COVERT POSITIVE REINFORCEMENT IN THE TREATMENT OF NAILBITING: TARGET-RELEVANT VERSUS TARGET-IRRELEVANT CONSEQUENCES

by

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Clinicians working within a behavioral framework are frequently criticized for ignoring the role of cognitive-symbolic processes in the formulation and remediation of clinical problems. With the emergence of what some have termed the "new cognitive trend in behavior therapy," however, cognitive processes are acquiring a central role as explanatory constructs in behavioral analysis (e.g., Mahoney, 1974). Cognitive behavior therapies (e.g., covert positive reinforcement), which involve applying strategies found to be successful in modifying overt behavior to covert behavior, are increasing in popularity.

The empirical evidence related to the outcome of cognitive behavior modification techniques is difficult to interpret. Therapeutic results have sometimes been reported as only marginally successful and at other times as dramatically effective. A possible explanation for the contradictory nature of the outcome literature might be discrepancies in procedural conditions and subject variables in the studies which have been reported.

In the present investigation, the effectiveness in reducing nailbiting of self-monitoring (SM) in conjunction with two procedural variations of covert positive reinforcement (CPR) (Cautela, 1970b), one using target-relevant (CPR-R) and the other target-irrelevant (CPR-I) reinforcing scenes, were compared. The effect of each variation of the CPR procedure on nailbiting was compared to the effect on nailbiting of a self-monitoring package, which incorporated self-recording of nailbiting, expectancies of improvement, and feedback on changes in nail length. The effects of three subject variables—intelligence, pre-treatment level of nailbiting

severity, and awareness of the nailbiting habit were also investigated in relation to the outcome of treatment.

The data indicated that subjects in all treatment conditions (CPR-R, CPR-I, and SM) demonstrated significant increases in nail length relative to their pre-treatment lengths. There were no differences among treatment groups in nail length gains either at the conclusion of therapy or at a three-week follow-up assessment. Subjects in all three treatment groups exhibited significantly greater increases in nail length than subjects in the control group. There were no differences in the outcome of the CPR treatments between the use of target-relevant and target-irrelevant reinforcing scenes. The intellectual level of the clients and the pre-treatment levels of nailbiting severity were also unrelated to the outcome of treatment. The more awareness of nailbiting the clients reported after treatment, the greater was their maintenance of nail growth gains.

Inasmuch as a time-consuming treatment technique like covert positive reinforcement contributed nothing to the therapeutic effects of a simple technique, self-monitoring, it was recommended that before therapists become involved in selecting complicated treatment strategies for their clients, they should investigate the feasibility of using simpler, more efficient ones. For those cases in which the reactive effects of self-monitoring are insufficient to effect a cure, further research is recommended to discover which components of cognitive behavior therapies are most essential for behavior change, and for what subjects and troublesome responses cognitive therapies are most suitable.

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CHAPTER I

INTRODUCTION

Researchers working within a behavioral framework are frequently condemned for avoiding, denying, or de-emphasizing cognitive-symbolic processes in their formulations of clinical problems (Mahoney, 1974). Whereas the allegation that behavioral researchers ignore significant private events in studying behavior was almost universally true until the mid-1960's, this omission is becoming the exception, rather than the rule. The policy of including cognitive processes (e.g., thoughts, images, and feelings) and inferring mediational constructs to explain the outcome of behavior therapy has been accepted enthusiastically by many behavior therapists during the past ten years (e.g., Beck, 1976; Mahoney, 1977a; Meichenbaum, 1977). Strategies which have been found to be effective in modifying overt behavior (e.g., positive reinforcement) are now being applied to covert behavior (Rachlin, 1977a).

Mahoney (1977a) has recently provided a succinct overview of the basic premises of the mediational perspective of cognitive behavior therapy as it exists today. He contends that (a) people respond to a cognitive representation of the environment rather than to the environment itself; (b) these cognitive representations are functionally related to learning concepts; (c) learning is cognitively mediated; and (d) covert and overt behavior are interactive in a causative sense. One reason that mediational theories and cognitive behavior therapy are gaining in popularity, Mahoney (1974) contends, is what he per-

ceives to be the inadequacies of nonmediational models in explaining the results of certain kinds of laboratory research, and the inability of traditional overt behavior therapy techniques to produce enduring and general results. He argues that the data generated in investigations of verbal conditioning and awareness, covertly mediated stimulus transformation, attribution, locus of control, and responsiveness to covert self-stimulation cannot be adequately explained within the constraints of a nonmediational model. In addition, evidence from placebo research (e.g., Frank, 1961) suggests that thoughts, expectancies, and attitudes play a large part in the effectiveness of psychotherapy of any variety (Mahoney, 1974).

As a result, many behavior therapists have jumped on the cognitive bandwagon, with behavior therapy often becoming "a set of operations focused on the patient's cognitions (verbal or pictorial) and on the premises, assumptions, and attitudes underlying these cognitions" (Beck, 1970, p. 187). Bergin (1970) contends that nothing is gained by attaching a label of "cognitive" or "behavioral" to particular therapy techniques. Some techniques the behavior therapist uses may have a more cognitive or behavioral focus than others, but these strategies are usually embedded in a multidimensional context having both cognitive and behavioral aspects. It is thus not possible, according to Bergin, to operate along a single therapeutic or theoretical dimension. One can focus on overt behavior, but that does not mean that cognitions are not affected concurrently (Beck, 1970). Private and public events have an equal status in explaining and controlling human behavior (Cautela & Baron, 1977).

COVERT EVENTS IN AN EXPERIMENTAL ANALYSIS OF BEHAVIOR

The legitimacy of covert events in the experimental analysis of behavior was initially established by Homme (1965), who, building on Skinner's (1953) comment that "we need not suppose that events which take place within an organism's skin have special properties for that reason" (p. 257), emphasized that it was time for operant conditioners to attend to the "operants of the mind" or covert operants to which he applied the catchy label, "coverants." Homme's basic contention was consistent with Skinner's (1953) assumption that private events obey the same laws of behavior that public ones do and are thus subject to the same manipulations. Further, they are observable -- to an audience of one (Homme, 1965; Skinner, 1953).

Homme (1965) claimed that private events (e.g., thoughts, images, feelings) are (covert) components in a response chain; that is, they mediated some aspect of the input (stimulus) — output (response) process. Homme suggested that Premack's differential probability hypothesis — "for any pair of responses, the more probable one will reinforce the less probable one" (Premack, 1971) — should be applied to control the occurrence of coverants. By arranging for the occurrence or nonoccurrence of certain overt responses, the individual can control his covert behavior systematically, according to Homme. Operant conditioning could thus be used as a cognitive behavior therapy tool in that therapists could reinforce or countercondition what clients said to themselves (Homme, 1965).

Since Homme (1965) first introduced the concept of cognitive events as covert operants, cognitive behavior therapists have conceptualized covert phenomena or coverants in a number of different ways. Whether the theorist views private events as imaginal representations of the environment (Bandura, 1969), belief systems (Ellis, 1972), rational or irrational thinking styles (Beck, 1970), self-statements (Meichenbaum, 1974), self-evaluations (Kanfer, 1970), coping skills (Meichenbaum & Cameron, 1973), or problem-solving abilities (D'Zurilla & Goldfried, 1971), the implicit underlying assumption is that covert events are a form of behavior which differs from overt events only in terms of its accessibility to public inspection (Skinner, 1953). As a result, one feature that most cognitive behavior modification techniques have in common is that covert events are treated within the same learning theory framework as overt events are in regular behavior modification procedures.

An early attempt to apply a conditioning model to thought patterns is the work of Cautela. Cautela's (1966, 1967, 1970a,b, 1971b, 1973) techniques are based on the assumption that imaginal stimuli have similar relationships with covert and overt responses as externally presented stimuli do, and that manipulating covert events will alter overt events in a potentially specifiable manner (Cautela, 1970a). Thus imaginally presented reinforcing and punishing stimuli may be expected to modify behavior in much the same way externally presented stimuli do. Behavior change is achieved as a consequence of the effects of symbolically presented outcomes (Mahoney, 1974).

Shortly after Homme (1965) published his exposition on coverants, Cautela (1966, 1967) introduced covert sensitization, which is designed to change the valence or attractiveness of certain environmental stimuli. In later years, Cautela has developed such techniques as covert positive reinforcement (Cautela, 1970b), covert negative reinforcement (Cautela, 1970a), covert extinction (Cautela, 1971b), and covert punishment (Cautela, 1973). Each of these techniques is designed to manipulate the frequency of cognitive responses by applying learning concepts to covert events. The rationale for using any of these techniques is the belief that private events obey the same rules that public ones do.

Continuity and Covert Conditioning

The assumption that private phenomena obey the same psychological laws and are open to the same manipulations as public phenomena is called the "continuity" or "homogeneity" assumption (Thoresen & Mahoney, 1974) and is the central postulate of the covert conditioning model (Mahoney, 1974). The covert conditioning model transfers the language and theory of operant conditioning to private events and invokes traditional learning concepts to explain and predict cognitive behavior. A sort of miniature operant laboratory is seen to exist within the skin (Rachlin, 1977c).

Private events are presumed to be established as a consequence of external events and to follow the same set of rules of acquisition, maintenance, and extinction that public events do (Kanfer & Karoly, 1972). Covert events are seen as functioning as stimuli which control human behavior, responses which mediate elements in a longer response chain, and/or consequences which may reinforce or punish overt or covert

responses, according to this model (Mahoney, 1974). Further, coverants are believed to be modifiable by external as well as other internal events. Imaginal stimuli are presumed to have the same functional relationship with covert and overt behavior as externally-presented stimuli (Cautela, 1971a).

The covert conditioning model of private events is not a new one. Early and persistent support for continuity and the covert conditioning perspective has come from Skinner (1953, 1963, 1969, 1974), Dollard and Miller (1950), and a variety of other prominent behavior theorists (e.g., Bandura, 1969; Homme, 1965; Ullmann, 1970). Initial support for the continuity assumption was based on logical inference: there was no reason to suggest that private events differed from public events (Mahoney, 1974). Further, in postulating cognitions as different from overt behavior one must also espouse a separate model of cognitive and of behavioral development. Such a dualistic formulation of the nature of man would lead to behavioral and cognitive psychologists studying two different aspects of man, overt and covert behavior, respectively (Ullmann, 1970).

Thus, the homogeneity assumption is seen by some as a more parsimonious method of accounting for the relationship between overt and covert behavior than postulating nonhomogeneity. Fewer inferences are needed. Further, the assumptions of the covert conditioning model have internal consistency; that is, they do not disagree with one another (Cautela & Baron, 1977).

Although acceptance of the continuity assumption may have strong intuitive appeal, another question that must be raised before the

tenability of covert conditioning can be assumed is whether there is in fact empirical evidence that cognitive behavior is influenced by reinforcement operations, that cognitions may function as antecedent discriminative stimuli, or that cognitions may function as consequences. An investigation of physiological arousal by Miller (1935) suggesting that cognitions may act as antecedents for emotionality, an investigation by Weiner (1965) indicating they may function as consequences, and two verbal learning experiments reported by Mahoney, Thoresen, and Danaher (1972) suggesting that internal events are modifiable by external processes are frequently cited as providing empirical support for the continuity assumption.

Covert Events as Stimuli

Miller (1935) collected galvanic skin response (GSR) data on the same subjects performing similar covert and overt responses. The symbols "T" and "4" were presented in random order, with "T" always being followed by an electric shock and "4" never followed by a shock. The subjects called the name of the symbol as it was presented. As would be expected, the subjects showed a large GSR to "T" and a small GSR to "4". During the next phase of the experiment, a series of dots was presented. The subjects were told to say "4" to the first one, "T" to the second, "4" to the third, etc. During the final phase, the subjects were instructed to think "T" and "4" in response to the dots. Even though shock was no longer presented, saying and thinking "T" produced a large GSR while saying and thinking "4" elicited a small one.

Miller's data suggest that the cue value of saying and thinking a word may be functionally equivalent. That a covert event was able

to produce the same response as an overt event suggests that cognitive events may function as stimuli which control responses. Some other investigations which also lend support to the concept of covert events as stimuli which can control autonomic arousal have been reported by Proctor and Malloy (1969), Masters and Johnson (1970), and many others.

Covert Events as Consequences

To determine whether covert events can function as consequating stimuli, Weiner (1965) examined whether instructions to imagine an aversive event can approximate the effects produced by the veritable occurrence of an aversive event. The effects of actual occurrences of response cost (punishment) on response suppression under fixed-interval (FI) contingencies were compared with instructions to imagine response cost on a key pressing task. Conditioning was conducted in three phases.

During phase I, the subjects, two psychiatric nursing assistants, were conditioned on a FI 10-second schedule to earn points for key-pressing. A no-cost condition was in effect at that time so that although key presses between FI 10-second reinforcements were irrelevant so far as earning points was concerned, the nurses did not lose points for these extraneous presses. Both subjects responded almost continuously between reinforcements.

During phase II, the subjects were conditioned to respond on the same FI 10-second schedule. Periods of no-cost for irrelevant presses alternated with periods of one-point response cost for irrelevant presses in a random manner. A light signalled when the real cost condition was in effect, telling the nurses when one point would be subtracted from their scores for each response. Under this real

cost condition, the subjects emitted low rates of temporally spaced responding with little inter-reinforcement responding.

During phase III, FI 10-second no-cost responding contingencies were once again in effect. The subjects were instructed to imagine that the light which signalled the response cost condition was on and that they were losing one point for key presses during periods that were signalled by a distinctive tone. No cost periods were alternated with imaginal cost periods as in phase II. At no time, however, did the subjects actually lose points for responses during phase III. Under imaginal cost conditions, the subjects produced variable frequencies and patterns of inter-reinforcement responses. Inter-reinforcement responding during imaginal cost conditions tended to be less than under no cost conditions.

Weiner's (1965) data suggest that inasmuch as imagined cost contingencies had a suppressive effect on responding relative to no-cost contingencies, verbal instructions to imagine consequencies may exert a similar effect on responding that real consequences do. Other support for the role of covert events as consequating stimuli is provided by Asher (1973), Krop, Messinger, and Reiner (1973); Steffan (1974); Epstein and Peterson (1973); all of whom are reviewed by Mahoney (1974).

Covert Events as Behavior

The Mahoney et al. (1972) studies suggest support for the notion of conceptualizing covert events as behavior. In these studies, subjects were differentially rewarded or punished for using four different associative methods -- repetition, sentence generation, imagery, or other — to learn noun pairs. Imagery, which is usually demonstrated to be the most effective recall technique in verbal learning experiments, was

the mediating response selected for modification because it provided a covert response for which an indirect reliability check (improved performance) would be available (Mahoney et al., 1972).

The first experiment consisted of presenting noun pairs and having the subject indicate the covert associative response he/she had selected. Following a baseline assessment of the subjects' free operant level of using imagery to associate the noun pairs, those who reported few incidences of using imagery were given dimes when they reported using imagery to associate subsequent pairs. Those who had high baseline levels of using imagery as their associative strategy were given dimes for reporting using covert repetition as their associative technique. During the next phase, reinforcement was given for reporting the use of opposite strategies. Next, the original reinforcement contingencies were reinstituted. Finally, a recall test for all of the paired associates presented during baseline, intervention, reversal, and reintervention was administered. The second experiment followed the same design but, instead of rewarding selected associative strategies, punished them by taking dimes away when subjects reported using the target associative strategy (Mahoney et al., 1972).

In both experiments, the subjects' reports of covert responses corresponded to the experimental phases. Mahoney et al. (1972) contend that it was not just the performance of reporting associative styles that was affected by the contingencies in effect but the actual nature of the associative style employed. In the first experiment, all the subjects displayed superior recall of noun pairs that they reported had been associated through imagery. In the second experiment, this superiority was

demonstrated in 92% of the subjects. Mahoney et al. (1972) conclude that the covert events themselves were being manipulated by the environment, which suggests to them proof of the empirical validity of the continuity assumption.

Not everyone agrees with their conclusion. Rachlin (1977c), for example, contends that all these two experiments show is that instructions influence performance while the relationship between the rewards and thoughts is not clear. Although it may be possible that the dimes reinforced thoughts, it is equally plausible that the subjects were merely "taught to repeat overtly a discriminative stimulus and then behave in accordance with a previously-learned discrimination" (p. 370). By analogy, Rachlin suggests that a person can be trained to go left when he hears the word "black" and right when he hears the word "white." If the person is rewarded for saying black and then goes left, Rachlin questions whether anyone would contend that this provided an example of rewarding thoughts.

Rachlin (1977c) also offers a very convincing argument that the adoption of the continuity assumption is a more illogical than logical choice.

> It is of course conceivable that events within the nervous system follow the same dynamic laws as events outside it, but to expect such a coincidence is putting a great deal of faith in homogeneity. When we open a rock we do find little rocks, but the whole point of an organism is that its various parts are not homogeneous. Why should the parts of a person behave like little persons? It's like expecting the carburetor of an automobile to behave like a little automobile (p. 370).

Continuity and Therapeutic Efficacy

Rachlin (1977a, 1977b, 1977c) admits, however, that it is possible for experimental or philosophical issues to be irrelevant to the utility

of a concept in behavior therapy. An illogical premise may have tremendous heuristic value. If drawing inferences about unobserved phenomena results in the development of clinically useful intervention strategies, perhaps inferential leaps should not be criticized.

For the purpose of the present investigation, the tenability of the continuity assumption on logical grounds is thus not of particular importance. What will be important is whether or not particular therapeutic strategies derived from the continuity assumption possess clinical utility for a wide variety of subjects with a variety of presenting problems. In the next section of this introduction, a description and evaluation of the various covert conditioning therapies will be presented. The covert conditioning therapies to be discussed in this section represent only one subtype of cognitive behavior modification techniques. Other techniques which are unrelated to the proposed project (e.g., thought stopping, Wolpe, 1969; coverant control, Homme, 1965; systematic desensitization, Wolpe, 1958), will not be discussed. Only Cautela's (1966, 1967, 1970a, 1970b, 1971a, 1971b, 1973) covert conditioning procedures — covert sensitization, covert positive reinforcement, covert negative reinforcement, covert extinction, and covert punishment — will be reviewed.

A GENERAL DESCRIPTION OF COVERT CONDITIONING PROCEDURES

Cautela's (1966, 1967, 1970a, 1970b, 1971a, 1971b, 1973) covert conditioning procedures are imagery techniques which are based on extrapolations from experimentally derived learning principles. Covert positive or

negative reinforcement, extinction, and punishment are seen as direct applications of the respective operant procedures. Covert sensitization involves punishment, negative reinforcement, classical conditioning, and aversion relief procedures (Kazdin, 1977).

The covert conditioning therapies have been applied to a wide variety of clinical problems: for example, phobic avoidance, sexual deviance, obesity, and alcoholism. After the particular response a client wishes to change has been identified, the therapist selects the appropriate covert conditioning technique and constructs scenes for the client to imagine. Whichever covert conditioning technique is selected or whatever the goal of therapy might be, the client is directed to imagine the response to be increased or decreased and then to imagine the consequences immediately (Cautela, 1973).

If, for example, the object of therapy were to decrease the frequency of an undesirable behavior, the scenes would feature the typical antecedents of the response (e.g., seeing a child), the troublesome response (e.g., a sexual assault), and therapeutic consequences (e.g., vomiting) designed to reduce the probability of the behavior in the future instead of the usual positive consequences (e.g., orgasm) of the response present in the natural environment. If, on the other hand, the object of therapy were to increase the frequency of a response, the scenes would feature the typical (for other persons) antecedents of the response (e.g., an attractive female), the deficient response (e.g, asking her out for a date), and therapeutic consequences (e.g., the woman's accepting the date) designed to increase the probability of the behavior in the future. In either case, the client would initially imagine the scenes with help from the therapist and then practice the scenes independently (Cautela, 1973). The therapist would assess the clarity of the

client's imagery by having him/her narrate the contents of the scene while he/she was imagining it (Kazdin, 1976).

Before any scenes are presented, however, the client is given a convincing rationale for the procedure:

> Your behavior occurs because it is maintained by the environment. Whenever you perform that behavior, it is rewarded or punished by other people. There are many studies which indicate that if the consequences of behavior can be manipulated, then the behavior can be increased or decreased in frequency. We have found that just by having people imagine particular consequences, that behavior can change in a similar manner. I am going to have you imagine certain scenes, and ask you to imagine you are really there. Try not to imagine that you are simply seeing what I describe; try to use your other senses as well. If in the scene you are sitting in a chair, try to imagine you can feel the chair against your body. If, for example, the scene involves being at a party, try to imagine you can hear people's voices, hear glasses tinkling and even smell the liquor and food. Now remember, the main point is that you are actually there experiencing everything. You don't see yourself there, but are actually there. First, let's determine if you can imagine the scene clearly. Close your eyes and try to imagine everything I describe. Ready? Raise your right index finger when the scene is clear (Cautela, 1973, p. 28).

When the client indicates that the scene is clear and that he/she can imagine the consequences of his/her behavior, he/she is directed to imagine the scene by himself/herself. If the client has difficulty imagining any part of the scene, the therapist repeats the scene with elaborated or modified instructions, designed to help the client imagine those parts of the scene he/she had difficulty imagining (Cautela, 1973).

The client is instructed to signal with his/her index finger when he/she finishes imagining the scene on his/her own. Further inquiry about the vividness and clarity of the scene is made at this point. The therapist then presents the scene to the client to imagine 10 times, alternating with 10 independent imagining trials by the client. The client is asked to practice the scene 10 - 20 times a day at home (Cautela, 1973).

SPECIFIC COVERT CONDITIONING PROCEDURES

Covert Sensitization

Procedure

Covert sensitization (CS) is analogous to a punishment paradigm. It is used to treat maladaptive approach behavior. The client is directed to imagine the inappropriately attractive stimulus (e.g., liquor, food, homosexual partner), imagine that he/she is about to partake of the forbidden pleasurable object (e.g., drink, eat, fellate), and then imagine some aversive consequence (e.g., nausea, ridicule) for commiting the compulsive act. He/she then imagines a feeling of relief contingent on turning away from the pleasurable object. When anxiety contributes to the maladaptive behavior, systematic desensitization (Wolpe, 1958) is also combined with CS (Cautela, 1967).

Outcome

The therapeutic effectiveness of CS tends to be response-specific. That is, CS to a particular kind of food or alcohol typically does not generalize to other types of food or liquor. After the subject has been sensitized to one member of the class of troublesome stimuli (e.g., Scotch), however, it tends to be easier to sensitize him to other members of the stimulus family (e.g., rye) (Cautela, 1966).

Since CS was first introduced, it has been applied to the treatment of alcoholism (e.g., Ashem & Donner, 1968), smoking (e.g., Sachs, Bean, & Morrow, 1970), obsessive-compulsive behavior (e.g., Wisocki, 1970), obesity (e.g., Manno & Marston, 1972), and sexual deviation (e.g., Barlow, Agras, Leitenberg, Callahan, & Moore, 1972). Most of the literature on CS involves reports of single case studies in which CS has been effective.

Few controlled investigations are reported, and often those that are have methodological confounds which make isolating the effects of CS difficult. Frequently, results of these various studies are contradictory with respect to the effectiveness of CS in treating particular clinical problems.

Although conflicting outcomes, the absence of a standardized treatment program, and the failure to isolate treatment components in the CS package make it difficult to evaluate the clinical utility of CS, several general conclusions may be drawn. The effect of CS in smoking or alcohol consumption has not been consistent or impressive; CS has had variable success with obesity; and CS has demonstrated consistent and substantial effectiveness in the treatment of sexual deviation. The effectiveness of CS seems limited to those classes of behavior in which symbolic events (e.g., fantasies) play a functional role in the emission of the troublesome response (Mahoney, 1974).

Covert Extinction

Procedure

Covert extinction (CE) is analogous to operant extinction. It is used to treat behavioral excesses complicated by the fact that the home or institutional environment is reinforcing behavior at a higher rate than it can be extinguished during therapy sessions (Cautela, 1973). The client is directed to imagine himself/herself emitting the undesireable behavior (e.g., stuttering) and then imagine that the usual reinforcing consequences maintaining the behavior do not occur (e.g., no one notices his/her stuttering in any way). As a result, the undesirable behavior should decrease in probability or be eliminated entirely (Cautela, 1971b). Occasionally, imaginal withdrawal of reinforcement is followed by a temporary increase in responding (Cautela, 1973), as in operant extinction.

Outcome

Empirical evidence for the therapeutic effectiveness of CE is meager and equivocal. Cautela (1971b) presents several case studies in which CE was used to reduce excessive eating, disruptive classroom, homosexual approach, self-injurious, and phobic avoidance behavior. He does not comment on the outcome of most of these cases (six of the seven presented). In some controlled analog studies (Ascher & Cautela, 1972), CE is paired with other covert conditioning techniques so the isolated effects of CE are difficult to evaluate.

One of the few clinical tests of CE was conducted by Gotesdam and Melin (1974), who reported a direct experimental test of CE with intravenous amphetamine addicts. The clients were instructed to imagine giving themselves amphetamine injections and then to imagine that they did not experience the pleasurable physiological sensations normally associated with the injections. All four clients reported at least one instance of not experiencing pleasurable feelings when injecting the drugs. Nine months after treatment, two of the four had stopped injecting amphetamines, one had relapsed, and one had given up drugs and taken up heavy drinking. These findings do not lend particularly strong support to the notion of the clinical utility of CE, although Cautela (1973) claims they do.

Some other experimental data may be construed as indirectly supportive of CE techniques. Mahoney (1974) suggests that the "exposure only" control groups employed in research on systematic desensitization and implosive therapy are similar to CE. The differences between these techniques and CE are marked, however, so that extreme caution must be

exercised in generalizing support for CE from reported successes of systematic desensitization and implosive therapy.

Covert Negative Reinforcement

Procedure

Covert negative reinforcement (CNR) is analagous to an escape-conditioning paradigm. It is used to treat excessive and inappropriate avoidance behavior in those clients who either claim that there are no reinforcing stimuli in their lives or have difficulty imaging anything reinforcing. Instead of reinforcing approach behavior with a positive image, CNR involves instructing the client to terminate an aversive image before imagining himself engaging in the phobic behavior (Cautela, 1973). The client is directed to imagine an unpleasant situation (e.g., somebody yelling at him/her). The client is then instructed to stop imagining the aversive stimulus and begin imagining approaching the feared stimulus (e.g., a large dog). Like operant negative reinforcement procedures, CNR is designed to increase the probability of the approach response (Cautela, 1973).

Outcome

Although Cautela (1970a) estimates a 90% success rate for CNR, data on the clinical utility of CNR are scarce. Marshall, Boutilier, and Minnes (1974) found that using CNR with snake phobic subjects resulted in more approach behavior than placebo and no-treatment control procedures, but less than systematic desensitization. They agree with Cautela (1970a) that CNR is probably most useful when a positive reinforcement approach does not seem possible, but similarly do not specify how to decide *a priori* what technique to use.

Other investigations of CNR (e.g., Ascher & Cautela, 1972) have employed clinically irrelevant responses (e.g., circle size estimations). One basic problem with interpreting CNR outcome research is that CNR, as described by Cautela (1970a), is actually quite different from the operant paradigm of negative reinforcement, so that the assumptions of operant negative reinforcement cannot be appropriately applied to CNR. In CNR, termination of the aversive stimulus precedes the emission of the target response whereas in the operant paradigm, negative reinforcement refers to the procedure in which termination of the noxious stimulus follows the target response (Mahoney, 1974).

Covert Positive Reinforcement

Inasmuch as covert positive reinforcement (CPR) is the subject of the present investigation, both the CPR procedure and outcome literature will be reviewed in greater detail than were the procedures and outcomes related to Cautela's other covert conditioning therapies.

Procedure

CPR involves presenting a reinforcing stimulus in imagination in order to manipulate behavior in the same way external presentations of reinforcing stimuli do. The purpose of the CPR procedure, as is the purpose of operant reinforcement procedures, is to increase response probability. Cautela (1970b) claims that CPR is applicable to all behavior influenced by learning and may be used to modify both maladaptive avoidance and approach behavior.

Selecting reinforcers. The first step in the CPR procedure as outlined by Cautela (1970b) is to discover stimuli that will serve as reinforcers for the client. Cautela suggests three ways of determining

reinforcers. The therapist can have the client fill out the Reinforcement Survey Schedule (RSS) (Cautela & Kastenbaum, 1967); ask the client to suggest other items or events, not listed on the RSS, that could serve as reinforcers; and/or consult with the client's friends, relatives, case history, or ward personnel for possible reinforcers (Cautela, 1973).

An item is included as a possible reinforcer in the CPR procedure if the client perceives it as highly pleasurable, enjoyable, or desirable; is able to create a clear image of the stimulus; and obtains a clear image of the stimulus within around five seconds of its presentation (Cautela, 1970b). It is advisable to have a variety of different possible reinforcing images available for the client to use so that stimulus satiation will not occur. Reinforcers are frequently varied even within the same session (Cautela, 1973).

Pre-training imagery. Once a variety of reinforcers has been selected, the client receives training in imagining the reinforcers. Elaborate descriptions of the scenes are provided to encourage the involvement of several of the client's sensory modalities in the imaging process. The subject is questioned about the clarity of the image and the ease of imaging. Once the subject is imagining the reinforcing scene quickly and easily, he/she is trained to begin imagining the scene in response to a cue word (e.g., "shift" or "reinforcement") (Cautela, 1973).

Conditioning. During this phase of the CPR procedure, cueing of the reinforcing scene is made contingent on imagining the target behavior. The target behavior may involve discrete overt activities (e.g., pronoun selection[Ascher, 1973]) or a sequence of overt activities (e.g., hetero-

sexual approach behavior [Cautela, 1973]). Cautela (1970b) presents an example of a typical conditioning trial designed to increase the probability of a male homosexual client's calling up a female for a date.

> I want you to imagine that you are home in the kitchen and you say to yourself, 'I think I'll call Jane for a date.' When you have that scene clearly, raise your finger. (As soon as he raises his finger to signal clear imagery, the experimenter says, 'Reinforcement.') Was the delivery of the reinforcement clear? All right, let's continue. After you've decided to call Jane, you walk toward the phone and you start dialing. Raise your finger when this is clear. ('Reinforcement.') All right, now you have finished dialing. Jane answers. You say, 'Hello' and ask her if she is free Saturday night and tell her that you would like to take her out. Raise your finger when this is clear. (Reinforcement.) Now do the whole procedure yourself. Imagine you decide to call. Deliver a reinforcement to yourself, then imagine you are dialing, then deliver a reinforcement to yourself. Then imagine you are asking for a date and again deliver a reinforcement to yourself. When you are finished, raise your right index finger. Now take your time. Make sure you get clear imagery. You can see the kitchen. You can see and feel the phone, etc. Also try to imagine that you are comfortable and confident while you are in the kitchen going through the procedure. All right. Start (p. 38).

The therapist usually requests the client to narrate the content of the scenes being imagined so that the clarity of his/her imagery may be assessed (Kazdin, 1976). In addition, the client is instructed to practice the conditioning scenes on his/her own between sessions (Cautela, 1973).

Parameters of CPR. In applying CPR procedures, Cautela (1970b) suggests that the therapist attend to the same parameters of reinforcement in administering imaginal reinforcers that are important to control when using externally presented consequences. These parameters are number of reinforcements, intertrial intervals, immediacy of reinforcement, schedules of reinforcement, and drive states. To maximize the effectiveness of CPR, Cautela contends that the same parameter manipulations should be employed that are used in regular operant procedures.

Possible problems associated with the use of CPR. Sometimes clients report that they have poor imagery, fail to practice outside the office, experience anxiety while they imagine approaching phobic objects, or undergo spontaneous recovery or reconditioning after treatment has been terminated. Cautela (1970b) suggests that if the client complains of poor imagery, the therapist should be careful to describe the scenes in as much detail as possible, including all of the sensory modalities. The likelihood of the client's practicing outside the office may be increased by using the CPR procedure with scenes of practicing outside the office. If the client reports anxiety in imagining approaching a phobic object, Cautela suggests having him/her imagine feeling comfortable while imagining approach responses. Finally, to minimize the chance of spontaneous recovery, treatment should be continued for at least six sessions after the maladaptive behavior has been ostensibly eliminated, to produce overlearning. The client may also be instructed to start using the CPR procedure immediately if the maladaptive behavior returns.

Outcome

Most of the outcome research on the clinical effectiveness of CPR consists of individual case reports. CPR has been used successfully to treat a variety of troublesome categories of behavior. Small animal phobias (e.g., Ladouceur, 1974; Marshall et al., 1974), obsessive-compulsive behavior (e.g., Wisocki, 1973), self-injurious behavior (e.g., Cautela & Baron, 1973), homosexuality (Kendrick & McCullough, 1972), obesity (Manno & Marston, 1972) and negative self-statements (Cautela, 1971a) have all been treated with CPR. Usually, several other intervention strategies (e.g., relaxation, externally-imposed contingencies) are used in combination with CPR, which makes it difficult to assess the contribution

of CPR proper to therapeutic outcome.

Experimental analogs. Ascher (1973) investigated the effect on pronoun-selection of pairing imaginal reinforcing scenes with imaginal representations of pronouns. He presented cards with six pronouns (I, you, we, they, he, she) and the infinitive form of a common verb to four groups of subjects. Subjects were given instructions to generate sentences using the verb and one of the pronouns. Each of the four groups was exposed to three experimental phases.

For CPR subjects (Group 1), Phase 1 consisted of a 50-trial baseline assessment of pronoun selection. During Phase 2, the word "shift" was used to cue imaginal reinforcement scenes. Three pronouns were selected for reinforcement by having the subject imagine them and then "shift" to the reinforcing scene. One of the target pronouns was paired with CPR 30 times; the other two, 10 times apiece. Over the next 50 trials, the rate of pronoun selection was monitored to assess the effects of CPR on pronoun selection. After this, during Phase 3, an extinction condition was introduced. The subjects were instructed to imagine the three pronouns but no reinforcement was cued. A final presentation of 50 trials was then administered and pronoun selections monitored.

For CPR Extinction Control subjects (Group 2), Phases 1 and 2 were the same as for the CPR group. During Phase 3, the CPR Extinction Control subjects were not given extinction training before the last 50 trials were administered. For CPR Control subjects (Group 3), Phases 1 and 3 were the same as those given to the CPR Extinction Control group. During Phase 2, the CPR Control subjects were instructed to imagine their reinforcing scenes 50 times and then to imagine the target pronouns

50 times to control for the CPR-pronoun pairing given to the CPR and CPR Extinction Control groups. Finally, Control subjects (group 4) participated in baseline assessments throughout all three phases.

The data on incidence of pronoun selection suggest a strong effect of CPR on pronoun choices, particularly for those pronouns which were paired with CPR 30 times. Although the data indicate a greater attractiveness for CPR-associated pronouns, these findings are also open to a nonreinforcement explanation. Ascher's paradigm was more associative than instrumental. Instead of cueing reinforcement when the subject selected a target pronoun, CPR was paired with experimenter-selected pronouns. Also, no extinction effects were noted. One weakness in the design of this study is the omission of a neutral imagery control group.

Another analog of CPR was conducted by Epstein and Peterson (1973). During the first phase of the experiment, baseline assessments of the subjects' number choices from 1 - 100 were taken. Subjects were then trained in positive (e.g., "listening to country and western music") imagery. During Phase 3, subjects in one group were cued to create positive imagery after selecting particular numbers and negative imagery after selecting other specific numbers. The opposite number-contingencies were in effect for subjects in the other group.

As with the results of the Ascher (1973) study, the selection of reinforced numbers increased and punished numbers decreased. Also as in the Ascher study, however, a neutral imagery control group was omitted from the design of this study, making any definitive statements about the effectiveness of CPR difficult to defend. In both cases, differential

responding may have been a function of the instructions given. Two additional analog studies by Steffan (1971, 1972; cited by Mahoney, 1974) offer mixed evidence for the effects of CPR on behavior change.

Clinical experiments. Few studies of CPR have employed clinically relevant dependent measures. Many of these studies are inadequately designed, thereby permitting several plausible explanations for the apparent effectiveness of the experimental procedures. Often these investigations of the clinical effectiveness of CPR have yielded contradictory results. Studies involving the use of CPR to treat obesity, small animal phobias, test anxiety, and several other isolated clinical problems will be reviewed in the following sections.

Obesity. Manno and Marston (1972) compared the effectiveness of CPR, CS, and a minimal treatment control condition in a four-week treatment program for obesity. Both CS and CPR subjects lost significantly more weight than control subjects. There was no difference in the amount of weight lost by CS and CPR subjects.

Foreyt and Hagen (1973) compared CS, attention-placebo, or no-treatment control in the treatment of obesity. Subjects in the attention-placebo condition imagined the same food-approach scenes as the subjects in the CS group; however, instead of imaging nauseating imagery after imagining the food-approach scenes, subjects in the placebo control condition imagined pleasant imagery. Essentially, the "placebo" subjects were given CPR for symbolic rehearsals of food-approach behavior. Although there were no significant differences in weight loss between groups, those subjects in the "placebo" group did lose more weight than those in the other groups and reported decreases in the attractiveness

of their favorite foods. These results, which the authors attribute in part to expectancy influences, are in contrast with the Manno and Marston findings and are counter-intuitive. One would expect that pairing CPR with food approach behavior would lead to an increase in eating behavior, subsequent weight gains, and greater attractiveness of food stimuli.

Small animal phobias. Blanchard and Draper (1973) used CPR, covert exposure, imaginal presentation of the feared stimulus, covert extinction, and participant modeling to treat a rat phobia in the framework of a single-subject experimental design. They found that adding a CPR component to the covert-exposure-alone phase did not result in a substantial increase in behavioral approach. The addition of CPR may, however, have provided a facilitative therapeutic function, according to subjective data elicited from the client. Behaviorally, covert exposure alone was sufficient to induce rat-approach behavior.

Flannery (1972) also used CPR to treat rat phobias. He compared standard imaginal CPR with CPR administered in vivo (as the subjects approached the rat) and a positive-imagery-only control group. Both CPR groups exhibited greater rat-approach behavior at the conclusion of the experiment than the imagery-only group. The in vivo CPR subjects showed greater rat-approach behavior than the imaginal CPR group. Seventy-three per cent of the in vivo CPR subjects were able to hold the rat after treatment whereas fewer than seven per cent of the regular CPR subjects were willing to do so.

The impact of these data is somewhat attenuated by the absence of attention-placebo control and exposure-only groups in this study. In addition, follow-up and gereralization data are not presented. It is possible that in vivo exposure alone may have been the effective

treatment in this experiment. The finding that in vivo CPR was superior to imaginal CPR is consistent with findings that in vivo systematic desensitization is more effective than imaginal desensitization procedures (Davison & Neale, 1974).

Ladouceur (1974) treated rat phobic college students with traditional CPR, reversed CPR, and a no-treatment control procedure. Subjects in the reversed CPR group were instructed to imagine the reinforcing scene before imagining the approach scene, whereas subjects in the traditional CPR group imagined the approach response and then imagined the reinforcer. Subjects in both CPR groups exhibited less avoidance behavior after treatment than those in the control group, but there were no differences between the two CPR groups. Ladouceur concludes that these data do not support an operant conditioning explanation for the therapeutic effects of CPR and suggests that reciprocal inhibition (Wolpe, 1958) may provide a plausible basis for the observed effects which is consistent with Blanchard and Draper's (1973) and Flannery's (1972) suggestions.

Marshall et al. (1974) treated snake-phobic subjects with systematic desensitization, CPR, CNR, noncontingent CPR, placebo control, and no-treatment control techniques. They found that the CPR and desensitization treatments were equally effective in treating snake phobia and that subjects treated by either CPR or desensitization exhibited less phobic avoidance with respect to snakes than subjects in the attention-placebo or no-treatment control conditions.

Noncontingent-CPR subjects showed greater improvement than subjects in either control group, which casts doubt on the effectiveness of CPR as distinct from other positive-imagery-alone procedures. Marshall

et al. (1974) concur with Ladouceur (1974) that the effects of CPR may be a function of pleasant imagery's reciprocally inhibiting anxiety. One problem with interpreting the results of this study is that therapists were confounded with treatments, making it inadvisable to assert that the nature of the treatments alone was responsible for therapy outcome.

Test anxiety. Wisocki (1973) used CPR to treat test anxiety in college students. She used self-report (paper-and-pencil) measures of anxiety to compare anxiety reduction in CPR and no-treatment control subjects. CPR subjects reported greater reductions in test anxiety than control subjects, with anxiety decrements being significantly correlated with reports of imagery vividness. At follow-up, CPR subjects also reported feeling more relaxed, feeling more self-confident in test-taking situations, and receiving better grades. Because follow-up assessments were not conducted in control subjects, it is not possible to rule out the chance that spontaneous remission was responsible for these improvements. In addition, the design of the study failed to control for placebo effects.

Miscellaneous problems. Two studies discussed by Mahoney (1974) failed to demonstrate the effectiveness of CPR in enhancing self-evaluative statements or remedial reading task performances.

Kingsley (1973; cited by Mahoney, 1974) trained subjects to generate neutral, reinforcing, or aversive imagery contingent on positive self-evaluative statements. In spite of extreme differences in the nature of the covert consequence applied to self-evaluative statements, there was no difference in subsequent self-evaluations between CPR, CS, or neutral image control subjects. Similarly, Schmickley, Johnson, Elson, Rote,

Ripstra, and Yager (1974; cited by Mahoney, 1974) compared the effects of CPR and neutral imagery on remedial reading task performance. Schmickley et al. (1974) found no differences between groups on reading performance, comprehension, or task valuation.

Outcome Summary

The empirical evidence related to the effectiveness of CPR is difficult to interpret. Many of the studies conducted in this area are plagued by methodological problems. Often self-report data or pencil-and-paper measures of performance are relied upon to attest to the efficacy of a particular experimental manipulation. Therapeutic results have sometimes been reported as only marginally successful and at other times as dramatically effective. The contradictory nature of the CPR outcome literature may be explained in terms of procedural and subject variables.

Accounting for the Discrepancies in CPR Outcome Literature

Procedural factors. Probably many of the contradictory findings in the CPR outcome literature may be traced to differences in procedures among experiments. Because standardized treatment procedures which specify particular scenes, methods of presentation, and imagery training procedures are not employed, empirical replication and unequivocal outcome evaluations are not really possible (Mahoney, 1974). Differences in the effectiveness of CPR techniques as employed by different investigators may arise as a consequence of different investigators using fundamentally different procedures calling all of these procedures CPR.

Probably one of the most important procedural variables influencing CPR outcome is the nature of the symbolic consequences presented to the clients (Wisocki, 1976). The real-life relevance of these reinforcing

stimuli may affect their effectiveness (Mahoney, 1974). Cautela and his associates (e.g., Cautela, 1970b) generally use target-irrelevant reinforcers in CPR therapy, whereas others (e.g., Manno & Marston, 1972) have used realistic anticipated consequences in CPR and in other covert conditioning therapies such as CS (e.g., Harbert, Barlow, Heisen, & Austin, 1974; Hayes, Brownell, & Barlow, in press). No direct comparisons between the use of target relevant and target-irrelevant reinforcers, however, have been reported.

Subject variables. Another important variable which may account for the contradictory results in the CPR outcome literature are subject characteristics (Mahoney, 1974). A frequent criticism of more traditional psychotherapies (e.g., psychoanalysis) is that treatment is only suitable for those subjects who fit in with the "YAVIS" syndrome -- those who are youthful, attractive, verbal, intelligent, and successful (Schofield, 1964). Inasmuch as the major treatment technique of traditional psychotherapy is conversation, it seems logical to assume that therapeutic success would be linked with the verbal ability of the client (Goldstein, Heller, & Sechrest, 1966). Could it not be possible then that the efficacy of CPR and other cognitive behavior modification techniques, all of which rely heavily on conversation and cognitive events (e.g., imagery), might also depend on such characteristics of the client as intelligence or verbal ability? It seems likely, owing to the cognitive nature of CPR, this technique can be expected to work best for more intelligent subjects for the same reasons that traditional psychotherapies are more effective with "YAVIS" clients (Kiesler, 1971).

To test the hypothesis that the nature of the imaginally presented reinforcer and the intellectual level of the client would dramatically

affect CPR outcome, the present project examined the relationship between these two variables -- target-relevant versus target-irrelevant reinforcers and intelligence -- and the efficacy of CPR in the treatment of onchyophagia (nailbiting). Nailbiting was selected for treatment because it is an easy behavior to measure.

ISSUES IN NAILBITING

Nailbiting as a Clinical Problem

For people who bite their nails to excess, onchyophagia can be a serious clinical problem. Having the fingers in the mouth on a habitual basis may interfere with the articulation of clear speech sounds, may harm the dentition, and may also be hazardous to the nailbiter's health in that germs on the fingers are continually being introduced into the mouth. In addition, severely bitten nails are unattractive to look at and the severe nailbiter's fingertips often hurt and/or bleed (Coleman & McCalley, 1948; Malone & Massler, 1952; Massler & Malone, 1950).

Prevalence of Nailbiting

Nailbiting is a commonly observed oral habit of children and young adults. It usually begins between 4 to 6 years of age, levels off between 7 and 10 years, rises again during early puberty, and finally decreases during adolescence. Nailbiting is considered to be a "normal" behavior between the ages of 4 and 18 because of its high prevalence during those years (Massler & Malone, 1950). Approximately 40% of school children between the ages of 5 and 10 have been observed to bite one or more fingernails, with most of the biters biting all 10 nails (Malone & Massler, 1952). Among college students, 29% of the men and 19% of the women have been identified as nailbiters (Coleman & McCalley, 1948).

Although some authors have found sex differences in the prevalence of nailbiting, many claim that the only difference between male and female biters is that males tend to persist in the biting habit longer. Some reasons women have given for giving up the nailbiting habit include social disapproval for nailbiting, the social value of well-kept nails, fear of infection, and imitations of parental care of the hands. Apparently, there is greater social pressure placed on females to stop biting their nails than is exerted on males, because male biters frequently are not affected by these social contingencies (Coleman & McCalley, 1948).

Nailbiting tends to run in families. It is probably learned through imitation. No relationship has been found between nailbiting and intelligence (Massler & Malone, 1950). Nailbiters often report higher subjective levels of anxiety than nonbiters (Coleman & McCalley, 1948); however, nailbiting is commonly found in subjects diagnosed as primary sociopaths, (Walker & Ziskind, 1977) who are believed to be exceptionally low in anxiety.

Degrees of Nailbiting

Nailbiting may be classified as mild, moderate, or severe.

Mildly bitten nails often look broken rather than bitten. The free edge of the nail is irregular but reasonably intact. Fingernailbiting can usually be confirmed only by questioning the subject.

Moderately bitten nails have obviously been chewed. The free margin of the nail is completely absent. The soft tissue of the fingers is still covered by the nails, however.

Severely bitten nails are bitten below the free edge. The nail margin is below the soft tissue border of the finger. About half of

the people who bite their nails do so to a severe degree (Malone & Massler, 1952).

The Nailbiting Response Chain

Nailbiting consists of a series of four distinct response components, according to Billig (1941; cited by Massler & Malone, 1950). These steps consist of

> (1) Placing of either hand in the vicinity of the mouth. This posture continues from a few seconds to a half a minute. (2) Rapidly tapping the finger against the anterior teeth. (3) A sequence of quick, spasmodic bitings with the nail of the finger pressed tightly against the incisal edge of the anterior teeth. (4) Removal of the finger from the oral cavity. The finger is inspected visually or palpated (Massler & Malone, 1950, p. 523).

Behavioral Treatment of Nailbiting

Nailbiting is well suited to behavioral intervention efforts because therapeutic effectiveness (e.g., normal nail growth) is easy to observe and measure. In addition, nailbiting behavior is often influenced by social consequences, as evidenced by the fact that most biting occurs when the biter is alone (Bucher, 1968). Given the solitary nature of finger nailbiting behavior, treatment strategies that rely on mediators to provide aversive consequences for nailbiting are unlikely to be effective. Self-management of nailbiting is necessary for therapeutic success.

Aversive Control Procedures

Shock. Bucher (1968) used aversive stimulation to suppress nailbiting behavior. Some subjects were instructed to carry a portable shock device and self-administer shocks whenever they placed a finger in their mouths or on their lips. Others used a rubber band snapped against their wrist to punish nailbiting. Other responses that were punished included

rubbing the fingers together and touching or picking the nails or cuticles. Some subjects were assigned different punishers for different hands (e.g., left hand, shock; right hand, rubberband).

Bucher reports that in 9 of 20 cases, no biting occurred after the first day and in four cases, after four days (not counting relapses). As a result of the aversive therapy procedure, some subjects became more aware of early components in the nailbiting chain. Bucher suggests that by making early stimuli more discriminable, the subject will be better able to control his biting behavior. One problem with evaluating Bucher's data is that he did not obtain measurements of nail growth as an index of decreased nailbiting behavior. He relied on casual inspection of the subjects' hands and their self-reports of nailbiting behavior.

Threatened loss of money. Ross (1974) set up a contingency contract with a client who was a chronic nailbiter. Failure to exhibit an increase in nail length between sessions resulted in the client's being compelled to contribute money to a strongly disliked political party. Ross reports that nailbiting was effectively suppressed for the duration of the contract and at three-and six-month follow-up assessments.

Stephen and Koenig (1970) required nailbiters to deposit $25.00 at the beginning of their participation in the experiment. The subjects were informed that the money would be forfeited if they failed to meet the conditions of the experiment. All subjects were required to have their nails inspected twice a week for five weeks. For some subjects, a portion of the deposit was returned after each inspection session contingent on not biting; for others, half was returned after five sessions and the other half after ten; for others, at the end of the ten sessions.

Control subjects had no abstinence contingencies imposed on having their money refunded; they were merely required to attend inspection sessions.

Stephen and Koenig found an overall treatment effect (everyone's nails grew) without differentiation among groups, which is consistent with Bucher's (1968) findings. They suggest that merely focusing the subjects' attention on the length of their nails through biweekly inspections may have been responsible for reductions in nailbiting behavior. This hypothesis may explain why the control group subjects, whose money was returned whether they bit their nails or not, also showed a reduction in nailbiting. One weakness of the Stephen and Koenig study is that follow-up data are not reported, and follow-up nail measurements were not obtained.

Comparison of aversion techniques. Vargas and Adesso (1976) compared the effectiveness of three aversion therapies in the treatment of nailbiting. Nailbiters were assigned to either electrical aversion, chemical aversion, negative practice, or attention-placebo control groups. Half the subjects in each of the groups were also instructed to self-monitor nailbiting behavior. Vargas and Adesso found that self-monitoring subjects exhibited an increase in nail length and reported greater awareness of nailbiting than subjects who did not self-monitor nailbiting.

One problem with the design of this study is that experimenters were confounded with treatments. Also, reliability assessments of the subjects' self-monitoring made the subjects more aware of their nailbiting behavior, and it is possible that this increased awareness lead to reductions in nailbiting, independent of the aversive procedures administered.

Covert sensitization. Daniels (1974) reports applying CS in a variety of imaginal contexts to reduce chronic nailbiting behavior in

one subject. Imaginal representations of early components in the nail-biting chain were paired with imaginal nausea. After one two-hour CS session, Daniels reports, his client exhibited a complete cessation of nailbiting in all situations.

Davidson and Denney (1976) compared the relative effectiveness of CS and information procedures in controlling nailbiting. The information procedure was designed as a placebo-control procedure and was equated in terms of nonspecific treatment factors (e.g., demand, expectancy, attention to nails) with the CS procedure. A third group was exposed to a combination of CS and the information procedure. The CS procedure was automated to standardize presentation and facilitate group administration.

Compared to a no-treatment control condition, information was the only significant treatment technique. Not only did CS not contribute to reducing nailbiting behavior, it detracted from the efficacy of the information procedure when the two were presented to the same subjects. Comparisons among the various treatment groups did not reveal any differences in effectiveness of one treatment technique over another either at post-test or follow-up. These findings are consistent with earlier nailbiting studies (e.g., Bucher, 1968; Stephens & Koenig, 1970; Vargas & Adesso, 1976) that demonstrated overall treatment effects but no superiority of one treatment over another.

Although nonspecific treatment factors (e.g., attention, demand, or expectancy) seem to account for the reduction in nailbiting from pre- to posttest in this and other studies, Davidson and Denny question whether these decreases will be maintained when the subjects no longer expect to

have their nails measured. Perhaps a nailbiting reduction program managed by the nailbiter himself and which involves the nailbiter in measuring his own nails would produce enduring response suppression.

Self-control of Nailbiting Through Self-monitoring

An early study of the effects of self-monitoring on nailbiting was conducted by McNamara (1972). McNamara combined self-monitoring of nailbiting with incompatible responses, resistance responses, instructions to record incompatible and resistance responses, and instructions to continue nailbiting. McNamara found that all groups increased their nail length as a function of time without differentiation among groups, an effect he attributed to increased awareness of fingernail biting through self-monitoring.

Katz, Thomas, and Williamson (1976) investigated the effects of self-monitoring as a function of expectancy factors and incompatible response training. Twenty college students were assigned to a self-monitoring alone, self-monitoring plus expectancy of improvement, self-monitoring plus expectancy of improvement plus incompatible response training, and waiting list control conditions. Katz et al. found that the reactivity of self-monitoring was a function of the subjects' expectancies. Self-monitoring alone did not reduce nailbiting nor did the addition of incompatible response training.

Horan, Hoffman, and Macri (1974) used a complex self-control program consisting of self-monitoring, self-punishment, and self-reward to reduce the frequency of an early component of the nailbiting chain, placing the fingers in the mouth area. Placing fingers in the mouth was selected as the target response because administering punishment early in a response

sequence has been found to have a greater effect on response suppression than punishment administered following the undesirable response (Bandura, 1969).

During Phase 1 of the experiment, baseline nail-length data were collected and nonspecific "relationship" factors (e.g., therapist concern) were present. During Phase 2, subjects recorded the behavior of putting their fingers in their mouths and were requested to attend to possible antecedents of this behavior. During Phase 3, subjects were instructed to self-punish instances of fingers in the mouth by snapping a rubber band against their wrists and recording each occurrence of self-punishment. During Phase 4, self-punishment was discontinued although self-monitoring of fingers in the mouth was continued. Subjects were instructed to "do something else" when the antecedents of fingers in the mouth behavior were present. "Doing something else" was followed by self-reinforcement.

Nail length and cosmetic appearance of the nails of all subjects improved greatly, while the incidence of fingers in the mouth behavior decreased greatly during treatment. These gains were maintained at follow-up. No increases in nail length or improvements in appearance were reported during baseline, which suggests that nonspecific factors such as expectancy of improvement were not responsible for therapeutic change in this case study report.

The conclusions that can be drawn from this study are somewhat limited by the design of the study itself. Because no self-monitoring control group was included, the possibility that the reactive effects of self-monitoring (Nelson, 1977) were responsible for therapeutic outcome cannot be ruled out. Another factor limiting the generalizabity of these data is the fact that data for only four subjects were reported.

A Summary of the Behavioral Treatment of Nailbiting

A wide variety of behavioral procedures has been applied to modifying nailbiting behavior. Some of the techniques that have been used to modify nailbiting behavior, either by themselves or in combination with other techniques, include punishment (e.g., electrical stimulation, snapping a rubber band against the wrist) for biting the nails or emitting an earlier component in the nailbiting response chain; threatened loss of money for showing evidence of biting (e.g., failure of nails to increase in length over sessions, cosmetic appearance); negative practice; chemical aversion (e.g., bitter substances); CS; and self-management programs (e.g., self-monitoring, self-reward, and self-punishment). The outcome literature discussing the relative merits of these techniques is difficult to interpret.

Many of the studies have serious methodological flaws. Often the experimenters have neglected to measure nail length, collect follow-up data, include no-treatment control conditions, or monitor the accuracy of self-monitoring data. Frequently, therapists have been confounded with experimental conditions. In many cases, nonspecific treatment factors such as expectancies are seen as responsible for treatment outcome.

One tentative conclusion is possible, however. Probably the crucial element in reducing nailbiting is focusing the subject's attention on the behavior. By having the subject self-monitor instances of nailbiting, he/she is sensitized to nailbiting and is thus more likely to be able to control the habit (McNamara, 1972; Vargas & Adesso, 1976). Thus, an effective nailbiting treatment package should incorporate instructions to self-monitor nailbiting with awareness that nails will be measured,

expectancy of therapeutic benefit, and feedback on nail length. Whether such a program, which capitalizes on nonspecific therapy factors (e.g, demand), will produce enduring reductions (e.g., at three-or six-month follow-up) in nailbiting behavior, however, is questionable (Davidson & Denney, 1976).

STATEMENT OF PURPOSE

The primary purpose of the present investigation was to examine procedural variables and subject characteristics related to the clinical utility of covert positive reinforcement (CPR). Although CPR was used to treat nailbiting in a heterogeneous sample of adult subjects, nailbiting was selected for treatment only because it was a convenient behavior to measure. It is important to investigate procedural and subject variables related to CPR outcome because of the inconsistent results that have been reported for covert therapies.

Probably one of the most important procedural variables affecting CPR outcome is the nature of the symbolic consequences selected. The real-life relevance of these reinforcers to the target behavior may influence their effectiveness. Some therapists have used target-irrelevant reinforcers (e.g., eating a steak after an imagined sexual success) in CPR therapy, whereas others have used target-relevant or realistic anticipated consequences in CPR and in other covert conditioning therapies such as covert sensitization. One purpose of the present study was to compare systematically the efficacy of target-relevant and target-irrelevant reinforcers.

To investigate the effect of the nature of the reinforcing stimulus on CPR outcome, separate groups of subjects received one of two types of CPR consequences. One group of subjects imagined target-relevant reinforcing

scenes. The reinforcers they imagined were directly related to the benefits that accrue from refraining from nailbiting. The other group of subjects imagined target-irrelevant reinforcing scenes. The reinforcers they imagined were unrelated to nailbiting (e.g., eating a favorite food).

Another important variable which may account for the contradictory results found in the CPR outcome literature are subject characteristics such as intelligence. It seems logical that the efficacy of the cognitive behavior therapy techniques, all of which rely heavily on conversation and cognitive events (e.g., imagery), would depend on such characteristics of the client as intelligence and/or verbal ability. The second purpose of this study, accordingly, was to determine the relationship between the efficacy of CPR and verbal intelligence, to assess whether cognitive behavior modification techniques such as CPR are suitable for a broad range of subjects or whether, like analytic techniques, they may be expected to suceed with "YAVIS" subjects only. Two other subject variables investigated in relation to the outcome of treatment were the subjects' pre-treatment severity of the nailbiting habit and the subjects' awareness of nailbiting.

A third purpose of the present investigation was to determine whether CPR improved the efficacy of a "standard" nailbiting treatment package -- self-monitoring, expectancy, feedback, and nail measurements. The contribution of CPR was assessed by comparing the outcome on nailbiting of a "standard" nailbiting package (described above and henceforth referred to as self-monitoring [SM] alone) with two "packages" plus CPR treatment and a delayed treatment control condition.

In summary, the following hypotheses were investigated and predictions made:

1. Aside from those subjects assigned to the delayed treatment control condition, all subjects would exhibit a significant increase in nail length as a consequence of participating in the experiment, regardless of treatment condition. Subjects in the control group were not expected to show any significant increase in nail length.

2. Subjects in the CPR groups would exhibit greater increases in nail length than subjects in the SM alone group.

3. Greatest therapeutic gains would be realized among CPR subjects who were exposed to target-relevant consequences.

4. More intelligent (and hence more verbal) CPR subjects would experience greater therapeutic benefit than less intelligent CPR subjects.

5. The degree of pre-treatment nailbiting severity would affect therapeutic outcome, with subjects who bit their nails to a mild degree before treatment expected to show greater therapeutic gains in relation to their baseline lengths than severe biters.

6. The subjects' awareness of nailbiting would affect therapeutic outcome, with greater awareness of nailbiting being associated with greater therapeutic success.

In addition to the confrontation of the experimental questions described above, another contribution of the present study was its improved methodology. Some of the methodological problems common to studies designed to assess the value of the CPR procedure (e.g., confounding experimenters with treatments, failing to include a no-treatment control group) were circumvented in the design of the present study. In addition, factors hampering the interpretation of the results of the outcome literature on nailbiting (e.g., ignoring the pre-treatment degree of nailbiting -- mild, moderate, or severe -- providing unequal expectancies across procedures, failing to monitor the accuracy of self-recording data) were similarly minimized.

CHAPTER II

METHOD

Experimental Design

Forty adults who expressed an interest in reducing the frequency of nailbiting behavior were assigned to one of three experimental groups or to a control group. Groups of four subjects at a time were matched on the basis of intelligence and pre-treatment level of nailbiting severity, and then randomly assigned to one of the four groups. Ten subjects were assigned to a self-monitoring alone (SM) group; ten to a covert positive reinforcement (CPR) with target-relevant (related to nailbiting) consequences (CPR-R) plus self-monitoring group; ten to a CPR with target-irrelevant (unrelated to nailbiting) consequences (CPR-I) plus self-monitoring group; and ten to a delayed treatment control (DTC) group. These **treatments will be explained in detail in a subsequent section.**

The treatment program consisted of an orientation session, eight individualized treatment sessions spaced out over a four-week period, and a three-week follow-up session. Treatment sessions lasted between 10 and 30 minutes, depending on the subject's group assignment. During each treatment session, the subject's nails were measured, self-monitoring data were collected, and therapy was administered on an individual basis.

Between treatment sessions, telephone calls were made to the subject's friends to find out whether the subject was in fact recording instances of nailbiting behavior. Also between sessions, subjects assigned to the two CPR groups had homework assignments. They were requested to practice

CPR scenes that were presented during the treatment sessions and then report on the frequency of these practice sessions.

Data were collected for all subjects on actual nail length, the cosmetic appearance of the nails, the dimensions of the nailbiting problem (e.g., history of the nailbiting habit, situations in which nailbiting was likely, awareness of nailbiting), and intelligence. Subjects in the SM and CPR groups collected data on the frequency of biting the nails, picking the nails or cuticles, looking at the hands, having the fingers near or in the mouth, and tapping or pressing the nails against the teeth. Subjects in the CPR groups also reported on frequencies of between-session CPR practice, the clarity of their imagery, and the value of the reinforcing scenes which they imagined. In addition, data were collected on the clarity of the CPR subjects' imagery as assessed by the therapists.

Subjects

The subjects were 40 adults (10 males, 30 females; average IQ score = 119) from the University of North Carolina at Greensboro and the surrounding community who engaged in nailbiting on a habitual basis and who were inconvenienced by or unhappy about their biting behavior to the extent that they volunteered for treatment. Subjects were invited to participate in the experiment by word-of-mouth, by handbills posted in the dormitories, by public service announcements broadcast over local radio stations, and by announcements in two local newspapers.

Before participating in the treatment program, all of the subjects completed a Nailbiting Questionnaire (see Appendix A) which was specially designed for the present investigation and which elicited information about various aspects of the nailbiting problem. In response to this

questionnaire, ninety percent of the people who volunteered for treatment reported that in the past, they had tried to stop biting their nails by using such "home" remedies as painting bitter substances on the nails, sitting on the hands, wearing gloves, manicuring the nails at frequent intervals, trying to relax, or exercising "will power." Sixty percent reported that other family members had a nailbiting problem. Some of the common situations in which the people reported biting the nails were watching television, studying, taking a test, talking on the telephone, or feeling nervous, scared, or bored.

The average age of a subject was 25 and the average educational level was comparable to that of a college sophomore. Seventy-five percent of the subjects were female, twenty-five percent were male. Additional data on these and other characteristics of the subjects (e.g., IQ level, severity of nailbiting) plus therapist and treatment assignments are presented in Table 1 (Table 1 and all subsequent tables may be found in Appendix B).

In order to participate in the experiment, a subject was required to leave a "data deposit" (Best & Steffy, 1971). Each subject gave the author a check for $20.00 made out to his/her favorite charity, with the understanding that the check would be returned to the subject after all experimental obligations -- pre-treatment assessment, treatment sessions, post-treatment assessment -- were completed (see Appendix C). Had a subject failed to complete any of the above components of the treatment program, his/her check would have been fowarded to the designated charity (Stephen & Koenig, 1970). None of the subjects dropped out of the treatment program, however, so all the checks were returned.

Before participating in treatment sessions, subjects were required to attend an individual orientation session conducted by the author. At

this meeting, the general design of the treatment program was explained (viz., eight treatment sessions plus a three-week follow-up session) and a variety of pre-treatment assessment data was collected. The subjects were given an abbreviated version of an individual intelligence test, completed the Nailbiting Questionnaire (see Appendix A), and filled out an amended version (see Appendix D) of the Reinforcement Survey Schedule (Cautela & Kastenbaum, 1967), on which they rated a wide variety of stimuli in terms of how pleasurable they considered the particular items to be at that time. Subjects were contacted within two weeks after the first meeting to inform them that either they had been accepted for immediate treatment (SM, CPR-R, or CPR-I subjects) or they would have to wait for about one month before they could begin treatment (DTC subjects).

The subjects were told during the orientation session that from time to time during therapy, they might be observed by the author through a one-way mirror. It was made clear to the subjects that the purpose of these observations would be to monitor the therapists' performance and not to observe the subjects directly. None of the subjects objected to being observed during treatment sessions.

Until subjects completed the follow-up assessment, they were not informed about the design of the project or the rationale for selecting particular treatment techniques. In addition, no indication of expected results was given. During debriefing, which took place after the subject completed the follow-up assessment, information about the experimental design, rationale, and hypotheses was provided.

Experimenters

There were six experimenters: two female and one male undergraduate research assistants, one female graduate student, and one male and one

female who work in the community and who are college graduates. Each of these experimenter/therapists was involved in administering all treatments in such a way as to avoid confounding experimenters with therapy strategies (e.g., Vargo & Adesso, 1976). Therapist A treated six subjects, Therapist B treated six, Therapist C treated five, Therapist D treated four, Therapist E treated six, and Therapist F treated three. Subjects were randomly assigned to therapists within the constraints of schedule limitations. Each subject saw the same therapist throughout the entire treatment program (refer to Table 1).

During the treatment sessions, the therapists collected nail length, self-monitoring, and imagery data; answered any questions the subjects had about procedural details; and read the treatment "script" (see Appendix E), which consisted of therapy instructions, nailbiting scenes, and reinforcing scenes. The experimenters were trained by the author to follow the treatment script and to carry out the treatment program so that procedures were standardized within groups. The experimenters were observed by the author on a weekly basis to insure that they were carrying out the treatment procedures correctly.

The experimenters did not attempt to deal with non-nailbiting problems. They were instructed to discourage any personal statements the subjects made, or confidences the subjects wished to share, in a tactful manner. Like the subjects, the experimenters were kept uninformed about the rationale for selected procedures, experimental hypotheses, or predicted results, until the end of the study.

Treatments

To recapitulate: Ten subjects were randomly assigned to one of three treatment groups and ten others were assigned to a waiting-list control

group. The three experimental groups involved self-monitoring alone, covert positive reinforcement with target-relevant consequences plus self-monitoring of nailbiting behavior, and covert positive reinforcement with target-irrelevant consequences plus self-monitoring. These treatments were given during eight 10- to 30-minute sessions spaced out over a four-week period. Therapy instructions were read to the clients by the experimenters from a treatment script (see Appendix E) so that procedures could be standardized as much as possible for all subjects within groups.

Self-monitoring Alone

During their first treatment session, subjects in the self-monitoring alone (SM) group listened to a description of the efficacy of self-monitoring procedures in controlling nailbiting behavior. The subjects were assured that by recording instances of nailbiting they would stop biting completely within a short period of time. The subjects were given explicit directions in how to self-monitor components of the nailbiting response chain. Precise definitions of nailbiting were presented and examples given (see Appendix F).

An instance of nailbiting behavior was defined as the emission of any component in the nailbiting response chain (Massler & Malone, 1952). Each time that a subject put either hand in the vicinity of or in his/her mouth, tapped a finger against his/her teeth, or actually chewed on a nail, was counted as an instance of nailbiting. In addition, subjects who reported that they picked their nails in addition to biting them kept track of instances of picking the nails. Subjects were given a small booklet in which to record instances of nailbiting behavior on a daily basis (see Appendix G).

These data sheets were examined by the experimenters at the beginning of the next seven treatment sessions and collected at weekly intervals. The experimenter praised the subject for collecting the nailbiting data. If self-monitoring data for some days were missing, the experimenter stressed the importance of collecting accurate data and requested the subject to try to remember to bring in his/her data sheets for the next session.

In order to promote the reliability of the self-recorded data, subjects were required at the beginning of the experiment to supply the names and telephone numbers of two "confederates"— that is, adults with whom they spent much time (Nesse & Nelson, 1977). The initials of the confederate or another adult were required for all self-monitored entries of nailbiting in the presence of others. In addition, regular telephone calls were made to the confederates throughout the treatment program to obtain estimates of both the subjects' nailbiting behavior and the faithfulness and accuracy with which the subjects were recording nailbiting behavior.

The confederates were asked to (1) estimate how many times they observed the subject emitting nailbiting behavior since the previous telephone call and (2) report whether the subject recorded all, some, or none of those instances (see Appendix H). One telephone call was made per week. Informing the subjects that the reliability of their self-monitoring data was being checked should have promoted more accurate record keeping (Nelson, 1977).

Subjects in the SM group had their fingernails measured at the beginning of each session. They were given feedback on any changes

in nail length (Katz et al., 1976). During sessions 2 through 8, the experimenter continued to answer any questions about the self-monitoring procedure the subjects had and stressed the importance of collecting accurate data. Photocopies of the hands were made during sessions 1, 4, and 8. The average length of sessions 2 through 8 was 10 minutes.

Covert Positive Reinforcement: General Procedure

The treatment procedures which were used for subjects in both CPR groups had many points in common. Accordingly, these common features will be presented first, and then the differences between the treatments given to subjects in each group will be detailed in a subsequent section.

During the first session, all CPR subjects had their nails measured, listened to the same introduction to self-monitoring as the SM group (see Appendix F), were given explicit directions in how to self-monitor nailbiting, and received self-monitoring record sheets (see Appendix G). As for the subjects in the SM group, turning in self-recording data was praised, telephone calls were made to confederates, and the subjects were given feedback on changes in nail length. The nails were measured at the beginning of each session and photocopies were made during sessions 1, 4, and 8 and at follow-up.

During Session 1, CPR subjects listened to an introduction to the CPR procedure, similar to one outlined by Cautela (1973, p. 28) (see Appendix I). Each subject was then exposed to two short scenes to imagine (see Appendix J). These scenes were the same for all CPR subjects and were unrelated to nailbiting. The subjects were given the opportunity to practice imagining the neutral scenes carefully and describing what they were imagining. After signalling that a particular scene was clear and vivid, the subjects were asked to keep imagining the scene for about 30

seconds and then describe the scene so that the clarity of their imagery could be assessed (Nesse & Nelson, 1977).

The experimenters checked off important details of the practice scenes as the clients mentioned them (see Appendix K). If a client failed to mention at least 75 percent of the important features of a practice scene, a second imagining trial was given. Otherwise, the therapist went on to the next practice scene. Following the practice trials, the treatment scenes were presented.

The remainder of the procedural details apply to sessions 2 through 8 as well as Session 1. During session 1, only one reinforcing and one nailbiting scene were presented. During sessions 2 through 8, two nail-biting and two reinforcing scenes were presented. The average length of sessions 2 through 8 was 30 minutes.

A reinforcing scene specific to the subjects' experimental group (target-relevant versus target-irrelevant) was introduced. Different subjects imagined different scenes. The subjects were directed to use all of their senses in imagining the reinforcing scene. The subjects then narrated the scene for the therapist so that the clarity of their imagery could be assessed. The subjects evaluated how pleasurable the scene seemed to them on a 10-point scale. They were instructed to begin imagining this reinforcing scene whenever the experimenter said the word "shift."

Next a nailbiting scene was presented. The manner in which nail-biting scenes were presented during the first session and all subsequent sessions followed a standard order.

First the situation (e.g., at school, driving) was described and the subject was instructed to signal clear imagery by raising his/her finger.

After the subject signalled, the situation was described again. Then the nailbiting chain was described and again the experimenter waited for the subject to signal clear imagery before continuing. The final segment of the nailbiting scene, in which the subject resisted the temptation to bite his/her nails was then presented. As soon as the subject signalled that he/she had imagined the entire scene clearly, including the failure to bite the nails, the experimenter asked the subject to imagine the reinforcing scene by saying the word "shift". Different subjects imagined different nailbiting scenes.

For purposes of illustration, here is a sample nailbiting scene that might have been presented to several subjects in both CPR groups:

> Close your eyes and try to imagine everything I describe... I want you to imagine that you are sitting in class, taking notes. You hear the teacher talking and you can see her writing on the chalk board. You can feel the chair you are sitting in pressing against your body and you can feel your pen in your hand as you write... When you have that scene in mind clearly, raise your finger.

Until the subject raised his/her finger, the experimenter stopped reading. Once the subject signalled clear imagery, the experimenter continued. The preceding segment of the scene was repeated, and then:

> Now I want you to imagine that you start looking at the fingers on your hand that is not involved in writing. You start to stare at the nails on those fingers. You get the urge to bite your nails. Slowly you lift your hand off your desk and start to bring that hand to your mouth. You open your mouth slightly and slide one of your fingers in. You can feel the slight pressure on your lips and tongue. You can feel your breath blowing gently against your finger. You can taste the tip of your finger... When you have this scene clearly in mind, raise your finger.

Again the experimenter stopped reading until the subject signalled clear imagery.

> Now imagine that just as you are tempted to bite on your nail you say to yourself "No. I don't want to bite my nails." Imagine you can actually hear yourself saying that you won't give in, you won't bite your nails. "I won't bite my nails. I won't bite my nails. I won't bite my nails." Imagine that you remove your finger from your mouth and put your hand back down on the desk.. When you can hear yourself saying that you won't bite your nails and when you can see your hand back on the desk, signal.

Again the experimenter stopped reading until the subject signalled. The experimenter then cued the subject to imagine a reinforcer by saying the word "shift." The nature of this reinforcing scene depended on whether the subject was assigned to the target-relevant or target-irrelevant consequences group. The differences between these two groups will be discussed later.

After the subject signalled he/she had delivered an imaginal reinforcer to himself/herself, the experimenter continued:

> Now do the whole procedure yourself. Imagine you are sitting in class. Imagine you start to look at your nails. Imagine you can feel your finger in your mouth. Imagine you can hear yourself saying that you won't bite your nails. Imagine you can see yourself putting your hand back down on the desk. Deliver a reinforcement to yourself. When you are finished, signal. Now take your time. Make sure you get clear imagery. You can see the classroom. You can feel your finger in your mouth. You can hear yourself saying you won't bite your nails. All right. Start.

Imagery clarity. After the subject signalled that he/she had imagined the nailbiting scene and delivered an imaginal reinforcer contingent on his/her failure to bite his/her nails, he/she was asked to narrate the contents of the scene to assess the quality of his/her imagery (Kazdin, 1976). During the subject's narrative report, the experimenter checked off important features of each scene as the subject mentioned them (see Appendix L). Important features of the scenes consisted of

the urge to bite, specific components of the biting chain, failure to bite, and the reinforcer for not biting. The subject also evaluated the clarity of his/her own imagery (see Appendix M).

Practice during treatment sessions. After the subject imagined the CPR scene while listening to the experimenter and then independent of the experimenter's instructions, and reported the contents of the nailbiting scene to the experimenter, the subject then practiced the nailbiting scene(s) presented that day before the session was terminated. (One nailbiting scene was presented during Session 1 and two each during sessions 2 through 8). An abbreviated version of each nailbiting scene was presented by the experimenter for the client to imagine. Two directed practice trials were alternated with two independent practice trials, as is suggested by Cautela (1973).

Homework assignments. Subjects in the CPR groups were given homework assignments. They were instructed to rehearse the CPR scene(s) presented during the previous session a minimum of 10 times per day between treatment sessions. The subjects were required to monitor the frequency and duration of these practice sessions on specially provided self-recording sheets (see Appendix N). Data sheets on the frequency of nailbiting behavior and between-session CPR rehearsal were examined by the experimenter at the beginning of sessions 2 through 8 and collected weekly.

Covert Positive Reinforcement: Nailbiting and Reinforcing Scenes

Reinforcing scenes. The only difference between the treatment procedures used for subjects in both CPR groups was the nature of the imaginal reinforcing scenes. Subjects in the CPR with target-relevant

consequence group (CPR-R) were trained to imagine reinforcers that were relevant to nailbiting. Subjects in the CPR with target-irrelevant consequences group (CPR-I) were trained to imagine reinforcers that were irrelevant to nailbiting. Otherwise, the treatment procedure was identical.

In all, there were 30 imaginal reinforcers; 15 which were target-relevant (related to nailbiting), and 15 which were target-irrelevant (unrelated to nailbiting). Of the 15 scenes available in each category, eight were selected for use with a particular subject. The scenes were selected by the author, judgment being based on such subject characteristics as sex, living situation, and/or expressed preference for particular stimuli. Three sample target-relevant reinforcing scenes are presented in Appendix O, and three sample target-irrelevant reinforcing scenes are presented in Appendix P.

CPR with target-relevant consequences. As mentioned above, subjects in this group were trained to imagine reinforcers that were relevant to the target behavior. For example, the subject may have been trained to imagine the following reinforcement scene after he/she imagined that he/she had removed his/her hand from his/her mouth without nibbling on his/her nails:

> Imagine that you feel really terrific that you were able to resist biting your nails. You feel really proud of yourself and start to smile. You can feel the skin on your face becoming tight as your grin keeps getting wider and wider. You are really thrilled with the will power you have just shown. The student sitting next to you notices that you took your finger out of your mouth without biting your nails and she is really impressed. She compliments you on your self-control.

Whenever the experimenter cued reinforcement, the subjects were directed to imagine this scene or some other target-relevant reinforcer.

In all, eight reinforcing scenes were presented over the course of treatment so that satiation effects would not undermine the efficacy of the CPR procedure (Cautela, 1970b). Other reinforcing scenes dealt with imagining friends and relatives praising the subjects' efforts to reduce biting, imagining having beautifully manicured nails, or receiving compliments from strangers on how well the hands looked (see Appendix O).

CPR with target-irrelevant consequences. As mentioned above, the subjects in this group were trained to imagine reinforcers that were irrelevant to the target behavior. The reinforcing scenes that these subjects generated were based in part on the subjects' reports of potential reinforcers on the amended version of the Reinforcement Survey Schedule (Cautela & Kastenbaum, 1967) which was filled out before the first experimental session (see Appendix D). For example, the subject may have been trained to imagine the following target-irrelevant reinforcing scene after imagining that he/she removed his/her hand from his/her mouth without nibbling on his/her nails:

> Imagine that you are eating a thick, juicy steak. The aroma of the steak is almost too wonderful to bear. The steak just melts in your mouth. It has been cooked to perfection. You can't remember when you've enjoyed a steak so much.

Whenever the experimenter cued reinforcement delivery, the subjects were trained to imagine this scene or other target-irrelevant reinforcers. Again, eight reinforcing scenes were presented over the course of treatment so that satiation effects would not undermine the efficacy of the CPR process (Cautela, 1970b). Other scenes dealt with athletic activities, going to the movies, or going out on a date (see Appendix P).

Nailbiting scenes. The same group of nailbiting scenes was used for subjects in both CPR groups. Specific scenes were selected from

this group for use with particular subjects. The situation in which the urge to bite the nails occurred varied from scene to scene. In all, there were fifteen possible situations in which nailbiting could be imagined. These situations were drawn from a nailbiting questionnaire (see Appendix A) which was administered during the pre-treatment assessment. Nailbiting scenes were selected for presentation to individual clients by the author, with reference to the particular situations in which the clients reported that nailbiting was probable.

As treatment progressed, the clients imagined themselves making the decision not to bite the nails at an earlier point in the nailbiting chain (looking at the hands, having the fingers in or near the mouth, tapping or pressing the nails against the teeth, picking the nails or cuticles, or biting the nail) each week. During the first week of treatment (sessions 1 and 2) the clients imagined themselves breaking the nailbiting chain just before starting to bite a nail. During week two (sessions 3 and 4), they imagined terminating the chain just before pressing or tapping a finger against the teeth. During week three (sessions 5 and 6), they imagined stopping before their fingers even got near their mouths. During the final week of treatment (sessions 7 and 8), they imagined themselves breaking the chain before starting to gaze at their fingers intently. A sample nailbiting scene that could have been used during week one of treatment is presented in Appendix Q; week two, in Appendix R; week three, in Appendix S; and week four, in Appendix T.

Delayed-Treatment Control

Subjects assigned to the delayed-treatment-control (DTC) condition participated in the pre-treatment assessments (e.g., nail measurements,

IQ test, photocopies of the hands, Nailbiting Questionnaire, and Reinforcement Survey Schedule.) They were contacted within two weeks of the first meeting and informed that their treatment would be delayed about one month. When treatment sessions were completed for subjects in the three experimental groups, DTC subjects were called in for treatment. Their nails were measured, the Nailbiting Questionnaire was completed, and they were randomly assigned to treatment groups. Treatment was then given to them.

Follow-up

Approximately three weeks after their last treatment session, subjects in the SM, CPR-R, and CPR-I groups came in for a short-term follow-up assessment. At that time, their nails were measured, photocopies of their hands were made, and they filled out the Nailbiting Questionnaire. After completing all these procedures, the subjects were debriefed (see Appendix U) and their deposit checks were returned.

In order to obtain some long-term follow-up data, the nailbiting questionnaire will be mailed to the subjects at three- and six-month intervals after treatment. The importance of completing and returning the questionnaires was repeatedly stressed to the subjects. These long-term follow-up assessments are not included for discussion in the present manuscript.

Dependent and Independent Measures

During the course of the treatment program, data were collected on the severity of nailbiting (the cosmetic appearance of the nails), the intelligence of the subjects as assessed by the Wechsler Adult Intelligence Scale (Wechsler, 1955), nail length, awareness of nailbiting, preferences for particular stimuli and situations, self-reports of instances of

nailbiting, self-reports of between-session CPR rehearsals, the clarity of the clients' imagery as assessed by the experimenters and the clients, the reliability of the experimenters' judgments of imagery clarity, and the value of the reinforcing scenes for the subjects. Each of these measures is discussed in turn in the following sections.

Severity of Nailbiting

To assess pre-treatment levels of nailbiting severity and changes in severity as treatment progressed, pictures were taken of subjects' hands before treatment, during sessions 1, 4, and 8, and at follow-up, using an IBM electrostatic photocopier, Copier Model II. The photocopies were examined by two "blind" judges who evaluated the cosmetic appearance of the nails according to Malone and Massler's (1952) guidelines (see Introduction, p. 32). Nailbiting severity was rated by the judges on a 4-point scale (1= no evidence of biting, 2= mild nailbiting, 3= moderate nailbiting, 4= severe nailbiting). The judge's ratings also took into account the number of fingers showing evidence of nail and/or cuticle damage and the number of fingers showing traces of blood or scabs (Horan et al., 1974).

About thirty percent of the photocopies were rated by both judges so that the reliability of the judges' ratings could be assessed. Of the 50 copies rated by both judges, identical severity ratings were assigned to 46 or 92 percent of them. On the remaining four photocopies, the judges' ratings differed by only one scale point (i.e., if one judge rated the nails moderately bitten (3), the other rated them either mildly (2) or severely (4) bitten).

The cosmetic appearance of the hands (severity of nailbiting) was used to assign subjects to experimental groups. Depending on the degree

to which they bit their nails, subjects were assigned to mild, moderate, or severe categories. Prior to treatment, 16 of the subjects were classified as mild nailbiters, 14 as moderate nailbiters, and 10 as severe nailbiters. The number of each type of nailbiter -- mild, moderate, or severe -- exposed to a particular therapeutic method was fairly equal across treatments.

Of the 30 experimental subjects, 7 were severe nailbiters, 10 were moderate nailbiters, and 13 were mild nailbiters prior to treatment. Of the 10 control subjects, 3 were severe nailbiters, 4 were moderate, and 3 were mild when the pre-treatment assessments were conducted. The distribution of pre-treatment severity levels among treatments is summarized in Table 1.

Intelligence

In order to be able to test the hypothesis that cognitive behavior therapy techniques will be more effective with more intelligent subjects, the overall level of intelligence and verbal development of the subjects was assessed. The Vocabulary and Block Design subtests of the Wechsler Adult Intelligence Scale (WAIS) (Wechsler, 1955) were administered to each subject by the author before the subjects were assigned to groups. Items on the Vocabulary subtest are designed to assess verbal development and knowledge of words. The Block Design subtest is designed to assess perceptual-motor integration and analytic and synthetic abilities. The prorated Verbal, Performance, and Full Scale IQ scores which were estimated from the subjects' scores on this short form of the WAIS may be expected to correlate higher than .90 with IQ scores which would have been obtained from an administration of the entire WAIS and thus provide

a valid measure of overall intellectual ability (Anastasi, 1961).

The IQ scores of the subjects ranged from 93 to 147. The mean IQ score was 119. The median score was 120. The IQ score a subject received on the WAIS was not disclosed to the experimenters.

For the sake of convenience, for some analyses the scores were grouped into four levels: 90 to 109, 110 to 119, 120 to 129, and 130 and above. These levels correspond to the average, bright normal, superior, and very superior ranges of intelligence defined by Wechsler (1955). The number of subjects falling within each of these IQ score classifications was fairly equal across treatments (see Table 1).

As mentioned earlier, subjects were matched on the basis of IQ score and severity of nailbiting and then randomly assigned to treatment groups in as balanced a fashion as possible. Table 1 presents the actual distribution of subjects among treatments in terms of their IQ score.

Nail Length

Subjects in the three experimental groups had their nails measured during pre-treatment assessment, at the beginning of all treatment sessions, and during follow-up. Subjects in the control group had their nails measured during the pre-treatment assessments and again during the week that experimental subjects completed treatment.

On each of these occasions, the individual lengths of each of the subject's nails were summed and divided by ten to yield an average nail length score for each subject. Difference scores were computed by subtracting the average pre-treatment length from the average length of the nails at subsequent measurements. Although the length of the subjects'

nails was measured on each of ten occasions (pre-treatment, eight treatment sessions, and follow-up), data from only five of these measurement sessions (viz., pre-treatment, sessions 1, 4, and 8, and follow-up) were analyzed, as no major changes in nail length were expected on a bi-weekly basis.

Fingernail length was measured to the nearest 1/128 (.198 mm) of an inch using a Vernier caliper. Measurements were taken from the top center of the nail to the point which separated the bottom center of the cuticle and the skin (Vargas & Adesso, 1976). The author and Therapist A were responsible for taking all nail measurements.

To assess the reliability of the nail measurements, the author and Therapist A both measured a subject's hands on the same occasion approximately 10 percent of the time. The reliability of these measurements was calculated by dividing the number of agreements (within 1/128") by the number of agreements plus disagreements. The author and Therapist A agreed on 93 percent of the sampled measurements.

Nailbiting Questionnaire

A Nailbiting Questionnaire (see Appendix A) was filled out by the subjects before participating in any experimental sessions, after their last treatment session, and during the follow-up assessment. The questionnaire, which was specially designed for the present study, elicited information about such aspects of the nailbiting habit as duration, frequency, intensity, situational variables, and awareness. Information disclosed by the subjects on situational variables related to nailbiting was used in constructing the nailbiting scenes used with the CPR treatment groups. Differences between the experimental groups with respect

to estimated frequencies and awareness of nailbiting at the conclusion of treatment, and also changes in these measures as treatment progressed were assessed.

Self-monitoring of Nailbiting

All experimental subjects recorded instances of nailbiting on a daily basis. The subjects were given special self-recording sheets (see Appendix G) on which to record components of the nailbiting chain (Malone & Massler, 1952). These data sheets were examined at the beginning of each session and collected during every other session. Daily averages of reports of the occurrence of each component of the nailbiting response chain -- looking at the hands, having the fingers in or near the mouth, tapping or pressing the nails against the teeth, biting or chewing on a nail, or picking a nail or cuticle -- were calculated on a weekly basis. It was possible to compare reported instances of nailbiting between treatment groups as treatment progressed and the relationship between reports of nailbiting and nail length. Although regular telephone calls were made to the subjects' confederates to check up on the subjects' self-recording behavior; as a consequence of the questionable validity of the confederates' reports, confederate judgments were not subjected to any statistical analyses (Nesse & Nelson, 1977).

Self-monitoring of Between-session Rehearsals

CPR subjects recorded instances of between-session rehearsal of CPR scenes on a daily basis. The subjects were given special self-recording sheets (see Appendix N) on which to record CPR practice. These data sheets were examined at the beginning of each session and

collected during every other session. Daily averages of self-reports of scene rehearsals were calculated on a weekly basis.

Clarity of Imagery

Therapist ratings. Subjects in the CPR groups were required to report on the content of the nailbiting and reinforcing scenes they imagined (Kazdin, 1976) so that the therapists could evaluate the quality of the clients' imagery. During the clients' narrations of the nailbiting scenes, the experimenter checked off salient aspects of the scenes on precoded data sheets (see Appendix L) as the subject mentioned them. Important details of the nailbiting scenes were the urge to bite the nails, the various components of the nailbiting chain, the decision not to bite the nails, and the reinforcer for not biting.

The therapists also assigned a global rating to the clarity of the subject's imagery. The narratives of the nailbiting scenes evaluated on a 10-point scale (5= adequate narrations, 10= overelaborations, 1= underelaborations) depending on the number of important details the subjects mentioned, how involved they seemed to be in a particular scene, and the number of extraneous details they fabricated. The clarity of the subjects' imagery during the presentation of the reinforcement scenes was evaluated in a similar manner. The therapist's global judgment of the client's imagery clarity was averaged for the scenes presented during two consecutive sessions so that average imagery score could be computed for each treatment week.

To assess the reliability with which the experimenters rated the contents of the subjects' narratives, the author also rated the contents of randomly selected narratives and compared her ratings with the

therapists' ratings. Four scenes were sampled for each therapist. The reliability of the ratings was defined by the number of agreements divided by the number of agreements plus disagreements on the presence of various components of the nailbiting and reinforcing scenes in the subjects' narratives when rated by both the therapist and the author. The global judgment of imagery clarity assigned by the therapist was correlated with the author's assessment. The therapists were informed that reliability checks would be conducted from time to time but were not told when these assessments would take place. The average percent agreement between the author's and the therapists' ratings of the scenes was .94 overall and ranged from .87 to 1.00 for individual scenes.

Client ratings. The clients also assigned ratings to the clarity of their own imagery. At the conclusion of each session, the clients completed a within session imagery questionnaire (see Appendix M). They rated how well they thought they had imagined various components of the nailbiting and reinforcing scenes which had been presented on a 10-point scale (5= moderately well, 10= extremely well, 1= not at all). The clients assigned a separate imagery quality rating to each aspect of the scene (e.g., the other people, themselves, the situation, the urge to bite the nails, the reinforcer for not biting). These individual ratings were averaged to assign an overall client clarity of imagery rating to the entire session. An average imagery score was computed for each treatment week.

Valence of Reinforcers

The clients were requested to report on how reinforcing the reinforcing scenes actually were for them. After each reinforcing scene

was presented, the clients rated it in terms of how much it appealed to them. Ratings were based on a 10-point scale (5= fairly pleasurable, 1= neutral, 10= extremely pleasurable). Client ratings of the two reinforcing scenes presented during each session were averaged to assign an overall valence to the reinforcing scenes presented during a session. The average valence assigned to the reinforcing scenes for two successive sessions was combined to compute a subjective value of reinforcers score for each treatment week.

CHAPTER III

RESULTS

OVERVIEW

This section provides an overview of the statistical analyses that were performed. Whenever an analysis is described as having been performed on the experimental groups, included in the analysis were data from subjects in all four groups: the self-monitoring (SM), covert positive reinforcement with target-relevant consequences (CPR-R), covert positive reinforcement with target-irrelevant consequences (CPR-I), and delayed treatment control (DTC) groups. When an analysis is described as having been performed on the treatment groups, included in the analysis were data from subjects in the first three groups only (SM, CPR-R, CPR-I). Although in the text the subjects' nail lengths are reported in metric units, the analyses were performed on the data in its nonmetric form. Tabular presentation of the data (e.g., the Newman-Keuls post hoc comparisons) reflects the nonmetric equivalents of the measurements.

In the first group of analyses, the dependent variable of interest was the subjects' nail growth. A preliminary analysis was conducted on differences in the actual nail lengths of the subjects in the treatment groups between the pre-treatment assessment and Session 1 (the beginning of treatment) to assess whether a representative sample of their baseline nail lengths had been obtained during the pre-treatment assessment and whether expectation of benefit from treatment by itself was sufficient to effect a decrease in nailbiting. In all future analyses, the subjects'

pre-treatment nail lengths were subtracted from their lengths at subsequent measurement points and the analyses were conducted on these difference scores rather than on the subjects' actual nail lengths. The rationale for using difference scores is that the actual length of the subjects' fingernails was affected more by the size of the subjects' hands than by nailbiting or treatment-related variables.

A second preliminary analysis involved assessing the effect of individual therapists on the outcome of treatment. The increases in nail length (relative to the pre-treatment length) exhibited by subjects at the conclusion of treatment and at follow-up were compared among therapists to determine whether certain therapists' clients exhibited greater increases in nail length than other therapists' clients, regardless of group assignment.

Several analyses were performed on the effects of the experimental conditions on increases in nail length (relative to the pre-treatment lengths). Differences in changes in nail length among subjects in the three treatment groups (SM, CPR-R, CPR-I) at the conclusion of treatment and at follow-up were compared with differences in nail length exhibited by subjects in the control group when these subjects returned for their first, delayed, treatment session. Differences in increases in nail length (relative to the pre-treatment length) among the three treatment groups were compared at the beginning of treatment, halfway through treatment, at the conclusion of treatment, and during the three-week follow-up assessments to determine whether any of the three treatment conditions was more effective in reducing nailbiting and promoting nail growth.

In the second group of analyses, the dependent variables of interest were the subjects' self-reports of various components of the nailbiting

chain; looking at the hands, having the fingers in or near the mouth, tapping the teeth, picking the nails, or biting the nails. The average daily frequency of engaging in each of these responses reported by the subjects in the SM, CPR-R, and CPR-I groups was compared between groups and over treatment weeks to determine whether subjects in different groups would report similar frequencies of nailbiting and whether self-reports of each component of the nailbiting chain would decrease over time. Self- reports of components of the nailbiting chain were correlated with each other and with the outcome of treatment.

In the third group of analyses, the dependent variables of interest were the CPR subjects' imagery data: self-reports of between-session CPR practice, therapists' ratings of the clarity of the clients' imagery for the reinforcing and nailbiting scenes, the clients' ratings of the clarity of their own imagery, and the clients' ratings of the valence of the reinforcing scenes. The average weekly ratings assigned to the imagery variables for subjects in the CPR-R and CPR-I groups were compared both between groups and over treatment weeks to determine if the subjects in the two CPR groups would obtain similar imagery scores and to discover whether imagery scores would increase over time. The imagery ratings were correlated with each other, with self-reports of components of the nailbiting chain, and with the outcome of treatment.

A final set of analyses was performed on subject variables hypothesized to be related to the outcome of treatment: intelligence, pre-treatment severity of nailbiting, and awareness of nailbiting. In these analyses, the dependent variables of interest were the subjects' increases in nail length (relative to the pre-treatment length); the initial severity

of the nailbiting habit as assessed by independent judges rating the photocopies of the subjects' hands; and the subjects' self-reports of awareness of the nailbiting habit prior to treatment, at the conclusion of treatment, and at follow-up.

The effect of the subjects' intellectual ability on the outcome of treatment for subjects in the SM, CPR-R, and CPR-I groups was assessed by comparing increases in nail length (relative to the pre-treatment lengths) at the conclusion of therapy and at follow-up for subjects with different levels of intelligence. The IQ scores of the subjects were correlated with self-reports of nailbiting, with the imagery variables, and with the outcome of treatment.

The effect of the pre-treatment severity of the nailbiting habit on the outcome of treatment was assessed by comparing increases in nail length at the conclusion of treatment and at follow-up among subjects with different pre-treatment levels of nailbiting severity. Changes in severity over time were correlated with treatment group assignments and awareness of nailbiting.

The effect of awareness of nailbiting on the outcome of treatment was assessed by comparing levels of awareness reported by the subjects with increases in nail length (relative to the pre-treatment length) at conclusion of treatment and at follow-up. Awareness of nailbiting at follow-up was correlated with experimental group membership and with maintenance of nail length gains.

PRELIMINARY ANALYSES

Before examining the effects of the four experimental conditions on nailbiting, several preliminary analyses were performed on the data.

Two measurements of the subjects' nail lengths before treatment were compared: one at the pre-treatment orientation session and the other at the beginning of Session 1. The lengths recorded at these two points in time were compared to determine whether a representative measure of the subjects' normal nail lengths had been obtained. In addition, by comparing the subjects' nail lengths at those two points in time, it was possible to assess whether expectation of benefit from treatment by itself was sufficient to effect a change in the subjects' nailbiting. A second preliminary analysis involved assessing the effects of the individual therapists on the outcome of treatment; that is, did individual therapists differ in the extent to which their subjects' nail lengths increased?

Differences in Nail Lengths Between the Pre-treatment Assessments and Session 1

The degree to which the expectation of benefitting from treatment by itself may have affected the subjects' nailbiting behavior was tested by comparing the treatment subjects' changes in nail length from the orientation session to the first treatment session. In general, subjects assigned to treatment conditions were required to wait about two weeks after the pre-treatment meeting before beginning therapy. If expectations of benefit from therapy alone were sufficient to account for a reduction in nailbiting behavior, or if an unrepresentative sample of their typical nail lengths had been obtained during the pre-treatment assessment, subjects would have exhibited significant differences in the lengths of their nails from the pre-treatment assessment to Session 1.

A two-way (3 group x 2 session) univariate analysis of variance was performed on differences in average actual nail length between the pre-treatment assessment and Session 1 (the within-subjects factor) for

members of the three treatment groups (the between-subjects factor). It was not possible to include the control subjects' data in this analysis because the control subjects did not return for "Session 1" measurements until between four and six weeks after the pre-treatment assessment. This analysis (Table 2) indicated no significant effects for sessions, F (1,27) = .16, p<.70; group, F (2,27) = .44, p<.65; or the group by session interaction, F (2,27) = .48, p<.62.

The average length of the subjects' nails at the pre-treatment assessments was 9.2 mm per nail. The average length at Session 1 was also 9.2 mm per nail. At Session 1, the average length of the subjects' nails in the CPR-R group was 8.9 mm per nail; CPR-I, 9.7 mm per nail; and SM, 9.1 mm. As there were no differences between the subjects' nail lengths at the pre-treatment assessments and at Session 1, the pre-treatment lengths were considered a valid baseline estimate of the subjects' typical nail lengths. Therefore, the nail length data collected from the subjects during the pre-treatment assessment were used to calculate an average nail-increase score for each subject by subtracting the subject's average pre-treatment length from lengths recorded on subsequent occasions. These difference scores were used in all subsequent analyses.

Therapists

Subjects in the CPR-R, CPR-I, and SM groups were assigned to one of six therapists in a random fashion within the constraints of scheduling limitations. Each therapist saw at least one client in each of the three treatment conditions. The assignment of subjects to therapists is presented in Table 1. It was hypothesized that there would be no differences in the outcome of treatment, as reflected in increases in nail length, as a result of therapist assignment.

A two-way (6 therapists x 3 sessions) univariate analysis of variance was performed on increases in nail length (relative to the pre-treatment length) at the beginning of treatment, at the conclusion of treatment, and during the three-week follow-up assessment (the within-subjects factor) for all subjects who received treatment, regardless of group assignment, in order to determine the effects of the therapists (the between-subjects factor) on the outcome of treatment. This analysis indicated that across all three treatment groups, there were no significant differences in increases in nail length as a consequence of therapist assignment, F (5,24) = .50, $p<.78$ (Table 3). Therapist A's clients showed an average nail length increase of 1.52 mm across the three measurement points; Therapist B's, 1.27 mm; Therapist C's, 1.78 mm; Therapist D's, 1.02 mm; Therapist E's, 1.78 mm; and Therapist F's, 1.27 mm. Inasmuch as there were no significant differences in the outcome of treatment either at the conclusion of treatment or at the short-term follow-up assessment as a result of therapist assignment, therapists are not used as a factor in any of the analyses presented below.

Regardless of therapist or group assignment, all subjects who received treatment exhibited a significant increase in nail length from the pre-treatment assessment to the conclusion of treatment and the follow-up assessment, F (2,48) = 36.54, $p<.0001$. Results of Newman-Keuls post hoc comparisons (Table 4) on the average increases in nail length over time indicated that the subjects' nails were significantly longer with respect to the pre-treatment assessment at the conclusion of treatment and at the follow-up assessment than they were at Session 1. There was no difference in increases in nail length between the conclusion of treatment and

the follow-up assessment. The average increase in nail length from the pre-treatment assessment to Session 1 was .035 mm per nail; to the conclusion of treatment, 1.92 mm; and to follow-up, 2.17 mm. There was no significant therapist by session interaction, F (10,48) = .40, p<.66.

EFFECTS OF TREATMENTS ON NAIL LENGTH

It was predicted that a subject's change in nail length from the pre-treatment assessment to the conclusion of treatment and at follow-up would be affected by his/her group assignment and the pre-treatment severity of the nailbiting habit. To test these hypotheses, a variety of analses was conducted on differences in nail length over time as a function of group assignment and pre-treatment severity. Some of these analyses were performed on data from all four groups -- CPR-R, CPR-I, SM, and DTC -- whereas others were performed on the first three groups exclusively.

The effect of group assignment on the outcome of treatment is reviewed first. The effect of pre-treatment level of nailbiting severity is discussed in a subsequent section.

Comparisons Among All Four Groups

In the first of these analyses, the comparison involved changes in nail length between the treatment subjects (CPR-R, CPR-I, and SM) at the conclusion of treatment and the DTC subjects when the DTC subjects returned for their first (delayed by four weeks) treatment session. In the second analysis, the treatment subjects' changes in nail length at follow-up are compared to the same data used for the control subjects in the previous analysis. The rationale for using the control subjects' data in both comparisons was to address the following concern.

It may have been possible that although the treatment subjects' nails had grown significantly more from pre-treatment to the conclusion of

treatment than the control subjects' nails, the treatment subjects might not have shown such superiority in nail growth at follow-up. That is, treatment effects may not have persisted once the treatment sessions were concluded. If that were the case, it could be argued that no treatment at all was just as helpful in the long run as the treatment techniques used in this study. If, on the other hand, it could be demonstrated that the treatment subjects' superiority over the control subjects persisted at follow-up, then it could be concluded that the treatments were in fact helpful.

Gains at the Conclusion of Treatment

A two-way (4 groups x 3 levels of severity) univariate analysis of variance was performed on differences in average increases in nail length relative to the pre-treatment length among all groups at the conclusion of treatment to determine the effects of the experimental conditions on increases in nail length. The results of this analysis (Table 5) indicated that there was a significant difference in nail length change as a consequence of group assignment, F (3,28) = 21.25, p<.0001. Results of Newman-Keuls post hoc comparisons (Table 6) indicated that the control subjects exhibited significantly lower increases in nail length than subjects in either of the three treatment groups. In fact, while the nails of those subjects receiving treatment increased in length relative to the pre-treatment length over the course of treatment, the control subjects' nails got shorter during that same period. There were no differences in changes in nail-length among the treatment groups (see Figure 1 in Appendix V).

The mean change in nail length for the control subjects was an average decrease of .43 mm per nail. The treatment subjects all exhibited increases

in nail length from pre-treatment to the conclusion of treatment. CPR—R subjects exhibited average increases of 2.27 mm per nail; CPR-I subjects, 1.50 mm per nail; and SM subjects, 1.87 mm per nail. There were no differences in increases in nail length among the treatment groups.

Gains at Follow-up

A two-way (4 groups x 3 levels of severity) univariate analysis of variance (Table 7) was performed on differences in the average increases in nail length relative to the pre-treatment length among all groups at follow-up to determine the effects of the experimental conditions on maintenance of gains in nail length. The results of this analysis indicated again that there was a significant difference in nail length change as a consequence of group assignment, F (3,28) = 9.62, $p<.0002$. Results of Newman-Keuls post hoc comparisons (Table 8) indicated that subjects in the three treatment groups exhibited greater increases in nail length relative to the pre-treatment assessment than those in the control group, whose nails actually became shorter during that same period. There were no differences in changes in length among the three treatment groups. Follow-up gains in nail length, relative to the pre—treatment length, were positively correlated with end of treatment increases, $r = +.54$, $p < .002$.

The treatment subjects all exhibited increases in nail length from pre-treatment to follow-up. CPR-R subjects exhibited average increases of 2.84 mm per nail; CPR-I subjects, 1.85 mm; and SM subjects, 1.80 mm. On the average, the CPR-R and CPR-I subjects' nail lengths increased slightly from the conclusion of treatment to follow-up; the SM subjects' lengths decreased slightly. Because the same data were used for the control subjects in this analysis as in the previous analysis, the mean nail length change remains the same for the control subjects: a decrease of .43 mm.

Comparisons Among the Three Treatment Groups

To test the hypothesis that subjects in certain treatment groups would experience greater increases in nail length over time than subjects in other groups, a three-way (3 groups x 4 sessions x 3 levels of severity) univariate analysis of variance (Table 9) was performed on changes in nail length over time with respect to the pre-treatment length. Nail length data collected during the first, fourth, and eighth (last) treatment sessions and at follow-up (the within-subjects factor) for subjects in the CPR-R, CPR-I, and SM groups who were mild, moderate, or severe nailbiters (the between-subjects factors) were analyzed. It was not possible to include the control subjects' nail length data in this analysis because the control subjects did not have their nails measured at points in time which would have corresponded to Session 1 or Session 4 for subjects assigned to treatment conditions.

The results of this analysis indicated that there were no significant differences among groups in the increases in nail length exhibited over sessions, F (2,21) = 1.42, $p<.27$. The average increase in nail length at the end of treatment for subjects in the CPR-R group was 2.27 mm per nail; CPR-I, 1.80 mm; and SM, 1.87 mm. The average increase in nail length at follow-up for the subjects in the CPR-R group was 2.84 mm; CPR-I, 1.85 mm; and SM, 1.80 mm.

Although there were no differences in increases in nail length as a function of treatment group, there was a significant difference in increases in nail length (relative to the pre-treatment length) over sessions, F (3,63) = 34.3, $p<.0001$. The mean nail length increase across groups was .035 mm at the beginning of treatment (Session 1), .064 mm after about

one and a half to two weeks of treatment (Session 4), 1.92 mm at the conclusion of treatment (Session 8), and 2.17 mm at follow-up. Results of Newman-Keuls post hoc comparisons on the effects of sessions (Table 10) on increases in nail length indicated that relative to their pre-treatment lengths, the subjects' nail lengths had increased significantly more at the end of treatment and at follow-up than they had either at the beginning of treatment (Session 1) or half way through treatment (Session 4). There was no difference between the Session 1 and Session 4 length gains or between the Session 8 and follow-up increases in length. There was no group by session interaction, F (6,63) = .43, $p < .86$, indicating that there were no differences in average nail length among groups at any of the four measurement points. The main effect for severity and interactions between severity, groups, and session will be reported in a subsequent section.

TREATMENT COMPONENTS

Self-monitoring Variables

In the present investigation, self-monitoring could be viewed as either a dependent variable, reflecting the outcome of treatment, or an independent variable, a treatment technique. For the purpose of the analyses reviewed in this section, the self-monitoring data are viewed as dependent variables, whereas in the previous section, self-monitoring was considered an independent variable.

The focus of the SM treatment was training and then instructing the subjects to record components of the nailbiting chain when they occurred. Subjects were directed to record whenever they looked at their hands, placed their fingers in or near their mouth, tapped or pressed a fingernail against their teeth, or bit or picked at a nail. Subjects in both CPR

groups also recorded instances of the above responses. Subjects in the control condition did not record instances of nailbiting and are therefore not included in these analyses.

The purpose of the analyses performed on the subjects' self-monitoring data was to determine whether there were any differences in the frequencies with which subjects in the various treatment groups reported engaging in components of the nailbiting chain. Equally important was to discover whether self-reports of nailbiting were related to the outcome of treatment. As the subjects' nail lengths increased, decreases in self-reports of nailbiting were expected.

For each of the four weeks of treatment, a daily average for the frequency of reports of each component of the nailbiting chain was calculated. A two-way (3 groups x 4 treatment weeks) multivariate analysis of variance was performed on the self-monitoring data, considering together all five components of the nailbiting chain (viz,, looking at, biting, or picking the nails, tapping the teeth, or having the fingers in or near the mouth) in order to determine whether there would be differences either between the groups or among the four weeks of treatment in self-reports of nailbiting. This analysis was followed by five separate univariate analyses of variance on each of the components of the nailbiting chain considered individually. Correlation coefficients were calculated between each of the self-monitoring variables and the outcome of treatment and among the self-monitoring variables themselves.

Multivariate Analysis of Self-monitoring Data

The multivariate analysis of variance (Table 11) which was performed on the differences between groups (the between-subjects factor) and over

the course of treatment (the within-subjects factor) on the frequency of self-reports of nailbiting yielded a Wilk's Λ of .69 for the effects of treatment group, which is equivalent to F (10,27) = .55, $p>.05$, and indicates no significant multivariate differences in reports of nailbiting among groups. The multivariate analysis also yielded a Wilk's Λ of .61 for the effects of treatment weeks, which is equivalent to F (15,212) =2.80, $p<.0006$, and indicates a significant multivariate difference in reports of nailbiting over treatment weeks. The multivariate analysis also yielded a Wilk's Λ of .67 for the group by treatment week interaction, which is equivalent to F (30,310) = 1.11, $p<.32$, and indicates no significant group by treatment week interaction.

Results of Newman-Keuls post hoc comparisons (Table 12) of the means of the canonical variables for treatment weeks indicated that fewer instances of nailbiting were reported during Week 3 and Week 4 of treatment than were reported during Week 2. Otherwise, there were no differences in the frequency with which nailbiting components were recorded. The average daily report for components of the nailbiting chain for Treatment Week 1 was 2.44; Week 2, 2.58; Week 3, 1.83; and Week 4, 1.50.

Univariate Analysis of Self-monitoring Data

Looking. To determine whether there were any differences in the frequency with which subjects in any of the three treatment groups recorded instances of looking at the hands and to discover whether self-reports of the frequency of looking at the hands would decrease over time, a two-way (3 groups x 4 treatment weeks) univariate analysis of variance (Table 13) was performed on the average daily reports of looking at the hands for subjects in each of the three treatment groups (the

between-subjects factor) for each of the four weeks of treatment (the within-subjects factor). There was no significant difference among groups in the frequency of reports of looking, F (2,27) = .77, p<.47. Subjects in the CPR-R group reported looking at the hands an average of 3.66 times per day over treatment; CPR-I subjects, 2.13; SM subjects, 3.27.

Reports of looking at the hands showed a tendency to decrease over time. The average rate of looking at the hands during Week 1 was 3.33 times per day; Week 2, 3.08; Week 3, 3.29; and Week 4, 2.39. These differences among treatment weeks just missed being significant at the .05 level, F (3,81) = 2.55, p <.06. There was no significant group by treatment week interaction, F (6,81) = .46, p <.84.

Mouthing. To determine whether there were any differences in the frequency with which subjects in any of the three treatment groups recorded instances of having the fingers in or near the mouth and to discover whether self-reports of frequencies of having fingers in the mouth would decrease as treatment progressed, a two-way (3 groups x 4 treatment weeks) univariate analysis of variance (Table 14) was performed on the average daily reports of looking at the hands for each of the four weeks of treatment. There were no significant differences among groups in frequencies of having the fingers in or near the mouth, F (2,27) = 1.16, p <.33. Subjects in the CPR-R group reported a daily average of fingers in the mouth of 1.46 times per day over treatment; CPR-I, 2.32; and SM, 3.85.

There were significant differences in reports of frequencies of fingers in or near the mouth as treatment progressed, F (3,81) = 5.89, p <.001. Results of Newman-Keuls post hoc comparisons (Table 15) indicated that reports of fingers in or near the mouth during the third and fourth

weeks of treatment were significantly lower than reports during the first week of treatment. There were no differences in self-reports of frequencies of hands in or near the mouth between any other combination of treatment weeks. Subjects reported having fingers in or near the mouth an average of 3.37 times per day during Week 1; 2.55 times during Week 2; 2.2 during Week 3; and 2.03 times during Week 4. There was no significant group by treatment week interaction, F (6,81) = .58, p<.75.

Tapping. To determine whether there were any differences in the frequency with which subjects in any of the three treatment groups recorded instances of tapping or pressing the fingers against the teeth and whether self-reports of frequencies of tapping would decrease as treatment progressed, a two-way (3 groups x 4 treatment weeks) univariate analysis of variance (Table 16) was performed on the average daily reports of tapping the teeth by subjects in the three treatment groups (the between-subjects factor) for each of the four weeks of treatment (the within-subjects factor). There were no significant differences among groups in frequencies of reports of tapping the teeth, F (2,27) = 1.93, p<.17. The average report of tapping the teeth was .52 times per day for CPR-R subjects; .51 for CPR-I subjects; and 1.78 for SM subjects. There was also no significant change in the frequencies of tapping reported as treatment progressed, F (3,81) = 2.00, p<.12; nor was there a significant group by session interaction, F (6,81) = .72, p<.63. The average daily report of tapping for Week 1 was 1.07 times per day; Week 2, 1.21; Week 3, .75; and Week 4, .71.

Biting. To determine whether there were any differences in the frequency with which subjects in any of the three treatment groups recorded instances of biting behavior and to discover whether there would be a

decrease in self-reports of biting as treatment progressed, a two-way (3 group x 4 treatment weeks) univariate analysis of variance (Table 17) was performed on the average daily reports of biting the nails by subjects in the three treatment groups (the between-subjects factor) for each of the four weeks of treatment (the within-subjects factor). There were no significant differences among groups in reports of frequencies of biting the nails, F (2,27) = .44, p<.65. The average report of biting the nails was .74 times per day for CPR-R subjects, 1.18 for CPR-I subjects, and 1.24 for SM subjects, over the four weeks of treatment.

There was a significant change in the reports of biting the nails as treatment progressed, F (3,81) = 6.54, p<.0006. Results of Newman-Keuls post hoc comparisons (Table 18) indicated that the subjects recorded significantly fewer instances of biting during Week 3 and Week 4 of treatment than they did during Week 1. Otherwise, there were no significant differences for daily reports of nailbiting among weeks. The average daily report of biting was 1.64 times per day during Week 1; during Week 2, 1.08; Week 3, .79; and Week 4, .70. There was no significant group by treatment week interaction, F (6,81) = 2.05, p<.06.

Picking. To determine whether there were any differences in the frequency with which subjects in any of the three treatment groups recorded instances of picking the nails and to discover whether there would be a decrease in self-reports of picking as treatment progressed, a two-way (3 groups x 4 treatment weeks) univariate analysis of variance (Table 19) was performed on average daily reports of the subjects in the three treatment groups (the between-subjects factor) of picking the nails during each of the four weeks of treatment (the within-subjects factor). There were

no significant differences among groups in frequencies of picking the nails, F (2,27) = 1.02, $p<.37$. The average daily report of picking the nails was 1.07 times per day for the CPR-R subjects; 2.50 for CPR-I; and 3.17 for SM.

There was a significant change in the frequencies of reports of picking the nails as treatment progressed, F (3,81) = 3.05, $p<.03$. Results of Newman-Keuls post hoc comparisons (Table 20) indicated that the subjects reported significantly fewer instances of picking the nails during the fourth week of treatment than during the first week, but otherwise there were no differences in the reported frequencies of picking among any of the treatment weeks. The average daily report of picking for Week 1 was 2.8 times per day; Week 2, 2.4; Week 3, 2.1; and Week 4, 1.7. There was no significant group by treatment week interaction, F (6,81) = 1.56, $p<.17$.

Self-Monitoring Correlates

Pearson correlation coefficients were computed between individual self-monitored dependent variables (i.e., looking at the hands, having the fingers in or near the mouth, tapping the teeth, and biting or picking the nails) and increases in nail length. Correlation coefficients among the self-monitored variables were also calculated. These correlation coefficients were calculated for the three treatment groups considered separately, the three groups considered simultaneously, on a session by session basis, and over all treatment sessions.

Across the three treatment groups (SM, CPR-R, and CPR-I) and the four weeks of treatment, there was a significant negative correlation between self-reports of biting the nails and increases in nail length, $r = -.26$, $p<.005$. As expected, subjects who reported biting their nails more frequently exhibited smaller increases in nail length (relative to the

pre-treatment length) at the conclusion of treatment and at follow-up than subjects who reported biting the nails less frequently. There were no significant relationships between self-reports of other components of the nailbiting response chain and the outcome of treatment. More specifically, the correlations between increases in the length of the nails (relative to the pre-treatment length) and picking the nails (r = -.14, p<.12), tapping the teeth (r = -.12, p<.20), having the fingers in or near the mouth (r = -.16, p<.08), and looking at the hands (r = -.08, p<.36) were all nonsignificant. Similar to reports of biting the nails, however, the more often the subjects reported each of these components of the nailbiting response chain, the smaller their increase in nail length (relative to the pre-treatment length) at the conclusion of treatment and at follow-up.

In general, the more frequently subjects reported emitting one component of the nailbiting response chain, the more frequently they reported emitting other components. For example, there were significant positive correlations between reports of having the fingers in or near the mouth during the third week of treatment and tapping the teeth (r = +.87, p<.01), picking the nails (r = +.65, p<.0001), and looking at the hands (r = +.60, p<.0005) during that week. Similar relationships between the self-monitored dependent variables existed during other treatment weeks.

Imagery Variables

The focus of the CPR treatments was the presentation of imaginal consequences contingent on imaginal failure to bite the nails. Data were collected on five imagery-related variables: self-reports of between-session CPR practice; the therapists' ratings on a 10-point scale of the clarity of the clients' imagery for the nailbiting scenes; the therapists'

ratings on a 10-point scale of the clarity of the clients' imagery for the reinforcing scenes; the clients' ratings on a 10—point scale of their own imagery clarity; and the clients' ratings on a 10—point scale of the valence of the reinforcing scenes. Subjects in the DTC and SM groups did not participate in any treatment activities involving imagery and are therefore not included in these analyses.

Similar to the self-monitoring data, one purpose of the analyses performed on the subjects' imagery data was to determine whether there were any differences in the imagery scores between the two CPR groups and over time. Equally important was to discover whether the imagery scores were related to the outcome of treatment. Higher imagery scores were expected to be associated with greater increases in nail length at the conclusion of treatment and at follow-up, relative to the pre-treatment lengths. The clients' clarity of imagery was expected to increase with repeated imagery trials, i.e., as treatment progressed.

For each of the four weeks of treatment, a daily average for the frequency of reports of between-session CPR practice was calculated. An average imagery score for the data collected during the two sessions the client attended that week was computed for the therapist's ratings of imagery clarity, the client's rating of imagery clarity, and the valence of the reinforcing scenes for the client. A two-way (2 groups x 4 treatment weeks) multivariate analysis of variance was performed on the imagery data, considering together all five imagery-related variables at once (viz., therapist ratings of the clarity of the clients' imagery for the nailbiting scenes, therapist ratings of the clients' clarity of imagery for the reinforcing scenes, client ratings of the valence of the reinforcing

scenes, and self-reports of between-session practice), in order to determine whether there would be differences either between the two CPR groups or among the four weeks of treatment in the clients' imagery scores. This analysis was followed by five separate univariate analyses of variance on each of the imagery-related variables considered individually. Correlation coefficients were calculated between each of the imagery variables and the outcome of treatment, the self-monitored dependent variables, and among the imagery variables themselves.

Multivariate Analysis of Imagery Variables

The multivariate analysis of variance (Table 21) which was performed on the differences between groups (the between-subjects factor) and over the course of treatment (the within-subjects factor) on the imagery data yielded a Wilk's Λ of .55 for the effects of treatment group, which is equivalent to F (5,18) = 2.93, $p<.05$, and indicates a significant multivariate difference in imagery scores between groups. The multivariate analysis also yielded a Wilk's Λ of .46 for the effects of treatment weeks, which is equivalent to F (15,138) = 2.95, $p<.0004$, and indicates a significant multivariate difference in imagery scores over treatment weeks. The multivariate analysis also yielded a Wilk's Λ of .83 for the group by treatment week interaction, which is equivalent to F (15,138) = .66, $p<.82$, and indicates no significant group by treatment week interaction.

A comparison of the multivariate means indicated that overall, the CPR-R group (M = 8.20) had significantly higher imagery scores than the CPR-I group (M = 8.13). Results of Newman-Keuls post hoc comparisons (Table 22) of the means of the canonical variables for treatment weeks indicated that the clients' imagery scores were higher during Week 3 and

Week 4 of treatment than Week 1 and Week 2 of treatment. Otherwise, there were no differences in the clients' imagery scores. The average imagery score for Week 1 of treatment was 7.93; Week 2, 7.86; Week 3, 8.44; and Week 4, 8.43.

Univariate Analysis of Imagery Data

Practice. To determine whether there were differences in the frequency with which subjects in both CPR groups reported doing their between-session homework assignments during different treatment weeks, a two-way (2 groups x 4 treatment weeks) univariate analysis of variance (Table 23) was performed on the average daily reports of CPR subjects (the between-subjects factor) of practicing for each of the four weeks of treatment (the within-subjects factor). There was no significant difference between groups in reports of practicing, F (1,18) = .14, $p<.71$. Subjects in the CPR-R group reported an average of 7.05 practice trials per day; CPR-I reported 6.57 trials. The subjects had been instructed to practice CPR scenes a minimum of 10 times per day, so, in general, subjects in both groups did not report practicing as often as they had been instructed to practice.

There was also no significant difference in reports of practice as treatment progressed, F (3,54) = .63, $p<.60$. The average daily report of practice was 6.39 times per day for Week 1, 6.89 for Week 2, 7.03 for Week 3, and 6.93 for Week 4. There was also no significant group by treatment week interaction, F (3,54) = .41, $p<.75$.

Therapists' ratings of clarity of imagery of nailbiting scenes. To discover whether there were any differences between groups in the clarity of the clients' imagery for the nailbiting scenes, as assessed by the therapists, and to discover whether the clients' imagery clarity would improve with repeated imagery trials (i.e., as treatment progressed), a

two-way (2 groups x 4 treatment weeks) univariate analysis of variance (Table 24) was performed on the average weekly ratings the therapists assigned to the clients' imagery clarity for the nailbiting scenes for the clients in the two CPR groups (the between-subjects factor) for each of the four weeks of treatment (the within-subjects factor). There was no significant difference between groups in the therapists' ratings, F (1,18) = .14, p<.71. The average imagery rating assigned to the CPR-R subjects was 8.64 (on a 10-point scale); to CPR-I subjects, 8.76.

There were significant differences in imagery clarity over the course of treatment, F (3,54) = 5.39, p<.003. Results of Newman-Keuls post hoc comparisons (Table 25) on the mean weekly imagery scores indicated that lower clarity of imagery scores were assigned to the subjects' narrations of the nailbiting scenes during the first week of treatment than during the third or fourth weeks. Significantly lower scores were assigned during the second week than during the fourth week. Otherwise, there were no differences in imagery scores among weeks. The average score assigned by the therapists during Week 1 was 8.34 (on a 10-point scale); Week 2, 8.50; Week 3, 8.89; and Week 4, 9.07. There was no significant group by treatment week interaction, F (3,54) = .86, p<.47.

Therapists' ratings of clarity of imagery of reinforcing scenes. To discover whether there were any differences between groups in the clarity of the clients' imagery for the reinforcing scenes, as assessed by the therapists, and to discover whether the clients' imagery clarity would improve as treatment progressed (i.e., with practice), a two-way (2 groups x 4 treatment weeks) univariate analysis of variance (Table 26) was performed on the average weekly ratings the therapists assigned to the

clients' imagery clarity for the reinforcing scenes for the clients in the two CPR groups (the between-subjects factor) for each of the four weeks of treatment (the within-subjects factor). There was no significant difference between groups in the therapists' ratings, F (1,18) = 3.17, $p<.09$. The average imagery rating assigned to the CPR-R subjects was 9.3 (on a 10-point scale); to the CPR-I subjects, 8.7.

There was also no clear-cut difference in the imagery ratings for the reinforcing scenes as treatment progressed, F (3,54) = 2.741 $p<.0511$, but there was a slight tendency for the ratings to increase over the treatment weeks. The average imagery rating assigned to the subjects' narrations of the reinforcing scenes during Week 1 was 8.82 (on a 10-point scale); Week 2, 8.82; Week 3, 9.28; and Week 4, 9.13. There was no significant group by treatment week interaction, F (3,54) = 1.42, $p<.24$.

Clients' ratings of imagery clarity. To discover whether there were any differences between CPR groups in the clients' assessments of the clarity of their own imagery and to discover whether the clients would assign higher estimates to their imagery clarity as treatment progressed, a two-way (2 groups x 4 treatment weeks) univariate analysis of variance (Table 27) was performed on the average weekly ratings clients in both CPR groups (the between-subjects factor) assigned to the clarity of their imagery for each of the four weeks of treatment (the within-subjects factor). There was no significant difference between groups for client imagery ratings, F (1,18) = .01, $p<.91$. The average imagery score the clients in the CPR-R group assigned to themselves was 8.26 (on a 10-point scale); the CPR-I subjects assigned an average score of 8.22.

There was a significant effect for treatment weeks, F (3,54) = 4.20, $p<.0097$. Results of Newman-Keuls post hoc comparisons on the mean imagery

scores assigned by the clients (Table 28) indicated that the ratings assigned during Week 2 of treatment were significantly lower than those assigned during Week 3 or Week 4. Otherwise, there were no differences in scores assigned by the clients between any other pair of treatment weeks. The average imagery score assigned by the clients during Week 1 was 8.15 (on a 10-point scale); Week 2, 7.78; Week 3, 8.48; and Week 4, 8.56. There was no significant group by treatment week interaction, F (3,54) = .21, p<.83.

Clients' ratings of the reinforcing value of the reinforcing scenes. To discover whether there were any differences between groups in the reinforcing value assigned to the reinforcing scenes by the clients and to discover whether the scenes would lose their appeal (as reflected by lower ratings) with repeated presentations (i.e., satiation effects), a two-way (2 groups x 4 treatment weeks) univariate analysis of variance (Table 29) was performed on the clients in both CPR groups' (the between-subjects factor) ratings of the reinforcing scenes for each of the four weeks of treatment (the within-subjects factor). There was no significant difference between groups in the ratings the clients assigned to the pleasurable qualities of the scenes, F (1,18) = 2.20, p<.16. The average reinforcing value the clients in the CPR-R group assigned to the reinforcing scenes they imagined was 7.78 (on a 10-point scale); the CPR-I subjects assigned an average rating of 8.36.

There was a significant effect of treatment weeks on the clients' ratings, F (3,54) = 7.86, p <.0002. The average rating assigned to the reinforcing scenes during Week 1 was 7.97; Week 2, 7.33; Week 3, 8.53; and Week 4, 8.45. Results of Newman-Keuls post hoc comparisons (Table 30)

indicated that the ratings assigned by the clients during Week 2 of treatment were significantly lower than ratings assigned during any other week. Otherwise, the ratings assigned during Week 1, Week 3, and Week 4 did not differ significantly from one another. There was also no significant group by treatment week interaction, F (3,54) = .76, p<.53.

To summarize briefly the results of the imagery analyses: there were significant multivariate differences in imagery scores between CPR groups, with subjects in the CPR-R group having higher overall imagery scores than the subjects in the CPR-I group. There were no differences between groups in any of the univariate analyses of the imagery variables considered individually. There was also a significant multivariate effect for treatment weeks, and significant univariate effects for treatment weeks for dependent variables therapists' ratings of the clients' imagery clarity for the nailbiting scenes, clients' ratings of their own imagery clarity, and the clients' ratings of the value of the reinforcing scenes, all of which tended to increase as treatment progressed. There were no significant group by treatment week interactions noted in any of the analyses.

Imagery Correlates

Pearson correlation coefficients were computed between individual imagery variables (i.e., therapists' ratings of the clarity of the clients' imagery for the nailbiting scenes, therapists' ratings of the clarity of the clients' imagery for the reinforcing scenes, the clients' ratings of the clarity of their own imagery, the clients' ratings of the valence of the reinforcing scenes, and the clients' reports of between-session CPR practice) and increases in nail length and self-reports of components of the nailbiting chain. Correlation coefficients among the imagery variables

themselves were also calculated. These correlation coefficients were calculated for the two CPR groups considered separately, the two groups considered simultaneously, on a session by session basis, and over all treatment sessions.

For subjects in the CPR-R group, significant positive relationships were found between the therapists' ratings of the clarity of the clients' imagery for the reinforcing scenes and the therapists' ratings of the clarity of imagery for the nailbiting scenes, $r = +.59$, $p < .0001$; the clients' self-reports of between-session CPR practice, $r = +.35$, $p < .03$; and the clients' assesments of their imagery clarity, $r = +.39$, $p < .01$. Significant correlations were also found between the therapists' ratings of the clarity of the clients' imagery for the nailbiting scenes and the clients' ratings of their imagery clarity, $r = +.47$, $p < .002$; and with the clients' reports of between-session CPR practice, $r = +.43$, $p < .006$. In addition, significant relationships were found between the clients' assessment of the reinforcing value of the reinforcing scenes and their assessments of the clarity of their imagery, $r = +.44$, $p < .004$; and with the therapists' assesments of their clarity of imagery for the reinforcing scenes, $r = +.41$, $p < .008$.

Fewer relations among imagery variables were found among subjects in the CPR-I group. Significant relationships were found between the clients' assessments of the clarity of their imagery and the valence of the reinforcing scenes, $r = +.63$, $p < .0001$; and with the therapists' ratings of the clarity of the reinforcing scenes, $r = +.39$, $p < .01$. The less frequently the clients reported practicing between sessions, the higher they rated their clarity of imagery within sessions, $r = -.36$, $p < .02$.

Across both groups and over all four treatment weeks, significant correlations were found between the value of the reinforcers to the clients and the therapists' (r = +.23, p<.04) and clients' (r = +.52, p<.0001) ratings of imagery clarity of the scenes. Therapists' and clients' ratings of imagery clarity were also significantly correlated, r = +.29, p<.01. Therapists' ratings of imagery clarity were related to clients' reports of homework practice, r = +.23, p<.04.

The clients' imagery data were virtually unrelated to the outcome of treatment as reflected in increases in nail length relative to the pre-treatment assessments. There was a significant negative correlation between the lengths of the clients' nails at follow-up and the valence assigned to the reinforcing scenes during the fourth week of treatment, r = -.50, p<.02. The lower the clients rated the reinforcing scenes in terms of pleasurable aspects or intrinsic appeal during the last week of treatment, the greater their increase in nail length (relative to the pre-treatment length) at follow-up tended to be. Aside from this one negative correlation, there were no significant relationships between the imagery variables and the subjects' nail length gains, either at the end of particular treatment weeks or at follow-up.

There were also very few significant relationships between the self-monitored and imagery variables. During the third treatment week, there was a significant negative relationship between reports of biting the nails and the therapists assessments of the clarity of the clients' imagery for the reinforcing scenes, r = -.59, p<.006. During the second week, reports of tapping the teeth were negatively correlated with therapists' assessments of imagery clarity for the nailbiting scenes, r = -.53, p<.02.

During this treatment week, the nailbiting scenes culminated in the clients' imaging themselves tapping the nails against the teeth and then breaking the nailbiting chain. Other than these few relationships, the correlations between self-monitoring and imagery variables were slight.

SUBJECT VARIABLES HYPOTHESIZED TO BE RELATED TO THE OUTCOME OF THERAPY

It was speculated earlier that the intellectual ability of the subjects, the pre-treatment severity of the nailbiting habit, and the subjects' awareness of nailbiting would affect the outcome of treatment. More intelligent subjects assigned to the CPR groups were expected to show greater evidence of therapeutic success and to have better imagery than less intelligent subjects. Severe nailbiters were expected to show less evidence of therapeutic success and maintenance of gains in nail length than mild biters. In addition, awareness of nailbiting was expected to be an important factor in decreasing biting. More severe nailbiters were expected to be less aware of their biting behavior than milder biters. Increases in awareness of biting from the pre-treatment awareness level over the course of treatment was expected to be related to greater increases in nail length (relative to the pre-treatment length) than either decreases or no changes in awareness of biting.

Intelligence

To test the hypothesis that more intelligent subjects would experience greater benefits from CPR treatment than less intelligent subjects, a two-way (2 group x 4 levels of IQ) univariate analysis of variance was performed on the effects of IQ level on nail-length gains at the conclusion of treatment (Table 31) and at follow-up (Table 32) for subjects

in the CPR groups. A two-way (3 groups x 2 sessions) univariate analysis of variance (Table 33) was also performed on the nail-length gains exhibited by all subjects at the conclusion of treatment and at the follow-up assessment (relative to the pre-treatment length), regardless of group assignment, to discover whether there was an overall IQ effect on the outcome of treatment. For the purposes of these three analyses, the prorated IQ scores the subjects had obtained on the short form of the WAIS (Wechsler, 1955), which the author administered during the pre-treatment assessment, were used to assign subjects to IQ levels. Subjects were grouped into the following IQ score ranges: 90 to 109, 110 to 119, 120 to 129, and 130 and above.

The subjects' IQ level had no significant effect on the outcome of the CPR treatments as assessed by gains in nail length (relative to the pre-treatment length) at the conclusion of treatment, F (3,13) = 1.60, $p<.24$; or at follow-up, F (3,13) = .76, $p<.54$. The average gain in nail length for CPR subjects who scored between 90 and 109 was 1.62 mm per nail; for subjects who scored between 110 and 119, 2.52 mm per nail; between 120 and 129, 2.04 mm; and for those who scored 130 and above, 1.65 mm at the conclusion of treatment. At follow-up, the average increase in nail length for CPR subjects was 1.42 mm, 3.01 mm, 2.58 mm, and 1.93 mm respectively.

As in previous analyses, there was no difference between the CPR-R and CPR-I groups in the outcome of treatment, either at the conclusion of treatment, F (1,13) = 4.42, $p<.056$; or at follow-up, F (1,13) = .18, $p<.72$. There was also no group by IQ level interaction, either at the conclusion of treatment, F (2,13)= .10, $p<.88$; or at follow-up, F (2,13) = 2.31, $p<.11$.

Across all three treatment groups, there were no significant differences in the outcome of treatment, either at the conclusion of treatment or at the three-week follow-up assessment as a consequence of IQ level F (3,26) = 1.79, $p<.19$. There was also no significant IQ level by session interaction, F (3,26) = .53, $p<.82$. As in previous analyses, there was no significant difference in the subjects' nail lengths between the conclusion of treatment and the follow-up assessment, F (1,26) = 1.15, $p<.22$.

IQ Correlates

The subjects' IQ levels and their actual IQ scores were correlated with a variety of variables. The subjects' IQ levels (e.g., 90 to 109) were unrelated to awareness of nailbiting at the conclusion of treatment (r = -.01, $p<.92$) or changes in severity as treatment progressed (r = -.25, $p<.19$). IQ score was generally not related to the clarity of the clients' imagery. During the fourth week of treatment, there was even a significant negative relationship between the subjects' IQ scores and the therapists' assessments of the clarity of their imagery, r = -.68, $p<.0009$. Over treatment, the subjects' self-reports of between-session CPR practice were negatively correlated with IQ score, r = -.36, $p<.001$. More intelligent subjects reported practicing less frequently than less intelligent subjects.

Severity of Nailbiting

Prior to treatment, 13 subjects assigned to the treatment conditions were classified as mild nailbiters, 10 as moderate, and 7 as severe, based on the ratings independent judges assigned to the photocopies made of their hands. At the conclusion of treatment, three subjects were

classified as mild nailbiters, five as moderate, and one as severe. Twenty-one subjects showed no evidence of nailbiting at all. Among the control subjects, three were mild biters, four were moderate, and three were severe at the time of the pre-treatment assessment. When the control subjects returned for their first delayed treatment session, two were mild, five were moderate, and three were severe biters.

To test the hypothesis that the subjects' pre-treatment levels of nailbiting severity would affect the outcome of treatment, a three-way (3 groups x 4 sessions x 3 levels of severity) univariate analysis of variance (Table 9) was performed on changes in nail length over time (the within-subjects factor) with respect to the pre-treatment length of subjects in the CPR-R, CPR-I, and SM groups (a between-subjects factor) for subjects with different pre-treatment levels of nailbiting severity (a between-subjects factor). As mentioned earlier, on page 77, there were no significant differences among groups in increases in nail length (relative to the pre-treatment length) at any time during treatment (Session 1, Session 4, or Session 8) or at follow-up, with all groups exhibiting significantly greater increases in nail length at the conclusion of treatment and at follow-up than at the beginning of treatment. There was also no significant group by session interaction.

In addition to these already-reported relationships, there were no significant differences in increases in length as a function of pre-treatment level of nailbiting severity, $\underline{F}$ (2,21) = .08, $\underline{p}<.92$. The average increase in nail length (relative to the pre-treatment length) for mild biters at the conclusion of treatment was 1.92 mm per nail; moderate biters, 1.92 mm; and severe biters, 1.93 mm. The average increases at follow-up were 1.95 mm, 2.43 mm, and 2.23 mm respectively. There was no significant

severity by group interaction, F (4,21) = 1.12, $p<.21$; severity by session interaction, F (6,63) = 1.29, $p<.27$; or severity by session by group triple interaction, F (12,63) = .70, $p<.75$. These data suggest that pre-treatment level of nailbiting severity had no effect on the outcome of treatment and that even severe nailbiters showed significant increases in nail length over time, comparable to those exhibited by mild and moderate biters.

Severity Correlates

The initial severity of the subjects' nailbiting habit and changes in nailbiting severity as treatment progressed were assessed by independent judges who examined photocopies of the subjects' hands taken at the pre-treatment assessment, Session 1, Session 4, Session 8, and at follow-up. Spearman rank order correlation coefficients were computed between the initial severity of the clients' nailbiting and changes in severity over the course of treatment, awareness of nailbiting, and the outcome of treatment.

Pre-treatment severity of nailbiting was not related to increases in nail length at the conclusion of treatment, $r = -.05$, $p<.81$; or at follow-up, $r = +.12$, $p<.52$. At the conclusion of treatment, experimental group membership was correlated with severity of the biting habit, $r = +.45$, $p<.004$, with subjects in the three treatment groups (CPR-R, CPR-I, and SM) being less severe nailbiters than control subjects. The same relationship between group assignment and nailbiting severity was noted at the follow-up assessment, $r = +.55$, $p<.0003$.

More severe nailbiters reported being less aware of their nailbiting prior to treatment than mild or moderate biters, $r = +.39$, $p<.04$.

Increasing awareness of nailbiting over time was positively correlated with decreasing severity of the nailbiting habit at the end of treatment, $r = +.48$, $p<.002$; and at follow-up, $r = +.63$, $p<.0001$.

Awareness of Nailbiting

The subjects rated their awareness of nailbiting on a 6-point scale (1=almost always aware to 6=almost never aware) at three different times during the experiment: pre-treatment, at the conclusion of treatment, and at the follow-up assessment. Spearman rank order correlation coefficients were calculated between levels of awareness and severity of nailbiting, and awareness of nailbiting and gains in nail length at the conclusion of treatment and at follow-up. The subjects' changes in average nail length, which ranged from a decrease of .5 mm per nail to an increase of 5.6 mm per nail were grouped into six categories for the purpose of this analysis.

More severe nailbiters reported being less aware of their habit prior to treatment than milder biters, $r = +.39$, $p<.04$. Changes in awareness over the course of treatment were significantly correlated with changes in severity of the nailbiting habit at follow-up, $r = + .63$, $p<.0001$. Subjects who became more aware of their nailbiting habit as treatment progressed exhibited greater decreases in the severity of the habit than those whose awareness remained the same or decreased. At the conclusion of treatment, experimental group membership was correlated with reported awareness of the nailbiting habit, $r = +.33$, $p<.04$, with subjects in the treatment groups (CPR-R, CPR-I, and SM) reporting being more aware than the control subjects.

The level of awareness reported at follow-up was related to the pre-treatment report of awareness, $r = +.37$, $p<.04$. The more aware subjects

reported being of nailbiting prior to treatment, the more aware they reported being at the end of treatment. In addition, the more aware subjects reported being of nailbiting at the follow-up assessments, the greater their maintained increase in nail length at follow-up, $r = -.40$, $p < .03$, in terms of the scale employed.

SUMMARY OF RESULTS

It was predicted that expectancy of benefit from treatment alone would not affect the subjects' biting behavior. This hypothesis was confirmed by the finding that there was no significant difference between the subjects' nail lengths between the pre-treatment assessments and Session 1. The equivalence of the nail-length data collected at these two points in time also indicated that a representative sample of the subjects' nail lengths had been obtained during the pre-treatment assessments.

It was also predicted that therapist assignment would have no effect on the outcome of treatment. There were no differences in the subjects' gains in nail length (relative to the pre-treatment assessments) at either the conclusion of treatment or at follow-up as a consequence of the particular therapist to whom they had been assigned.

As was predicted, subjects who received treatment (CPR-R, CPR-I, or SM) exhibited significant increases in nail length, with respect to their baseline levels, at the conclusion of treatment and at follow-up. Further, all treatment conditions resulted in the subjects' attaining significantly greater increases in nail length than the control condition, whose subjects' nails tended to decrease from the time of the pre-treatment assessments until they returned for their first delayed treatment session. Contrary to the hypotheses that subjects in the two CPR groups would exhibit greater

increases in nail length than subjects in the SM or control groups, and that subjects exposed to target-relevant consequences (CPR-R) would exhibit greater increases than those exposed to target-irrelevant consequences (CPR-I), there were no differences between treatment groups in the extent of length changes at either the conclusion of treatment or at follow-up.

It was predicted that there would be no differences among treatment groups in either self-reports of components of the nailbiting chain or in scores on the imagery variables. Further, self-reports of nailbiting were expected to decrease as treatment progressed, and imagery scores were expected to increase as treatment progressed. These self-monitoring and imagery variables were expected to be related to reductions in nailbiting as reflected in increases in nail length.

There were no differences among treatment groups in terms of the frequencies with which each component of the nailbiting chain was reported. The frequencies with which having the fingers in or near the mouth, biting the nails, or picking the nails were reported decreased as treatment progressed. There was a significant negative relationship between reports of biting the nails and the gains in nail length at the conclusion of treatment and at follow-up. In general, the more frequently subjects reported emitting a particular component of the nailbiting chain, the more frequently other components were reported.

There were no significant univariate differences between groups in either self-reports of between-session CPR practice or any of the imagery ratings, although a multivariate effect was noted. In general, the therapists' assessments of the clarity of the clients' imagery, the clients'

assessments of their own imagery clarity, and the valences that the clients assigned to the reinforcing scenes tended to increase as the treatment weeks progressed. The valences the clients assigned to the reinforcing scenes were negatively correlated with increases in nail length at the conclusion of treatment, but otherwise, there were no relationships between the imagery variables and the outcome of treatment.

It was hypothesized that the intellectual level of the clients would affect the outcome of the CPR treatments, with more intelligent clients expected to benefit more from CPR and have better imagery. The intelligence of the clients was completely unrelated to the outcome of treatment. The only relations noted between intelligence and the imagery variables was the finding that more intelligent subjects tended to practice less frequently than less intelligent subjects and, contrary to prediction, during one week of treatment less intelligent subjects received higher clarity of imagery scores from the therapists than more intelligent subjects.

Despite predictions to the contrary, the pre-treatment severity of the biting habit was demonstrated to be unrelated to the outcome of treatment. Severe nailbiters did not differ in the extent of their nail length gains (relative to their pre-treatment lengths) from moderate or mild biters at the conclusion of treatment or at follow-up. Prior to treatment, 13 subjects in the treatment groups were classified as mild nailbiters, 10 as moderate, and 7 as severe. At the conclusion of treatment, three were classified as mild, five as moderate, and only one as severe. Twenty-one subjects showed no evidence of nailbiting whatsoever.

As was predicted, the subjects' reports of awareness of nailbiting were related to the outcome of treatment. The less aware subjects reported

being of their nailbiting habit, the more severe it tended to be prior to treatment. The more aware subjects were of nailbiting at the end of treatment, the less severe their nailbiting problem. The more aware subjects reported being of nailbiting during the follow-up assessments, the greater their maintained nail length gains at follow-up.

CHAPTER IV

DISCUSSION

Restatement of Hypotheses

To recapitulate, this investigation was designed to examine some procedural variables and subject characteristics hypothesized to be related to the outcome of covert positive reinforcement in the treatment of nailbiting. Two forms of covert positive reinforcement (CPR) treatment were compared. One procedure involved (a) instructing subjects to imagine reinforcers related to the benefits which accrue from not biting the nails (CPR-R) contingent on imagining failure to bite the nails and (b) self-monitoring of nailbiting. The other procedure utilized (a) imaginal reinforcers unrelated to nailbiting (CPR-I) and (b) self-monitoring of nailbiting. The effects of three subject characteristics, IQ score, awareness of nailbiting, and pre-treatment severity of the nailbiting habit, were also investigated in relation to the outcome of treatment.

The effect of both CPR procedures on nailbiting was compared to the effects on nailbiting of a standard self-monitoring package and to the effects of no treatment at all. The self-monitoring package involved directing the clients to self-monitor instances of nailbiting and giving the clients instructions to stop biting, feedback on changes in nail length, and expectancies of improvement. This package has been referred to as self-monitoring alone.

It was predicted that subjects in all three treatment groups (CPR-R, CPR-I, and SM) would exhibit a decrease in nailbiting behavior as

reflected in increases in nail length relative to their pre-treatment lengths. Subjects receiving either form of CPR therapy were expected to show greater therapeutic success than those subjects who merely self-recorded instances of nailbiting, with subjects exposed to target-relevant consequences experiencing the greatest therapeutic gains overall. All three treatment conditions were expected to be superior to the no-treatment condition in reducing nailbiting.

The intellectual level of the subjects was expected to influence the outcome of the CPR treatments, with more intelligent subjects expected to experience greater therapeutic success than less intelligent subjects, and with the intellectual level of the subjects being related to such treatment variables as the clarity of the clients' imagery. The pre-treatment severity of the nailbiting habit was expected to affect the outcome of treatment, with more severe biters benefiting less from treatment than milder biters. Awareness of nailbiting was also predicted to be related to the outcome of therapy, with greater awareness of biting being associated with greater therapeutic gains.

Preliminary Analyses

Expectancy Effects

The subjects' nails were measured during the pre-treatment assessment and at the beginning of Session 1. By comparing the measurements taken at those two points in time, it was possible to determine whether a representative sample of the subjects' typical nail lengths had been obtained. It was also possible to assess whether any changes in nail length occurred which may have been attributable simply to expected benefit from treatment or to the knowledge that the hands would be inspected, demand characteristics

which Stephen and Koenig (1970) have suggested may be responsible for the widespread success reported for the outcome of diverse nailbiting treatments. That there were no differences observed in average nail length between the pre-treatment assessment and the beginning of treatment indicates that 1) a representative sample of the subjects' nail lengths had been obtained during the pre-treatment assessment and 2) expectation of benefit from treatment alone was not sufficient to effect a cessation of nailbiting. Therefore, the clients' nail lengths at the pre-treatment assessments were subtracted from their lengths at all subsequent measurement points and all future analyses were performed on the resultant difference scores.

Therapist Effects

The effects of the individual therapists on the outcome of treatment were assessed by comparing the increases in nail length their subjects experienced between the pre-treatment assessment and the conclusion of therapy and the follow-up assessment. That there were no differences among therapists in the extent to which their subjects improved in nail length indicates that the therapists were equally effective in carrying out treatment. This result is not surprising in that the therapists essentially read all treatment instructions from a prepared treatment script, were carefully trained to use the treatment script consistently, and were observed at regular intervals and given prompt feedback about any deficiencies in their performance. Prior to participating in the present project, none of the experimenters had any experience in administering any form of psychotherapy. Inasmuch as there were no effects of therapist assignment on the outcome of treatment noted, therapists were not used as a factor in later analyses.

Effects of Treatments on Nail Length

Differences Between CPR, SM, and DTC groups

It was predicted that subjects in all three treatment groups (CPR-R, CPR-I, and SM) would show evidence of a reduction in nailbiting, as reflected in increases in nail length, over the course of treatment, relative to the length at the pre-treatment assessments. Subjects in the two CPR groups were expected to experience greater gains over time than those in the SM group. All three treatment conditions were expected to be superior to the delayed treatment control condition in reducing nailbiting.

The data indicated that although subjects in the DTC condition did not experience any reductions in biting, subjects in the CPR-R, CPR-I, and SM groups all experienced significant decreases in nailbiting as evidenced by increases in nail length from the pre-treatment assessment to the conclusion of therapy and to follow-up. All three treatment conditions were effective in reducing nailbiting. There were no significant differences in increases in nail length between the CPR and SM groups. There were also no differences in self-reports of the frequency of the occurrence of each component of the nailbiting chain (viz., tapping, biting, picking, looking at, or having the fingers in or near the mouth) between the three treatment groups, as therapy progressed.

Effects of Self-monitoring on Nailbiting

In the present investigation, the self-monitored data were considered both as dependent variables, reflecting the outcome of treatment, and as an independent variable, a treatment technique. Whether SM is viewed as an independent or dependent variable, the results are the same. There were no differences among groups in either their reports of components

of the nailbiting chain (self-monitoring as a dependent variable) or in the outcome of treatment as reflected in changes in nail length relative to the pre-treatment length (self-monitoring as an independent variable).

Self-monitoring of nailbiting by itself was sufficient to suppress nailbiting, at least for the duration of the treatment program and the short-term follow-up assessment. In this case, the CPR treatments were superfluous, adding nothing to the effects of a standard self-monitoring treatment package for nailbiting. The fact that the CPR procedures were no more effective in reducing nailbiting than SM alone is remarkable when one considers the differences in time and therapist and subject involvement each procedure took. The SM procedure involved about five to ten minutes of therapist time per week. The CPR procedures involved approximately an hour's worth of therapists' time each week plus daily homework assignments in addition to the self-monitoring aspect of the CPR procedures. There are two probable explanations for the fact that CPR was no more effective than SM in the present investigation.

The effect of self-monitoring on the reduction of nailbiting was not unexpected owing to the reactive nature of recording one's own behavior (Nelson, 1977). However, such widespread and overwhelming therapeutic success was not anticipated because others (e.g., Katz et al., 1976) have found that SM alone has not always been sufficient to effect a complete nailbiting cure. As has been suggested by McNamara (1972), self-monitoring of nailbiting probably leads to a reduction in nailbiting as a consequence of making the clients more aware of their biting and by making early components in the nailbiting chain more discriminable (Bucher, 1968).

That self-monitoring of nailbiting by itself was sufficient to prevent nailbiting for the duration of treatment in this instance makes it difficult to assess the possible differential effects of target-relevant versus target-irrelevant reinforcers on the outcome of the CPR treatments or to evaluate the relationship between IQ level and the outcome of therapy. Exposure to the CPR treatment could not suppress nailbiting any better than the SM treatment which suppressed it almost completely by the end of treatment nor, of course, could it make the nails grow any faster.

Neither of these limitations is a deficiency of the CPR procedures. Rather, the failure of CPR to demonstrate any superior ability in reducing nailbiting than SM is a function of a combination of two factors: the success of self-monitoring in reducing nailbiting and the fact that the nature of the dependent measure selected to assess therapeutic success, increases in nail length, had a built-in biological "ceiling." If CPR had been compared to a procedure other than SM or if a different dependent variable had been used, the contribution of CPR may have been more dramatic. It is also possible that the effects of the CPR procedures will be longer lasting than those of the self-monitoring alone procedure (Davidson & Denney, 1976), a hypothesis which will be investigated during the long-term follow-up assessments, planned at three and six-month intervals after the conclusion of treatment.

Differences Between CPR Groups

It was predicted that those subjects who were exposed to target-relevant (CPR-R) imaginal consequences contingent on imaginal failure to bite the nails would experience greater therapeutic success than those

exposed to target-irrelevant (CPR-I) reinforcing scenes. There were no differences between the two CPR groups in increases in nail length at the conclusion of treatment or at follow-up relative to the pre-treatment length. There were also no differences between the two groups in terms of self-reports of between-session CPR practice, the therapists' assessments of the clarity of the clients' imagery for the nailbiting or reinforcing scenes, the clients' assessments of the clarity of their own imagery, or the valences the clients assigned to the reinforcing scenes.

That no differences were found in the outcome of therapy between the CPR-R group and the CPR-I group may indicate that the nature of the reinforcers makes little or no difference in the outcome of CPR treatment. More likely, however, is that potential differential effects of the target-relevant versus target-irrelevant reinforcers may have been blurred by the overwhelming positive effect of self-monitoring alone on nailbiting; the reinforcers were thus immaterial. It is possible that had separate groups of subjects been exposed to either CPR with target relevant consequences without self-monitoring of nailbiting or CPR with target-irrelevant consequences without self-monitoring of nailbiting, those exposed to target-relevant consequences may have experienced greater therapeutic success.

Mediational Versus Nonmediational Views of SM and CPR

The dramatic effect in this case of SM itself in reducing nailbiting makes it difficult to assess what mechanism may be responsible for the successful outcome of CPR in those situations where CPR is the sole therapy technique employed. It is also not possible to specify why SM by itself was sufficient to suppress nailbiting. Different

explanations for the effectiveness of both techniques may be formulated, depending on whether one adopts a mediational or nonmediational perspective.

Within a mediational framework (e.g., Kanfer, 1970), self-monitoring may be explained as a self-observation process in which the observer compares his/her performance with social or personal performance standards and then delivers self-reinforcement or self-punishment contingent on the outcome of a self-evaluation process. Self-reinforcement and self-punishment usually take the form of self-statements (e.g., "I did a good job on this one" or "I could have done better on this one"). These self-statements, cued by the self-observation process, are believed to be responsible for the reactivity of self-monitoring.

The nonmediational explanation (e.g., Rachlin, 1974) for the reactive effects of self-monitoring is that recording a behavior makes the relationship between the behavior and its consequences more salient. The client is given instructions to stop emitting a particular response and to record whenever the response occurs. Recording the response merely reminds the subject of the ultimate environmental consequences of not engaging in the response, which in this case was longer nails. It is the long-term environmental consequences of the response that control responding regardless of any subsidiary rewards (e.g., positive self-statements) inserted between the two events.

When a covert conditioning therapy is the sole therapeutic technique employed, mediational theorists (e.g., Mahoney, 1974) would argue that behavior change is in fact achieved as a consequence of the symbolically-presented outcomes. Nonmediational theorists (e.g., Rachlin, 1977c)

would argue that, once again, it is the ultimate environmental consequences of the behavior that control responding. Although the symbolically presented consequences might make the relationship between the response and its long-term consequences more salient, the symbolic consequences in no way control responding.

The results of the present investigation do not add any real clarification to the process variables responsible for the outcome of treatment nor do they resolve whether mediational or nonmediational explanations of the effects of SM or CPR are more tenable. The fact that there was a negative relationship between the valences the clients assigned to the reinforcers and increases in nail length relative to the pre-treatment length, however, suggests that the latter explanation is more tenable. If behavior change were in fact effected by the presentation of the imaginal reinforcers contingent on the desired behavior, one would expect a positive relationship between the valences assigned to the reinforcers and the outcome of treatment. Therefore, these data hint at a nonmediational explanation of the mechanism responsible for the outcome of CPR.

Whatever explanation is adopted, explicit instructions to deliver self-reinforcement contingent on imaginal failure to bite the nails did not add any therapeutic benefit to any self-reinforcement the clients may have delivered while self-monitoring nailbiting. All three treatments (SM, CPR-R, and CPR-I) probably work as a function of environmental effects. Regardless of explanation, self-monitoring seems so much easier to implement than the covert therapies and thus should logically be the treatment of choice for nailbiting and perhaps most other self-control problems.

Effects of Subject Variables on Nail Length

Intelligence

It was predicted that the intellectual level of the subjects, as estimated by the short form of the WAIS (Wechsler, 1955) administered prior to treatment, would be related to the outcome of CPR treatment. Inasmuch as covert therapies such as CPR rely so heavily on conversation and cognitive events (e.g., imagery) to effect behavioral change, more intelligent subjects were expected to benefit more from exposure to CPR than less intelligent subjects. More intelligent subjects were also expected to have greater clarity of imagery than less intelligent subjects. The data indicated that there were no differences in the outcome of treatment as a function of intellectual level.

The fact that no effect on the outcome of treatment was noted for the IQ level of the subjects may indicate that the intellectual level of the subjects makes no difference in the outcome of CPR treatment. Equally likely, however, is that as in the case of the nature of the reinforcers, the effect of the intelligence of the subjects on the outcome of treatment was masked by the dramatic effects of self-monitoring on the suppression of nailbiting. It is likely that high levels of intellectual development are unnecessary for the successful use of self-monitoring as a treatment technique, in that self-monitoring has been used successfully to modify behavior in retarded populations (Nelson, 1977). To answer the question of whether the intellectual ability of the subjects does affect the outcome of covert therapy, it would be necessary to expose separate groups of subjects to both variations of the CPR procedures, without self-monitoring of nailbiting, and then examine the resultant nail length gains with respect to IQ level.

Another possible explanation for the failure to find intellectual differences in the outcome of treatment in the present investigation is related to the restricted range of IQ scores represented in the subjects (no score below 90). It is possible that as long as a subject possesses a minimal degree of intellectual development (i.e., average intelligence), covert therapies are viable treatment alternatives. To answer this question, it would be necessary to investigate the effects on nailbiting of covert positive reinforcement by itself (without self-monitoring), using subjects with a broader range of intellectual ability.

In an attempt to procure subjects with lower levels of intelligence, nailbiters who were residents of the Henry Weisman Kendall Center for the Retarded in Greensboro, North Carolina were included in the experiment. In all, four subjects from Kendall Center, with IQ scores ranging from 33 to 68, were selected by the director of the center for treatment. During the course of treatment, one of the subject's parents moved away from the area, taking the subject with them. Halfway through treatment, one of the subjects refused to participate in the treatment program any longer. It was the opinion of two of the therapists who were working with the retarded subjects (Therapist A and Therapist E) that a third retarded subject did not have a nailbiting problem at all. Further, the therapists were not given a quiet or nonpublic area in which to work with the subjects, and after the first treatment week the center closed for a two-week vacation. For these reasons, it is not possible to analyze or interpret the data collected on the retarded subjects.

In an additional attempt to obtain subjects with lower levels of intelligence than the average college student, members of the local

community were invited to participate in the treatment program. Unfortunately for the purposes of this study, most of the community members who volunteered for treatment were college graduates and some even had advanced degrees.

Another possible explanation for the failure to find an IQ effect was that IQ score was negatively related to CPR practice. More intelligent subjects reported practicing less frequently than less intelligent subjects, which may have led to the higher IQ subjects' not receiving as much benefit from exposure to the CPR treatments as they would have had they practiced more diligently. However, inasmuch as self-reports of between-session CPR practice were in no way related to the outcome of treatment, it is unlikely that differences in frequencies of CPR practice among subjects of different IQ levels interacted with the subjects' intelligence to affect the outcome of treatment. Again, because self-monitoring of nailbiting by itself was so effective in suppressing nailbiting, the effects of practice on the outcome of treatment are difficult to evaluate.

Severity of Nailbiting

Severity of the nailbiting habit was assessed by two independent judges, who examined photocopies of the subjects' hands made during the pre-treatment assessments, at Session 1, Session 4, Session 8 (the conclusion of treatment) and at follow-up and who assigned severity ratings based on Malone and Massler's (1950) guidelines. It was predicted that severe nailbiters would experience less therapeutic benefit than mild biters; that is, milder biters would experience greater increases in nail length relative to their pre-treatment lengths than more severe

biters. As a consequence of the fact that a severe nailbiter's habit is more intense and probably more pervasive than a mild biter's habit, the severe biter's habit should have been more resistant to behavioral intervention attempts (Bandura, 1969).

That there were no differences in gains in nail length at the conclusion of treatment and at follow-up, as a function of the severity of the clients' nailbiting prior to treatment, indicates that self-monitoring of nailbiting is an effective treatment technique for all nailbiters, regardless of pre-treatment levels of nailbiting severity. Not only did the treatments result in a general increase in the subjects' nail lengths, but also a decrease in the severity of the biting habit. At the conclusion of treatment, 70 percent of the subjects in the three treatment groups showed no evidence of nailbiting whatsoever, 10 percent were mild nailbiters, 17 percent were moderate biters, and 3 percent were severe biters. Before treatment, 43 percent were mild biters, 33 percent moderate, and 24 percent severe.

Awareness of Nailbiting

The subjects assessed their awareness of nailbiting prior to treatment, at the conclusion of treatment, and at follow-up. It was predicted that the subjects' awareness of their nailbiting habit would be related to the severity of the nailbiting habit before treatment and to the outcome of treatment. Severe nailbiters were expected to be less aware of their nailbiting than mild biters. The more aware the subjects reported being of their nailbiting at the end of treatment and at follow-up, the greater their increases in nail length at the end of treatment and their maintenance of increases at follow-up were expected to be. As

suggested by McNamara (1972), making subjects more aware of their nail-biting habit is probably the crucial element in reducing nailbiting.

The data supported each of these hypotheses. Severe nailbiters reported being less aware of nailbiting than mild biters prior to treatment. Increases in awareness over the course of treatment was related to decreases in the severity of the biting habit at the follow-up assessments. The more aware of nailbiting subjects reported being at the follow-up assessments, the greater their maintained increases in nail length at follow-up, relative to their pre-treatment lengths. Subjects receiving treatment reported being more aware of nailbiting at the end of treatment than control subjects.

Implications for Therapy

That self-monitoring of nailbiting by itself, a treatment technique which required only minimal amounts of therapist involvement, was as effective in reducing nailbiting as the CPR treatments, techniques which required extensive therapist involvement, has important implications for the practice of behavior therapy. Before selecting a cognitive therapy technique for use with a client, the therapist should first consider the feasability of using less complicated therapeutic strategies (e.g., self-monitoring). If a technique (i.e., SM) that involved five to ten minutes of therapist time per week could be as effective in reducing nailbiting as ones (i.e., CPR-R and CPR-I) which involved an hour per week in actual therapy sessions plus extensive extra-therapy preparation on the part of the client (e.g., between-session CPR practice) and the therapist (e.g., construction of nailbiting and reinforcing scenes), it would seem only logical that the former, simpler strategy should be elected. In those

instances in which self-monitoring is not a viable treatment alternative (such as when a client is unable or unwilling to record instances of the target behavior or when the reactive effects of self-monitoring are insufficient to effect a behavioral change), other therapeutic strategies could be explored.

Directions for Future Research

The present study left several questions unanswered. Although the data indicated that self-monitoring by itself is an effective treatment procedure for nailbiting and the effectiveness of treatment was not mitigated by the pre-treatment severity of the nailbiting habit, it was not possible to determine whether covert positive reinforcement by itself would have been sufficient to effect a suppression of nailbiting, an important question to consider for those clients for whom self-recording of a troublesome behavior is not feasible (e.g., a welder troubled by obsessive thoughts). It was also not possible to determine whether the target-relevant versus target-irrelevant nature of the reinforcers is an important variable to consider in planning a CPR-based intervention program, or whether the intellectual level of the client should affect the selection of treatment techniques.

Future research should be addressed to isolating the effects of covert positive reinforcement on the outcome of treatment and then assessing the differential effects of the nature of the reinforcers. To study the effect of intelligence on the outcome of treatment, it would be necessary to obtain subjects with a broad range of intellectual abilities.

In addition to these procedural modifications, it might be advisable to select a behavior other than nailbiting in subsequent research. There

is a biological limit to the rate at which a persons' nails can grow. For this reason, as long as the use of a treatment technique results in a suppression of nailbiting, it is not possible to assess fine differences between that technique and any other whose use also results in a suppression of biting. Dependent measures which are more qualitative in nature than increases in nail length and are also not subject to "ceiling effects" might be better suited to evaluating the effects of covert positive reinforcement.

The outcome of the type of research outlined above would make it possible to address several crucial issues in cognitive behavior therapy. The suitability of cognitive behavior therapy techniques for a broad range of subjects and troublesome responses is a question that still needs to be addressed. In addition, whether behavior change is in fact achieved as a consequence of symbolically-presented outcomes (Mahoney, 1974) or whether it is the symbolic consequences' cueing environmental consequences that influence behavior (Rachlin, 1977c) are questions that remain unanswered. Outcome research, such as the present investigation, may only answer the question of whether covert techniques do work. Process research such as is outlined above is necessary to isolate those variables responsible for the outcome of treatment.

SUMMARY

Clinicians working within a behavioral framework are frequently criticized for ignoring the role of cognitive-symbolic processes in the formulation and remediation of clinical problems. With the emergence of what some have termed the "new cognitive trend in behavior therapy," however, cognitive processes are acquiring a central role as explanatory

constructs in behavioral analysis (Mahoney, 1974). Cognitive behavior therapies (e.g., covert positive reinforcement), which involve applying to covert behavior strategies found to be successful in modifying overt behavior, are proliferating (Rachlin, 1977c).

The empirical evidence related to the outcome of cognitive behavior modification techniques is difficult to interpret. Therapeutic results have sometimes been reported as only marginally successful and at other times as dramatically effective. A possible explanation for the contradictory nature of the outcome literature might be discrepancies in procedural and subject variables in the various studies which have been reported.

In the present investigation, the effectiveness in reducing nailbiting of self-monitoring in conjunction with two procedural variations of covert positive reinforcement (CPR) (Cautela, 1970b), one using target-relevant (CPR-R) and the other target-irrelevant (CPR-I) reinforcing scenes were compared. The effect of both variations of the CPR procedure on nailbiting was compared to the effect on nailbiting of simply recording instances of nailbiting and related responses when they occurred (SM). The effects of three subject variables, intelligence, awareness of nailbiting, and the pre-treatment severity of the nailbiting habit were also investigated in relation to the outcome of treatment.

The data indicated that subjects in all treatment conditions (CPR-R, CPR-I, and SM) demonstrated significant increases in nail length relative to their pre-treatment lengths. There were no differences among treatment groups in nail length gains either at the conclusion of therapy or at follow-up. Subjects in all three treatment groups exhibited

significantly greater increases in nail length than subjects in the control group. There were no differences in the outcome of CPR treatment between the use of target-relevant and target-irrelevant reinforcing scenes. The intellectual level of the clients and the pre-treatment levels of nailbiting severity were also unrelated to the outcome of treatment. The more awareness of nailbiting the clients reported after treatment, the greater were their maintenance of nail length gains.

Inasmuch as a time-consuming treatment technique like covert positive reinforcement contributed nothing to the therapeutic effects of a simple technique, self-monitoring, it was recommended that before therapists become involved in selecting complicated treatment strategies for their clients, they should investigate the feasibility of using simpler more efficient ones. For those cases in which the reactive effects of self-monitoring alone are insufficient to effect a cure, further research is recommended to isolate which components of cognitive behavior therapies are most essential for behavior change and for what subjects and troublesome responses cognitive therapies are most suitable.

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APPENDIX A

Nailbiting Questionnaire

Name _____ Occupation _____

How old are you? _____ Highest Grade Completed _____

Please answer the following questions completely. Your answers will help us in designing the best treatment program for you.

1. How long have you been biting your nails?
   _____less than 1 year
   _____1-3 years
   _____4-7 years
   _____8-10 years
   _____11-20 years
   _____more than 20 years

2. How many of your nails do you bite? _____

3. Do you bite your cuticles too? _____yes _____no

4. How often do you bite your nails?
   _____never
   _____once a month
   _____once a week
   _____once a day
   _____more than once during the day
   _____many times during the day

5. Does anyone else in your family bite his/her nails? _____yes _____no

6. If someone does, who? _____

7. Do you "eat" your nails after you bite them off?
   _____yes _____no _____sometimes

8. When do you bite your nails? (Check as many as apply to you)
   _____when I'm alone
   _____when I feel nervous or anxious
   _____when I'm at parties
   _____when I'm with just one or two friends
   _____when I'm driving
   _____when I'm in classes

APPENDIX A (continued)

_____when I'm at work
_____when I play cards
_____when I'm studying
_____when I'm taking a test
_____when I'm bored
_____when I'm watching television
_____other: please specify

_____

9. Of all these situations; in which do you think you bite your nails the most? _____

10. How do the people around you act when you bite your nails? For example, do they yell at you, or pull or slap your hands away from your mouth? What do they do or say?

_____
_____

11. How aware do you think you are of your nailbiting?
_____I almost always know when I'm biting my nails
_____I usually know when I'm biting my nails
_____I sometimes know when I'm biting my nails
_____I occasionally know when I'm biting my nails
_____I almost never know when I'm biting my nails

12. When was the last time you thought your nails looked attractive?
_____now
_____fairly recently
_____quite a while ago
_____I can't ever remember them looking good

13. What kinds of things have you tried in the past to get you to stop biting your nails? (check as many as apply to you)
_____putting bitter substances on my nails
_____will power or positive thinking
_____asking a friend (or spouse) or relative to yell at me to stop
_____manicuring my nails everynight
_____trying to relax
_____wearing gloves
_____other: please specify

_____
_____

14. Why do you think you bite your nails?

_____
_____
_____
_____

APPENDIX B

Tables

Table 1

Subject Characteristics

Group	Subject Number	Sex	Age	IQ Level[a]	Therapist	Initial Severity Level[b]	Follow-up Severity Level[b]
CPR-R	1	F	20	1	E	2	1
	2	F	21	3	D	4	1
	3	F	21	2	B	2	1
	4	F	22	1	A	4	3
	5	F	40	1	A	4	3
	6	F	22	3	F	3	1
	7	F	26	3	B	2	1
	8	F	31	3	C	2	1
	9	F	23	3	A	3	1
	10	F	19	3	C	2	1

(continued)

APPENDIX B (continued)

Table 1 (continued)

Subject Characteristics

Group	Subject Number	Sex	Age	IQ Level[a]	Therapist	Initial Severity Level[b]	Follow-up Severity Level[b]
CPR-I	11	F	26	3	B	3	3
	12	F	27	3	A	3	1
	13	F	32	3	F	2	1
	14	F	21	2	A	3	1
	15	F	19	1	B	3	3
	16	F	18	1	D	2	2
	17	M	24	3	C	2	1
	18	M	25	3	F	4	2
	19	F	21	2	D	2	1
	20	M	18	1	E	4	1

(continued)

APPENDIX B (continued)

Table 1 (continued)

Subject Characteristics

Group	Subject Number	Sex	Age	IQ Level[a]	Therapist	Initial Severity Level[b]	Follow-up Severity Level[b]
SM	21	F	18	2	B	3	1
	22	F	31	3	A	3	3
	23	F	19	1	D	4	4
	24	F	20	1	E	2	1
	25	F	19	3	C	3	1
	26	M	28	1	F	2	1
	27	F	20	3	D	2	2
	28	F	21	3	F	4	1
	29	F	21	3	F	2	1
	30	F	24	1	B	3	1

(continued)

APPENDIX B (continued)

Table 1 (continued)

Subject Characteristics

Group	Subject Number	Sex	Age	IQ Level[a]	Therapist	Initial Severity Level[b]	Follow-up Severity Level[b]
DTC	31	M	26	3	—	3	3
	32	F	28	1	--	3	3
	33	M	29	3	--	2	3
	34	M	28	3	--	2	2
	35	M	26	3	--	2	2
	36	M	25	3	--	3	3
	37	F	35	1	--	3	3
	38	F	48	3	--	4	4
	39	F	32	2	--	4	4
	40	F	29	1	--	4	4

[a] 1= 90-109
2= 110-119
3= 120 and above

[b] 1= no evidence of biting
2= mild nailbiting
3= moderate nailbiting
4= severe nailbiting

APPENDIX B (continued)

Table 2

Univariate Analysis of Variance on Differences in Nail Length from the Pre-treatment Interview to the Beginning of Treatment for Subjects Assigned to Treatment Groups

Source	df	MS	F
Group	2	.006	.44
S(Group)	27	.014	
Session	1	.00003	.16
Group x Session	2	.00009	.48
S(Group) x Session	27	.00002	

APPENDIX B (continued)

Table 3

Univariate Analysis of Variance on Therapist Effects on Increases in Nail Length

Source	df	MS	F
Therapist	5	.001	.50
S(Therapist)	24	.002	
Session	2	.059	36.54**
Therapist x Session	10	.0006	.40
S(Therapist) x Session	48	.0016	

**p<.01

APPENDIX B (continued)

Table 4

Newman-Keuls Post Hoc Comparisons on the Main Effect of Sessions on Increases in Nail Length Found in Analysis of Variance on Therapist Effects

	Sessions			
Follow-up	8	1	r	C. V. for .05
Follow-up	.011	.085*	3	.0344
8		.074*	2	.0286
1				

* $p<.05$

APPENDIX D (continued)

Table 5

Univariate Analysis of Variance on Gains in Nail Length at the End of Treatment for All Subjects

Source	df	MS	F
Group	3	.0216	21.25**
Severity	2	.0001	.10
Group x Severity	6	.0007	.65
S(Group x Severity)	28	.001	

** $p<.01$

APPENDIX B (continued)

Table 6

Newman-Keuls Post Hoc Comparisons on the Main Effect of Group on Increases in Nail Length at the End of Treatment for All Subjects

	Groups					
	CPR-R	SM	CPR-I	DTC	r	C. V. for .01
CPR-R		.016	.026	.107**	4	.0485
SM			.011	.091**	3	.0449
CPR-I				.081**	2	.0391
DTC						

**p<.01

APPENDIX B (continued)

Table 7

Univariate Analysis of Variance on Gains in Nail Length at Three-Week Follow-up for All Subjects

Source	df	MS	F
Group	3	.0323	9.62**
Severity	2	.0021	.62
Group x Severity	6	.0025	.75
S(Group x Severity)	28	.0034	

**p<.01

APPENDIX B (continued)

Table 8

Newman-Keuls Post Hoc Comparisons on the Main Effect of Group on Increases in Nail Length at Three-Week Follow-up for All Subjects

	Groups					
	CPR-R	CPR-I	SM	DTC	r	C. V. for .05
CPR-R		.0388	.040	.1293*	4	.0824
CPR-I			.001	.0905*	3	.0763
SM				.0893	2	.0665
DTC						

* $p<.05$

APPENDIX B (continued)

Table 9

Univariate Analysis of Variance on Gains in Nail Length as a Function of Group Assignment, Pre-treatment Degree of Nailbiting Severity, and Sessions

Source	df	MS	F
Group	2	.0034	1.42
Severity	2	.0001	.08
Group x Severity	4	.0027	1.12
S(Group x Severity)	21	.0027	
Session	3	.0024	34.30**
Group x Session	6	.0449	.43
Severity x Session	6	.0006	1.29
Group x Severity x Session	12	.0009	.70
S(Group x Severity) x Session	63	.0013	

**p<.01

APPENDIX B (continued)

Table 10

Newman-Keuls Post Hoc Comparisons on the Main Effect of Sessions on Increases in Nail Length Found in Analysis of Variance on Group Assignment and Severity

	Sessions				
Follow-up	8	4	1	r	C. V. for .05
Follow-up	.011	.061*	.085*	4	.0396
8		.50*	.074*	3	.0358
4			.024	2	.0295
1					

*p<.05

APPENDIX B (continued)

Table 11

Multivariate Analysis of Variance of Self-monitoring Data for the Effects of Group, Treatment Week, and the Group x Treatment Week Interaction

Source	df	MS	F
Group	10	7.82	.94
S(Group)	27	8.30	
Treatment Week	15	34.98	2.80**
S(Group) x Treatment Week	212	12.53	
Group x Treatment Week	30	30.00	1.11
S(Group) x Treatment Week	310	27.00	

**p<.01

APPENDIX B (continued)

Table 12

Newman-Keuls Post Hoc Comparisons on the Main Effect of Treatment Weeks on Self-Monitoring Data

	Treatment Weeks				
2	1	3	4	r	C. V. for .01
2	.0930	.1252**	.1693**	4	.1138
1		.0322	.0763	3	.0967
3			.0441	2	.0652
4					

**p<.01

APPENDIX B (continued)

Table 13

Univariate Analysis of Variance on Self-monitoring Data for Dependent Variable Look

Source	df	MS	F
Group	2	25.24	.77
S(Group)	27	32.67	
Treatment Week	3	5.66	2.55
Group x Treatment Week	6	1.02	.46
S(Group) x Treatment Week	81	2.22	

APPENDIX B (continued)

Table 14

Univariate Analysis of Variance on Self-monitoring Data for Dependent Variable Mouth

Source	df	MS	F
Group	2	58.61	1.16
S(Group)	27	50.45	
Treatment Week	3	10.57	5.89**
Group x Treatment Week	6	1.03	.58
S(Group) x Treatment Week	81	1.79	

**p<.01

APPENDIX B (continued)

Table 15

Newman-Keuls Post Hoc Comparisons on the Main Effect of Treatment Weeks on Dependent Variable Mouth

	Treatment Weeks				
1	2	3	4	r	C. V. for .05
1	.82	1.17*	1.34*	4	.8856
2		.35	.52	3	.8064
3			.17	2	.6720
4					

*p<.05

APPENDIX B (continued)

Table 16

Univariate Analysis of Variance on Self-monitoring Data for Dependent Variable Tap

Source	df	MS	F
Group	2	21.24	1.93
S(Group)	27	11.02	
Treatment Week	3	1.77	2.00
Group x Treatment Week	6	.64	.72
S(Group) x Treatment Week	81	.89	

APPENDIX B (continued)

Table 17

Univariate Analysis of Variance on Self-monitoring Data for Dependent Variable Bite

Source	df	MS	F
Group	2	3.04	.44
S(Group)	27	6.85	
Treatment Week	3	5.36	6.54**
Group x Treatment Week	6	1.68	2.05
S(Group) x Treatment Week	81	.82	

**p<.01

APPENDIX B (continued)

Table 18

Newman-Keuls Post Hoc Comparisons on the Main Effect of Treatment Weeks on Dependent Variable Bite

	Treatment Weeks				
1	2	3	4	r	C. V. for .05
1	.555	.843*	.941*	4	.6363
2		.288	.385	3	.5728
3			.097	2	.4720
4					

*p<.05

APPENDIX B (continued)

Table 19

Univariate Analysis of Variance on Self-monitoring Data for Dependent Variable Pick

Source	df	MS	F
Group	2	45.83	1.02
S(Group)	27	44.80	
Treatment Week	3	7.03	3.05*
Group x Treatment Week	6	3.60	1.56
S(Group) x Treatment Week	81	2.30	

*$p<.05$

APPENDIX B (continued)

Table 20

Newman-Keuls Post Hoc Comparisons on the Main Effect of Treatment Weeks on Dependent Variable Pick

	Treatment Weeks				
1	2	3	4	r	C. V. for .05
1	.4	.685	1.145*	4	1.0600
2		.285	.745	3	.9666
3			.460	2	.7965
4					

*p<.05

APPENDIX B (continued)

Table 21

Multivariate Analysis of Variance of Imagery Data for the Effects of Group, Treatment Week, and the Group x Treatment Week Interaction

Source	df	MS	F
Group	5	6.30	2.937*
S(Group)	18	2.15	
Treatment Week	15	20.40	2.950**
S(Group) x Treatment Week	138	6.90	
Group x Treatment Week	15	9.11	.660
S(Group) x Treatment Week	138	14.01	

*p<.05

**p<.01

APPENDIX B (continued)

Table 22

Newman-Keuls Post Hoc Comparisons on the Main Effect of Treatment Weeks on Imagery Data

Treatment Weeks					
4	3	1	2	r	C. V. for .05
4	.008	.178*	.238*	4	.169
3		.170*	.230*	3	.154
1			.060	2	.137
2					

*p<.05

APPENDIX B (continued)

Table 23

Univariate Analysis of Variance on Imagery Data for Dependent Variable Practice

Source	df	MS	F
Group	1	4.51	.14
S(Group)	18	31.99	
Treatment Week	3	1.62	.63
Group x Treatment Week	3	1.05	.41
S(Group) x Treatment Week	54	2.57	

APPENDIX B (continued)

Table 24

Univariate Analysis of Variance on Imagery Data for Dependent Variable Therapist Assessments of Imagery Clarity for Nailbiting Scenes

Source	df	MS	F
Group	1	.28	.14
S(Group)	18	1.91	
Treatment Week	3	2.35	5.39**
Group x Treatment Week	3	.37	.86
S(Group) x Treatment Week	54	.43	

**p<.01

APPENDIX B (continued)

Table 25

Newman-Keuls Post Hoc Comparisons on the Main Effect of Treatment Weeks on Dependent Variable Therapist Assessments of Imagery Clarity for Nailbiting Scenes

	Treatment Weeks					
	4	3	2	1	r	C. V. for .05
4		.18	.57*	.735*	4	.52
3			.39	.555*	3	.48
2				.165	2	.40
1						

*p<.05

APPENDIX B (continued)

Table 26

Univariate Analysis of Variance of Imagery Data for Dependent Variable Therapist Assessments of Imagery Clarity for Reinforcing Scenes

Source	df	MS	F
Group	1	6.67	3.17
S(Group)	18	2.10	
Treatment Week	3	1.03	2.74
Group x Treatment Week	3	.53	1.42
S(Group) x Treatment Week	54	.37	

APPENDIX B (continued)

Table 27

Univariate Analysis of Variance on Imagery Data for Dependent Variable Client Assessments of Imagery Clarity

Source	df	MS	F
Group	1	.02	.01
S(Group)	18	1.74	
Treatment Week	3	2.53	4.20**
Group x Treatment Week	3	.13	.21
S(Group) x Treatment Week	54	.60	

**p ≤01

APPENDIX B (continued)

Table 28

Newman-Keuls Post Hoc Comparisons on the Main Effect of Treatment Weeks on Dependent Variable Client Assessments of Imagery Clarity

	Treatment Weeks				
4	3	1	2	r	C. V. for .05
4	.080	.405	.780*	4	.6358
3		.325	.700*	3	.5780
1			.375	2	.4811
2					

*p<.05

APPENDIX B (continued)

Table 29

Univariate Analysis of Variance on Imagery Data for Dependent Variable Client Ratings of the Reinforcing Scenes

Source	df	MS	F
Group	1	6.73	2.20
S(Group)	18	3.06	
Treatment Week	3	6.11	7.86**
Group x Treatment Week	3	.56	.76
S(Group) x Treatment Week	54	.78	

**p<.01

APPENDIX B (continued)

Table 30

Newman-Keuls Post Hoc Comparisons on the Main Effect of Treatment Weeks on Dependent Variable Client Ratings of the Reinforcing Scenes

	Treatment Weeks				
3	4	1	2	r	C. V. for .05
3	.075	.555	1.200*	4	.7360
4		.480	1.125*	3	.6698
1			.645*	2	.5575
2					

*p<.05

APPENDIX B (continued)

Table 31

Univariate Analysis of Variance on the Effect of IQ Level on Nail Length Gains at Session 8 for CPR Subjects

Source	df	MS	F
Group	1	.0038	4.42
IQ Level	3	.0100	1.60
Group x IQ Level	2	.0001	.10
S(Group x IQ Level)	13	.0009	

APPENDIX B (continued)

Table 32

Univariate Analysis of Variance on the Effect of IQ Level on Nail Length Gains at Follow-up for CPR Subjects

Source	df	MS	F
Group	1	.0006	.18
IQ Level	3	.0026	.76
Group x IQ Level	2	.0079	2.31
S(Group x IQ Level)	13	.0034	

APPENDIX B (continued)

Table 33

Univariate Analysis of Variance on the Effect of IQ Level on Nail Length Gains at Session 8 and at Follow-up for All Subjects Assigned to Treatment Groups

Source	df	MS	F
IQ Level	3	.0064	1. 79
S(IQ Level)	26	.0035	
Session	1	.0017	1.15
IQ Level x Session	3	.0008	.53
S(IQ Level) x Session	26	.0014	

APPENDIX C

Deposit Agreement

Statement of Deposit Conditions

I agree to the following requirements of the Nailbiting Clinic Program:

1. To attend all scheduled bi-weekly meetings for four weeks and the three-week follow-up meeting. If I cannot attend a meeting, the Clinic must be notified at least 24 hours in advance.
2. To turn in all required data forms.

I understand that my entire deposit will be refunded upon my completion of the program unless:

1. I miss a scheduled session without notifying the clinic. One missed session will constitute grounds for forfeiture.
2. I fail to turn in all required data. More than one missing data record will constitute grounds for forfeiture.
3. I decide at some point during the program that I can no longer participate. In the event that I drop out of the program (with the exception of documented, prolonged illness) prior to its completion, I understand that my deposit will be forfeited.

I understand that regardless of my success or failure in the Nailbiting Clinic Program, my entire deposit will be refunded provided I attend all sessions and collect data. In the event that I do not meet these obligations, I agree that my deposit (a $20 post-dated check made out to my favorite charity) will be forwarded to the designated charity.

APPENDIX C (continued)

I fully understand the conditions above and agree to have my deposit forwarded to the designated charity in the event that I do not meet the conditions stated above.

_____ _____

Date Signature

APPENDIX D

Reinforcement Survey Schedule

The items on this questionnaire refer to things and experiences that may give you joy or other pleasurable feelings. Rate each item in terms of how much pleasure it gives you at present by checking the appropriate column.

	Not at All	A Little	A Fair Amount	Much	Very Much
Section I					
Eating					
a. Ice Cream					
b. Candy					
c. Fruit					
d. Pastry					
e. Nuts					
Beverages					
a. Water					
b. Milk					
c. Soft Drink					
d. Tea					
e. Coffee					
Alcoholic Beverages					
a. Beer					
b. Wine					
c. Hard Liquor					
Beautiful Women					
Handsome Men					
Solving Problems					
a. Crossword Puzzles					
b. Mathematical Problems					
c. Figuring out how something works					
Looking at Interesting Buildings					
Looking at Beautiful Scenery					

APPENDIX D (continued)

	Not at All	A Little	A Fair Amount	Much	Very Much
Listening to Music					
a. Classical					
b. Western Country					
c. Jazz					
d. Show Tunes					
e. Rhythm & Blues					
f. Rock & Roll					
g. Folk					
h. Popular					
Animals					
a. Dogs					
b. Cats					
c. Horses					
d. Birds					
Section II					
Watching Sports					
a. Football					
b. Baseball					
c. Basketball					
d. Track					
e. Golf					
f. Swimming					
g. Running					
h. Tennis					
i. Pool					
j. Other					
Reading					
a. Adventure					
b. Mystery					
c. Famous People					
d. Poetry					
e. Travel					
f. Politics & History					
g. How to-do-it					
h. True Confessions					
i. Humor					
j. Comic Books					
k. Love Stories					
l. Spiritual					
m. Sexy					
n. Sports					
o. Newspapers					

APPENDIX D (continued)

	Not at All	A Little	A Fair Amount	Much	Very Much
T.V., Movies or Radio					
Like to Dance					
a. Ballroom					
b. Discotheque					
c. Ballet or Interpretive					
d. Square Dancing					
e. Folk Dancing					
Playing a Musical Instrument					
Playing Sports					
a. Football					
b. Baseball					
c. Basketball					
d. Track & Field					
e. Golf					
f. Swimming					
g. Running					
h. Tennis					
i. Pool					
j. Boxing					
k. Judo or Karate					
l. Fishing					
m. Skin Diving					
n. Hunting					
o. Skiing					
Shopping					
a. Clothes					
b. Furniture					
c. Auto parts & supply					
d. Appliances					
e. Food					
f. New Car					
g. New place to live					
h. Sports equipment					
Gardening					
Playing Cards					
Hiking or Walking					

APPENDIX D (continued)

	Not at All	A Little	A Fair Amount	Much	Very Much
Completing a Task					
Camping					
Sleeping					
Taking a Bath					
Taking a Shower					
Being Right					
a. Guessing what somebody is going to do					
b. In an argument					
c. About your work					
d. On a bet					
Being Praised					
a. About your appearance					
b. About your work					
c. About your hobbies					
d. About your physical strength					
e. About your athletic ability					
f. About your mind					
g. About your personality					
h. About your moral strength					
i. About your understanding of others					
Having People Seek You Out for Company					
Flirting					
Having Somebody Flirt with You					
Talking with People Who Like You					
Making Somebody Happy					
Babies					
Children					

APPENDIX D (continued)

	Not at All	A Little	A Fair Amount	Much	Very Much
Old Men					
Old Women					
Having People Ask Your Advice					
Watching Other People					
Somebody Smiling at You					
Making Love					
Happy People					
Being Close to an Attractive Man					
Being Close to an Attractive Woman					
Talking about the Opposite Sex					
Talking to Friends					
Being Perfect					
Winning a Bet					
Being in Church or Temple					
Saying Prayers					
Having Somebody Pray for You					
Peace and Quiet					

Section III - Situations I Would Like To Be In

How much would you enjoy being in each of the following situations?

1. You have just completed a difficult job. Your superior comes by and praises you highly for "a job well done." He also makes it clear that such good work is going to be rewarded very soon.

not at all ( ) a little ( ) a fair amount ( ) much ( ) very much ( )

APPENDIX D (continued)

2. You are at a lively party. Somebody walks across the room to you, smiles in a friendly way and says, "I'm glad to meet you. I've heard so many good things about you. Do you have a moment to talk?"
not at all ( ) a little ( ) a fair amount ( ) much ( ) very much ( )

3. You have just led your team to victory. An old friend comes over and says, "You played a terrific game. Let me treat you to dinner and drinks."
not at all ( ) a little ( ) a fair amount ( ) much ( ) very much ( )

4. You are walking along a mountain pathway with your dog by your side. You notice attractive lakes, streams, flowers and trees. You think to yourself, "It's great to be alive on a day like this, and to have the opportunity to wander alone out in the countryside."
not at all ( ) a little ( ) a fair amount ( ) much ( ) very much ( )

5. You are sitting by the fireplace with your loved one. Music is playing softly on the phonograph. Your loved one gives you a tender glance and you respond with a kiss. You think to yourself how wonderful it is to care for someone and have somebody care for you.
not at all ( ) a little ( ) a fair amount ( ) much ( ) very much ( )

6. As you are leaving your place of worship, a woman turns to you and says, "I want you to know how much we appreciate all that you did for us in our time of trouble and misery. Everything is wonderful now. I'll always remember you in my prayers."
not at all ( ) a little ( ) a fair amount ( ) much ( ) very much ( )

Now place a check next to the number of the situation that appeals to you the most.

APPENDIX E

Treatment Script

DIRECTIONS TO EXPERIMENTERS (THERAPISTS)

General Rules and Procedures

1. It is essential that you be on time for all appointments with clients. If you cannot make an appointment, try to give me as much advance notice as possible so arrangements can be made to cover for you.

2. Make sure you are neatly dressed (e.g., no jeans) at all times and particularly when you meet with clients from the community.

3. Do not eat, smoke, or drink during sessions.

4. Clients may ask you for your opinion on a wide variety of subjects (e.g., "Is it all right for me to lock my child in a closet when she is bad?") or confide all sorts of personal secrets to you.
   a. Do not discuss any nonnailbiting problems with the clients.
   b. Do not give any opinions or offer any suggestions.
   c. Tell the clients that your training is limited to dealing with nailbiting problems only and you have been instructed not to deal with any other kinds of problems.
   d. Discourage all confidences tactfully, but firmly.
   e. If any clients seem really unhappy about a lot of things, suggest that they talk to me and I will refer them to the appropriate professional.
   f. Any personal information a client gives you is not to be divulged to anyone.
   g. Do not divulge even the names of the people taking part in the study to anyone.

5. If clients ask you if you are a psychologist, be truthful. You may tell them that you have been trained to carry out the treatment techniques you are using with them by a psychologist and that your work is being carefully monitored and supervised on a continual basis.

6. Do not tell clients about any of your own personal business.
   a. You do not have the time.
   b. You will wind up chatting instead of doing therapy -- it is very easy to get side-tracked if you are not careful.
   c. You may tell them you are students, otherwise, what you do with yourself is none of their business.
   d. If the clients ask personal questions, say very politely something along the lines of "I'd rather not get into that right now." If the

APPENDIX E (continued)

client persists, make some comment about how your next appointment is coming up soon and you have to write up the results of their session.

7. Make sure you follow standard treatment procedures during each session. Do not improvise!
   a. We need to behave consistently toward all clients in every group, otherwise the results of the project will be meaningless and we will have been wasting our (and the clients') time.
   b. Follow the directions given in this treatment manual for each client.
   c. Make sure you collect all the data you are supposed to during each session.
   d. If you forget to ask certain questions, collect certain data, etc., do not make them up. We can always work around missing data, but fabricated data can throw everything off.

8. Many of your verbal interactions with clients will involve your reading directions, descriptions, etc. to them. Try to speak in a soft, relaxed voice when you read. Try to sound as if you are speaking and not reading. If you are very familiar with what you are going to be reading before the session, it will be easier to sound natural and to be relaxed. Practice reading the descriptions aloud before the sessions.

9. Clients will have been assigned to one of two treatment groups before you meet with them. Try to avoid mentioning that other clients are receiving different treatment. If clients ask you if others are doing different things, be truthful. Tell them that we expect all treatments to work equally well for nailbiters. If a client asks what happens if a particular treatment technique does not work for him or her, tell him/her that we will try the other treatment if that should happen. Tell him/her that we do not expect that to be a problem; the technique we are using will work for him/her.

Treatment Procedures

1. During your first meeting with a client, you will be presenting the rationale for the various treatment techniques, introducing the treatment procedures, and stressing the importance of collecting data. After the first session, you will begin each session by:
   a. collecting the clients' self-monitoring data (explained below),
   b. giving them new self-monitoring sheets if necessary (e.g., they have run out of sheets or lost their booklets), and
   c. praising them for turning in their self-monitoring data.
      1. Tell them you are glad they are keeping track of their biting and/or practicing (explained below).
      2. Stress that collecting data is an important part of the treatment program and is essential for therapeutic success.
      3. If they dont't turn in their data, stress the importance of bringing it in next time.

APPENDIX E (continued)

2. The particular treatments you will be using with each client are presented to them in great detail. If, however, you think that the client does not understand what he/she is supposed to do, you may elaborate on the written instructions you have read to him/her or answer any treatment-relevant questions. Ignore such statements as "I don't think I'm smart enough to do this."

Treatment Script for Self-monitoring Subjects

First session. For at least the first treatment session:
a. Present the rationale for self-recording nailbiting (Appendix F) to all subjects.
b. Present a self-recording sheet (Appendix G) and give self-recording instructions (Appendix F).
c. Permit the clients to practice self-recording in your presence so that you are sure they understand what they are to do. Have them say back the directions to you in their own words to check for their understanding.
d. Remind them that we will be calling their friends or spouse to check up on their self-recording of nailbiting.
e. Give them a week's worth of self-recording sheets and remind them to bring them back when they come for their next session.
f. Stress the importance of making accurate recordings of nailbiting.

Subsequent sessions. During subsequent sessions:
a. Examine the clients' self-monitoring data, collecting it weekly.
b. Give the clients feedback on the data they report.
   1. If they have had an unsuccessful week, tell them that it will get easier for them to control their nailbiting as time goes on and they keep coming in for measurements and collecting data.
   2. If they have been doing well and do not think they need to come anymore, explain that if they want their nailbiting to stop on a permanent basis, they will need to complete the entire treatment program. Otherwise, any changes in their biting behavior will be only temporary.
   3. If they ask why they need to come for sessions when all that happens is that their nails get measured and their data examined, tell them that people tend to stop collecting data when nobody is keeping track of their recording behavior. Inasmuch as recording nailbiting is a new habit for them, they will need the support of coming in for sessions to keep them recording. After a few weeks, recording nailbiting will become a firmly entrenched habit and they will then no longer need to have our help to keep recording.
c. Review for the client how to self-monitor nailbiting, if necessary.

Treatment Script for Covert Positive Reinforcement Subjects

First session. The first session for the covert positive reinforcement (CPR) subjects has five parts to it:

a. Same as self-monitoring groups.
b. Present the rationale for the CPR techniques (Appendix I) to the clients.
c. Present a sample scene (Appendix J) for the client to imagine. Have the client narrate the scene to you and record significant details on the pre-coded recording sheet (Appendix K). Repeat with second practice scene.
d. Present a reinforcing scene (Appendices O and P) and a nailbiting scene (Appendix Q) for the client to imagine, following all directions on the reinforcing and nailbiting scene sheets.
    1. The particular scenes you will present to the client will be placed in his/her file before the session.
    2. When the client narrates the nailbiting scene, check off relevant details of the scene (Appendix L) as he/she mentions them, and then assign a global estimate to the clarity of the client's imagery on a 10-point scale (5=adequate narrations, 10=over elaborations, 1=under elaborations).
    3. When the client narrates the reinforcing scene, assign a global estimate only to the clarity of imagery, using the same 10-point scale.
    4. At the end of the presentation of scenes for the session, ask the client the questions on the Within-Session Imagery Questionnaire (Appendix M).
e. Instruct the client to practice the scenes at least 10 times a day between sessions and to record instances of between-session practice. Present a CPR practice recording sheet (Appendix N) and give the client directions in recording between-session CPR practice (Appendix I).

Subsequent sessions. During subsequent sessions:
a. Follow the procedures outlined above for the first CPR session, omitting the introductions to self-monitoring and CPR and the presentation of sample scenes.
b. Follow the procedures outlined under Subsequent sessions for subjects in the self-monitoring group.
c. Stress the importance of collecting self-monitoring data, practicing at home, and recording instances of practice.

APPENDIX F

Introduction to Self-Monitoring

The following was read by the therapist to all clients during their first session:

> Most people who bite their nails find that although they have compelling reasons to stop biting and have tried every way they can think of to keep from biting them, the habit persists. In the past, you have probably tried to stop biting your nails on your own and may have been successful for a while. But then, little by little, you started biting your nails again. Maybe something happened that made you nervous. Perhaps you simply forgot your resolution not to bite. What is most likely is that you were not aware that you started biting again.
>
> Whatever the reason you started biting your nails again, the fact that you were not able to quit permanently probably made you feel kind of discouraged. You probably felt that you would keep biting your nails forever and ever. As a result, you lost your motivation to try to stop biting your nails. You did not have any systematic outside support or instructions to get you back on the right track again so you gave up trying to quit biting.
>
> What we are going to be doing in the Nailbiting Clinic is to provide you with the systematic support and guidance you need to break the nailbiting habit forever. The agreement you signed and the deposit you made to participate in the Nailbiting Clinic and the treatment sessions you attend will help provide you with the motivation you need to stop biting forever. The procedures we will be using will make you more aware of your nailbiting than you have ever been before. Being aware of when you bite your nails is the first step in learning how to stop biting your nails. If you are aware of when you bite your nails, you will be in a much better position to break your nailbiting habit.

At this point, the therapist stopped reading and handed the client an observation booklet. The therapist then continued reading:

> I am giving you a booklet of observation sheets to help you keep track of nailbiting. Use a new sheet everyday and remember to fill in your name and the date on the top of each sheet. If you run out of room, you can use two sheets for one day. It is important that you carry these observation sheets with you at all times so that you can quickly and easily record when you bite your nails. Accurate record keeping is essential for therapeutic success.

APPENDIX F (continued)

> Let us look at a sample sheet. Here [the therapist pointed] is where you will fill in your name and the date. Here [the therapist pointed again] is where you will record nailbiting. Every time you look at your hands, put your fingers in or near your mouth, tap or press your fingers against your teeth, pick a nail, or actually bite a nail, you will need to put a check mark in the appropriate column. Whenever you do any of these things in front of another adult, you will need to ask the person you are with to put his or her initials next to your check marks. Whenever you do any of these things when you are alone, put a circle around these check marks.
>
> Everytime you just look at your hand you will need to put a check mark in this [the therapist pointed] column. If you happen to see your hands "by accident" you would not make a check mark. Only if you actually looked at your hands and particularly at your fingernails deliberately like, for example, this [the therapist demonstrated looking at the hands] would you make a check mark. Make one check mark for each hand involved. If you did this [the therapist looked at one hand deliberately] what should you record on the data sheet?

The tharapist waited for the client to make the appropriate response. If it were correct, the therapist praised him or her (e.g., "That's right!" or "Very good!"). The therapist helped him or her if he or she had difficulty. The therapist gave several examples involving one and both hands and then continued reading:

> Now that you know how to record the first segment in the nailbiting response chain, let us go on to recording when you have your fingers in or near your mouth. Whenever you have a finger in or near your mouth, you will need to put a check mark in this [the therapist pointed] column. You will need to make one check mark for each finger involved. If you did this [the therapist rested one finger on his or her lips] what would you record on the data sheet?

Again the therapist waited for the client to make the appropriate response. If it were correct, the therapist praised him or her. If not, the therapist gave assistance. The therapist gave several examples involving one or more fingers and then continued reading:

APPENDIX F (continued)

> Now that you know how to record the first two components in the nailbiting chain -- looking at your hands and having your fingers in or near your mouth -- let us go on to the next step, tapping or pressing a nail against your teeth. Whenever you tap or press a finger against your teeth, you will need to make a check mark in this [the therapist pointed] column. Make one check mark for each finger involved. If you did this [the therapist tapped his or her finger against his or her teeth] what would you record on the data sheet?

Again, the therapist waited for an appropriate response. The therapist gave several examples involving both tapping and pressing and multiple fingers and then continued reading:

> Anytime you pick a nail you will put a check mark in this column [the therapist pointed]. Put one check mark for each finger involved. So if you did this [the therapist pretended to pick one of his or her nails] what would you record on the data sheet?

Again, the therapist waited for the client to make the appropriate response. If it were correct, the therapist praised him or her. If not, the therapist gave assistance. The therapist gave several examples involving one or more fingers and then continued reading:

> Anytime you actually bite or chew on a nail you will put a check mark in this column [the therapist pointed]. Put one check mark for each finger involved. So if you did this [the therapist pretended to bite a nail] what would you record on the data sheet?

Again, the therapist waited for the client to respond. The therapist then gave several examples involving multiple fingers and then continued reading:

> You seem to have a good idea of what you are supposed to do. Just to make sure that I have explained what I want you to do correctly, tell me in your own words what you are supposed to do.

The therapist listened to what the client said and corrected any mis-

APPENDIX F (continued)

taken notions. The therapist answered any questions the client had and then continued reading:

> As I mentioned before, the purpose of having you keep track of your nailbiting by having you record each time you even look at your nails is to help you become more aware of your nailbiting. It is important that you keep accurate records of your nailbiting and that you do it every day. To help you keep accurate records, I will be checking the data you collect each time you come in. You must bring your observation booklet each time so I can see the daily data sheets.
>
> In between sessions, I will also be calling up the friends whose names you provided to ask them if you have been keeping track of your nailbiting. If you know that your friends will be on the lookout for you to record your nailbiting behavior, you will be more likely to remember to keep track of nailbiting. Remember that the more accurate your recordings are, the more chance you will have of breaking the nailbiting habit forever.
>
> Do not forget to keep your observation booklet with you all the time and record whenever you bite your nails. Remember that whenever you bite your nails in the presence of other adults you should have them initial the entries you make on your observation sheet. Whenever you bite your nails when you are alone, remember to circle the check marks you use to record those nailbiting episodes.
>
> Bring the record sheets with you when you come for each session. Warn the friends whose names and numbers you gave to the Clinic that we will be calling them to check up on you.

For subjects in the self-monitoring alone group, the therapist ended here. The therapist answered any questions the clients might have had, thanked them for coming, reminded them to collect data, and concluded the session. For subjects in both covert positive reinforcement groups, the therapist presented an introduction to the covert positive reinforcement procedure.

APPENDIX G

Sample Self-monitoring Sheet

The clients recorded occurrences of components of the nailbiting chain on this sheet.

Name _____ Date _____

MAKE A CHECK MARK (✓) IN THE APPROPIATE
COLUMN EACH TIME YOU DO ONE OF THESE THINGS.
MAKE ONE CHECK MARK (✓) FOR EACH FINGER INVOLVED.

LOOK AT HANDS	FINGERS IN OR NEAR MOUTH	TAP OR PRESS ON TEETH	BITE OR CHEW NAIL	PICK A NAIL
TOTALS				

APPENDIX H

Sample Confederate Phone Call Recording Sheet

The therapists recorded the responses given by the clients' confederates on this sheet.

Subject_____
Treatment Program Week_____
Date_____
Therapist_____

Confederate's Name_____
Phone #_____

Questions to be asked of confederate:

1) Have you seen _____(subject's name) bite his/her nails in the past week? _____Y _____N

2) Estimate how many times you saw _____ bite his/her nails, on the average, during the past week: _____

3) How many of these times did you actually initial your friend's observation booklet? _____

4) How many times in the past week do you think your friend bit his/her nails alone (i.e., without your having seen him/her?
_____

Additional question to be asked of confederates of subjects in the covert positive reinforcement group only:

5) As far as you know, did your friend practice his/her homework?
_____Y _____N

APPENDIX I

Introduction to Covert Positive Reinforcement

The following was read by the therapist to all clients in the covert positive reinforcement (CPR) groups during their first treatment session:

> An essential part of training you to stop biting your nails is to make you aware of your nailbiting. That is why you will be recording each time you bite your nails. To help you further to stop biting your nails I will be training you how to use a behavior modification procedure called covert positive reinforcement or CPR. CPR has been designed to help you manage your own behavior and has been used successfully by many people to control all sorts of troublesome habits.
>
> Your nailbiting behavior occurs because it is maintained by the environment. Whenever you perform that behavior, it is rewarded or punished by other people or by yourself. There have been many studies which indicate that if the consequences of behavior can be manipulated, then the behavior can be increased or decreased in frequency. We have found that just by having people imagine particular consequences of a behavior, the behavior will change in a similar manner.
>
> I am going to have you imagine certain practice scenes. Try to imagine that you are really there. Try not to imagine that you are simply seeing what I describe; try to use your other senses as well. If in the scene you are sitting in a chair, try to imagine you can feel the chair against your body. If, for example, the scene involves being at a party, try to imagine you can hear peoples' voices, hear glasses tinkling, and even smell the liquor and food. Remember, the main point is that you are actually there, experiencing everything. You do not see yourself there, you actually are there.
>
> First, let us determine if you can imagine a scene clearly. Close your eyes and try to imagine everything I describe. Ready? Raise your right index finger when the scene is clear.

At this point, the therapist presented the first practice scene ("Beach") for the client to imagine. The client was given the opportunity to imagine the scene while the therapist read it. Then the client imagined the scene while the therapist reviewed the highlights of it. Finally, the client was instructed to narrate the contents of the scene. If the client reported fewer than 75 percent of the important details of the scene, the

APPENDIX I (continued)

therapist gave the client an additional imagining trial. If the client reported at least 75 percent of the important details of the scene, the therapist presented the next practice scene ("Restaurant") for the client to imagine. The same procedure was repeated. The therapist then continued reading:

> Some of the scenes you will be imagining during therapy sessions will be descriptions of situations in which you might be tempted to bite your nails and may be called biting scenes. Other scenes will consist of pleasant events and may be called reinforcing scenes. While you are imagining the biting scenes I will say the word "shift." Whenever I say the word "shift" I want you to begin imagining the reinforcing scene immediately. Let us practice a reinforcing scene first. Close your eyes and try to imagine everything I describe. Remember to use all of your senses. When you have the scene clearly in mind, signal by raising your right index finger. Ready? Here is your first reinforcing scene.

The therapist then presented a reinforcing scene for the client to imagine. The particular scene selected for presentation was determined by the client's group assignment and in part by preferences the client had previously expressed on the Reinforcement Survey Schedule (Cautela & Kastenbaum, 1967). As for the practice scenes, the client was given the opportunity to imagine the reinforcing scene while the therapist read it. Then the client imagined the scene while the therapist reviewed the highlights of it. Finally, the client was instructed to narrate the contents of the scene so that the therapist could assess the client's clarity of imagery. The client also rated the subjective valence of the reinforcing scene on a 10-point scale (5=fairly pleasurable, 1=neutral, 10=extremely pleasurable). After all these steps were completed, the therapist continued reading:

> Remember that whenever I say the word "shift," you are to start imagining this scene. Now let us try imagining nailbiting scenes.

APPENDIX I (continued)

The therapist then presented a nailbiting scene for the client to imagine. The particular scene selected for presentation was determined by situations in which the client had reported nailbiting was common on the Nailbiting Questionnaire. As for the reinforcing scenes, the client was given the opportunity to imagine the nailbiting scene as the therapist read it. Then the client imagined the scene while the therapist reviewed the highlights of it. Finally, the client was instructed to narrate the contents of the scene so that the therapist could assess the client's clarity of imagery. After all these steps were completed, the therapist gave the client homework instructions.

Instructions for CPR Homework

At the end of the first session, the therapist read the following homework instructions to the clients in both CPR groups:

> In order to get the maximum therapeutic benefit from the treatment program, it is essential that you practice the scenes we imagined today, at home. You will need to practice these scenes very carefully everyday.
>
> You must close your eyes, concentrate, and vividly imagine the events and people in a particular scene. Try to actually feel some sort of emotional reaction to the scene as a result of your successful coping with the desire to bite your nails. It is not enough to merely sit still for a minute and rapidly run through a scene and let it go at that. You should stop everything you are doing, take a couple of minutes, and really make an effort to imagine the scene as vividly and carefully as you can.
>
> Imagine the situation you are in, the urge to bite your nails, and the fact that you resisted biting your nails. Then imagine one of the reinforcing scenes right after you imagine not biting your nails. Imagining these scenes should prompt you to imagine other feelings or emotions which will then help you to strengthen your ability to cope with the nailbiting urges and will increase your success. Remember, it is very important that you take the time to imagine vividly and clearly each scene every time you practice.

APPENDIX I (continued)

This is the manner in which you are to practice. Now it is important for you to understand when you are to practice these scenes.

You must practice at least 10 nailbiting and 10 reinforcing scenes each and every day. If you wish, you may practice more than 10. You must practice at least 10 times each day. You may practice any of the scenes you used during your meeting with your therapist.

Practice the scenes at any time of the day. You may want to practice when you feel the urge to bite your nails. This is not essential, however. What is essential is that you try to space out your scene practice. In other words, do not practice 10 times right before you go to bed. Instead, try to practice when you can take enough time to imagine the scene clearly.

Remember, you must practice your scenes very carefully. Do not run through a scene rapidly. Careless practice will not help you. You must take the time to imagine each scene vividly. You will also need to keep accurate records of your practicing.

The therapist then gave the client a sample sheet on which to record CPR practice and resumed reading:

Use these sheets to keep track of your between-session scene practicing. Make sure you put your name and the date on top of each sheet. Each time you practice a scene, write down the time you began practicing, the time you finished practicing, and how many times you imagined the nailbiting scene followed by the reinforcing scene on that occasion [the therapist pointed to the appropriate spaces each time]. Try to space out your practice sessions during the day.

Remember to take the time to practice the scenes carefully so that you will get the maximum benefit from imagining the scenes. Practice the scenes at least 10 times a day. Bring your self-recording sheets with you next time so I can check them.

The therapist then answered any questions the client had about the self-monitoring or covert positive reinforcement procedure or about the homework assignment and concluded the session. During all subsequent sessions, the same procedure for presenting the reinforcing and nailbiting scenes was followed.

APPENDIX J

Practice CPR Scenes

Practice Scene I: Beach

This was the first practice scene presented to all CPR Subjects:

Imagine yourself lying on the beach on a hot summer's day. You are lying on your back watching the clouds float slowly by. They look like cotton candy. The sky is a bright Carolina blue. The sun is high in the sky and you can feel its warm rays caressing your body. The warmth of the sand is making you feel very relaxed. You can hear the surf gently breaking against the shore. The fragrance of the salt water and salty air is all around you. You stretch out a bit more and just lie there feeling warm and good all over. Signal when you have that scene clearly in mind.

Practice Scene II: Restaurant

This was the second practice scene presented to all CPR subjects:

Imagine yourself sitting in a comfortable overstuffed chair at an elegant restaurant. The table is all set with magnificent china and crystal and there are flowers on your table. While you are waiting for your dinner to be served you are listening to the beautful dinner music someone is playing on the harp. You feel like singing along and start humming softly. You are watching the people dancing. Now your waiter arrives with your order. It is a thick, juicy steak. The aroma of the steak is almost too wonderful to bear. The steak is so tender it just melts in your mouth. It has been cooked to perfection. You can not remember when you have enjoyed a steak so much. Signal when you have this scene clearly in mind.

APPENDIX K

Sample Practice Scene Detail Recording Sheet

The therapists recorded details of the practice scenes as the clients mentioned them on this sheet.

Name_____ Date_____
CHECK OFF THE DETAILS AS CLIENT MENTIONS THEM

1. Beach Scene: Give a second trial if the client fails to mention six details.

1st	2nd	1st	2nd
___	___hot day	___	___hear surf
___	___clouds	___	___smell air and/or water
___	___blue sky	___	___warm sand
___	___warm rays of sun	___	___feel good or relaxed

2. Restaurant Scene: Give a second trial if the client fails to mention six details.

1st	2nd	1st	2nd
___	___comfortable chair	___	___people dancing
___	___table detail	___	___waiter arrives
___	___music	___	___aroma of steak
___	___humming	___	___tenderness of steak
		___	___enjoyment of steak

APPENDIX L

Sample Nailbiting Scene Detail Recording Sheet

The therapists recorded details of the nailbiting scenes as the clients mentioned them on this sheet.

Name _____ Date _____

CHECK OFF DETAILS AS CLIENT MENTIONS THEM

SESSION ___

1st Scene Presented		2nd Scene Presented
_____	Situation	_____
_____	Urge To Bite	_____
_____	Looking At Hands/Fingers	_____
_____	Near Mouth	_____
_____	In Mouth	_____
_____	Failure To Bite	_____
_____	Reinforcer For Not Biting	_____
_____	Overall Judgment Of Client's Imagery (1 - 10 Scale)	_____

APPENDIX M

Sample Within-session Imagery Questionnaire

The therapists recorded the clients' overall estimation of the clarity of their imagery for each session on this sheet.

Name_____ Date_____

At the end of each treatment session, ask the client the following and record his/her responses:

Where "1" indicates "not at all," "5" indicates "moderately well," and "10" indicates "extremely well:"

1. How clearly did you imagine the scene on a scale of 1-10? _____

2. How much of the material that was presented were you successfully able to imagine? _____

3. Rate each of the following on a 1-10 scale:
a) How well did you imagine the situation? _____
b) How well did you imagine the other people in the situation? _____
c) How well did you imagine yourself? _____
d) How well could you imagine the reinforcer? _____
e) How well did you imagine the urge to bite your nails? _____

APPENDIX N

Sample CPR Practice Record Sheet

The clients recorded instances of between-session CPR practice on this sheet.

Name _____ Date _____

USE THIS SHEET TO KEEP TRACK OF BETWEEN-SESSION CPR PRACTICE

TIME BEGAN	TIME FINISHED	NUMBER OF TIMES IMAGINED SCENES
(TOTALS)		

APPENDIX O

Sample Target-relevant Reinforcing Scenes

The following sample reinforcing scenes were presented to some of the subjects in the CPR-R group. The therapists read the scenes to the subjects.

Sample Scene 1

> Close your eyes and try to imagine everything I describe. Imagine that you have a friend who is always annoying you to stop biting your nails. She tells you that you just don't have the will power to stop biting your nails. You tell her that you could stop biting your nails forever if you felt like it. Imagine that your friend suggests a bet. She bets you that you can't grow your nails out so that they'll look really attractive. At the end of a month, if you haven't bitten your nails, she will do all your laundry for the next three months. If you have bitten your nails, you have to do all her laundry for 3 months. Now imagine that a month has passed. You haven't bitten your nails and they look great. You show them to your friend. She picks up your dirty laundry and walks off to the laundry room. Signal when you have that scene in mind.

Sample Scene 2

> Close your eyes and try to imagine everything I describe. Imagine that your back itches. Imagine that you have a bug bite and it is really driving you crazy, it itches so much. Imagine that you reach back to scratch your back, thinking that it's not going to do you much good to try to relieve the itch because you have no nails to scratch with. Now imagine that you start to scratch your back and you are amazed at how good it feels. You haven't been biting your nails so they have grown out enough so that you can use them to scratch your back. The scratching you're doing really feels terrific. You feel so happy to have long enough nails so that you can do a good job of scratching yourself. Signal when you have this in mind.

Sample Scene 3

> Close your eyes and try to imagine everything I describe. Imagine yourself walking into a store at the mall with (your

APPENDIX O (continued)

husband) (a male friend). It is a jewelry store. Slowly you walk over to the ring counter. You see an antique ring that is so beautiful you cannot resist trying it on. You try it on. The salesperson walks over and comments how beautiful the ring looks on your hand because you have such nicely shaped and manicured nails. Your (friend) (husband) says "your hands make that ring look so beautiful I simply must buy it for you." You look down at your hands and see that he is right. Your nails are lovely. Signal when you have that scene clearly in mind.

APPENDIX P

Sample Target-irrelevant Reinforcing Scenes

The following sample reinforcing scenes were presented to some of the subjects in the CPR-I group. The therapist read the scenes to the subjects.

Sample Scene 1

> Close your eyes and try to imagine everything I describe. Imagine you are walking along a mountain pathway with your dog by your side. It is a warm spring day. The air smells delightfully fragrant because the trees are starting to come into bloom. The blossoms are beautiful. As you look at the scenery and listen to a babbling brook, you think to yourself; "It's great to be alive on a day like this and have the opportunity to wander around alone out in the countryside." Signal when you have that scene clearly in mind.

Sample Scene 2

> Close your eyes and try to imagine everything I describe. Imagine you are at a really lively party. You can hear people talking and laughing. You can hear the tinkle of glasses and ice and you can smell the aroma of the delicious food the hostess has prepared. Everybody seems to be having a terrific time, dancing and talking. A very attractive (man) (woman) walks across the room to you, smiles in a friendly way and says "I'm glad to meet you. I've heard many nice things about you. Do you have a moment to talk?" Signal when you have that scene clearly in mind.

Sample Scene 3

> Close your eyes and try to imagine everything I describe. Imagine you are sitting in front of your fireplace with the person you love. The room is pleasantly warm and cheerful because of the roaring fire in the fireplace. Music is playing softly on the phonograph. Your loved one gives you a tender glance. You respond with a warm kiss. You think to yourself how wonderful it is to care for somebody and have them care for you. You really feel lucky to be sharing this beautiful moment with somebody you love. Signal when you have that scene clearly in mind.

APPENDIX Q

Sample Nailbiting Scene for Treatment Week 1

The following scene was presented to some subjects in both CPR groups during the first treatment week. The therapists read the scene to the clients, pausing in between sentences to give the client time to imagine each component of the scene.

> Close your eyes and try to imagine everything I describe. I want you to imagine that it is the night before your interview for a job you really want. This is the perfect job for you. You are well qualified for the job so you know that as long as you do a good job at the interview and make a favorable impression on the people you speak with, the job is yours. You are in your bedroom. You sit down on the bed and start thinking about the things you will need to tell the interviewers to do the best job of selling yourself to them. You start feeling a bit nervous. You begin to worry that they may ask you some questions you can't answer You start to worry that maybe you won't be wearing the right outfit to the interview. Your stomach starts feeling a little bit queasy and your hands start perspiring. You start to breathe heavily. When you have that scene clearly in mind, raise your finger.

After the client signalled clarity of imagery, the therapist repeated this segment of the scene again and then went on to the next segment.

> Now I want you to imagine that you get the urge to bite your nails. You start lookng at the fingers on your hand that is resting on the bed. You start to stare at the nails on those fingers. Slowly you lift your hand off your bed and start to bring that hand to your mouth. You open your mouth slightly and slide one of your fingers in. You can feel the slight pressure on your lips and tongue. You can feel the wetness of your mouth on your finger. You can feel the wetness of your mouth on your finger. You can feel your breath blowing against your finger. You can taste the tip of your finger. When you have this scene clearly in mind, raise your finger.

The therapist waited for the client to signal before going on.

> Now imagine that just as you are tempted to bite on your nail you say to yourself "No, I don't want to bite my nails." Imagine

APPENDIX Q (continued)

> you can actually hear yourself saying to yourself that you won't give in, you won't bite your nails. I won't bite my nails. I won't bite my nails. Imagine that you remove your finger from your mouth and put your hand back down on the bed. When you can hear yourself saying you won't bite your nails and when you can see your hand back on the bed, signal.

When the client signalled, the therapist said the word "Shift" and waited for the client to signal when he/she had the reinforcing scene clearly in mind. When the client signalled, the therapist continued reading.

> Now do the whole procedure yourself. Imagine you are sitting on your bed, worrying about your job interview. You can feel your stomach knotting up and you can feel your hands perspiring. You really feel nervous and you move your hand off your bed and bring it to your mouth. You can feel your finger in your mouth. Imagine you can hear yourself saying that you won't bite your nails. Imagine you can see yourself putting your hand back down on the bed. Deliver a reinforcement to yourself. When you are finished, signal. Now take your time. Make sure you get clear imagery. You can see your bedroom. You can feel yourself getting anxious. You can feel your finger in your mouth. You can hear yourself saying you won't bite your nails. All right. Start.

When the client signalled that he/she had finished imagining the nailbiting and reinforcing scene by himself/herself, the therapist instructed him/her to narrate the contents of the scene. The therapist checked off the important details of the scene as the client mentioned them. The therapist then presented the reinforcing scene and the nailbiting scene again for the client to imagine.

APPENDIX R

Sample Nailbiting Scene for Treatment Week 2

The following scene was presented to some subjects in both CPR groups during the second week. The therapists read the scene to the clients, pausing in between sentences.

> Close your eyes and try to imagine everything I describe. I want you to imagine that you are sitting in the dentist's office, waiting for him to call you in. You feel kind of nervous just sitting there waiting your turn. You'd really like to get the whole thing over with. You pick up a magazine and try to read it but you just don't have the patience. You start looking around at the other people in the office. No one looks interesting to talk to. You've been waiting about 45 minutes and are starting to feel a little bored. At the same time, you start to feel kind of apprehensive, wondering what the dentist is going to do to you once he gets you inside his office. Signal when you have this scene clearly in mind.

After the client signalled clarity of imagery, the therapist repeated this segment of the scene again and then went on to the next segment.

> Now I want you to imagine that you feel the urge to bite your nails. You start looking at your hands. You stare at the nails on your hands. Slowly you lift your hand out of your lap and start to bring your hand to your mouth. Your finger is against your lips. You can start to feel the slight pressure of your finger against your mouth. You can feel your breath blowing gently against your finger. When you have this in mind, signal.

The therapist waited for the client to signal before going on.

> Now imagine that just as you are tempted to put your finger in your mouth, you say "No!" You say "I will not put my finger in my mouth." Imagine you can actually hear yourself saying that you won't give in, you won't put your finger in your mouth. "I won't put my finger in my mouth. I won't put my finger in my mouth." Imagine that you remove your finger from your mouth area and put your hand back in your lap. When you can hear yourself saying that you won't put your finger in your mouth and when you can see your hand back in your lap, signal.

APPENDIX R (continued)

When the client signalled, the therapist said the word "shift" and waited for the client to signal when he/she had the reinforcing scene clearly in mind. When the client signalled, the therapist continued reading.

> Now do the whole procedure yourself. Imagine you are sitting in the dentist's office, waiting your turn. Imagine you are bored and start looking at your nails. Imagine you can see yourself bringing your hand to your mouth. Imagine you can feel your finger pressing against your mouth. Imagine you can hear yourself saying that you won't put your finger in your mouth. Imagine you can see yourself putting your hand back in your lap. Deliver a reinforcement to yourself. When you are finished, signal. Take you time. Make sure you get clear imagery. You can see the dentist's office. You can feel your finger against your mouth. You can hear yourself saying you won't put your finger in your mouth.

When the client signalled that he/she had finished imagining the nail-biting and reinforcing scene by himself/herself, the therapist instructed him/her to narrate the contents of the scene. The therapist checked off the important details of the scene as the client mentioned them. The therapist then presented the reinforcing scene and the nailbiting scene again for the client to imagine.

APPENDIX S

Sample Nailbiting Scene for Treatment Week 3

The following scene was presented to some subjects in both CPR groups during the third week. The therapists read the scene to the clients, pausing to give the clients the opportunity to get clear imagery.

> Close your eyes and try to imagine everything I describe. Imagine that you are on a trip to Wahington D.C. for an extended weekend. You decided at the last minute to fly there. The only airline that had a seat available at the time you wanted to leave was Fly-By-Night. Reluctantly you decide to make your reservation to fly with them. Imagine that the plane takes off and everything is going along smoothly. You are really enjoying the flight when all of a sudden the pilot comes on and says "We are going to run into some rough weather. Please fasten your seat belts." The plane ride starts to get very bumpy. The engine starts making really scary noises. The flight attendant seems to be praying. Signal when you have this scene in mind.

After the client signalled clarity of imagery, the therapist repeated this segment of the scene again and then went on to the next segment.

> Now imagine as the plane keeps jerking around in the air you are clenching and unclenching your fists in your lap. You start to look down at your hands. You have an overwhelming urge to bite your nails. You start to bring both hands up to your mouth intending to stick your fingers in your mouth and start chewing. Signal when you have this scene in mind.

The therapist waited for the client to signal before going on.

> As you are lifting your fingers to your mouth you say to yourself "Wait a minute! Biting my nails isn't going to solve anything. I'm not even going to put my hands near my mouth. I won't let my hands near my mouth. You quickly put your hands back down in your lap. When you can hear yourself saying that you won't put your fingers near your mouth and when you can see your hands back in your lap, signal.

When the client signalled, the therapist said the word "shift" and waited for the client to signal when he/she had the reinforcing scene

APPENDIX S (continued)

clearly in mind. When the client signalled, the therapist continued reading.

> Now do the whole procedure yourself. Imagine that you are sitting in an airplane and the flight is very rough. You can hear the engine sounding funny. Imagine that you start clenching and unclenching your fists and then you feel the urge to bite your nails. Imagine that you start to bring your hands to your mouth and then stop. You tell yourself you won't bring your hands to your mouth and put them back in your lap. Then deliver a reinforcement to yourself. Take your time so you get clear imagery. Begin. Signal when you're done.

When the client signalled that he/she had finished imagining the nailbiting and reinforcing scene by himself/herself, the therapist instructed him/her to narrate the contents of the scene. The therapist checked off the important details of the scene as the client mentioned them. The therapist then presented the reinforcing scene and the nailbiting scene again for the client to imagine.

APPENDIX T

Sample Nailbiting Scene for Treatment Week 4

The following scene was presented to some subjects in both CPR groups during the fourth treatment week. The therapists read the scene to the clients, pausing in between sentences to give the client time to imagine each component of the scene.

> Close your eyes and try to imagine everything I describe. Imagine that you are all alone in your house (apartment). You have been watching a scary movie on TV. A heavy rainstorm is in progress outside. The thunder is almost deafening. The lightning is very bright and seems to be close by. The lights start to flicker and finally go out along with the TV. You are sitting all by yourself in the dark and you start to feel very, very nervous. You light a candle and sit there, wondering when the lights will go back on. You can hear the neighborhood dogs howling. You can hear a police siren in the distance. You think you can just barely make out a shadowy figure lurking by your window. You just wish the lights would go on or that you had somebody there with you. Signal when you have this scene in mind.

After the client signalled clarity of imagery, the therapist repeated this segment of the scene again and then went on to the next segment.

> Now imagine that while you are sitting there in the darkened room, you get the urge to bite your nails. You look down at your hands to pick out a good finger to bite. While you are inspecting your fingers, you start thinking. "Wait a minute. I don't want to bite my nails. I don't want to have chewed up, ugly looking fingers. I'm not going to bite my nails. I won't even look at them." You stop looking at your nails and look at the candle instead. You sit and wait in the darkness for the lights to come on. Signal when you have this scene in mind.

When the client signalled, the therapist said the word "shift" and waited for the client to signal when he/she had the reinforcing scene clearly in mind. When the client signalled, the therapist continued reading.

APPENDIX T (continued)

> Now do the whole procedure yourself. Imagine that you are watching a scary movie during a thunderstorm. Imagine that the lights go out and you are pretty nervous sitting there in the dark. Imagine that you get the urge to bite your nails and start looking at your fingers in the candlelight to pick out one to bite. Imagine that you decide that you won't bite your nails, you won't even look at them. Imagine that you start looking at the candle instead. Then deliver a reinforcement to yourself. Take your time so that you get clear imagery. Begin. Signal when you're done.

When the client signalled that he/she had finished imagining the nailbiting and reinforcing scene by himself/herself, the therapist instructed him/her to narrate the contents of the scene. The therapist checked off the important details of the scene as the client mentioned them. The therapist then presented the reinforcing scene and the nailbiting scene again for the client to imagine.

APPENDIX U

Debriefing Statement

When subjects returned for the follow-up assessments, three weeks after their last treatment session, they were debriefed. They were told the following:

> What we were trying to do in this experiment was to investigate how effective certain behavior therapy techniques would be in helping you to stop biting your nails. Three techniques were compared. We took pictures of your nails during sessions 1, 4, and 8 as well as today so we could look at changes in the appearance of your nails over a period of time.
>
> The first treatment technique we tried was used with approximately one-third of the nailbiting clinic people. This third of you simply self-recorded instances of looking at your nails, putting your fingers in or near your mouth, picking on your nails, or actually biting your nails. In addition, we made random phone calls to your friends to check up on whether or not you were in fact recording nailbiting. We made these calls because it has been found that if people know in advance that others are checking up on their self-recording, the records they keep are more accurate.
>
> The other two-thirds of you participated in groups that not only self-recorded nailbiting but also came for individual CPR treatment sessions. During these sessions, those of you in these two groups were trained to imagine scenes in which you typically bite your nails. You were then trained to imagine that you resisted biting your nails and then to imagine that something pleasant happened.
>
> Half of you who came for individual sessions imagined that the pleasant event or reinforcing scene that occurred was related to nailbiting. For example, you imagined people complimenting you on your nails. The other half of you who came for individual treatment sessions imagined that the pleasant event that occurred was unrelated to nailbiting. For example, you imagined eating a tasty food.
>
> At the present time, it is unknown which of these three treatments was most effective because we don't have all of the data in or analyzed yet. It is probable, however, that those people who self-recorded instances of nailbiting plus came for individual treatment sessions will show greater increases in nail length than those who self-recorded alone. Those who imagined pleasant events related to not biting their nails probably did better than those who imagined scenes unrelated to nailbiting.

APPENDIX U (continued)

There was also another group, a delayed treatment control group, whose treatment was simply delayed for four weeks. These people are now in one of the three therapy groups.

The way a person was chosen to be in a specific group was through a random process, similar to pulling a number out of a hat.

From what I have seen so far the vast majority of people in the Nailbiting Clinic have stopped biting their nails. There are still some people who did not show any great improvement and we will be offering them additional treatment this summer in our next clinic.

APPENDIX V

Figure

Figure 1. Average Nail Length in mm at the Pre-treatment Assessment, Session 1, Session 4, Session 8, and Follow-up.

APPENDIX V (continued)