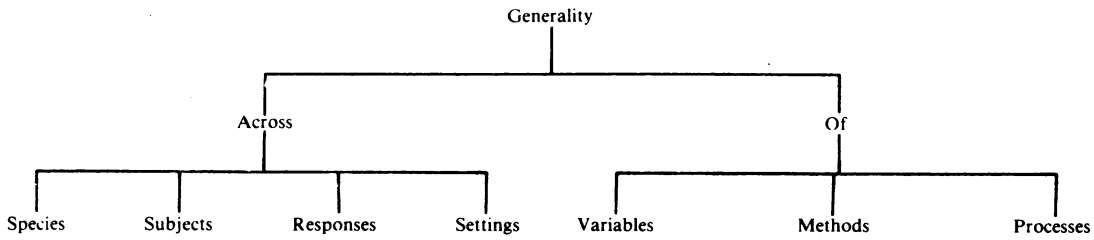

Figure 1. Dimensions of generality.

behavioral research is considered. *Subject* generality has to do with the representativeness of a finding across subjects and is less important than it might seem. As Sidman (1960) enhaustively points out, this usually has nothing to do with the size of a group of subjects; the distribution of some quantitative aspect of the data in the population is actually of little importance. However, if the same kind or type of orderliness occurs widely among individuals in the population as a result of some procedure, then we would say that the finding has great subject generality. We can also examine the generality of a functional relation across *response classes* in the same (or different) subject(s), just as we may be interested in the generality of a finding across different *settings*.

In examining generality *across* these dimensions, we are also unavoidably probing the generality *of* certain other dimensions. We can subdivide these meanings as having primarily to do with the independent variable (generality of variables and methods) or the dependent variable (generality of processes). It must be pointed out, however, that it is possible to fractionate both categories further if desired. For example, we could examine the generality of any number of data characteristics or we could investigate particular parameters of some variable in a search for generality. However, whatever the particular interest, we are always assessing the generality of both sides of a functional relation. We can look at variables and methods only through their associated effect, and a behavioral process cannot be studied independently of its environmental determinants.

Process generality refers to either the generality of the interaction of different variables which we might call a behavioral process (such as extinction) or the generality of a wide range of quantitative values of a single variable (such as FI values). *Methodological generality* refers to the replicability of the effects of procedures or techniques, usually of environmental control over behavior, such as the time-out procedure. *Generality of variables* is at the base of all other types. Here we are talking about the universality of effect of a variable or class of variables, such as intermittency of reinforcement.

Both researcher and practitioner are really asking about generality when they ask how to extend behavioral changes from one setting to another. In particular, most of the time we are interested in the generality of methods and, ultimately, of variables. For example, in asking how to get the same effects in situation B that we produced in situation A, we are actually asking particular questions about the generality of that method of environmental control and about the generality of the arrangement of the different variables which constitute it. For example, in the case of time-out, these might be the typical questions. Will time-out produce the same effects in other situations? What variations of the procedure will continue to produce those effects? What variables which are crucial in time-out can be used in a different way to yield the same effect? What elements of the time-out procedure can be omitted while still retaining its effectiveness? What variables of all those used are minimally necessary to produce the same effect in situation B?

It is our understanding of *how* the effect in situation A was produced that will provide the answers for situation B, and this has to do with the thoroughness of our analysis and understanding of the procedures and their elements which we use—that is, their generality. If our knowledge is such that we are confident about the generality of methods of environmental control and their component variables, the question of how to extend or maintain a behavioral change becomes a much easier one. Instead of making educated guesses about proper techniques and their likely effects or reaching into a bag of tricks for a procedure that may not be applicable, we will

increasingly be able to select confidently with relative precision the procedures which will yield maximum effect with minimum artificial environmental arrangement in any setting of interest.

This perspective seems to be more than slightly at variance with prevailing attitudes and practices in our field. How can we ameliorate this situation? What must be our research strategies? A catalog of inadequately replicated techniques (the components of which have not been analyzed) each of which worked at least once for the investigator who published it may hold the appearance of an interwoven and established literature, but it will prove to be a disappointing facade which does not live up to its seeming utility. Investigators must concurrently work to conduct both applied and laboratory research specifically designed to establish and extend the generality of the various aspects of such variables and techniques (including procedures for maximizing the effects of the processes of stimulus and response generalization). This generality is not necessarily a natural outgrowth of any cumulation of studies; it must be a strong theme of the research in an area, and it must be the central focus of at least some careful and skilled investigators who can specifically design programs which will weave together the results of many independent studies.

This style of research may be described as *thematic,* in contrast to the more demonstration-style, one-shot projects that are independent of the needs of an area of behavioral literature (Johnston and Pennypacker, in press). A thematic study may be conducted in any setting with any kind of subject; what makes it thematic is the nature of the question addressed and the methodological style that characterizes the effort. The thematic study fits into a carefully predetermined position in a larger research program. The program may be directed by one person or a collaborative team, or it may exist as a program only through the complementary but independent efforts of investigators whose contact is primarily through the formal channels of communication (e.g., journals, etc.). The questions addressed by thematic research are less likely to result from a local opportunity to work in a certain setting or with a particular population than from the specific needs of a coherent and relatively integrated yet still incomplete literature.

In thematic behavioral research, when there is a conflict between experimental and service goals the scales are tipped in favor of empiricism so that the resulting interpretations may be unambiguous. Thus, it may be expected that the quality of methodological decisions may be somewhat higher in thematic efforts than in the more independent, demonstration studies. After all, in thematic research the goal is not just to change behavior but to determine the controlling variables in a relatively detailed manner. This in no way vitiates service delivery; the work of Lovaas and his colleagues with autistic children is an excellent example of thematic applied behavior analysis that is successful from both analytical and service perspectives. Furthermore, the studies reviewed by Lovaas and Newsom (1976) comprising the language training literature with normal, autistic, and retarded populations describe an area of investigation that has largely resulted from thematic research efforts that have not compromised therapeutic or educational responsibilities.

It may indeed be that when we work for behavioral changes in one setting we happily observe them appearing in other settings without any special efforts on our part. However, most often we will have to direct specific efforts at such effects, and the seemingly simple questions which we then ask must be seen as a part of a larger and more important range of questions about generality.

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