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Relational frame theory and the experimental analysis of human sexuality

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Abstract

Behavior analysts have not been particularly active in the experimental analysis of human sexual behavior. This may be because the complexity of human sexuality suggests that it defies a molecular empirical analysis. Recent developments in the experimental analysis of complex behavior and language, however, have opened the way for a modern behavior-analytic research program into human sexual conduct. The present article outlines the most important of these recent developments and illustrates how, at the Cork laboratory, advances in the study of arbitrarily applicable relational responding have been harnessed to form the basis of a modern behavior-analytic treatment of human sexuality.

Key words: Human sexuality, Relational frame theory, Derived transformation of functions

The Sexual Revolution

References to behavior-analytic findings in the field of human sexual behavior are sparse, receiving mere token mention in many major clinical psychology texts. This was not always the case, however. The 1960s witnessed not only a sexual revolution in the private lives of individuals but also in the laboratories of behavioral psychologists. During this time, a number of behavior-analytic researchers were actively investigating the psychological processes by virtue of which previously nonsexual stimuli might acquire sexual functions, thereby giving rise to sexual fetishism (e.g., sexual attraction to shoes, hair, hands, leather, fur; see LoPiccolo, 1994). Perhaps most notably, Rachman (1966) reported the first laboratory induced fetish in a group of male volunteers. By pairing slides of nude females with slides of female boots, Rachman established a conditioned sexual response to the images of female boots alone. Previous research had produced earlier demonstrations of sexual conditioning using abstract stimuli (e.g., Lovibond, 1963), but Rachman's laboratory demonstration of the acquisition of sexual stimulus functions in a shoe apparently struck a chord with the sex research community. Further studies replicated these findings, both with female boots and shoes Rachman & Hodgson, 1968) and abstract stimuli such as red circles (McConaghy, 1970).

These early, basic behavior-analytic studies appeared promising, but within a decade of research leading sex researchers (e.g., Bancroft, 1969; McConaghy, 1969) were persuaded that conditioned sexual responses to experimental stimuli were simply too weak to serve as realistic experimental analogues of fetishistic behavior in the world outside the laboratory. In effect, these early "Pavlovian" demonstrations simply did not capture the strength and complexity of fetishes in a naturalistic setting.[1] Perhaps for this reason little has been done to supplement this early research (Laws & Marshall, 1990; LoPiccolo, 1994), with the result that experimental behavior analyses of human sexuality have almost entirely ceased (Quinsey & Marshall, 1983; but see Grey & Barnes, 1996).

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[1]Behavioral sex research has rarely extended to operant analyses and none of the studies conducted within an operant framework appear to constitute basic laboratory research. One group of researchers (Quinn, Harbison, & McAllister, 1970), however, did report the shaping of erectile responses to slides of nude females in a group of homosexual males. This unique research suggested that erectile responses are susceptible to reinforcement, although no follow-up studies appear to have been conducted.

The early research outlined above has not led to a satisfactory understanding of the acquisition of sexual stimulus functions, much less provided insight into more complex phenomena such as how sexual functions, once established in stimuli, might develop and transfer to other stimuli as a result of an individual's interaction with the broader culture. We believe, however, that recent developments in behavior analysis, and in particular the study of what we call *derived relational responding,* may have important implications for the experimental analysis of human sexuality. In the following section, therefore, we outline the concept of derived relational responding. Then, in the remainder of the article we will describe three different relational-responding studies, each of which we believe provide new insights into various dimensions of human sexuality.

Before going any further, however, we would like to emphasize one critical caveat. Although our research is clearly concerned with developing an "experienced-based" account of human sexuality, we do not take the view that evolutionary and biological variables are irrelevant to an understanding of human sexual behaviors (see Lalumiere & Quinsey, 1996; Quinsey & Lalumiere, 1995). At the present time, however, our primary concern is to identify and analyze the basic behavioral processes involved in a range of human sexual activities. We therefore readily accept that a relatively complete behavior-analytic account of human sexuality would incorporate a role for evolutionary and biological variables. Although such an account represents another day's work, we strongly suggest that the interested reader refer to a recent article by Daryl Bem (1996) for an excellent example of the way in which evolutionary and biological variables may be incorporated into an "experienced-based" account of sexual orientation. We also recommend Morris (1992) for an excellent description of how evolutionary and biological variables are inherent in all behavior-analytic accounts of psychological phenomena.

Derived Relational Responding

Over the last 26 years an increasing number of behavior analysts have been developing experimental preparations that generate "novel" or untrained behavior under laboratory conditions. This novel behavior is typically studied using a "matching-to-sample" format to teach conditional discriminations among stimuli. For example, one of three "sample" stimuli is presented to a subject along with each of three "comparison" stimuli. The samples and comparisons may take the form of nonsense syllables, abstract shapes, or any stimulus event, with the sole restriction that samples and comparisons do not bear any consistent relationship to each other along a physical dimension (e.g., size, color). As is customary in the discussion of derived relational responding, we will refer to samples and comparisons using alphanumeric labels. A typical equivalence-training procedure might involve reinforcing the selection of comparisons B1, B2, and B3 in the presence of samples A1, A2, and A3, respectively, and reinforcing the selection of C1, C2, and C3 in the presence B1, B2, and B3, respectively. What is interesting about this preparation is that given the foregoing training, verbally able humans often spontaneously reverse the trained relations (i.e., they match A1, A2, and A3 to B1, B2, and B3, respectively, and match B1, B2, and B3 to C1, C2, and C3, respectively). When this occurs, derived symmetrical stimulus relations have been produced. In addition, subjects also often respond in accordance with derived transitive stimulus relations without any additional training (i.e., they will match C1, C2, and C3 to A1, A2, and A3, respectively). When both symmetry and transitivity emerge for a set of stimuli, the stimuli involved are said to participate in an equivalence relation (Sidman, 1990, 1992; see also Barnes, 1994; Fields, Adams, Verhave, & Newman, 1990). The reader should note that there are many variations on the training-and-testing design previously described. For example, rather than training A–B and B–C relations, some experiments have involved training A–B and A–C, and then testing for B–C and C–B equivalence relations (these relations are defined as equivalence because they combine both symmetry and transitivity).

Other novel or derived performances have also been generated using stimulus-equivalence procedures. For example, when a simple discriminative function is trained to one stimulus in an equivalence class, that function will often transfer to other stimuli in the class, in the absence of further explicit reinforcement. This derived transfer of function effect via equivalence relations has been demonstrated with discriminative (Barnes, Browne, Smeets, & Roche, 1995; Barnes & Keenan, 1993b; deRose, McIlvane, Dube, Galpin, & Stoddard, 1988; Gatch & Osborne, 1989; B. S. Kohlenberg, Hayes, & Hayes, 1991; Wulfert & Hayes, 1988), consequential (Hayes, Devany, Kohlenberg, Brownstein, & Shelby, 1987; Hayes, Kohlenberg, & Hayes, 1991), and respondent stimulus functions (Dougher, Auguston, Markham, Greenway, & Wulfert, 1994; Roche & Barnes, in press). In the study reported by Barnes, Browne, et al. (1995), for example, children were first trained in the following four stimulus relations; A1–B1, A2–B2, A1–C1, A2–C2. Each subject was then tested for equivalence responding (B1–C1 and B2–C2), and if he or she passed this test a stimulus from each equivalence relation was then given a distinct, simple discriminative function; in the presence of B1 clapping was reinforced, and in the presence of B2 waving was reinforced. During a subsequent test, the discriminative functions assigned to the B1 and B2 stimuli transferred in accordance with equivalence relations to the C1 and C2 stimuli, in the absence of differential consequences for either clapping or waving (i.e., B1→clap transferred to C1→clap, and B2→wave transferred to C2→wave).

Stimulus equivalence and derived transfer effects are not readily predicted using traditional behavioral concepts. In

respondent- (i.e., classical) conditioning preparations, for example, a conditioned stimulus (CS) predicts the onset of an unconditioned stimulus (UCS) and thus acquires some of its functions. We do not usually expect the UCS to acquire the functions of the CS through backward conditioning, however. In effect, in respondent conditioning the CS–UCS relation is *unidirectional.* In contrast, the relations between samples and comparisons in the equivalence preparation become *bidirectional* following training in one direction only (i.e., see sample → pick comparison generates see comparison → pick sample).

For the greatest part, equivalence and derived transfer are interesting because they appear to parallel many natural language phenomena, including, for example, naming behaviors. In the words of Hayes, Gifford, and Ruckstuhl (1996),

> If a child of sufficient verbal abilities is taught to point to a particular object given a particular written word, the child may point to the word given the object without specific training to do so. In an equivalence-type example, given training in the spoken word "candy" and actual candy, and between the written word CANDY and the spoken word "candy," a child will identify the written word CANDY as in an equivalence class with "candy," even though this performance has never actually been trained. In naming tasks, symmetry and transitivity between written words, spoken words, pictures, and objects are commonplace. (p. 285)

Furthermore, research indicates that the derivation of stimulus relations, such as equivalence, is related to verbal competence (Barnes, McCullagh, & Keenan, 1990; Devany, Hayes, & Nelson, 1986), and that equivalence-training procedures can be used effectively to teach reading skills (de Rose, de Souza, Rossito, & de Rose, 1992). To many behavioral researchers, therefore, the equivalence effect represents an empirical analogue of the symbolic properties of natural language (e.g., Barnes, 1994, 1996; Barnes, Browne, et al., 1995; Barnes & Hampson, 1993a, 1993b, in press; Barnes & Holmes, 1991; Barnes et al., 1990; Barnes, Lawlor, Smeets, & Roche, 1995; Barnes & Roche, 1996; Barnes, Smeets, & Leader, 1996; Biglan, 1995; Chase & Danforth, 1991; Dymond & Barnes, 1994, 1995, 1996; Hayes, 1991; Hayes et al., 1996; Hayes & Hayes, 1989; Lipkens, 1992; Lipkens, Hayes, & Hayes, 1993; Steele & Hayes, 1991; Watt, Keenan, Barnes, & Cairns, 1991).

Despite the fact that the equivalence effect has created considerable excitement within the behavior-analytic community, it is also the case that equivalence is merely a description of a set of procedures and a particular behavioral outcome; it does not suffice as an explanation for the effect to which it refers. In our research program, therefore, we have adopted the concepts and some of the procedures of relational frame theory (RFT). As outlined below, this theory aims to explain equivalence and other related effects, and also views these phenomena as having important implications for a behavior-analytic approach to the study of human language (Barnes, 1994; Barnes & Holmes, 1991; Barnes & Roche, 1996; Hayes, 1991, Hayes & Hayes, 1989).

Relational Frame Theory

RFT explains equivalence, and derived relational responding more generally, by drawing on two rather familiar ideas in behavioral psychology. The first of these is that a functional behavioral class cannot be defined in terms of a particular response topography. For example, a dog may press a lever with its front paw, back paw, nose, tail, or even by sneezing or coughing on it if the lever is sensitive enough. All of these response forms may thus become members of the same functional class. For the behavior analyst, therefore, class membership is defined by the functional relations obtained between responding and its antecedents and consequences, and thus the responses participating in any given class may take on an infinite variety of forms.

The concept of a response class with an infinite variety of forms is a defining feature of operant behavior. Nevertheless, topographical and functional classes of behavior–environment interactions often overlap, and thus the two may be confused. Lever pressing, for example, may be defined by the effect of activity on the lever, but in fact the vast majority of lever presses involve "pressing" movements. A sensitive lever might be deflected by sneezing or coughing, but for all practical purposes these can be ignored. Sometimes, however, the independence between topographical and functional classes is more obvious. The concept of generalized imitation (Baer, Peterson, & Sherman, 1967; Gewirtz & Stengle, 1968) provides a good example. Once a young child is taught a generalized imitative repertoire, an almost infinite number of response topographies can be substituted for the topographies used in the initial training. The behavior of imitating, therefore, is generalized in the sense that it is not limited to any particular response topography. Similarly, behavioral researchers have suggested that it is possible to reinforce "generalized attending" (McIlvane, Dube, & Callahan, 1995; McIlvane, Dube, Kledaras, Iennaco, & Stoddard, 1990), even though *what* is being attended to will vary.

Although these and other examples (see Neuringer, 1986; Pryor, Haag, & O'Reilly, 1969) represent a simple extension of the three-term contingency (stimulus–response–consequence) as an analytic unit, qualifiers are normally added when classes are not easily defined topographically; that is, the class is said to be "generalized," "higher order," or "overarching." These qualifiers are not technical terms or concepts—no additional mediational process leads to the formation of operants of this type. Rather, these qualifiers highlight that a particular functional class cannot be defined by its response forms, a fact that is true in principle of functional classes more generally. As we shall see, RFT

draws heavily on this idea of a functionally defined, generalized operant class.

The second feature of RFT is a relatively simple extension of the fact that organisms can respond to relations among events. The study of such responding has a long and venerable history in behavior analysis, but the vast majority of work has focused on responding that is based on the formal properties of the related events. For instance, mammals, birds, and even insects can readily be trained to select a stimulus as the dimmest of several options (see Reese, 1968, for a relevant review). In effect, the behavior of complex organisms may be brought under the stimulus control of a specific property of a stimulus relationship along a formal stimulus dimension. RFT suggests that this idea of relational responding may be extended to situations in which responding is brought under the contextual control of aspects of the situation other than the formal properties of the related events.

For illustrative purposes, imagine a young child who is taught to respond to questions such as "Which cup has more milk?" or "Which box has more toys?" If a relational response can come under the control of situational features other than the actual relative quantities, it could be *arbitrarily applied* to other events when the formal properties of the related events do not occasion the relational response—for example, "x is more than y." In this case, the relational response may be controlled by cues such as the words "more than" rather than by the relative physical sizes of the letters. But how does a relational response come to be arbitrarily applied?

According to RFT, arbitrarily applicable relational responding is normally produced, in part, by an appropriate history of multiple exemplar training (see Barnes, 1994, 1996; Barnes & Holmes, 1991; Barnes & Roche, 1996; Hayes, 1991, 1994; Hayes & Hayes, 1989). Learning to name objects and events in the world represents one of the earliest and most important forms of arbitrarily applicable relational responding. For example, parents often say the name of an object in the presence of their young child and then reinforce any orienting response that occurs toward the named object. This interaction may be described as hear name A → look at object B. Parents also often present an object to their young child and then model and reinforce an appropriate "tact" (Skinner, 1957). This interaction may be described as see object B → hear and say name A (see Barnes, 1994, for a detailed discussion). Initially, each interaction may require explicit reinforcement for it to become firmly established in the behavioral repertoire of the child, but after a number of name–object and object–name exemplars have been trained, the generalized, operant response class of derived "naming" is established. In effect, the multiple-exemplar training gradually establishes specific contextual cues as discriminative for the derived naming response. Suppose, for example, a child with this multiple exemplar naming history is told "This is your shoe." Contextual cues, such as the word "is" and the naming context more generally, will now be discriminative for symmetrical responding between the name and the object. In the absence of further training, for example, the child will now point to the shoe when asked "Where is your shoe?" (name A → object B) and will utter "shoe" when presented with the shoe and asked "What is this?" (object B → name A).

RFT suggests that arbitrarily applicable relational responding may be brought to bear on any stimuli, given appropriate contextual cues, and furthermore RFT explains stimulus equivalence as an instance of such relational responding. For example, when the generalized operant of derived naming is established in the behavioral repertoire of a young child, and he or she is then exposed to a matching-to-sample procedure, contextual cues provided by this procedure may be discriminative for equivalence responding. In fact, the matching-to-sample format itself may be a particularly powerful contextual cue for equivalence responding because it is often used in preschool education exercises to teach picture-to-word equivalence's (see Barnes, 1994, and Barnes & Roche, 1996, for detailed discussions). RFT therefore defines equivalence as a generalized operant-response class insofar as it emerges from a history of reinforcement with multiple exemplars, and once established any stimulus events, regardless of form, may participate in an equivalence relation.

As indicated earlier, RFT views stimulus equivalence and other related effects as having important implications for a behavior analysis of human language. Consider the following example. Suppose that a young child on hearing that she is going on a "boat" (Stimulus A), subsequently experiences a terrible bout of sea sickness. The child may then learn at school that a "car ferry" (Stimulus B) is a type of boat. Later, on hearing that she is going on a car ferry, the child may show signs of anxiety despite having had no direct experience with car ferries. This transfer-of-function effect is based on the behavioral function of A and the derived relation between A and B. In effect, the child does not need to experience the possibly aversive consequences of traveling on a car ferry in rough seas in order to show signs of anxiety (see Hayes & Hayes, 1989, 1992; Hayes & Wilson, 1994). This car ferry example illustrates one of the core assumptions of the relational frame account of verbal events. *That is, an event is rendered verbal by its participation in an equivalence or other type of derived relation* (examples of other types of derived relations will be outlined below). As we shall see at later points in the current article, this functional definition of verbal events has important implications for the experimental and conceptual analysis of human sexuality.

RFT also adopts the position that if equivalence can be viewed as a form of generalized operant behavior, then so too should other relational activities, such as responding in

accordance with the arbitrarily applicable relations of oppositeness, before/after, different, and so on. Indeed, several studies lend empirical support to this idea, thereby exponentially increasing the number of behavioral phenomena that might emerge from trained relational responding (e.g., Barnes & Hampson, 1993a; Barnes & Keenan, 1993; Dymond & Barnes, 1994; Roche & Barnes, in press; Steele & Hayes, 1991). Before we outline the first of these studies, however, it might be useful at this point to describe briefly the three defining characteristics of arbitrarily applicable relational responding. We need to do this because arbitrarily applicable relational responding requires unique defining characteristics to extend beyond those offered by equivalence researchers (e.g., symmetry, transitivity). For instance, the concept of symmetry readily captures the bidirectional nature of relations involving equivalent stimuli (e.g., if A is the same as B then B is the same as A). If A and B are related via a frame of comparison such that A is *greater than* B, however, it does not follow that B is greater than A (as required by "strict" symmetry), but rather that B is less than A. Because the concept of symmetry does not readily capture such effects, we need a broader nomenclature to describe a whole host of relations that may be derived between related stimuli.

Arbitrarily applicable relational responding is said to involve the following properties.

1. *Mutual entailment:* If a stimulus A is related to another stimulus B in a specified context, then a relation between B and A is entailed in that context. If the relation is one of equivalence (e.g., A is the same as B), then so too is the entailed relation (e.g., B is the same as A). Trained and entailed relations may be dissimilar, however. For instance, if A is *larger than* B, then a *smaller than* relation is entailed between B and A.
2. *Combinatorial entailment:* If a stimulus A bears some relation to B, and B bears a relation to another stimulus C, then a relation is entailed between A and C and another between C and A. For example, if A is *before* B, and B is *before* C, then a *before* relation is entailed between A and C, and an *after* relation is entailed between C and A. Mutually entailed relations may differ in their specificity. For instance, if A is different to B and B is different to C, then the entailed relations between A and C and between C and A are unspecified (i.e., A and C may be the same as or different from one another).
3. *Transformation of stimulus functions:* If stimuli A and B are in a relation, and stimulus A has some psychological function, then in a context that selects specific stimulus functions of A as psychologically relevant, the stimulus functions of B will be transformed in accordance with this relation. For example, if a subject is taught that a stimulus A is *less than* a stimulus B, which elicits fear, then we would expect that in some contexts stimulus A will elicit less fear than B. In effect, the functions of A and B differ in a manner determined by the nature of the relation that obtains between them.

The reader should note that when functions transform in accordance with equivalence relations, the term *transfer* is often used, rather than transformation (e.g., Barnes & Keenan, 1993). For illustrative purposes consider the following. If stimuli A and B participate in an equivalence relation and a sexually arousing function is established in B, the previously neutral function of A may be transformed in accordance with this relation, such that A also acquires a sexually arousing function. In this case, however, it would also be acceptable to say that the sexual function of B *transfers* to A (see Dymond & Barnes, 1995, 1996). Although the term "transfer" is acceptable here, the term "transformation" is generic to RFT because functions do not, strictly speaking, transfer in accordance with nonequivalence relations. If, for example, A is opposite to B, we would not expect a sexual-arousal function in B to transfer to A. Rather, the function of A would be transformed in accordance with the opposite relation, such that it may *reduce* sexual arousal. For this reason, relational frame theorists generally use the term "transformation."

Arbitrarily applicable relational responding, therefore, is characterized by patterns of responding involving mutual entailment, combinatorial entailment, and the transformation of stimulus functions. The first systematic empirical analysis of RFT was reported in 1991 by David Steele and Steven Hayes. In their study they examined the possibility that human teenage subjects could be trained and tested for responding in accordance with the three arbitrarily applicable relations of coordination (i.e., equivalence), opposition, and difference. Subjects were trained to relate same stimuli (e.g., a large line with a large line) in the presence of one contextual cue, opposite stimuli (e.g., a large line with a small line) in the presence of a second contextual cue, and different stimuli (e.g., a small line with an oval) in the presence of a third contextual cue. In this way the contextual control functions of SAME, OPPOSITE, and DIFFERENT were established for each of three abstract stimuli.

Subjects were then trained and tested in a number of related conditional discriminations, with each discrimination being made in the presence of one of the three contextual cues (this part of the experiment was particularly complex, and thus a schematic representation of the trained and tested relations are presented in Figure 1). There were six trained relations, and these were as follows; [S] A1/*B1*–B2–B3, [S] A1/*C1*–C2–C3, [O] A1/B1–B2–*B3,* [O] A1/C1–C2–*C3,* [D] A1/B1–*B2,* [D] A1/C1–*C2.* The letters S, O, and D represent the visual forms that had been

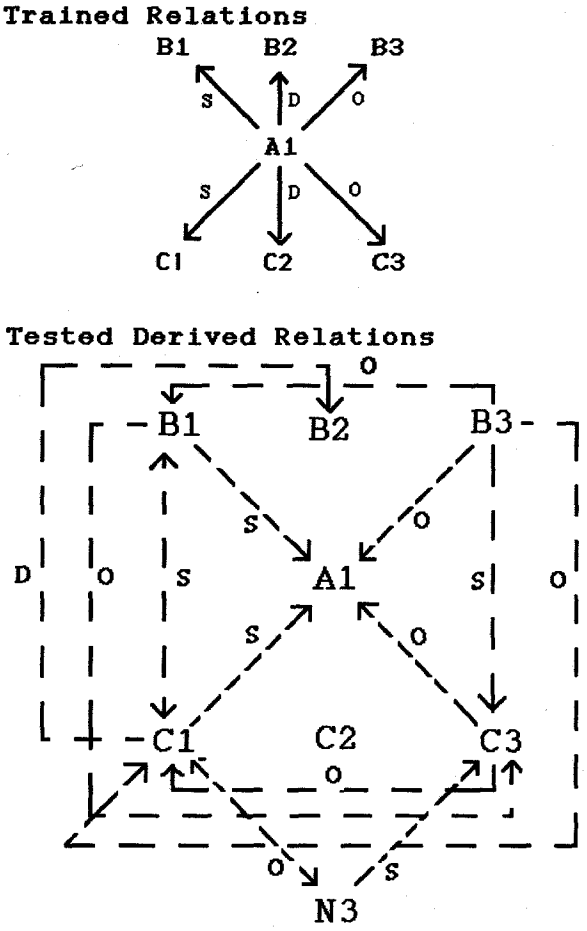


Figure 1. Schematic representation of trained and tested relations from Steele and Hayes (1991). Solid lines represent trained relations (upper panel), and dashed lines represent derived relations (lower panel). Letters S, D, and O indicate contextual cues, SAME, DIFFERENT, and OPPOSITE, respectively.

established as SAME, OPPOSITE, and DIFFERENT contextual cues, respectively, during pretraining. A1 represents the sample, and the B and C stimuli represent the comparisons. Choosing B1 and C1 was always reinforced in the presence of the SAME stimulus, choosing the B3 and C3 stimuli was always reinforced in the presence of the OPPOSITE stimulus, and choosing the B2 and C2 stimuli was always reinforced in the presence of the DIFFERENT stimulus (reinforced comparisons are italicized). For illustrative purposes, now consider three of the 15 tasks that were used to test for derived responding; [S] B1/C1–C2–C3, [S] B3/C1–C2–C3, [D] C1/B1–B2–N3 (N3 was a novel stimulus that had not be presented during the training). Subjects chose C1, C3, and B2, respectively on these tasks, indicating that the relational frames of coordination, opposition, and distinction had been brought to bear (i.e., if B1 and C1 are the same as A1, then B1 and C1 are the same; if B3 and C3 are opposite to A1 then B3 and C3 are the same; if B2 is different from A1, and C1 is the same as A1, then B2 is also different from C1). More recent research has replicated and considerably extended this initial study (e.g., Dymond & Barnes, 1995, 1996; Roche & Barnes, 1996).

Analyzing Social Categories

Having outlined the concepts and some of the procedures of RFT, and having provided some empirical evidence that human subjects may respond in accordance with a variety of derived stimulus relations, we may now proceed to examine the utility of RFT in the analysis of sexual behavior. The earliest study to use the concept of derived relational responding to examine behavior in a social context used a simple equivalence-type paradigm to investigate social categorization in the context of the "Troubles" in Northern Ireland (Watt et al., 1991). These researchers exploited the fact that people in Northern Ireland often respond to each others' names as discriminative for their religious backgrounds. During the study, Northern Irish and English subjects were trained to match three Catholic names to three nonsense syllables, and subsequently to match the three nonsense syllables to three traditionally Protestant symbols (i.e., the words "Union Jack," "Orange Order," and "Lambeg Drum"). During the test for derived relations, subjects were presented with Protestant symbols as samples; the comparisons were two of the Catholic names used during training and a novel Protestant name. All of the English subjects chose the Catholic name (related through equivalence to the Protestant symbols) but 12 of the 19 Northern Irish subjects choose the Protestant name in the presence of the Protestant symbols, thus failing to form laboratory-induced equivalence relations. On the basis of these findings, the researchers speculated that the social contingencies of reinforcement operating in Northern Ireland were responsible for the nonequivalence responding of the 12 Northern Irish subjects. In other words, the authors suggested that only the Northern Irish subjects had been socially trained to respond to Protestant symbols and Catholic names as belonging to socially exclusive (i.e., different or opposite) categories. If this interpretation of the findings is correct, this initial study showed that a person's prior history of social interaction may be revealed in the course of analyzing derived relational responding. This conclusion has also been supported in the context of sexual stereotyping and self-concept (Barnes, Lawlor, et al., 1995; B. S. Kohlenberg et al., 1991; Moxon, Keenan, & Hine, 1993).

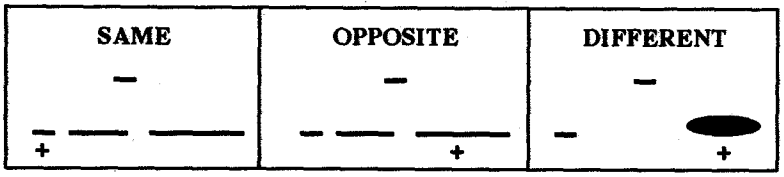
Although Watt et al. used the stimulus-equivalence paradigm with some success in the experimental analysis of human social behavior, these researchers also argued that the concept of equivalence alone may not readily capture the entire range of behavioral relations involved in human social categorization. Instead these researchers called for a relational frame analysis of social categorization that explicitly recognizes stimulus relations other than equivalence. Indeed, one of the most exciting aspects of RFT is the

breadth of complex behaviors that are captured by its concepts. For instance, insofar as the concepts of gender and sex-appropriate behavior are often spoken of in terms of "same" and "opposite" (e.g., "opposite sex", "same sex", "opposite orientation"; see S. L. Bem, 1993), relational frame procedures may be sensitive to a rich variety of sexual categories (e.g., stereotypes) operating in the verbal community. Thus, by facilitating the empirical investigation of a wide variety of socially established sexual categories in a laboratory setting, RFT may represent a step forward for the experimental analysis of human sexuality.

In the first part of one recent study we tested the idea that relational frame procedures are sensitive to preexperimentally established sexual relations (Roche & Barnes, 1996). Male and female undergraduate students attending University College, Cork were first exposed to relational pretraining as outlined by Steele and Hayes (1991), to establish the contextual control functions of SAME, OPPOSITE, and DIFFERENT in three abstract stimuli (Figure 2, upper panel). Before starting the pretraining, subjects were instructed that some images would soon appear on the computer screen before them, and that their task was to choose the left, middle, or right image by pressing the "Z," "V," or "M" key, respectively. If the subject's choice was correct, the screen cleared and "CORRECT" appeared on the screen accompanied by a beep from the computer. If the choice was incorrect, the screen cleared and the word "WRONG" appeared on the screen. After pretraining, a sexual categorization test was administered to see if subjects would categorize PENIS and VAGINA with DOMINATE, SUBMIT, and FORGET according to the relations specified by the SAME, DIFFERENT, and OPPOSITE contextual cues. No

Relational Pretraining

Explicit training across at least 3 problems of this type: Testing across 3 novel problems



Sexual Categorization Test: Contextual Control With Same, Opposite, and Different

60 Test trials (10 Exposures to Each Task)

SAME			DIFFERENT			OPPOSITE		
PENIS			PENIS			PENIS		
DOMINATE	FORGET	SUBMIT	DOMINATE	FORGET	SUBMIT	DOMINATE	FORGET	SUBMIT
+?	-?	-?	-?	+?	-?	-?	-?	+?
SAME			DIFFERENT			OPPOSITE		
VAGINA			VAGINA			VAGINA		
DOMINATE	FORGET	SUBMIT	DOMINATE	FORGET	SUBMIT	DOMINATE	FORGET	SUBMIT
-?	-?	+?	-?	+?	-?	+?	-?	-?

Figure 2. Diagrammatic representation of the training and testing tasks employed in relational pretraining and the sexual categorization test. Where question marks appear underneath comparisons, this indicates a test task. A "+" sign next to a question mark indicates a predicted choice, and a "−" sign next to a question mark indicates an unpredicted choice. (Question marks are omitted on those tasks that were directly trained.)

feedback (CORRECT or WRONG) was presented during this or any other test described in the current article. Specifically, PENIS was presented as a sample with DOMINATE, SUBMIT, and FORGET as comparisons in the presence of SAME, DIFFERENT, and OPPOSITE; and VAGINA was presented as a sample with DOMINATE, SUBMIT, and FORGET as comparisons in the presence of SAME, DIFFERENT, and OPPOSITE (see Figure 2, lower panel).

When the SAME contextual cue was present, all subjects reliably (i.e., at least 9 times out of 10) matched PENIS with DOMINATE and VAGINA with SUBMIT. In the presence of the OPPOSITE contextual cue subjects consistently matched PENIS with SUBMIT and VAGINA with DOMINATE. When presented with PENIS or VAGINA in the presence of the DIFFERENT contextual cue, subjects always chose FORGET. It would appear, therefore, that the relational test "tapped into" some rather robust sexual categories in operation in the verbal community.

At this point, some readers may be wondering why we did not simply use the actual words, "same," "different," and "opposite," instead of employing the relatively complex pretraining procedure. Two reasons are relevant here. First, the pretraining procedure provided us with more precise knowledge about the history of the subjects. Although it seems likely that English speakers will have been taught to use words such as "same," "different," and "opposite" in similar ways, the possibility that slightly different histories have become attached to these words is always possible. The Steele and Hayes pretraining procedure is one way in which to establish very similar histories for specific contextual cues. Second, using the pretraining procedure allowed us to test a key assumption of RFT; that human language often involves arbitrarily applicable relational responding, which is closely related to nonarbitrarily applicable relational responding (see Hayes, 1994). More specifically, RFT predicts that if a verbally able subject is provided with a particular history of nonarbitrarily applicable relational responding, such as the pretraining used by Steele and Hayes, it should be possible to use this history to produce predictable responding to words that occur in the subject's natural language. We wished to test this prediction, and thus we employed the Steele and Hayes pretraining procedure. If we had used "real" words as contextual cues, however, we could not be certain that the words had acquired their functions, at least in part, from a history of nonarbitrarily applicable relational responding, and thus we would have been left with a relatively weak test for RFT.

During the second part of our study we used the relational-frame procedures to model the process by which sexual categories may be extended and modified in the real world (Roche & Barnes, 1996). Specifically, subjects from the first part of the study were further trained (using CORRECT and WRONG feedback) to choose the words DOMINATE, FORGET, and SUBMIT, in the presence of the nonsense

Arbitrarily Applicable Relational Training and Testing

Training (Blocks of 60 Trials)

SAME			DIFFERENT			OPPOSITE		
S1			S1			S1		
X1	X2	X3	X1	X2	X3	X1	X2	X3
+	-	-	-	+	-	-	-	+

SAME			DIFFERENT			OPPOSITE		
S1			S1			S1		
DOM	FOR	SUB	DOM	FOR	SUB	DOM	FOR	SUB
+	-	-	-	+	-	-	-	+

Testing (Blocks of 60 Trials)

SAME				DIFFERENT				OPPOSITE			
PENIS				PENIS				PENIS			
X1	X2	X3	Q	X1	X2	X3	Q	X1	X2	X3	Q
+?	-?	-?	-?	-?	-?	-?	+?	-?	-?	+?	-?
SAME				DIFFERENT				OPPOSITE			
VAGINA				VAGINA				VAGINA			
X1	X2	X3	Q	X1	X2	X3	Q	X1	X2	X3	Q
-?	-?	+?	-?	-?	-?	-?	+?	+?	-?	-?	-?

Figure 3. Diagrammatic representation of the tasks employed in relational training and testing. (See Figure 2 caption for further details.)

syllable, S1, given the contextual cues SAME, DIFFERENT, and OPPOSITE, respectively (see Figure 3, upper panel). These subjects were also trained to choose the nonsense syllables X1, X2, and X3 in the presence of S1 given the contextual cues SAME, DIFFERENT, and OPPOSITE, respectively. The training tasks employed were as follows; SAME/S1–X1, SAME/S1–DOMINATE, DIFFERENT/S1–X2, DIFFERENT/S1–FORGET, OPPOSITE/S1–X3, OPPOSITE/S1–SUBMIT, where S1 was a nonsense syllable.

Subjects were then tested (i.e., no feedback) across six tasks to determine whether, in the presence of SAME, DIFFERENT, and OPPOSITE, they would categorize PENIS and VAGINA with X1, X2, and X3 according to the predicted relations (see Figure 3, lower panel). The reader should note, however, that S1 was never presented as a sample during testing. It was concluded, based on the authors' exposure to the prevailing Irish heterosexual culture, that the word PENIS should, for example, enter into an equivalence relation with S1 (i.e., subjects should respond according to the predicted socially established SAME/PENIS–DOMINATE relation, as well as the trained labora-

tory relation SAME/S1–DOMINATE). Therefore, the interaction of laboratory and socially established relations should control the categorization of the word "PENIS."

During testing, a fourth comparison was made available to the subjects. This was represented by a question mark, located at the bottom of the screen, underneath the other three comparisons. Immediately prior to the testing phase subjects were told to; "press the Q key if you think that none of the available choices are correct." This option was made available so that we could test the unspecified nature of the combined difference relations. Thus, for example, it was predicted that given PENIS or VAGINA as a sample, in the presence of DIFFERENT, subjects would identify the relation between X2 and FORGET as unspecified by choosing the question mark (i.e., if X2 and FORGET are both different from S1, then the relation between X2 and FORGET remains unspecified, and thus the relations between X2 and PENIS and X2 and VAGINA remain unknown). It was further predicted that during testing subjects should relate X1 with PENIS and X3 with VAGINA in the presence of SAME, but in the presence of OPPOSITE they should reverse these relations (i.e., X1 with VAGINA and X3 with PENIS). This test performance was predicted on the basis of the untested socially established relations between PENIS and VAGINA, and DOMINATE, FORGET, and SUBMIT, as well as the emergent, but untested, laboratory relations between DOMINATE, FORGET, and SUBMIT, and X1, X2, and X3.

Six of the 10 subjects consistently responded in accordance with all of the predicted relations. Specifically, these subjects matched PENIS with X1 and X3, and VAGINA with X3 and X1, in the presence of SAME and OPPOSITE, respectively. Furthermore, given PENIS or VAGINA as a sample, in the presence of DIFFERENT, subjects identified the relation between X2 and FORGET as unspecified by choosing the question mark. The remaining four subjects matched PENIS with X1 and X3, and VAGINA with X3 and X1, in the presence of SAME and OPPOSITE, respectively, as predicted. In the presence of DIFFERENT, however, these subjects selected X2, rather than the question mark (i.e., because both X2 and FORGET are different to S1, these subjects responded to X2 and FORGET as the same as each other and therefore to PENIS and VAGINA as different to X2).

These results demonstrate that relational responding can be brought under highly complex forms of contextual control. For instance, the choice of a question mark in the presence of DIFFERENT given PENIS and VAGINA, suggests that two difference relations (i.e., between X2 and S1 and Forget and S1) can be combined to form an unspecified relation (i.e., between X2 and FORGET). Furthermore, these data support the view that relational frame procedures can be used to analyze and extend verbal sexual relations in operation in the world outside the laboratory (e.g., the male penis is "dominant" and the female vagina is "submissive").

Interestingly, the current analysis may also have important implications for our understanding of human sexual behavior and dysfunction (we remind the reader that although the current analysis focuses on social and verbal contingencies, we do not dismiss an explanatory role for evolutionary and biological variables). For instance, a relational-frame view of human sexual behavior may shed some light on how the violence of sexual assault acquires reinforcing sexual functions for some men. Although men in our culture are not explicitly reinforced for raping, they do, however, live in a social/verbal culture in which gentle, caring, and submissive women often participate in a frame of coordination with sexual attraction (e.g., a common theme in childrens' fairy stories is the rescue of a beautiful damsel in distress by a knight in shining armor) (see Biglan, 1995; Guerin, 1994). Men and boys also participate in a social/verbal culture in which women often participate in frames of coordination with "not knowing their own minds," and "meaning 'yes' even when they say no" (see Bellof, 1992, Biglan, 1995, Guerin, 1994). Thus, women may fall into a frame of coordination with "weakness" and "must be controlled for their own good," and into a frame of opposition with "strength" and "must be taken seriously." Conceptualizing behavior in this way may help us to understand how rape (and other deviant sexual behaviors) can acquire sexually arousing stimulus functions in the absence of explicit reinforcement for the act of rape itself.

Although the foregoing analysis is clearly speculative, the experimental procedures did provide at least one way of tapping into and extending already existing social/sexual categories manifested in the behavior of young adult subjects. Of course, the study represents only the first of many that will be needed to develop a behavior-analytic methodology for measuring attitudes in a valid and reliable fashion. Nonetheless, in our opinion, the current data are sufficiently promising to warrant further investigation along similar lines.

Incongruous Verbal Categories and Sexual Stimulus Functions

Although the previous studies supported the use of relational frame theory in the analysis of specific dimensions of human sexuality, the use of real words as stimuli (e.g., PENIS, VAGINA) obscured precisely how the social/sexual functions of these words were established in the first instance. In effect, it is still unclear how stimuli acquire sexual functions in the real world, and perhaps more important, how these functions are then transformed by contacting the broader verbal community. Indeed, little or nothing is known of the relationship between sexual-stimulus functions that are established through direct experience and those that are established by the verbal community through codes of sexual practice and moral guidelines.

For instance, consider an individual who responds to condoms as sexual in an intellectual sense (i.e., knows that they are for use during sexual intercourse), but who dislikes wearing condoms in practice. In other words, at an intellectual level this person responds to condoms as sexual on the basis of information he has received from the broader culture, but at an emotional level condoms are seen as a "turn-off" (and thus he does not practice "safe sex"). What do we know, at a behavior-analytic level, about the psychological processes at work in instances such as this? A first step in understanding such processes might be to develop an appropriate laboratory analogue, so that we can systematically examine the key variables involved. We believe that we have developed such an analogue. The analogue involves exposing subjects to a matching-to-sample procedure that establishes a derived "verbal" equivalence relation between two nonsense syllables, A1 and C1. Incongruous "*emotional*" functions are then established in A1 and C1 by pairing presentations of A1 and C1 with sexual and nonsexual film clips, respectively. In a series of experiments outlined subsequently (see also Roche, Barnes, & Smeets, in press) we have examined the effects of this type of incongruous verbal/emotional training and we have attempted to gain control over the observed effects.

In Experiment 1, sexual film clips were paired with two nonsense syllables, A1 and C2, using film clips taken from a popular sex-instruction video. Similarly, nonsexual film clips were paired with two further nonsense syllables, A2 and C1, using film clips taken from a geographic documentary. To achieve this, subjects were seated alone in a small experimental room before a television monitor to which stimulus-pairing trials were relayed from a video machine located in an adjacent monitoring room. The A1, C2, A2, and C1 stimuli were presented in the center of the television screen. Each stimulus remained on the screen for 3 sec and was followed by a 5-sec interval during which the screen went dark. At the end of the 5-sec interval a sexual or nonsexual film clip was presented. The stimulus that appeared before the onset of the film clip also flashed periodically during the film clip in the top right corner of the screen. That is, once every 15 sec one of the nonsense syllables appeared on the screen for 1 sec and then disappeared for 0.2 sec before reappearing again for a further 1 sec (this stimulus flashing continued until the stimulus had appeared five times).

The film clips differed on every trial but were taken from the same sex-instruction video or nature documentary, respectively. Film clips varied from 45–60 sec in duration. The flashing stimuli, therefore, appeared three to four times during each film clip (i.e., every 15 sec). Intertrial intervals also varied from 45–60 sec. Subjects were exposed to 16 training trials (i.e., four exposures to each of A1, C2, A2, and C1), the order of which was randomized within and across subjects, with the restriction that neither stimulus could appear more than two times in succession. The stimulus-pairing phase of the experiment lasted approximately 30 min.

To begin matching-to-sample training, a subject was oriented toward the microcomputer on which all conditional discrimination trials were presented. Subjects were then instructed to look at the nonsense syllable at the top of the screen, and choose one of the nonsense syllables at the bottom by pressing one of the marked keys on the keyboard. The first sample-and-comparison stimuli were then presented, and remained on the screen until the subject pressed one of the marked keys on the computer keyboard. If the choice was defined as correct, the screen cleared and "CORRECT" appeared on the screen for 1.5 sec, accompanied by a beep from the computer; if the choice was defined as incorrect, the screen cleared and the word "WRONG" appeared on the screen for 1.5 sec. This feedback followed all training trials. The screen position of the comparison stimuli (i.e., left or right) was counterbalanced across trials.

There were four training trial types; choose B1 or B2 given A1 or A2, respectively, and choose C1 or C2 given B1 or B2, respectively. Under normal training-and-testing conditions we would expect such training to lead to the emergence of the novel relations C1–A1 and C2–A2 during an equivalence test. In this study, however, the matching-to-sample training competed with the stimulus-function training insofar as predicted emergent relations (e.g., C1–A1) contained members with opposing psychological functions (e.g., the stimulus-pairing procedure had previously established sexual and nonsexual functions in A1 and C1, respectively). In a further condition, subjects were first exposed to conditional discrimination training (i.e., A1–B1, B1–C1, A2–B2, B2–C2) and the matching-to-sample test before being exposed to the incongruous stimulus-pairing procedure (i.e., A1 and C2 were paired with sexual stimuli, A2 and C1 were paired with nonsexual stimuli) and the matching-to-sample test.

The matching-to-sample test phase (no feedback) served two purposes. First, it allowed us to probe for the transitive (i.e., A1–C1 and A2–C2) and combined symmetrical and transitive (i.e., C1–A1 and C2–A2) relations following conditional discrimination training. Second, following stimulus pairing, the matching-to-sample test probed for control by emotional functions (i.e., C2–A1 and C1–A2).

Results from Experiment 1 indicated that subjects' performances on the final matching-to-sample test were determined by the training and testing to which they were *first* exposed. Specifically, if a subject first passed conditional discrimination training and then produced equivalence relations on the matching-to-sample test, it was likely that this test performance would not be disrupted even following exposure to incongruous stimulus pairing. That is, subjects continued to match A1 with C1 and A2 with C2 based on equivalence relations irrespective of their distinct emotional functions (see Figure 4).

Similarly, if a subject first matched stimuli on the basis of his or her emotional/sexual functions on the matching-to-sample test, then this performance was unlikely to alter even following exposure to incongruous conditional discrimination training. In other words, subjects continued to match A1 with C2 and A2 with C1 on the basis of their similar emotional functions, irrespective of their possible participation in distinct equivalence relations (see Figure 4). In effect, once a response pattern was established during a matching-to-sample test, this performance was persistent even following exposure to incongruous training phases that we might otherwise expect to give rise to an alternative performance. Interestingly, results from a further experiment (Experiment 3) indicated that this persistence was apparent even following *repeated* exposure to incongruous training phases (see Figure 4).

Because subjects were both trained (i.e., stimulus pairings or conditional discriminations) and tested in Experiment 1 before incongruous training trials (i.e., conditional discriminations or stimulus pairings) were administered, it was unclear to what extent training and/or testing controlled the observed performances on the final matching-to-sample test. Experiment 2, however, demonstrated that subjects' performances on a matching-to-sample test following conditional discrimination training were unlikely to be affected by prior exposure to untested incongruous stimulus pairings. Similarly subjects' performances on a matching-to-sample test following stimulus pairing were unlikely to be affected by prior exposure to untested incongruous conditional discrimination training trials. In effect, bearing in mind the data obtained in Experiment 1, it appeared that persistent matching-to-sample test performances were not controlled by exposure to either conditional discrimination or stimulus pairing alone; persistent test performances only arose if subjects were first allowed to produce the derived relations on a matching-to-sample test *before* being exposed to the incongruous contingencies.

In Experiment 4, subjects were exposed to preliminary stimulus pairing and matching-to-sample testing, using novel stimuli, before being exposed to conditional discrimination training and testing followed by incongruous stimulus pairing and testing as used in Experiment 1. Further subjects were exposed to preliminary conditional discrimination training and testing, using novel stimuli, before being exposed to stimulus pairing and testing followed by incongruous conditional discrimination training and testing as used in Experiment 1. Data revealed that subjects provided with a history of stimulus pairing and testing were more likely to alter equivalence-based test performances when incongruous stimulus pairing and testing was introduced. Similarly, given a history of conditional discrimination training and testing, subjects were more likely to alter stimulus-pairing-based test performances when incongruous conditional discrimination training and testing was introduced.

We believe that these analogue studies may have important implications for our understanding of the formation and change of attitudes concerning sexuality. Specifically, a number of researchers (e.g., Moxon et al., 1993; Watt et al., 1991) have argued that social attitudes may be conceptualized usefully in terms of derived and explicitly reinforced stimulus relations (e.g., a negative attitude toward condom use could be seen as responding in accordance with an equivalence relation between actual condoms and descriptive terms such as "unromantic" and "disgusting"). Insofar as this interpretation is correct, the current data suggest that once an attitude has been formed (e.g., an equivalence relation between "condoms" and "turn-off"), this relation may persist, despite personal experiences that we might otherwise expect to militate against such attitudes (e.g., seeing an advertisement for an acquired immunodeficiency syndrome (AIDS) awareness campaign). This is a disconcerting finding to say the least. Interestingly, however, Experiment 4 of the foregoing study suggests a means by which we might disrupt such persistent attitudes. Consider, once again, the procedure employed in Experiment 4.

In Experiment 4, some of the subjects were exposed to a history of responding in accordance with two equivalence relations that were unrelated to subsequent training and testing phases. These subjects were then exposed to stimulus-pairing and matching-to-sample testing. All subjects responded to the test by matching samples and comparisons on the basis of their common sexual and nonsexual functions. Finally, the subjects were exposed to incongruous conditional discrimination training, after which they now shifted their stimulus-pairing-based performance to one based on derived equivalence relations. In effect, given the data from Experiments 1 and 3, it appears that the subjects' test performances were "loosened up" or sensitized to new learning experiences by the provision of pretraining resembling that to which response patterns might later be resistant.

Although Experiment 4 appeared to rely on obtaining control over subjects' matching-to-sample test performances before persistent test performances could emerge, the experiment suggests means by which we might control already-established persistent attitudes. For example, consider a man who has learned from his peers that "real men don't use condoms." As Experiment 3 of the current study would suggest, the attempts of a community worker to attack this man's attitude by *repeatedly* contradicting him (e.g., insisting that real men do use condoms or introducing him to individuals who have succumbed to the AIDS virus through unsafe sex) may do little to alter his attitude toward condom use. As Experiment 4 would suggest, the negative attitude toward condoms persists because the individual in question has no history of reinforcement for responding in accordance with any statement made by the community worker.

Experiment 4, however, does indicate two ways in which we might help "sensitize" a person's attitudes to information that contradicts an already established attitude. First, we

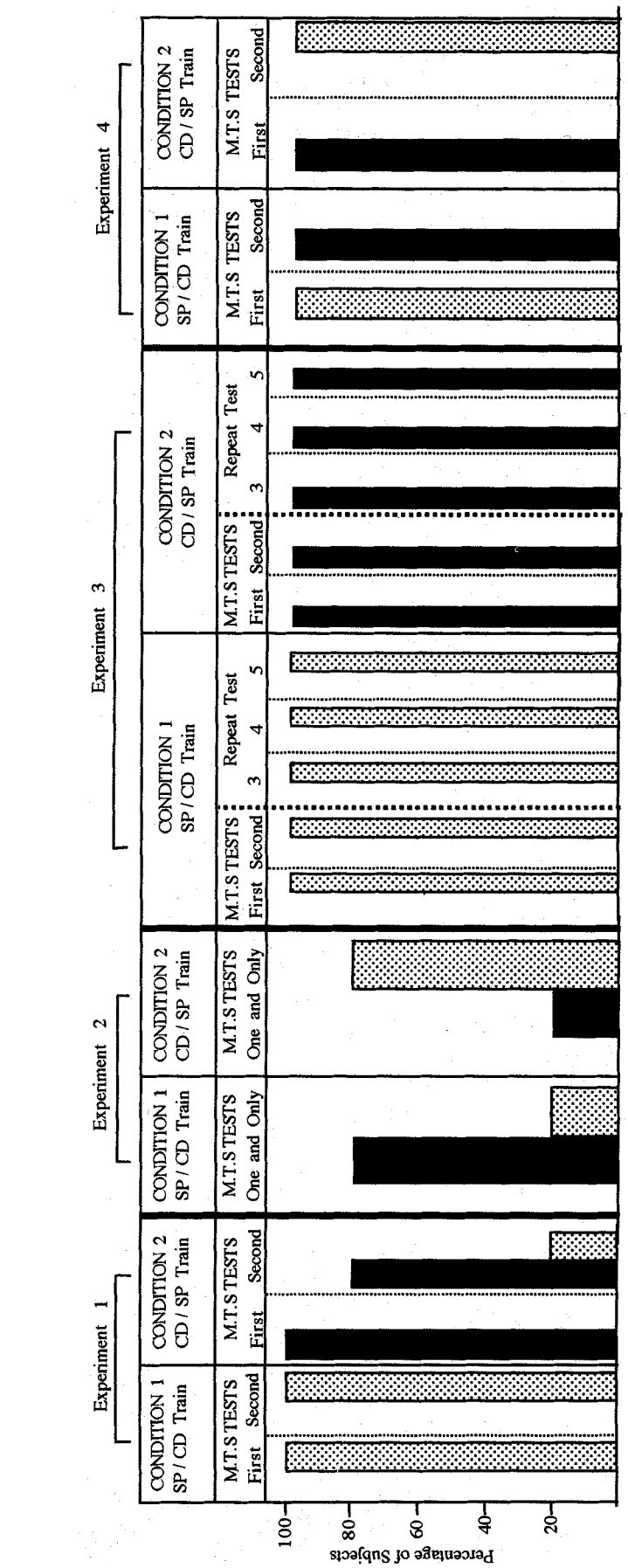


Figure 4. The percentage of subjects (Y-axis) responding in accordance with conditional discrimination training (i.e., equivalence relations) and stimulus pairings on both first and second matching-to-sample tests across all four experiments (X-axis) of Roche, Barnes, & Smeets (in press). A summary of the experimental procedure is also presented for each condition of each experiment: The acronyms CD and SP refer to conditional discrimination and stimulus-pairing phases, respectively. Thus, in condition 1, Experiment 1, for example, the initial- and final-training phases were stimulus pairing and conditional discrimination training, respectively.

might expose an individual to a form of "pretraining," not unlike that employed in Experiment 4 of the current study, in which the formation of stimulus or verbal relations, *unrelated to the issue of condom use,* and entirely congruous with already established attitudes, are reinforced *by a community worker* (e.g., regular exercise and a balanced diet prolongs life). Thus, if the individual in question is a nonsmoker, for example, the community worker might discuss with him or her the many disadvantages of smoking. By reinforcing already-established verbal relations, the community worker thereby establishes him or herself as a "reliable source of information," and thus subsequent efforts to change persistent attitudes may be more effective.

Second, Experiment 4 suggests that persistent attitudes, or verbal relations, may be sensitive to change when contradictory information is provided by a person who already has acquired some form of control or influence over the individual holding the persistent attitude. Insofar as the is true, a respected individual may serve as a more effective agent of attitude change than a relatively unfamiliar individual. Indeed, this conclusion has been supported by recent intervention studies, which found that the safe-sex practices employed by eminent members of social groups eventually were emulated by members of those groups (Kelly et al., 1991, 1992; Wulfert & Biglan, 1994).

Clearly, the current analogue studies described here represent only the very first step in the experimental analysis of those behavioral processes involved in persistent attitudes, and in analyzing how we might alter such attitudes when they are to the detriment of the individual and/or culture within which the individual is embedded. Nevertheless, the relatively consistent data we have obtained, and its apparent relevance to recent community interventions, suggest that further basic research would be well worthwhile.

Derived Relations and Sexual Arousal

One criticism of the foregoing experiments, as possible analogues of sexual behavior, might be that the measure of behavioral change employed (i.e., in terms of matching-to-sample test performances) did not reflect "genuine" sexual behavior on the part of subjects. In other words, pressing buttons on a computer keyboard might not be considered by many to be reflective of emotional or sexual behavior. Thus, if the behavior-analytic approach to sexual behavior advocated here is to advance our understanding of human sexuality, the relationship between relational responding and sexual behavior, as traditionally defined by sex researchers, requires further investigation. With this in mind, the study described in this section employed electrodermal activity as a physiological measure of sexual responding, the aim of which was to examine the emergence of novel sexual behavior in response to a combination of conditional-discrimination and stimulus-pairing procedures. The study, therefore, represents an important step toward combining the traditional methodologies employed by sex researchers with the experimental techniques described thus far.

Many researchers have argued that the concepts of respondent (i.e., stimulus pairing) and operant conditioning (i.e., differential reinforcement and punishment), as traditionally defined, cannot readily account for certain aspects of human sexual activity, such as the emergence of highly unusual fetishistic behavior for which there appears to be no conditioning history (e.g., a fire fetish; see Bourget & Bradford, 1987; Cox, 1979; Laws & Marshall, 1990; LoPiccolo, 1994). Interestingly, however, an interpretation of sexual responsivity in terms of a derived transformation of physiological sexual-arousal functions in accordance with arbitrarily applicable relations may account for the emergence of "novel" or unreinforced sexual behavior. In fact, we have tested this idea empirically in a number of recent studies (Roche & Barnes, in press). After outlining one of these studies we will consider some of the wider implications of the data for a behavior-analytic understanding of fetishistic behavior, and crimes of sexual violence.

Having been exposed to the Steele and Hayes' (1991) relational pretraining described previously, six subjects were presented with the following relational training tasks; SAME/A1–[*B1*–B2], SAME/A1–[*C1*–C2], OPPOSITE/A1–[B1–*B2*], OPPOSITE/A1–[C1–*C2*], where all stimuli were nonsense syllables and italicized comparisons indicate reinforced choices. The relational-testing phase (no feedback) determined whether responding in accordance with the derived relations of coordination and opposition would emerge (see Figure 5).

The test tasks were as follows; SAME/B1–[C1–C2]; SAME/B2–[C1–C2]; OPPOSITE/B1–[C1–C2]; OPPOSITE/B2–[C1–C2]. During testing, subjects related B1 with C1 in the presence of SAME (i.e., B1 and C1 are both the same as A1 and therefore the same as each other); B2 with C2 in the presence of SAME (i.e., B2 and C2 are both opposite to A1 and therefore the same as each other); B1 with C2 in the presence of OPPOSITE (i.e., B1 is the same as A1, and C2 is opposite to A1, and therefore B1 is opposite to C2); and B2 with C1 in the presence of OPPOSITE (i.e., B2 is opposite to A1, and C1 is the same as A1, and therefore B2 is opposite to C1). In summary, the emergence of the derived relations [Same] B1–C1 and [Same] B2–C2 was observed during testing.

Using the stimulus-pairing procedure outlined in the previous section, sexual arousal and emotionally neutral functions were then established for the two nonsense syllables, B1 and B2, respectively (for some subjects the functions of these stimuli were reversed but for ease of communication we will always refer to B1 and B2 as conditioned sexual and nonsexual stimuli, respectively). Specifically, a short sexually explicit film taken from a popular sex-instruction video followed quasi-random presentations of B1, whereas a short nonsexual film depicting scenic landscapes followed quasi-random presentations of B2.

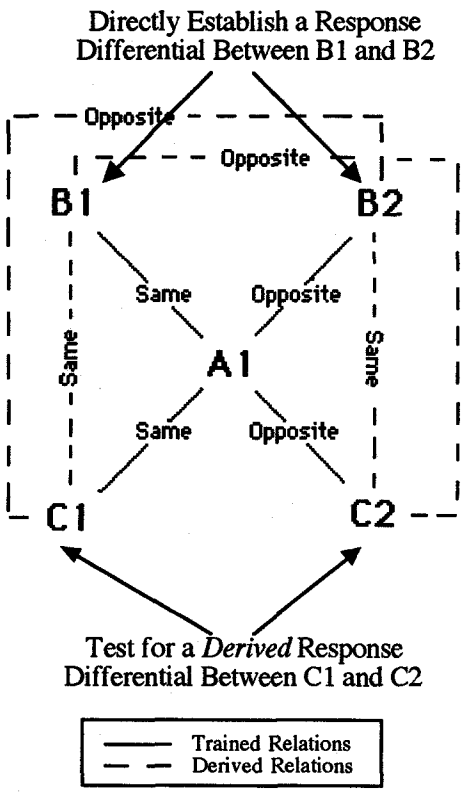


Figure 5. Diagrammatic representation of the relational network that was trained and tested prior to the direct establishment of a B1/B2 skin resistance response differential. The experiment also involved testing for a transformation of functions in accordance with the relational network by probing for a derived skin resistance response differential between C1 and C2.

We probed for respondent conditioning by measuring skin resistance responses (SRRs) during the 5-sec interval between the presentation of the nonsense syllable and the subsequent presentation of the film clip across the 12 final-conditioning trials (i.e., six responses to either stimulus were recorded). Following approximately 18 conditioning trials, subjects generally showed differential conditioning[2] (i.e., B1 produced significantly greater SRRs than B2). The test for a derived transformation of sexual functions involved the presentation of the C1 and C2 stimuli alone. Four of the five subjects who showed significant respondent conditioning (i.e., a response differential to B1 and B2) also showed a transformation of sexual-arousal functions in accordance with the relational network (i.e., significantly greater responses to C1 over C2). The six subjects' mean skin resistance responses to each of B1, B2, C1, and C2 can be seen in Figure 6.

As suggested earlier, researchers have argued that it is difficult to interpret unusual fetishes, such as a fire fetish (Bourget & Bradford, 1987; Cox, 1979), in traditional behavioral terms (see Gelder, 1979; McConaghy, 1987). The data reported previously, however, suggest that sexual arousal may emerge for stimuli in more indirect ways than might previously have been envisaged. Specifically, a relational frame interpretation of sexual fetishism suggests that the cultural/verbal relations according to which individuals respond may help to account for the emergence of highly unusual fetishes for which there appears to be no explicit reinforcement history. In effect, we expect that an individual's sexual behavior should depend, in part, on the way in which his or her verbal culture is organized. For example, we might account for the emergence of a fire fetish by pointing to the significant overlap between "sexual frames" and "fire frames." More specifically, both sexual arousal and fire are spoken of as "explosive" and "hot." In popular romantic literature lust is often referred to as "burning desire" and love as a "flame." Indeed a European pornographic television channel is known as "Red Hot Dutch." Furthermore, the *Collins English Dictionary and Thesaurus* (1992) lists the terms "ardor," "excitement," "luster," and "passion" under the reference term "fire." And who can forget the Doors classic "Come on baby light my fire." Thus, given that terms pertaining to fire and sexual behavior often participate in frames of coordination with each other, we would expect to observe occasionally a transfer of functions from sexual arousal to fire, even though the physical pain of contacting fire makes such a transfer unlikely. In effect, where fetishistic behavior is difficult to account for using the traditional concepts of behavior analysis, RFT suggests that the specific arbitrarily applicable verbal relations according to which the fetishist responds are of primary importance in the control of sexual behavior.

Although the foregoing analysis lends some support to a relational-frame interpretation of unusual and rather novel sexual preferences, perhaps the current analysis also may make a contribution to our understanding of more common behavior, such as rape. Earlier in the article we pointed out that many men reside in a social/verbal culture in which caring, gentle, helpless, and submissive women often participate in a relational frame of coordination with sexual attraction. We also suggested that, for such men, women often participate in frames of coordination with "not knowing their own minds" and "meaning 'yes' even when they say 'no.'" Thus, women may fall into a frame of coordination with "weakness" and "must be controlled for their own good" and into a frame of opposition with "strength" and "must be taken seriously." To appreciate more fully how this analysis may help us to understand the act of rape, consider the relational network in Figure 7.

The lower section of this figure (indicated by brackets) represents one possible set of taught and derived relations according to which members of our culture might respond in the context of gender and sexuality. For example, it is fair to say that most members of our culture are explicitly taught

[2]A detailed account of the development of the current conditioning procedure and related methodological issues can be found in Roche and Barnes (1995).

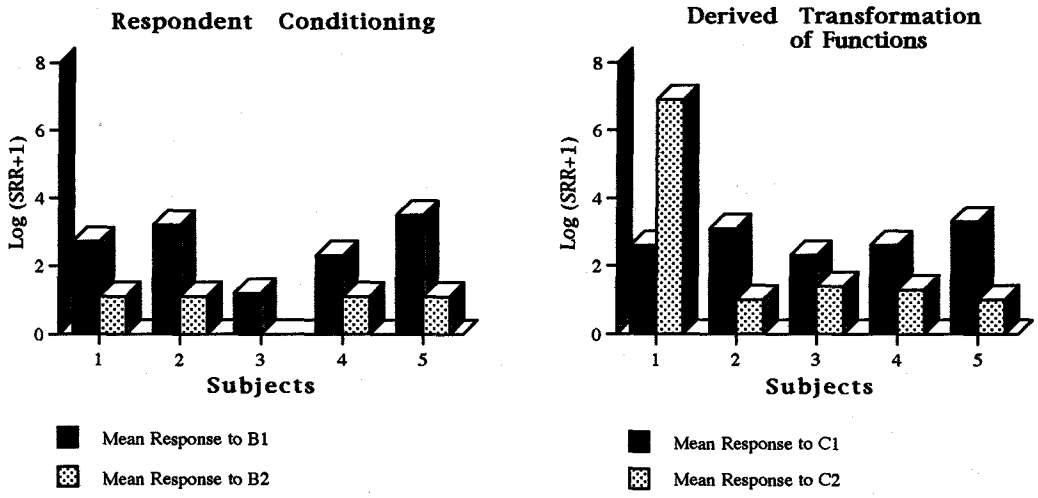


Figure 6. Each subject's mean skin resistance response to at least six presentations of each of B1, B2, C1, and C2. B1 and B2 were conditioned sexual and nonsexual stimuli, respectively, related through derived frames of coordination to C1 and C2, respectively. For mathematical convenience, subjects' skin resistance responses (SRRs), denoted along the Y-axis, were transformed according to the function; Log (SRR+1) (see Roche & Barnes, 1995; Venables & Christie, 1980).

that, in the context of gender relations, males and females are "opposites" (e.g., members of "opposite" sexes; see S. L. Bem, 1993). Many children also learn through interaction with popular culture (i.e., television, magazines, "pop" music) that women are submissive, whereas men are dominant (indeed the feminist movement is based largely on attempts to change this fact). Furthermore, the words "dominant" and "submissive" often participate in frames of coordination with the terms "a lot of control" and "lacking control," respectively. Given that many members of our culture respond in accordance with the foregoing relational network, we might expect to find that many men are sexually attracted to submissive women, or women who lack control. Similarly, we might expect to find that many women are sexually attracted to powerful men, or men who possess a lot of control.

Although the foregoing analysis refers only to sexual activities that fall within what we might call the "normal" range of sexual behaviors, the relational-frame interpretation offered here makes its most significant contribution to our understanding of more unusual sexual activities, such as rape. Consider, for instance, the upper right-hand section of Figure 7. This extended relational frame indicates that in a suitable context men may respond to the term "lack of control" as related to the term "no control" through a relational frame of comparison (i.e., greater than). Also, in an appropriate context, the term "no control" may be related to the term "victim" according to a frame of coordination. This extended relational network represents one of the processes by which terms pertaining to femininity (e.g., woman, female) may become related to those pertaining to victimization. In most contexts, of course, (e.g., that of reading the present article) the derivation of such a relation involves the transformation of nonsexual functions. More informally, it is likely that you, the reader, are currently responding to the derived relation between the terms "female" and "victim" at a purely intellectual level. In some limited contexts, however, the sexual-arousal functions that have been socially established for terms pertaining to femininity will transform according to this extended relational frame, and emerge for terms pertaining to victimization. Under these circumstances, verbal descriptions of powerless, submissive, or victimized women (e.g., in pornography) will actualize sexual arousal. In effect, the relational-frame interpretation offered here makes an immediate theoretical contribution to our understanding of how verbal functions established in childhood (e.g., by media images and fairy stories) might give rise to sexual coercion or violence in later life.[3]

Interestingly, the foregoing analysis suggests that using aversive-conditioning techniques to countercondition devi-

[3]Although we refer to rape as possessing sexual-stimulus functions, we do not mean to say that the act of rape is purely sexual in nature (see also LoPiccolo, 1994). Rather, the foregoing interpretation serves merely to help us understand how sexual-stimulus functions might combine with acts of violence and power to produce rape.

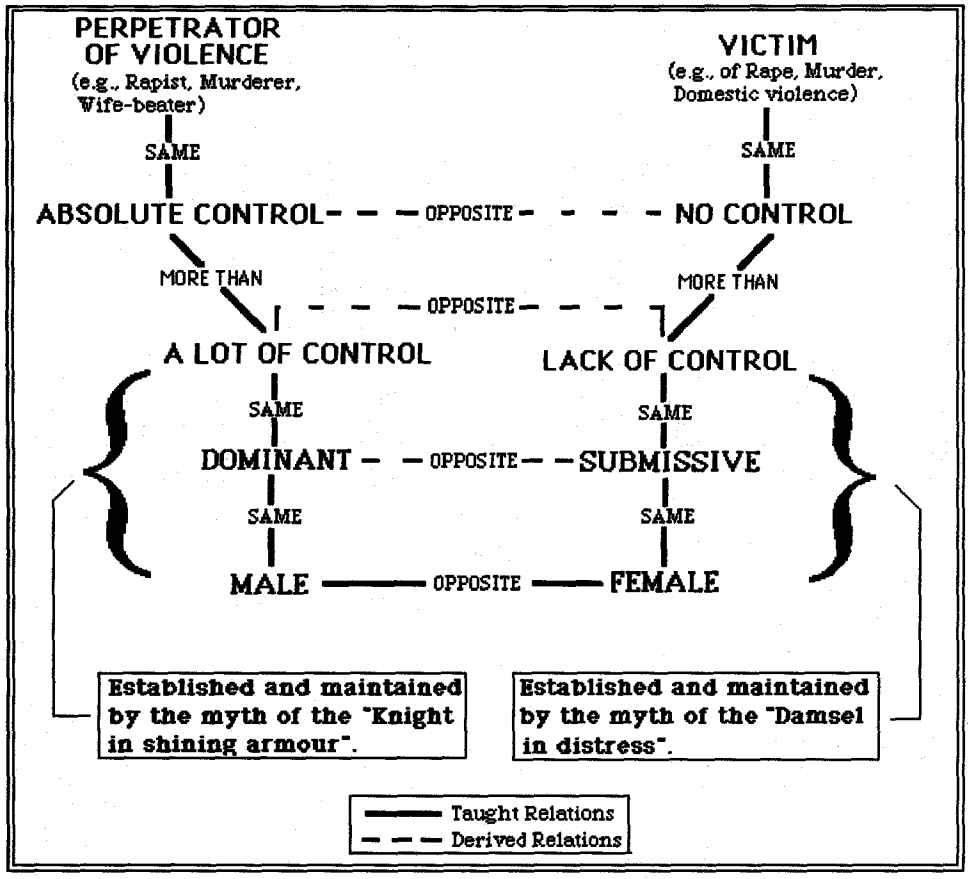


Figure 7. An extended relational network according to which sexual arousal functions might transform, thereby giving rise to sexual coercion.

ant sexual activities, such as rape, may not be satisfactory as the sexual offender may continue to participate in the same "troublesome" verbal culture (e.g., in which women are portrayed as submissive). We might not expect traditional behavior-therapeutic methods, therefore, to lead to the complete cessation of sexual violence. Indeed, researchers have found evidence that rape is one of the most difficult sexual practices to eradicate using traditional behavior-therapeutic methods (Maletzky, 1991; see also Furby, Weinrott, & Blackshaw, 1989; Marshall, Laws & Barbaree, 1990).

According to a relational-frame view, in order to eliminate unwanted sexual behavior completely, it would be necessary to alter the relational frames according to which sexual functions are transforming. Perhaps, therefore, future research in sexual therapy should focus on identifying efficient methods for the manipulation of verbal relations. One way in which a rapist's "deviant frames" might be altered, for example, is by allowing him to interact and become familiar with rape victims in a nonsexual clinical setting. Under these circumstances the rape victim may shift from a frame of coordination containing "submission," "needing to be controlled," or "deserving what they got," to a frame of coordination containing "a woman like my mother or sister" (or any platonic female friend or relative who is held in high esteem) or "a human being just like me." In fact, some therapists have had success with this type of perpetrator/victim interaction technique (e.g., Murphy, 1990), although an empirical account of how such therapy may produce the observed effects has not been forthcoming.

The foregoing issues are also directly relevant to the empirical study outlined in the previous section, in which it was shown that once a pattern of responding had emerged on a matching-to-sample test, it was highly resistant to change by incongruous training phases. More specifically, it could be argued that this finding is analogous to the emergence of sexual behavior that is resistant to change using traditional behavior-therapeutic strategies. Remember also that the data obtained from Experiment 3 of the study showed that repeated exposure to incongruous training phases did little to alter established behavior patterns. This finding indicates that simply reexposing clients to theraputic strategies that previously failed to change the target behavior may be of little value.

Experiment 4 from the study, however, indicates that behavior patterns can be more readily altered by training formats that have already controlled behavior in the past.

This suggests that therapists might serve as more effective agents of behavioral change if they first establish some influence over the client's behavior patterns. More informally, this would involve establishing a close emotional relationship with the client, in which the latter comes to like, trust, and respect the former. In effect, the therapist should establish him or herself as an important locus of behavioral control before attempting to change a behavior pattern that has perhaps developed across an extended period of time. Indeed, many nonbehavioral psychotherapies place great emphasis on the client–therapist relationship. Although placing a special emphasis on this relationship in a behavior-therapeutic setting may represent a departure from traditional behavioral practices, this strategy would be consistent with recent developments in behavioral psychotherapy, which consider the client–therapist relationship to be critical in the therapeutic process (e.g., Hayes & Wilson, 1994; R. J. Kohlenberg, Hayes, & Tsai, 1993).

Conclusion

The current research suggests that the capacity for derived relational responding in humans necessarily complicates our sexuality by exponentially increasing the number of ways that sexual arousal may emerge (i.e., be derived). In particular, this research suggests that it is verbal processes, as conceptualized by relational frame theory, that underlie the weakness of laboratory-induced fetishes and the sometimes poorly generalized effects of traditional behavior therapy. The research outlined in the current article, therefore, represents the beginnings of a basic research program into human sexual functioning that speaks to several issues that arise in applied settings.

Of course, some readers may question the implications of the current research for issues that arise in therapeutic contexts on the grounds that each of the reported studies constitutes analogue research that does not employ subjects indigenous to any clinical population. It is our view, however, that attempts to solve "real-life" problems in applied settings should not take precedence over the experimental goals of prediction and control. We take this position because the current constitution of applied behavioral psychology as a sort of loose mating between applied research and service provision does not sit well with the more widely used definition of applied science as "experimental research that is connected to basic research through its experimental style, and a basis in fundamental principles" (Johnston, 1996, p. 38). In effect, developing a science of behavior should not merely involve testing intervention strategies under ecologically valid conditions, but should also involve the systematic identification of controlling variables and their relations to historic and current contexts. In this regard, it would appear that the behavior-analytic contribution to our understanding of human sexuality has yet to be fully realized. Certainly, the basic research outlined in the current article indicates that techniques developed in behavior-analytic laboratories are providing important insights into the basic behavioral processes involved in violent sexual crime such as rape, the development and maintenance of sexual fetishes, and the relationship between what individuals say and actually do about safe sex-practices.

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