Human Sexual Arousal: A Modern Behavioral Approach

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Recent developments in the analysis of derived relational responding have contributed to the behavioral analysis of a wide range of complex human behaviors, including sexual behaviors. In particular, recent research has demonstrated that human sexual arousal patterns can emerge in the absence of a history of instrumental learning or stimulus association. These findings considerably expand the traditional behavioral approach to the analysis of human sexual arousal. The current paper provides an overview of the traditional behavioral approach to the analysis of sexual arousal, and outlines Relational Frame Theory as a modern behavioral approach to human language, cognition, and complex behavior in general. A relational frame approach to the analysis of human sexual arousal is then outlined and its interpretative power in dealing with a range of complex human sexual behavior is demonstrated.

Behavioral psychology has not been particularly concerned with providing an account of human sexual responding, or with analyzing the emergence and maintenance of complex patterns of human sexual arousal. Although there has been limited applied research into the treatment of sexual dysfunction, basic research into the emergence and maintenance of sexual arousal patterns has been sparse by any standards. Nevertheless, over the past four decades behavioral researchers have established that sexual arousal can be conditioned using respondent (Barlow, 1993; Barlow & Agras, 1973; Barlow, Agras, Leitenberg, & Callahan, 1972; Conrad & Winzce, 1976; Herman, Barlow, & Agras, 1974; Kantorowitz, 1978; McConaghy & Barr, 1973; Plaud & Martini, 1999; Rachman, 1966; Rachman & Hodgson, 1968) and operant procedures (Bancroft, 1969; Barker, 1965; Crawford, Holloway, & Domjan, 1993; Earls & Castonguay, 1989; Mandell, 1970; McConaghy, 1969; McConaghy, 1970; McGuire, Carlisle, & Young, 1965; McGuire & Valance, 1964; Quinn, Harbison, & McAllister, 1970; but see O'Donohue & Plaud, 1994, for some caveats).

Recent advances in the analysis of complex behavior, and verbal behavior in particular, have further extended the conceptual and methodological armory of the behavioral sex researcher. More specifically, Relational Frame Theory (RFT; Hayes, 1991; Hayes, Barnes-Holmes, & Roche, 2001; Hayes & Hayes, 1989) has provided a conceptual framework for the analysis of the phenomenon of derived stimulus relations in an attempt to explain the emergence of language effects (e.g., generativity) and related cognitive phenomena. In so doing, RFT has demonstrated that a variety of complex and novel human performances can emerge from verbal contingencies. Relational frame research has also provided exciting analyses of the emergence of sexual stimulus functions for stimuli that have neither been associated with unconditioned sexual stimuli, nor served as discriminative cues for the availability of sexual reinforcement. In effect, a relational frame approach explains sexual arousal patterns that involve more than a history of respondent or operant conditioning alone.

In the current paper, we will provide an outline of behavior analytic sex research to date. We will then briefly outline Relational Frame Theory as an approach to derived stimulus relations, verbal behavior, human cognition, and complex behavior more generally. We will then outline recent RFT findings which suggest that the emergence of human sexual arousal may involve process other than those posited in a traditional classical or operant conditioning account. The interpretive power of the relational frame approach to human sexual responding will also be demonstrated. Finally, we will describe how RFT may shed light on the relationship between predispositions to sexual behavior and the emergence of complex and novel sexual arousal patterns established through learning histories.

BEHAVIOR ANALYSIS AND SEX RESEARCH

Respondent Conditioning

Binet (1888) proposed the first "classical conditioning" model of sexual arousal, which suggested that sexual responses might be partially determined by previous stimulus associations. It was not until the 1960s, however, that Binet's ideas were investigated in any serious way. In one study, Lovibond (1963) demonstrated that electrodermal

responses of homosexual males could be conditioned, using film clips of nude males as unconditioned stimuli (USs) and abstract symbols as conditioned stimuli (CSs). This finding was further investigated by Rachman (1966) using genital measures of arousal. In this, by now famous study, a conditioned sexual response was established in male volunteers (measured using a penile plethysmograph) to a pair of female boots by repeatedly projecting slides of the boots on a screen immediately prior to the presentation of slides of "attractive" nude females. This "laboratory induced fetish" generalized to physically similar stimuli and extinguished with repeated presentations in the absence of the USs (i.e., the nude females). In a replication of this study, Rachman and Hodgson (1968) controlled for the effects of procedural artifacts and replicated the earlier findings. In a later study, McConaghy (1970) demonstrated conditioned penile volume increases in two groups of heterosexual and homosexual males using film clips of nude females and males, respectively, as USs (the CS was a red circle in both cases).

These and several further demonstrations of conditioned sexual arousal suffered from methodological problems that make a clear interpretation of the data difficult (see O'Donohue & Plaud, 1994). However, a recent study by Plaud and Martini (1999) addressed many of these issues in a well- controlled demonstration of respondently conditioned sexual arousal using nine male undergraduate volunteers as participants. This study convincingly demonstrated that sexual arousal can indeed be established for arbitrary stimuli (i.e., a penny-jar) using classical conditioning procedures.

Operant Conditioning

Experimental analyses of operant processes in human sexual behavior are extremely sparse. In one early operant study, Quinn, Harbison, and McAllister (1970) used small doses of a cold-lime drink to reinforce minimal erectile responses to slides of nude females in a group of liquid-deprived homosexual males (dehydration was achieved through an 18 hr abstinence period and the administration of a powerful diuretic). By gradually increasing the minimum erectile response required for reinforcement, heterosexual responsivity was enhanced. These authors suggested that erectile responses are highly susceptible to reinforcement, although no follow-up studies appear to have been conducted.

Applied Research

The roles of respondent and operant processes in human sexual arousal have been more widely studied in the clinical setting. For instance, Barlow and Agras (1973) employed a respondent fading procedure to increase heterosexual responsiveness in three male homosexuals. Clients were presented with slides of "attractive" nude males to which penile responses were monitored. The fading procedure involved the superimposition of slides of nude females as soon as an erectile response was recorded. Subjects demonstrated a decrease in responsivity to same-sex models and an increase in responsively to opposite-sex models. This procedure has also been used to reduce sexual responsivity towards prepubertal children (Beech, Watts, & Poole, 1971; see also Laws & Marshall, 1990).

A technique known as covert sensitization involves instructing clients to imagine aversive stimuli (e.g., vomiting) at the onset of a sexual response to "inappropriate" experimental stimuli. The technique has been used to reduce sexual responsivity to same-sex models in a group of homosexual males (Barlow, Agras, Leitenberg, & Callahan, 1972; see also Barlow, 1993; Marshall, Laws, & Barbaree, 1990). Other researchers have successfully used salient aversive stimuli, such as pictures, to induce nausea directly (Mandel, 1970) or have administered nauseating substances such as ammonium sulphide (Colson, 1972) and valeric acid (Maletzky, 1973).

Behavior analytic sex researchers have also used orgasm as an unconditioned stimulus in conditioning procedures. Using a technique known as orgasmic conditioning, Conrad and Wincze (1976) monitored the sexual arousal of four homosexual males as they masturbated. Slides of nude females were then presented to clients moments before orgasm. After several months of therapy, all four subjects reported an increase in heterosexual impulses (although erectile responses did not clearly support this claim; see also Herman, Barlow, & Agras, 1974). Kantorowitz (1978) later demonstrated a clearer case of orgasmic conditioning in eight male volunteers from a non-clinical population, using physiological measures. In this case, however, subjects' verbal reports did not bear this finding out and the conditioning effects were disappointingly short-lived.

In one typical aversive conditioning study, Feldman and MacCulloch (1971) administered

electric shocks to a group of male homosexuals during the final 0.5-s exposure to visual "homosexual" stimuli that were 2 s in duration. A subsequent decline in responding to nude males was recorded. In a more recent study, the administration of a noxious olfactory stimulus (ammonia) was successfully used to punish sexual responses towards children in a male pedophile (Earls & Castonguay, 1989). The reduction in responding was still significant one year after therapy had ceased. Marshall and Barbaree (1988) reported the use of a combination of electric shocks and noxious olfactory stimuli to eliminate "deviant" sexual thoughts in a group of pedophile outpatients. Although not particularly widespread, aversive conditioning techniques are still in limited use.

A MODERN APPROACH

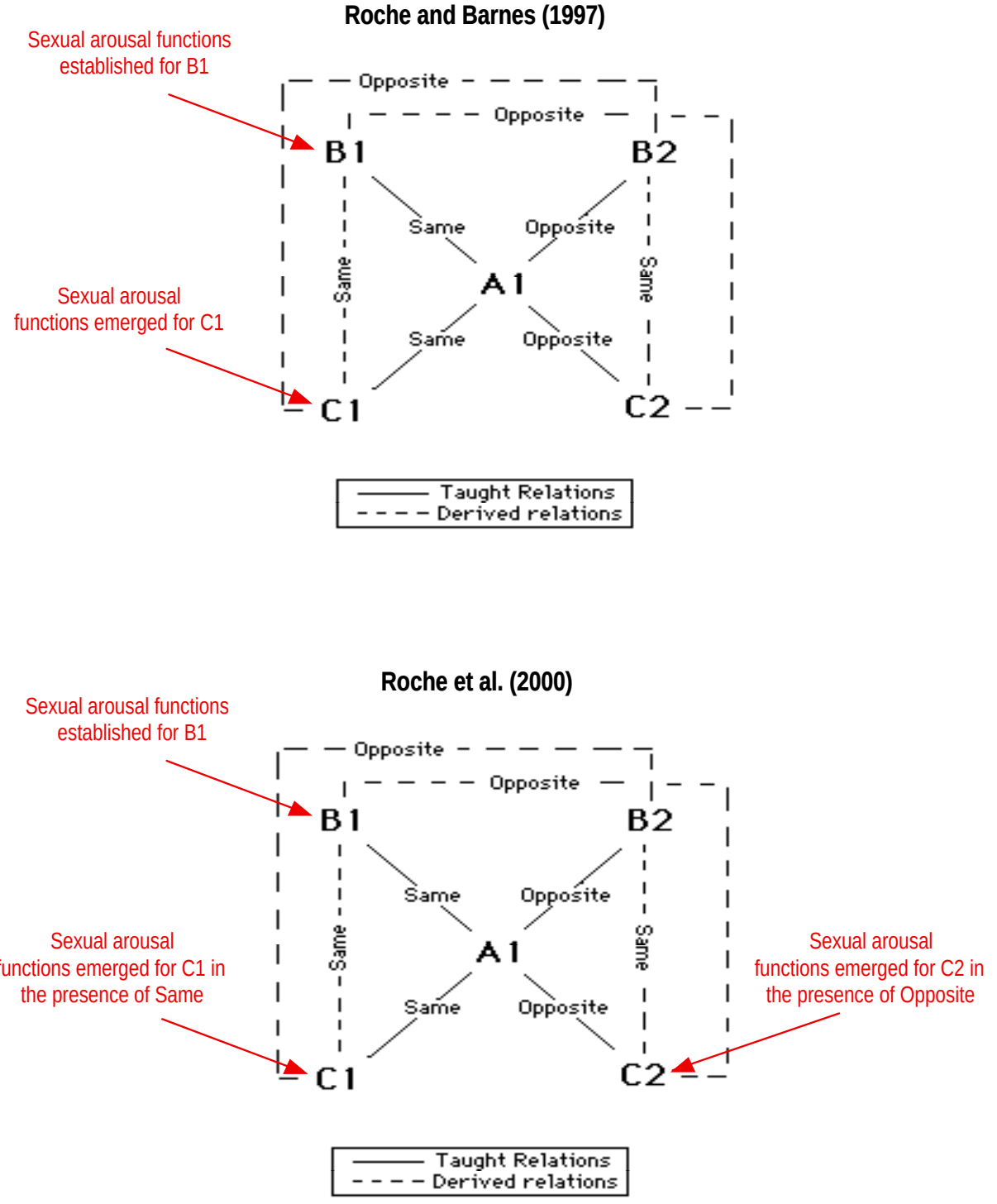
The basic and clinical sex research conducted to date within an operant or respondent framework has advanced our understanding of the etiology and maintenance of specific sexual arousal patterns. However, recent research under the rubric of Relational Frame Theory has extended the analysis of sexual arousal patterns to include instances in which sexual functions emerge for stimuli that have neither been associated with unconditioned sexual stimuli, nor served as discriminative cues for the availability of sexual reinforcement. Before we outline the relevant studies, we must first provide a brief outline of Relational Frame Theory as a modern account of derived relational responding, verbal behavior, human cognition, and complex behavior generally.

Perhaps the simplest derived stimulus relation is the equivalence or coordination relation. Specifically, when a subject is trained to match a stimulus A to B and to match B to C in a matching-to-sample (MTS) context, the subject will also likely match A to C and c to A without explicit reinforcement for doing so. This emergent performance defines the stimulus equivalence relation (c.f., Sidman, 1986; Sidman, 1990, pp. 100-102; see also Barnes, 1994; Fields, Adams, Verhave, & Newman, 1990). Furthermore, when a specific behavioral function is established of one of the stimuli in the equivalence relation, the function often transfers to the other stimuli without further training. For instance, if stimulus C in the foregoing example is paired with an aversive stimulus such as electric shock, then B and A may also acquire the fear eliciting functions based on their relation to C. This transfer of function effect has been demonstrated with discriminative (Barnes & Keenan, 1993; Barnes, Browne, Smeets, & Roche, 1995; deRose, McIlvane, Dube, Galpin, & Stoddard, 1988; Gatch & Osborne, 1989; 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, 1997; Roche, Barnes-Holmes, Smeets, Barnes-Holmes, & McGeady, 2000).

Relational Fame Theory approaches stimulus equivalence as one of many possible derived stimulus relations. In fact, much empirical evidence now exists that human subjects can respond in accordance with multiple stimulus relations in the presence of appropriate contextual cues, such as difference, opposition, more than, and less than (Dymond & Barnes, 1995, 1996; Lipkens, Hayes, & Hayes, 1993; O'Hora, Roche, Barnes-Holmes, & Smeets, in press; Roche & Barnes, 1996, 1997; Roche, et al., 2000; Steele & Hayes, 1991). According to RFT, contextual control for relational responding is likely established during early language interactions. During these interactions children are often presented with objects and asked to repeat their names (e.g., "What is this?"). Children are also taught to identify objects when they hear the appropriate name (e.g., "Show me the ball"). Initially, each of these word-object and object-word relations is trained explicitly using a variety of reinforcers, such as food, verbal praise, and physical contact. Across such interactions however, derived relational responding may begin to emerge (i.e., in the absence of reinforcement). For example, a child with an extensive history of naming might be taught "This is your toy". Familiar contextual cues such as the word "is", and the context of the social interaction more generally, predict that if this object is a " toy ", a "toy " is this object. Thus, the child may now identify the toy when asked "Where is your toy?" in the absence of any prior differential reinforcement for doing so. In effect, the derivation of stimulus relations is not genuinely novel, but is a type of *generalized operant behavior* (see Barnes-Holmes & Barnes-Holmes, 2000, for an extended discussion). Put simply, once an individual has learned to derive stimulus relations, they can do so with an infinitely wide variety of particular stimuli.

Other types of stimulus relations, such as comparison, are also understood in terms of generalized operant behavior. Consider, for example, a young child who is taught to respond to a range of questions such as; "Which cup has *more* milk?" or "Which box has *more* toys?" Given sufficient exposure to such questions and appropriate reinforcement for answering them correctly, the appropriate response to the cups may come under the control of cues other than the actual relative quantities of milk in the cups (e.g., the word "more"). For example, a dime is *worth more than* a nickel, even though a dime is actually smaller in size than a nickel. As responses are brought under the contextual control

Figure 1: Trained and derived stimulus relations in Roche and Barnes (1997) and Roche et al. (2000).



of the appropriate cues (e.g., the word "more"), they become arbitrarily applicable. In other words, the child may eventually answer questions regarding relative quantity correctly, even with novel varieties of stimuli and in contexts where the appropriate response cannot be based on the formal properties of the stimuli involved (e.g., the relative value of coins). When this occurs a relational frame of comparison has been established.

Relational Frame Theory can be used in the analysis of individual relations or whole networks of derived relations. Relational networks help us to describe complex patterns according to which functions transform in the presence of particular contextual cues. Imagine, for instance, that we train the following network of derived relations; stimulus A *More than* stimulus B, B *More than* C, C *Same as* D (i.e., A>B>C=D). Now suppose that we use a respondent conditioning procedure to establish an aversive response function for D. Given the trained relational network, we will expect the aversive response function to emerge for C (i.e., because it is the same as D), but to be amplified for B (because it is More than C), and to be amplified further for A (because it is More than B and More than C). Several studies have demonstrated this type of complex derived *transformation of function* effect with operant and respondent functions (see Dymond & Barnes, 1995, 1996; Roche & Barnes, 1997; Roche, et al., 2000).

A NEW AGENDA FOR BEHAVIORAL SEX RESEARCH

If stimulus functions can be transformed by virtue of their participation in derived relations or complex relational networks, our understanding of the emergence of sexual arousal functions for arbitrary stimuli is immediately expanded. More specifically, the transformation effect should make it possible for an individual to respond sexually to a stimulus that has never been paired directly with an unconditioned sexual stimulus or used as a cue for the availability of differential sexual reinforcement. As a starting point for testing this idea, Roche and Barnes (1997) determined whether respondent sexual arousal functions could emerge for stimuli via the derived transformation of functions in accordance with an arbitrary relational network. In that study, Roche and Barnes (1997; Experiment 4) exposed three male and three female undergraduate subjects to a respondent conditioning procedure in which a sexually explicit and nonsexual film clips were paired with presentations of nonsense syllables B1 and B2, respectively. The conditioned response differential to B1 and B2 was measured with a polygraph.

Subjects were then exposed to a relational pretraining procedure to establish contextual functions of Same and Opposite for two arbitrary stimuli. Specifically, across several training trials subjects were presented with sample stimuli and three comparison stimuli that were related to each other along a physical dimension. For example, one set of comparison stimuli consisted of a long line, a medium line, and a short line. Given a short-line sample stimulus, in the presence of the Opposite contextual cue, choosing the long-line comparison stimulus was reinforced. However, given the Same contextual cue and a short line, choice of the short-line comparison was reinforced. With a sufficient number of such exemplars contextual control by the arbitrary cues was established and was evident across novel sets of samples and comparisons. In a subsequent training stage, a series of stimulus relations were trained in the presence of the contextual cues (see Figure 1), and a series of derived stimulus relations emerged during testing. As illustrated in Figure 1, the trained relations were; SAME/A1-B1, SAME/A1-C1, OPPOSITE/A1-B1, OPPOSITE/A1-C1. The derived stimulus relations were SAME/B1-C1, SAME/B2-C2, OPPOSITE/B1-C2, OPPOSITE/B2-C1.

During the critical probes for a transformation of function, subjects were repeatedly presented with the C1 and C2 stimuli, but in the absence of film clips. All three male subjects and one of the female subjects showed a transformation of the functions of the C stimuli in accordance with the relational network and the established respondent functions of the B stimuli (see Figure 1). More specifically, where sexual arousal functions were established for B1, they emerged for C1 but not C2 (i.e., both B1 and C1 are the Same as A1, and therefore the same as each other). Where sexual arousal functions were established for B2 they emerged for C2 but not C1 (i.e., both B1 and C1 are Opposite to A1, and therefore the same as each other).

A further study by Roche et al. (2000) replicated and extended the findings of Roche and Barnes (1997) by bringing the derived transformation effect under further contextual control. More specifically, during the critical probe stage the C1 and C2 stimuli were presented in the presence of each of the Same and Opposite contextual cues on different

trials. The stimulus functions established for B1 emerged for C1 in the presence of Same (i.e., the subjects became aroused) but those established for B2 emerged for C1 in the presence of Opposite (i.e., the subjects remained relaxed). Similarly, the functions of B2 emerged for C2 in the presence of Same (i.e., the subjects remained relaxed), but those established for B1 emerged for C2 in the presence of Opposite (i.e., the subjects became aroused; see Figure 1).

The findings of Roche and Barnes (1997) and Roche et al. (2000) indicate that the study of derived stimulus relations has provided an opportunity to examine parameters of sexual responding that are not easily captured within a traditional respondent or operant paradigm. In particular, the transformation of functions in accordance with derived relations suggests that sexual arousal in the world outside the laboratory may sometimes arise in the absence of direct reinforcement or respondent conditioning. Thus, these findings significantly extend the existing behavioral literature on the development of sexual arousal patterns in humans.

Relational Frame Theory as an Interpretive Framework for Complex Sexual Behavior

From the RFT perspective, derived relations form the basis of language and cognitive skills in humans. Thus, some instances of human sexual arousal will depend upon verbal processes and will be controlled and maintained by verbal contingencies. The idea that human sexual arousal might emerge from verbal contingencies is not new. The feminist and sex research literature abounds with the suggestion that modes of discourse regarding sexuality both establish and constrain patterns of human sexual responding (see Brownmiller, 1985; Gergen, 1988; Segal, 1990). One language researcher (Lakoff, 1999), for instance, has suggested that the notably higher incidence of violent rape in the United States, compared to other countries, may be explicable, at least in part, by the way in which members of American culture talk about male sexual arousal by females. Specifically, some terms used to describe sexual arousal are aggressive and violent.

Roche and Barnes (1998) provided a detailed RFT interpretation of rape to explain how violent sexual responses may emerge from verbal contingencies for an individual who had never been exposed to explicit reinforcement for committing rape. Specifically, they suggested that many members of Western cultures are explicitly taught that, in the context of gender relations, males and females are "opposite" (e.g., members of "opposite" sexes). The authors further suggested that through interaction with popular culture, many children learn that women are submissive, whereas men are dominant (see Biglan, 1995, pp. 353-358; Guerin, 1994, pp. 283-287). In addition, 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 individuals in the culture respond to these verbal relations, we might expect to find that many men are sexually attracted to submissive women or women that lack control.

In a suitable verbal or social context, some 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). When the relational network is expanded in this way, terms describing women may be equivalent to terms describing total submission or victimization. Consequently, verbal descriptions of powerless, submissive, or victimized women (e.g., in pornography) will elicit sexual arousal. This relational frame analysis represents the behavioral counterpart of the feminist idea that the basic elements of rape are present in the way women are often spoken of in the wider culture and presented in pornography (see Segal, 1990, p. 233).

If verbal contingencies can control sexual arousal patterns, even in limited contexts, we should expect to find that aversive conditioning techniques used to counter-condition deviant sexual arousal may leave the verbal contingencies governing arousal in tact. For example, an individual for whom rape urges have emerged partially from verbal contingencies, will continue to be exposed to those verbal contingencies even following an aversive therapy program. This may explain why the effects of aversive therapy for deviant sexual arousal are relatively short-lived (see Bancroft, 1969; Gosselin & Wilson, 1984; Maletzky, 1991; Marshall, Laws, & Barbaree, 1990; McConaghy, 1969; Rimm & Masters, 1979). Furthermore, the role of verbal contingencies in the establishment and maintenance of sexual arousal may explain why laboratory conditioned sexual arousal patterns lack the complexity to serve as a realistic model of human sexual arousal development in the world outside the laboratory (e.g., real-world fetishistic responses are extremely powerful and resistant to extinction; see

Bancroft, 1969; McConaghy, 1969, 1987; O'Donohue & Plaud, 1994).

Although many patterns of sexual arousal are surely established, at least in part, through direct reinforcement and respondent contingencies (see Brown, 1986; Wysocki, 1993), some sexual arousal responses seem to defy explanation in these terms. Bourget and Bradford (1987), for instance, attempted to explain the emergence of a fire fetish in two clinical patients. These researchers suggested that it would be difficult to account for the emergence of such a fetish in terms of respondent or operant processes. That is, it is difficult to imagine a situation in which fire reliably predicts the onset of a sexual stimulus or in which contact with fire is sexually reinforced (see also McConaghy, 1987, for a similar argument pertaining to transvestism).

Roche and Barnes (1998) provided a relational frame interpretation of a fire fetish in terms of the cultural/verbal relations to which particular individuals respond. That analysis suggested that 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*." In popular music, lyrics and song titles have contained phrases such as "*Come on baby light my fire* (The Doors)", "*Come on stand next to my fire*" (Jimi Hendrix), and "*Burning love*" (Elvis). Furthermore, under the reference term "fire", the Oxford English Reference Dictionary cites the terms*; fervor, vivacity, vehement emotion, stimulate the imagination or emotion, fill with enthusiasm*, and *become heated or excited*. Other frames of coordination and opposition between sex and fire in common parlance are apparent in common expressions recorded by Lakoff (1999). These include: "*I've got the hots for her*", "*She's an old flame*", "*She's frigid*" (a frame of opposition), "*She's hot stuff*", "*Don't be cold to me*" (a frame of opposition), "*He's still carrying a torch for her"*, "*She's a red hot mama*", "*I'm warm for your form*", and "*I'm burning with desire*". In effect, it would appear that relational networks established for many members of the verbal community involve frames of coordination between sexual arousal and fire, and frames of opposition between sexual arousal and coldness. Thus, we should expect to observe occasionally a transformation of the response functions of fire by those of sexual arousal.

Contexts that support the transformation of the functions of sexual arousal and fire have yet to be identified in laboratory research. However, these contexts must be severely limited by the natural contingencies governing contact with fire. More specifically, given that physical contact with fire is painful and life threatening, any transformation of the functions of fire by those of sexual arousal will likely be punished by sexual advances towards fire. It is hardly surprising therefore, that a sexual predilection for fire is so rarely recorded. Nevertheless, the fact that fire fetishes do occasionally emerge, despite the immediate physical contingencies that make it unlikely, bears witness to the considerable behavioral control exerted by verbal contingencies over sexual arousal patterns in humans.

Behavioral Predispositions and Pragmatic Verbal Analysis

Respondent and operant conditioning processes, as well as derived relational responding, likely play roles in the emergence of sexual arousal patterns in humans. Consequently, humans are capable of responding sexually to an almost infinite variety of stimuli, depending on prevailing contingencies. However, the RFT approach to sexual arousal explicitly acknowledges natural constraints placed on sexual conditioning by the physical forms of stimuli. Although entirely derived sexual responses to arbitrary stimuli may be established in the laboratory (e.g., Roche & Barnes, 1997; Roche et al. 2000), it is likely that many directly conditioned and derived sexual stimulus relations in the world outside the laboratory have some nonarbitrary properties. Indeed, researchers have long noted that natural selection has favored associations between specific types of stimuli and specific types of responses (see Garcia & Koelling, 1966; Seligman, 1970). For instance, Gosselin and Wilson (1980) reported a surprising consistency across stimulus types that form fetish objects for males; they are typically pink, black, smooth, silky, and shiny. These characteristics have been likened to those of the female vulva, suggesting a biological preparedness for conditioning to such stimuli (McConaghy, 1987). Conversely, it has been argued, other objects commonly associated with sexual arousal, such as pillows and ceilings, are rarely reported as fetish objects.

A relational frame approach proposes that formal similarities between stimuli will make a wide variety of derived relations between them more likely

to emerge. As suggested by Roche and Barnes (1998), for instance, the physiological changes that occur during sexual arousal share many formal properties with the subjective experience of fire (e.g., perspiration, increased blood pressure, respiratory changes). In effect, the formal features of sexual arousal and fire facilitate the emergence of derived relations between them. In the case of sexual arousal and fire, this derived relation is one of coordination (i.e., they are similar, or "go together"). Thus, although a derived relation between sexual arousal and fire may in principle emerge from entirely arbitrary relational networks, the physical relationship between sexual arousal and fire may participate in the generation of those relational networks.

Although fire fetishism is likely partially based on the formal properties of sexual arousal and fire, it is unlikely that the formal properties are in themselves sufficient to account for the derived relation between fire and sexual arousal (e.g., radiators also produce heat but are not reported as fetish objects). In effect, while derived relations are arbitrarily applicable to any set of events (e.g., sexual arousal and fire) they are not arbitrarily applied. Instead, the application of derived relations between sexual arousal and other events is controlled arbitrarily by specific contextual cues (e.g., "she *is* hot"). By recognizing the subtle interaction between verbal and nonverbal learning processes, therefore, RFT provides a viable technical account of the emergence of highly complex and unusual sexual arousal patterns. This encompasses our knowledge of evolutionary variables, histories of direct stimulus association, instrumental learning, and the role of derived stimulus relations and verbal contingencies in the development of human sexual responding.

Conclusion

Our understanding of human sexual arousal has been expanded considerably by recent empirical and conceptual analyses of derived relational responding and its relationship to human sexual arousal. This research has shown that the human capacity for language impacts upon the emergence and maintenance of sexual arousal patterns. The control of sexual arousal by verbal contingencies increases the number of ways that sexual arousal may emerge beyond those posited in a traditional behavioral account of human sexual arousal. In addition, the RFT approach also speaks to natural constraints on sexual learning placed by the formal properties of the stimuli involved. Relational Frame Theory, therefore, promises to expand considerably the on-going behavior analytic contribution to human sex research in the field of psychology.

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