REVISTA MEXICANA DE ANÁLISIS DE LA CONDUCTA 1998, 24, 197-214 NÚMERO 2 (SEPTIEMBRE)
MEXICAN JOURNAL OF BEHAVIOR ANALYSIS NUMBER 2 (SEPTEMBER)

A TAXONOMY OF RULES AND THEIR CORRESPONDENCE TO RULE-GOVERNED BEHAVIOR

UNA TAXONOMÍA DE REGLAS Y SU CORRESPONDENCIA CON CONDUCTA GOBERNADA POR REGLAS

MARTHA PELÁEZ AND RAFAEL MORENO[1]
FLORIDA INTERNATIONAL UNIVERSITY AND
UNIVERSITY OF SEVILLE

ABSTRACT

A taxonomy of rules and their possible effects on the listener's behavior are presented. The taxonomy takes into account dimensions of an entire contingency arrangement specified in the rule and how these dimensions relate to the listener's behavior. The classification is made according to rule: *(a) explicitness, (b) accuracy, (c) complexity,* and *(d) source*. It is argued that the probability that the listener will behave according to a rule depends upon the type of rule provided, the context in which the rule is provided, and listener's history with that or other similar rules. Even though manipulations of some types of rules have been conducted in studies of stimulus equivalence, relational frames, and derived stimulus relations, a more systematic study of the differential effects of the proposed 16 types of rules on the listener's behavior is needed.

Key words: rules, rule-governed behavior, explicitness, accuracy, complexity, source, dimensions, contingency

---

[1] Portions of this article were reported in a paper titled *The Development of Rules that Control Behavior* delivered by the first author at the annual meeting of the Experimental Analysis of Behavior Group, London, UK, April, 1996. Appreciation is extended to Bryan Midgley, Peter Nogueras, and John Visconti for their critical reviews and suggestions on an earlier version of this paper. Correspondence on this article can be addressed to Dr. Martha Peláez, Department of Educational Psychology & Special Education, College of Education-EB 242B, Florida International University, Miami, FL, 33199, USA. (E-mail: marthapn@aol.com)

RESUMEN

Se presenta una taxonomía de reglas y también sus posibles efectos sobre la conducta de seguirlas. La taxonomía está basada en las cuatro dimensiones de la contingencia que cada regla especifica: *(a) explicitación, (b) exactitud, (c) complejidad, y (d) procedencia.* Se plantea además que la probabilidad de seguir una regla depende del tipo de ésta, del contexto en que se plantee y de la historia que el que la recibe tenga con esa regla u otras similares. La taxonomía de 16 reglas planteada podría facilitar un estudio de los efectos del tipo de regla que fuera más sistemático que el realizado hasta ahora por temáticas como las de equivalencia de estímulos o marcos relacionales.

Palabras clave: reglas, conducta gobernada por reglas, explicitación, exactitud, complejidad, procedencia de la regla, dimensiones, contingencia

---

We offer a taxonomy of rules and describe their effects on rule-governed behavior. Literature on this subject, for the most part, distinguishes rule-governed behavior from direct contingency-shaped behavior on the bases of different sets of controlling contingencies (Galizio, 1979; Reese, 1989; Verplanck, 1992; Zettle & Hayes, 1982). However, the contingency-specifying stimuli (i.e., rules), whose function is to control behavior, have not been systematically analyzed and classified. The classification of rules offered here may contribute to an advancement in the functional analysis of rule-governed behavior. We first discuss the meaning of existing concepts in the literature.

On the Meanings of Rules and Rule-Governed Behavior

Rule-governed behavior has been distinguished theoretically and experimentally from behavior that is shaped and maintained by its direct consequences (e.g., Catania, 1985; Catania, Shimoff, & Matthews, 1989; Cerutti, 1989; Hineline & Wanchinsen, 1989; Vaughan, 1989; Zettle & Hayes, 1982). Skinner (1953, 1957, 1966, 1969) distinguished between behavior shaped by direct consequences, naming it contingency-shaped behavior, and behavior controlled by verbal antecedents, naming it rule-governed behavior. In his account, contingency-shaped behavior is maintained by direct consequences and comes under the control of discriminative stimuli. In contrast, rule-governed behavior, is controlled by verbal behavior, and only indirectly maintained by its consequences. In this sense, Skinner (1966) identified rules as contingency-specifying verbal stimuli--as stimuli that specify, either directly or indirectly, consequences for the behavior.

A behavior-analytic conceptualization of rules seems more useful than a cognitivist view of rules (Chomsky, 1980), because the cognitivists appeal to

rules as heuristic with mental structures ("schemes") to explain behavioral phenomena. The notion of rules as "mental structures" for connecting experienced events posited by cognitive psychologists (e.g., Kohlberg, 1969; Piaget, 1932) creates problems; is not useful. Its usage precludes an understanding of the environmental functional relations and of the variables controlling rule-following behavior, creating circularity and reification instead of explanation.

Rules and Rule-Governed Behavior As Useful Concepts

A concept of rule-governed behavior can be useful *if* it accommodates the description of complex behavior that is under the control of contingencies and can be modified by antecedent verbal stimuli (i.e., rules). The primary function of a rule, then, is to influence or guide the behavior of the listener--controlling the listeners' behavior in ways specified by the verbal behavior of the speaker. Such control can include producing *novel* ways of behaving.

Although the control of rules in governing behavior has been demonstrated, the distinction between contingency-shaped behavior and rule-governed behavior, at times, is unclear. Theoretical inconsistencies in the distinction between notions of contingency-shaped and rule-governed behavior have been discussed (e.g., Cerutti, 1989; Peláez-Nogueras & Gewirtz, 1995; Ribes, 1992). Because both types of behaviors are shaped by their consequences, including those consequences that are remote, delayed, or intermittent, the distinction is difficult to maintain. For instance, individuals often respond to immediate stimuli (i.e., physically present) in terms of their direct physico-chemical or biological properties, as in the case of responding to a discriminative stimuli ("red light"). At other times, however, individuals respond to stimuli in terms of contingencies not physically present, but explicit or inherent in the language of the speaker, as *substitutional contingencies*, as when we speak about what happened yesterday or what could happen in the future (Ribes & López, 1985).

Substitutional contingencies is the case of responding to the contingencies verbally implied in the rule, which refers to events that occurred or that might occur at a different time and place or responding to abstracted relations. In these instances, the listener appears detached from the more apparent and immediate characteristics of present environment and responds to contingencies pertaining to a different time or place. For example, in the warning "Don't smoke," the listener's behavior of quitting smoking is influenced by implicit contingencies (e.g., "I might get cancer"), which refer to events that are not present in the current situation.

We should emphasize that although both are established by consequences, the controlling variables and functional properties of contingency-shaped and rule-governed behavior differ. The particular functions of verbal stimuli, as controlling rules, are to specify (either explicitly or implicitly) the entire contingency array among antecedent stimulus, response, and consequence, in a given context.

Rules as Setting Factors. Many times, stating a rule to the listener produces a change in, or alters the capacity of, events to function as reinforcers or punishers--that is, a rule can function as a contextual variable or setting factor (Morris, 1993; Peláez-Nogueras, 1994). For example, when a newspaper advertisement of a new film release reads "Adventurous, provocative, brilliant! Must-see," the ad may temporarily alter the degree to which certain stimuli (i.e., films) function as reinforcers. In other words, the verbal description will make that film to function as a positive reinforcement (S^{R+}), and not just evoke movie-going behavior. Hayes and Hayes (1994) have labeled this type of rule-following behavior *motivative augmenting,* which maps directly with Michael's (1982) concept of *establishing operation*.

Thus, a rule must be understood in terms of the descriptions it makes of contingent relations among the three-term contingency (four or five term) in context. Such relations might or might not be present in the very situation where the rule is given, which imply more complexity of the entire contingencies embedded in the rule. The transmission of these "non-present complex contingent relations" can be achieved *only* through *language*. Clearly, the ultimate controlling character of a rule is based on ready-made discriminative attributes that, by virtue of the listener's verbal history, do not require new conditioning in every new situation in which the rule is provided. Moreover, individuals can behave from the outset in accordance with rules that they have never before encountered.

Zettle and Hayes (1982) stress that rule-goverend behavior involves two sets of contingencies: those related directly to the behavior of interest, and those related to the verbal antecedents of such behavior (i.e., tracking and pliance). Specifically, the contingencies related to the behavior of interest (contacted by the listener) are those which have maintained the behavior of rule following. The contingencies related to the verbal antecedent are those mediated by the rule-giver (or speaker).

From our perspective, the emphasis is in the analysis of the *two sets* of the entire contingencies involved in terms of both *form* and *function*. The two sets of contingencies we are interested in analyzing are those specified in the rule (S^D--R--S^R) and those in which the listener's behavior is embedded (S^D--R--S^R) (see Figure 1)--the latter contingencies resulting from direct-acting. Rules

and rule-related behaviors can be meaningfully understood only when analyzed as an *interdependent* unit.

Analyzing the Interdependent Unit. There exists a co-dependent relation between the rule and the behavior of the listener. A rule's *function* can only be identified in terms of its relation to rule-governed behavior, and rule-governed behavior makes sense only in reference to a rule, or set of specified contingencies (see Figure 1). A rule's *form* or structure, however, can be identified *a priori,* before identifying the behavior of the listener.

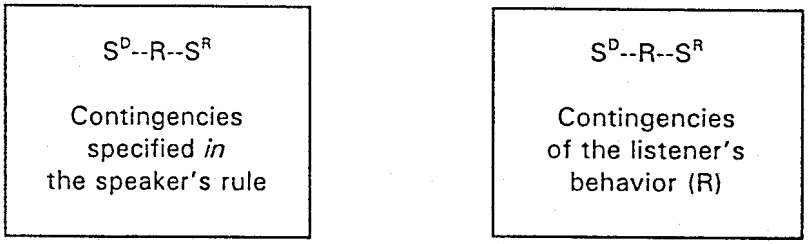

Figure 1. Embedded contingencies between the rule and the rule-governed behavior

We should stress, though, that the verbal character of rules must not be understood in a strictly morphological sense (i.e., in terms of rule form or structure), given that verbal stimuli of different forms can have an identical functions (e.g., red traffic light, the word "STOP"). In studying rules we must consider both their structure *and* function. Functionally speaking, then, each contingency set involves a mutually dependent relationship between environmental stimuli and the individual's responses. Each set is influenced by its current and historical context (Kantor, 1924/1926; Morris, 1988; Peláez-Nogueras, 1994). In sum, the probability that the listener will behave according to a rule depends on (a) the contingencies *specified* in the speaker's rule, (b) the *context* within which the rule is provided, and (c) the listener's *history* with that or other similar rules.

In our present analysis, we focus on rules and on the set of contingencies that they *specify* for the listener. The specifications of contingencies embedded in rules result from the speakers' verbal behavior. We should clarify that, we examine rules in terms of the contingencies they specify, although we do not analyze the behavior of the speaker per se (the behavior of the rule-giver), nor the history of contingencies and variables maintaining the speaker's rule-giving behavior. Rule-following behavior is controlled by the results of rule-giving behavior and it is in this sense that we are only indirectly interested in the behavior of the speaker.

In his analysis of verbal behavior, Skinner (1957) identified tacts, mands, autoclitics, and intraverbals as behavior emitted by the speaker. For the most part, his analysis focused on the consequences maintaining the behavior of the speaker (e.g., the listener's rule compliance). Clearly, the speaker's behavior depends on the context in which such rules are provided, whether the listener follows such rules or not, and on the history of interaction between listener and speaker. Skinner (1989) recognized that in his book *Verbal Behavior* (1957) he paid more attention to the behavior of the speaker than of the listener and to the antecedent and consequent stimuli that maintain the listener's rule-following.

Our main purpose in the remainder of this paper is to analyze: (a) the form and function of the contingency specifying verbal stimuli that can control listener's behavior, and, (b) the related listeners' rule-following behavior. Rule-governance may result or emerge from diverse processes ranging from generalized imitation to derived stimulus relations, or transfer of rule function. The developmental processes that account for the formation, learning or derivation of rules have been extensively discussed elsewhere (Peláez-Nogueras & Gewirtz, 1995). When rules are followed, the listener may have abstracted or learned the rule from: (a) his or her *direct* experience with the contingency arrangements, (b) *transfer* of learning and rule generalization, or through (c) the formation of stimulus equivalence or relational *frames*. We will expand on developmental processes for rule learning in a later section (see also Peláez-Nogueras & Gewirtz, 1995).

Dimensions of Rules and Their Related Behavior

A functional identification or classification among different types of rules and their correspondence to rule-governed behavior has been limited. In this section, we offer a taxonomy of rules and describe their effect on the listener's behavior. The taxonomy takes into account dimensions of an entire contingency arrangement specified in the rule and how they relate to the listener's behavior. The classification is made according to four dimensions: *(a) explicitness, (b) accuracy, (c) complexity, and (d) source.*

Explicitness of the Rule

Explicit versus implicit rules. Rules can be distinguished based on the completeness or specificity of the contingencies expressed by the speaker. The explicit rule clearly identifies the components of the entire contingency and its context. Such explicit rules incorporate all the contingency components, comprehensively specifying readily identifiable contexts. In contrast, in the

implicit rule, the contingencies may not gain verbal expression, either because some of the components are unnamed or because they are explicited in a way not identifiable in time and space. An example of an implicit rule omitting components of the entire contingency would be: "Keep your eyes on the road while you are driving," in which the consequence is not specified. In studies of matching-to-sample and stimulus equivalence, subjects often follow rules where the antecedent stimulus-response relations are omitted in the instructions provided by the experimenter. Some maxims and proverbs represent examples of implicit rules that name components without assigning them concrete identification. For instance, "A peaceable person is a long-lived one."

Explicitly versus implicitly rule-governed behavior. For the most part, correspondence between rule-governed behavior of the listener and the rule provided by the speaker will be determined by the explicitness of the contingencies contained in the rule. The more explicit the elements of the contingency expressed in the rule, the more direct the influence upon the listener's behavior (Martínez, González, Ortíz, & Carrillo, in press; Martínez, Moreno, Ortíz, & Carrillo, in press; Trigo, 1998). Nevertheless, the subject can learn to respond to classes of rules characterized by incomplete contingency specification, such as when the subject complies with the rule "Don't do it!," even though entire elements of the contingency and its context lack description. This is possible due to the listener's learning *history* in a given context. Certain experiences may facilitate rule compliance and, given different histories, subjects may respond differently to implicit rules. For instance, suppose we provide the rule "Define the root" to several students specializing in either biology, mathematics or philosophy. Each student will probably interpret the instruction in relation to his or her subject matter of study (based on his or her own context and history). Some students will relate the word "root" to plants, others will provide a mathematical definition, and others will search for a philosophical explanation. In this example, even though the behavior is explicit ("define") the contingencies and context are not.

Accuracy of the Rule

Accurate versus inaccurate rules. An accurate rule specifies contingencies that, when followed, match certain event-consequence relationship in the environment. Here, accurate rules specify contingencies that may occur. An inaccurate rule describes contingencies that do not correspond to those encountered in the environment. An example of the former is "If you keep looking away while you are speeding, you may have an accident." A rule of the inaccurate case is "If you keep speeding you are going to be rewarded by the police." Other examples can be found in laboratory experiments

employing matching-to-sample conditional discrimination procedures, providing subjects with accurate and inaccurate feedback from the experimenter (Crooks, Peláez-Nogueras, Gewirtz, Markham, & Galindo, 1998). When the programmed contingency corresponds to the feedback provided by the experimenter, we speak of accurate rules. Conversely, when programmed contingencies do not correspond to or contradict the experimenters' feedback or rules, then we speak of inaccurate rules. Recent research by Dixon and Hayes (1998) shows that the type of instruction given to a person affects the number of trials needed for an initial contact with programmed contingencies. Thus, inaccurate instructions result in differing degrees of extinction-induced resurgence to earlier forms of behaviors.

Adjusted versus non-adjusted rule-governed behavior. The listener's behavior may adjust to the speaker's rules when the contingencies specified in the rules are accurate or correspond to the programmed (or direct) contingencies (Degrandpre & Buskist, 1991). Rule-governed behavior is sensitive (or adjusted) to the prescribed contingencies only to the extent that these prescriptions are consistent (or correspond) with the programmed contingencies. Following inaccurate rules may desensitize the listener to the effects of programmed contingencies (Buskist & Miller, 1986; Catania, Matthews, & Shimoff, 1982). Initially, the listener may try to adjust his or her behavior to the speaker's rule but, at some point, the lack of correspondence experienced may produce a change and reverse the behavior to be maintained by programmed/contacted contingencies. In other words, the behavior of the listener may eventually become insensitive to incongruent or inaccurate rules which do not lead to reinforcement (Martínez & Ribes, 1996; Michel & Bernstein, 1991). Hence, in addition to the degree of accuracy in a given contingency-rule prescription, the listener's history and current context significantly affect the extent to which rules will govern behavior.

Complexity of the Rule

Lower versus higher rule complexity. The contingencies specified in a rule always include at least one relation among behavior, its antecedent stimuli, and its consequences. In our analysis, rule complexity refers to the number of dimensions of the antecedent stimuli and their relations (Peláez, Moreno, Martínez, Trigo, & Qiang, in review). Dimensions are characteristics or attributes of stimuli employed, for instance, in matching procedures. Colors, shapes, sizes, and positions represent dimensions of stimuli and can be related to one another. The taxonomy of rule complexity offered here is organized hierarchically and is inclusionary, meaning that each lower level of complexity forms part of the next higher level.

A rule's lowest level of complexity specifies at least *one dimension* of a sample stimulus. For example, the instruction: "Name the *colors* of the figures appearing on the screen" specifies only one dimension (where green, red, and blue are instances of the color dimension). The following example specifies two dimensions of the stimuli: "Indicate the *color* and *shape* of the figures appearing on the screen" (where green, red, and blue are instances of color dimension, and triangles, squares and circles are instances of the shape dimension). However, a more complex level of the rule specifies a *relation among two or more dimensions,* each relation forming a relational frame. For example, in the instruction "Give me the apples that are smaller than the oranges," the speaker implies a relation between apples and oranges in terms of size dimension. This level of relationship is equivalent to the typical first order matching-to-sample procedure where behavior of the subject comes under discriminative control of a fourth-term--as in Sidman's four-term contingency (S^D {S^D--R--S^R}) (1986). Experiments featuring the instruction to "Choose all stimuli from three bottom figures that are the same size as the central sample figure," offer sample sizes varying from trial to trial with subjects asked to relate the comparison stimuli (located at the bottom) to the sample stimulus (at the top). Hence, this procedure involves the two dimensions of size and stimulus location. But, conditional-discrimination procedures employing more than two dimensions may yield multiple stimulus relations. For example, in the matching to sample procedure just described, subjects might be asked to find a relation, or abstract a rule, considering similarity or difference in the colors, shapes, and locations of the sample stimuli, in addition to their sizes.

Thus far, we have discussed relations among stimulus dimensions. Rules of higher level of complexity, however, involve a secondary or higher-order class of relation. A second-order response then involves abstracting a relation from other relation(s). Thus, a higher order relation includes a second-order stimulus control of rules and associates one relation to other dimensions (or to other relations). The contingencies controlling the higher-order class define membership in the class (Catania, 1998). For example, a rule specified in some experiments using second-order matching-to-sample procedures is: "From the three bottom figures on the screen, choose those that hold a relation with the central (sample) figure that is the same as the relation between the two upper figures." This instruction involves a second-order relation between two-first-order relations.

Specifically, the two first-order relations in this example require: (a) abstracting a relation between the two top sample stimuli that set the rule, and (b) matching the bottom stimuli to the central sample based on the stimulus dimensions (e.g., color and shape). The second-order relation requires that subjects apply the rule abstracted between the two top sample stimuli to the

bottom and central-sample stimuli. This level seems to correspond to Sidman's five-term contingency ($S--S^D--\{S^D--R--S^R\}$).

We have organized our taxonomy of rule complexity hierarchically. Our system is inclusionary, which means that each complexity level forms part of the next level. A multiple relation includes several dimensions and a second-order relation includes at least one first-order relation. There is no limit to the complexity embedded in the rule because it is always possible to add one more dimension or to add more relations. For instance, a third order conditional relation would include at least one second order relation, and so on.

Simple versus complex rule-governed behavior. Correspondence between the level of rules and verbally-controlled behavior is likely. Less complex rule-governed behavior more often corresponds to simpler rules; in turn, more complex behavior adjusts to higher-level contingency arrangements. For the listener to adjust or respond according to a specified rule, his or her optimal performance should ultimately correspond to the complexity of the verbal stimuli controlling his/her behavior. A concept similar to maximizing may help here. Given two or more rules provided, an individual will follow the rule with higher probability of reinforcement. However, increased behavioral complexity occurs even in those cases characterized by changes solely in response function (in which response topography remains the same). Therefore, in analyzing behavioral complexity, one should keep in mind the interdependence between stimuli and response function. In addition to the level of rule complexity, the probability that the listener will follow a rule ultimately depends on the context within which the rule is provided and the listener's history with other similar rules. Listener's history may explain the disparities in behavior among recipients of similar rules in comparable contexts. For instance, a listener may interpret an algebraic rule of moderate complexity to be simple or complex, depending upon his or her knowledge of mathematics.

Source of the Rule

Rules provided by others versus self-provided and self-generated rules. Rule identification should consider the source of the antecedent stimulus control. In cases of rules provided by others, the speaker (other than the listener) specifies, implicitly or explicitly, the criterion for the listener's behavior. In the case of self-provided rules, the speaker and the listener are the same individual. Also, self-provided rules can be *taught by others* or *self-generated* or *abstracted* by the subject from learning experiences. In the first case, although the rule is self-provided, it does not originate in the behavior of the subject (e.g., problem solving behavior), but in the behavior of others. The speaker/listener may have no understanding of how to arrive at, or derive such

a rule, because he or she may "know that" but not "know how or why" the contingencies specified in such rules are related. Rules taught by others are often learned via *imitation* processes (i.e., immediate, delayed and pervasive or generalized imitation processes, see Peláez-Nogueras & Gewirtz, 1995).

In the case of self-generated rules, a developmental history of direct experiences with at least some of the related contingencies specified in the verbal rule is required. (The term "self" as used here, does not imply the initiation of a behavior by an autonomous internal agent or by some imaginary part of the individual, it refers to the individual's behavior repertory.) The verbal contingency specifications produced by the individual allows him or her to arrive, derive, or abstract other relations. Rule generation (rule derivation or rule emergence) can occur through transfer processes of learning, as in *transitivity* (Sidman, 1986) and *combinatorial entailment* (Hayes, 1991; Hayes & Hayes, 1992).

When analyzing rules and rule-related behavior, one must do it from a developmental perspective, that is, acknowledging the subject's ability to generate or derive a rule from his and her own previously learned repertory of stimulus relations. This represents the phenomena of *rule-generating behaviors*. Only after having acquired a receptive understanding of a rule and expressed an explicit rule, can the listener emit *rule-corresponding* behavior. When an individual can state or describe to others the orderliness of the environmental relations (the contingencies) we assume he or she "knows" the rule.

Conforming versus complying behavior. With rules provided by others, the speaker specifies the criterion for the listener's behavior, expecting the listener to adjust, conform, or behave according to rule descriptions (e.g., as in the mand). With self-provided rules, whether previously taught by others or self-generated, the subject's ability to verbalize the rule seems to affect his or her subsequent performance on a transfer task (Peláez et al., in review). The ability to self-state or self-provide a rule, however, may not be the sole cause of the rule-following behavior. This is due to the influence of the listener's experience with reinforcing contingencies and the nature of the specific contexts involved. Such factors significantly shape and strengthen the relationship between the contingency-rule prescription of the speaker and the consequent rule-corresponding behavior of the listener.

The distinction made in the literature between *complying* with and *conforming* to rules may be pertinent here (Verplanck, 1992). Rule compliance denotes following and behaving according to rules that have been either stated to the listener, or self-provided. Rule–conforming denotes behavior consistent with the rule, although the listener may remain unable to verbalize or self-generate the rule.

Taxonomy of Rules

The taxonomy is based on four different dimensions of rules and its corresponding rule-governed behavior. Each dimension stresses different aspects of rules and describes its potentially- related behavior. We examine the different dimensions of a rule in terms of accuracy, explicitness, complexity level, and source. Specifically, a rule should be described by analyzing *all four* dimensions involved, which will allow for a more systematic approach to the study of rule-governed behavior.

Figure 2 shows all possible types of rules (a total of 16 rules) resulting from combinations among the four different dimensions. The dimensions of a rule are presented in dichotomous fashion, even though they can operate along a ***continuum*** occurring within the four dimensions: (a) explicit vs. implicit, (b) accurate vs. inaccurate, (c) lower vs higher complexity, and (d) provided by others vs. self-provided. By deconstructing rules into their elements and examining each rule dimension individually, we attempt a more precise developmental approach to be employed in experiments where different types of rules are manipulated to determine their impact on rule-governed behavior and its progression.

Each cell in that table represents a case of 16 rules derived from a combination of the basic four dimensions. The rules in the taxonomy in Figure 2 include:

(a) Explicit, Accurate, Lower Complexity, and Provided by Others
(b) Explicit, Inaccurate, Lower Complexity, and Provided by Others
(c) Explicit, Accurate, Higher Complexity, and Provided by Others
(d) Explicit, Inaccurate, Higher Complexity, and Provided by Others
(e) Explicit, Accurate, Lower Complexity, and Self-Provided
(f) Explicit, Inaccurate, Lower Complexity, and Self-Provided
(g) Explicit, Accurate, Higher Complexity, and Self-Provided
(h) Explicit, Inaccurate, Higher Complexity, and Self-Provided
(i) Implicit, Accurate, Lower Complexity, and Provided by Others
(j) Implicit, Inaccurate, Lower Complexity, and Provided by Others
(k) Implicit, Accurate, Higher Complexity, and Provided by Others
(l) Implicit, Inaccurate, Higher Complexity, and Provided by Others
(m) Implicit, Accurate, Lower Complexity, and Self-Provided
(n) Implicit, Inaccurate, Lower Complexity, and Self-Provided
(o) Implicit, Accurate, Higher Complexity, and Self-Provided
(p) Implicit, Inaccurate, Higher Complexity, and Self-Provided.

		Lower Complexity		Higher Complexity	
		Accurate	Inaccurate	Accurate	Inaccurate
Explicit	Provided by others	a	b	c	d
	Self-provided	e	f	g	h
Implicit	Provided by others	i	j	k	l
	Self-provided	m	n	o	p

Figure 2. A combined taxonomy resulting in 16 types of rules. Each cell in the table represents a case of rules conformed to the basic four dimensions identified.

For example, cell (a) represents an explicit, accurate rule, of lower complexity, provided by a speaker other than the listener. The parental order: "Pick up these toys now if you want to watch TV" exemplifies such a rule. This example posits a clear specification of all the components of the three-term contingency in context (is of lower complexity and lower developmental level). In this case, the verbal descriptions are provided by the parent (speaker other than the listener), and the contingencies correspond to (are congruent with) the actual contingencies encountered by the child (the listener). The last type of rule (see the right bottom cell (p) in Figure 2), represents an implicit, inaccurate, of higher complexity level and self-derived rule (the speaker and the listener being the same). A rule of this type can be found, for example, in the self-instruction, "At the party, I should approach Linda the same way that Juan approaches Mary when they are dancing--not how he approaches her when they are at school." This represents a self-provided rule, which the subject assumes to contain implicit positive consequences (i.e., acceptance). But Linda's aversion to guys renders the rule inaccurate and the real consequence will be rejection. The complexity of this rule is high because it involves a second-order conditional discrimination (i.e., it first requires approaching Linda during dancing and not approaching her during school, and second, it requires matching, that is, to behave just as Juan towards Mary). This relation requires

that the subject *abstracts* the rule from the couple's relation (the sample stimuli) and applies it during his interaction with Linda, and only in a specific context. This type of rules represents higher complexity and developmental level.

In experiments conducted in our laboratory using matching-to-sample procedures, we instruct subjects to derive higher level complexity rules, immediately after completing conditional-discrimination training tasks (Peláez et al., in review; Trigo, Martínez, & Moreno, 1995). For instance, the following instructions are provided to the subjects: *"From the three bottom (comparison) figures choose those that have the same relation with the central-sample figure based on the relation that the two upper figures hold".* These instructions are not totally explicit, in that the specification of some components are left implicit. For instance, the specific dimensions among stimuli (e.g., color, shape), required for subjects to derive a relation, are not specified, nor are the consequences for the choice responses. The stimulus relations (e.g., sameness, difference or opposites) must be derived by the subject during training. This is a second-order rule in that it requires the subject to detect the relation between the two upper figures and apply it to the relation between center and bottom figures. In this case, the instructions are accurate, because the reinforcing contingencies maintaining the correct responses correspond to the actual contingent relations experienced by the subject. In other experiments, the feedback provided by the experimenter has been incongruous or inaccurate with the direct contingencies experienced by the subject (Crooks et al., 1998; Dixon & Hayes, 1998). [The above examples illustrate rules (k) and (l) on Figure 2.]

In sum, the rule-governed behaviors derived from this taxonomy are labeled according to each type of rule governing. We are starting a program of research that focuses on investigating these taxonomy of rules from a developmental perspective, that is, in determining their hierarchical organization in learning. Our assumption is that the taxonomy of rules offered here, by ranging from explicit to implicit, lower level to higher level of complexity, accurate to inaccurate, imposed by others to self-generated, can organize behavior by increased level of difficulty, compliance, and adjustment to the contingencies they specify.

Other Related Rule Taxonomies Not Included

The taxonomy of rules and rule-governed behavior offered here mainly considers the explicitness, accuracy, complexity, and source of rules. Our analysis attempted to relate the certain levels of *complexity* among stimulus relations with the *four-term and five-term contingency* model of stimulus equivalence (Sidman, 1986). In addition, when we discussed the functional

source of rule-following behavior and relevant histories, we identified the distinction between *pliance and tracking* behavior (Zettle & Hayes, 1982). We also emphasized the notion of *contingency substitutability* through language (Ribes, 1992).

Our taxonomy is not exhaustive; when employing other criteria, other taxonomies can be identified. *Ply* and *track* rules (Zettle & Hayes, 1982) were not included in our classification because, according to our analysis, a rule should *first* be defined in terms of the contingencies it specifies regardless of whether the listener obeys or violates such rule. Ply and track rules are defined in terms of their correspondence to pliance and tracking. Rule-governed behavior identified as *"pliance,"* can only be pliance if the listener is under the control of apparent speaker-mediated consequences for following the rule. Similarly, behavior identified as *"tracking,"* can only be tracking if the listener is under the control of the direct contacted *"natural "* (or *"nonsocial"*) contingencies (Hayes & Hayes, 1994). Thus, given that ply and track rules are exclusively defined in terms of their correspondence to pliance and tracking, rule-dimensions in plys and tracks cannot be identified nor manipulated (i.e., as independent variables)--independently of the specific behavior of the listener. This posits serious problems for an experimental situation, where the types of rules to be studied must be defined first. In such circular cases, an investigator would be unable to isolate and define a priori a rule and its dimensions for the purpose of experimental manipulations.

We have excluded Skinner's *mand* and *tact* from our rule taxonomy for similar reasons. A "tact" is a verbal operant in which a listener's response, of given form, is evoked or strengthened by a particular object or event or its properties (Skinner 1957, pp. 81-146). A "mand" is a verbal operant in which the listener's response is under the control of conditions of reinforcement in the speaker (e.g., relevant conditions of deprivation or aversive stimulation) and of antecedents indicating an availability of relevant consequences (pp. 35-51). Therefore, just like plys and tracks, mands and tacts are defined exclusively in terms of the listener's responses--these types of rules can not be properly identified *a priori* or independently of the history of the listener.

Another distinction made in the literature is that between *normative* and *normal* rules (Reese, 1989; Reese & Fremouw, 1984). A normative rule represents a prescription referring to what should be, a specification of the way one "ought" to behave. Normal rules, conversely, as mathematical equations or chemical formulas, commonly express relationships or laws. Normal laws do not specify a particular contingency or behavior for the listener to emit. In our analysis, we are only concerned with normative rules. Normal rules are not considered due to their lack of contingency specification and their dismissal of the listener's behavior, both necessary conditions in our taxonomy.

CONCLUSION

We offered a classification of 16 types of rules derived from four dimensions (i.e., explicitness, accuracy, complexity, and source) and their differential effects on listeners' behavior. Even though we assume a functional co-dependence between rules and rule-governed behavior, the taxonomy requires a separate analysis of the contingencies specified in the rule and of those related to the rule-following behavior. In studying the control that a rule exerts on rule-following behavior, one must first adequately define and identify separately the rule and the rule-following behavior. In studying behavioral development, when analyzing the various effects each rule exerts on the listener's behavior, one must consider the four dimensions of rule, the contingency history of the listener, and the context within which the rule is provided. Even though manipulations of some types of rules have been conducted in studies of self-instruction, relational frames, and derived relations, we believe that a more systematic study of the differential effects of the proposed four dimensions of rules on the listener's behavior is needed.

REFERENCES

Buskist, W. F., & Miller, H. L. (1986). Interaction between rules and contingencies in the control of human fixed-interval performance. *The Psychological Record, 36*, 109-116.

Catania, A. C. (1985). Rule-governed behavior and the origins of language. In C. F. Lowe, M. Richelle, D. E. Blackman, & C. M. Bradshaw (Eds.), *Behavior analysis and contemporary psychology* (pp. 135-156). London: Erlbaum.

Catania, A. C. (1998). *Learning* (4th ed). Upper Saddle River, NJ: Prentice Hall.

Catania, A. C., Matthews, B. A., & Shimoff, E. (1982). Instructed versus shaped human verbal behavior: Interactions with nonverbal responding. *Journal of the Experimental Analysis of Behavior, 38*, 233-248.

Catania, A. C., Shimoff, E., & Matthews, B. A. (1989). An experimental analysis of rule-governed behavior. In S. C. Hayes (Ed.), *Rule-governed behavior: Cognition, contingencies and instructional control* (pp. 119-152). New York: Plenum Press.

Cerutti, D. T. (1989). Discrimination theory of rule-governed behavior. *Journal of the Experimental Analysis of Behavior, 51*, 259-276.

Chomsky, N. (1980). *Rules and representations*. New York: Columbia University Press.

Crooks, N., Peláez-Nogueras, M., Gewirtz, J. L., Markham, M., & Galindo, J. (1998, May). *Contingent-relations description facilitates rule following in a generalization task*. Presented at the Experimental Analysis of Behavior session

of the annual meeting of the Association for Behavior Analysis, Orlando, Fl.

Degrandpre, R. J., & Buskist, W. F. (1991). Effects of accuracy of instructions on human behavior. *The Psychological Record, 41*, 371-384.

Dixon, M. R., & Hayes, L. J. (1998). Effects of differing instructional histories on the resurgence of rule-following. *The Psychological Record, 48*, 275-292.

Galizio, M. (1979). Contingency-shaped and rule-governed behavior: Instructional control of human loss avoidance. *Journal of the Experimental Analysis of Behavior, 51*, 53-70.

Hayes, S. (1991). A relational control theory of stimulus equivalence. In L. J. Hayes & P. N. Chase (Eds.), *Dialogues on verbal behavior* (pp. 19-40). Reno, NV: Context Press.

Hayes, S. C. & Hayes, L. J. (1992). Verbal relations and the evolution of behavior analysis. *American Psychologist, 47*, 1383-1395.

Hayes, S. C., & Hayes, G. J. (1994). Stages of moral development as stages of rule-governance. In L. H. Hayes, G. J. Hayes, S. C. Moore, & P. M. Ghezzi (Eds.), *Ethical issues in developmental disabilities*, (pp. 45-65). Reno, NV: Context Press.

Hineline, P. N., & Wanchisen, B. A. (1989). Correlated hypothesizing and the distinction between contingency-shaped and rule-governed behavior. In S. C. Hayes (Ed.), *Rule-governed behavior: Cognition, contingencies and instructional control* (pp. 221-268). New York: Plenum Press.

Kantor, J. R. (1924/1926). *Principles of psychology*. (Vol 1 and 2). Chicago: Principia Press.

Kohlberg, L. (1969). Stage and sequence: The cognitive developmental approach to socialization. In D. A. Goslin (Ed.), *Handbook of socialization theory and research* (pp. 347-480). Chicago: Rand McNally.

Martínez, H., González, A., Ortiz, G., & Carrillo, K. (in press). Aplicación de un modelo de covariación al análisis de las ejecuciones de sujetos humanos en condiciones de entrenamiento y de transferencia. *Revista Latinoamericana de Psicología.*

Martínez, H., Moreno, R., Ortiz, G., & Carrillo, K. (in press). Eficiencia en la ejecución: Una aplicación del modelo de covariación. *Revista de Psicología y Ciencia Social.*

Martínez, H., & Ribes, E. (1996). Interactions of contingencies and instructional history on conditional discrimination. *The Psychological Record, 46*, 301-318.

Michael, J. (1982). Distinguishing between discriminative and motivational functions of stimuli. *Journal of the Experimental Analysis of Behavior, 37*, 149-155.

Michel, R. L., & Bernstein, D. J. (1991). Transient effects of acquisition history on generalization in a matching to sample task. *Journal of the Experimental Analysis of Behavior, 56*, 155-166.

Morris, E. K. (1988). Contextualism: The world view of behavior analysis. *Journal of Experimental Child Psychology, 46*, 289-323.

Morris, E. K. (1993). Behavior analysis and mechanism: One is not the other. *The Behavior Analyst, 16*, 25-43.

Piaget, J. (1932). *The moral judgment of the child* (M. Gabain, Trans.). London:

Routledge & Kegan Paul.

Peláez-Nogueras, M. (1994). Contextualism in behavior analysis of development: Upon further reflection. *Behavioral Development, 4*, 8-12.

Peláez-Nogueras, M., & Gewirtz, J. L. (1995). The learning of moral behavior: A behavior-analytic approach. In W. M. Kurtines & J. L. Gewirtz (Eds.), *Moral behavior: An introduction* (pp. 173-199). Boston: Allyn & Bacon.

Peláez, M., Moreno, R., Martínez, R., Trigo, E., & Qiang, A. (in review). The function of self-verbalized rules on transfer learning in a higher-order conditional-discrimination task.

Reese, H. W. (1989). Rules and rule-governance: Cognitive and behavioristic views. In S. C. Hayes (Ed.), *Rule-governed behavior: Cognition, contingencies, and instructional control*, (pp. 3-84). New York: Plenum Press.

Reese, H. W., & Fremouw, W. J. (1984). Normal and normative ethics in behavioral sciences. *American Psychologist, 39*, 863-876.

Ribes, E. (1992). Some thoughts on thinking and its motivation. In S. C. Hayes & L. J. Hayes (Eds.), *Understanding verbal relations* (pp. 211-224). Reno, NV: Context Press.

Ribes, E., & López, F. (1985). *Teoría de la conducta*. Trillas: México.

Sidman, M. (1986). Functional analysis of emergent verbal classes. In T. Thompson & M. D. Zeiler (Eds.), *Analysis and integration of behavioral units* (pp 93-114). Hillsdale, NJ: Erlbaum.

Skinner, B. F. (1953). *Science and human behavior*. New York: Macmillan.

Skinner, B. F. (1957). *Verbal behavior*. Englewoods Cliffs, NJ: Prentice-Hall.

Skinner, B. F. (1966). An operant analysis of problem solving. In B. Kleinmuntz (Ed.), *Problem solving: Research, method and theory*. New York: Wiley.

Skinner, B. F. (1969). *Contingencies of reinforcement: A theoretical analysis*. New York: Appleton-Century-Crofts.

Skinner, B. F. (1989). The behavior of the listener. In S. C. Hayes (Ed.), *Rule-governed behavior: Cognition, contingencies, and instructional control* (pp. 85-96). NY: Plenum Press.

Trigo, E. (1998). Tareas experimentales de prueba de hipótesis: Estrategias de diseño en la tarea de selección. Dissertation manuscript. University of Seville Library, Spain.

Trigo, E., Martínez, R., & Moreno, R. (1995). Rule performance and generalization in a matching-to-sample task. *The Psychological Record, 45*, 223-240.

Vaughan, M. (1989). Rule-governed behavior in behavior analysis: A theoretical and experimental history. In S. C. Hayes (Ed.), *Rule-governed behavior: Cognition, contingencies, and instructional control* (pp. 97-118). New York: Plenum Press.

Verplanck, W. S. (1992). Verbal concept "mediators" as simple operants. *The Analysis of Verbal Behavior, 10*, 45-68.

Zettle, R. D., & Hayes, S. C. (1982). Rule governed behavior: A potential theoretical framework for cognitive-behavior therapy. In P. C. Kendall (Ed.), *Advances in cognitive-behavioral research and therapy* (Vol. 1, pp. 73-118). New York: Academic Press.