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DECREASING SELF-INJURIOUS BEHAVIOR IN TWO PROFOUNDLY HANDICAPPED
INDIVIDUALS BY INCREASING ON-TASK RESPONSES THROUGH THE USE OF A
REINFORCEMENT PROCEDURE

A Thesis

by

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DECREASING SELF-INJURIOUS BEHAVIOR IN TWO PROFOUNDLY HANDICAPPED
INDIVIDUALS BY INCREASING ON-TASK RESPONSES THROUGH THE USE OF A
REINFORCEMENT PROCEDURE. (May, 1982)

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The focus of this study was treatment of high levels of self-injurious behavior exhibited by two profoundly mentally retarded individuals. Both individuals participated in experimental sessions which followed a withdrawal research design with probe non-treatment sessions. Reinforcement for appropriate on-task behavior resulted in a substantial increase in engagement with task. Concurrent with this increase in appropriate behavior was a significant and rapid decrease in the level of self-injury by both subjects. During the probe non-treatment sessions, both of these behaviors immediately returned to their pre-treatment levels. The results of this study indicate that in these cases it was not necessary to suppress self-injury through the use of intrusive or restrictive methods before more appropriate behavior could be established in its place. Contrarily, the results imply that it was possible to significantly and quickly reduce self-injurious behavior by reinforcing appropriate behavior.

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DEDICATION

I would like to dedicate the efforts which went into the completion of this work to the members of my family. To my sisters and brothers, Debbie, Pat, Toni, Dante, and David, for all of the love and lessons we have shared.

There are no adequate words to express my love and gratitude to my father and mother, Pasquale and Esther. Their love, encouragement, support, and sacrifices were the force behind the attainment of this goal. The values which they instilled in me provided the strength, dedication, and desire required to complete this work. It is an accomplishment of mine but it belongs to them.

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Chapter 1

Introduction

Self-injury (SIB) has been the focus of a great deal of research in an attempt to discover the cause of the behavior as well as to identify treatments which might eliminate it. The reduction of self-injurious behavior is often urgent due to the danger involved to the individual who exhibits the behavior. In addition, research has demonstrated that SIB interferes with learning (Phillips & Muzaffer, 1961).

The elimination of self-injurious behaviors has most often been accomplished through the use of behavioral procedures (Favell, Azrin, Baumeister, Carr, Dorsey, Forehand, Foxx, Lovaas, Rincover, Risley, Romanczyk, Russo, Schroeder, & Solnick, 1982; Lovaas, 1982). The most prevalent treatment reported has been the use of punishment procedures, particularly contingent electric shock (Bucher & Lovaas, 1968; Lovaas & Simmons, 1969; Risley, 1968; Tate & Baroff, 1966). Differential reinforcement procedures have also been explored as benign and non-intrusive methods of eliminating SIB (Ragain & Anson, 1976; Tarpley & Schroeder, 1979). The effects of the reinforcement procedures have been mixed

(Corte, Wolf, & Locke, 1971; Duker, 1975). A major problem with the use of differential reinforcement to treat SIB has been that even when it has been effective the results have been slow (Weiher & Harmon, 1975).

Definition

Self-injurious behaviors have been defined as "measures carried out by the individual, upon himself, which tend to cut off, to remove, to maim, to destroy, to render imperfect, some part of the body" (Phillips & Muzaffer, 1961, p. 421). Self-injury includes behaviors such as eye-poking, vicious scratching, head-hitting, head-banging, self-biting, pica (eating non-edible substances), and rumination (repeated vomiting). Although other forms of self-injury exist, the behaviors listed above are the ones most frequently reported in the literature. The rate and intensity of SIB is extremely varied. The rate of self-injury can range from several times a month to hundreds of times an hour. The intensity of the behavior can range from very mild forms to actually life threatening.

Prevalence

The prevalence of self-injury among individuals not labeled mentally retarded or developmentally delayed is not very high. SIB has been reported to be present in 11-17% of normal children between the ages of 9 and 18 months, but declines to 10% by two years of age. Furthermore, the behavior generally disappears by the fifth year (Shintoub & Soulairac, 1961). The self-injury which does occur in the general population is rarely found to be

intense and nonsuperficial damage (i.e. severe tissue lacerations or broken bones) is uncommon.

Self-injury is most prevalent in the developmentally disabled population (Phillips & Muzaffer, 1961). Occasionally SIB persists beyond early childhood, particularly in individuals labeled psychotic or autistic, and often escalates to the point of severe damage to the individual (Picker, Poling, & Parker, 1979). Such severe and persistent behavior interferes or totally impedes learning and the performance of desired behaviors.

Although the incidence is low, self-injury is a behavioral anomaly which cannot be ignored. Physical jeopardy to the individual who engages in SIB, as well as the interruption and/or total prevention of participation in normal academic and social activities are the debilitating effects of this problem behavior (Carr, Newsom, & Binkoff, 1976). Hence, concern and attempts to discover treatment procedures which eliminate these behaviors is imperative if the individuals who engage in self-injury are to grow to their fullest potential as individuals.

Purpose of Study

The purpose of this research was to attempt to examine the efficacy of treating SIB with the use of a benign procedure, i.e. a technique, which did not utilize intrusive or restrictive tactics. The method employed was a reinforcement procedure of presenting reinforcers for appropriate on-task behavior. Further, the procedure was designed to ensure its practicality in

classroom applications in order for the results to be generalizable to routine teaching situations.

Research Questions

A number of research questions concerning self-injurious behavior were investigated. These questions were:

1. Can a reinforcement procedure, when used alone, be sufficient to decrease self-injurious behavior?
2. If there is a decrease in SIB resulting from the use of reinforcement, is it substantial enough to be clinically significant?
3. If there is a decrease in SIB resulting from the use of reinforcement, is the decrease rapid enough to be clinically significant?
4. Can not only a reduction in SIB occur, but can it be replaced with an alternate, more appropriate on-task behavior?
5. If more appropriate behavior increases, is the increase enough to be clinically significant?

Summary

Self-injury is a behavioral phenomenon which is dangerous and which interferes with the appropriate display of desired behaviors. A treatment procedure is necessary in order to eliminate this type of maladaptive behavior. A behavioral procedure which utilizes reinforcement principles as opposed to methods which are intrusive or restrictive was implemented in an attempt to reduce self-injury.

The following chapters will examine self-injurious behavior and the present research study in depth. Also discussed will be the results of this investigation and the implications of these results.

Chapter 2

Review of Related Literature

Self-injurious behavior has been described as interfering seriously with the acquisition of appropriate behavior and skills. The review of literature will examine several hypotheses concerning possible reasons individuals self-injure. After reviewing the major motivational hypotheses, a variety of treatment procedures will be reviewed. Research on these different methods will be presented, and positive and negative aspects of each will be discussed.

Motivation Hypotheses

Five major hypotheses concerning the reasons individuals engage in self-injurious behavior have been discussed in the literature. Of the five hypotheses most cited, the psychodynamic hypothesis and the organic hypothesis will not be reviewed in this paper due to lack of empirical support (Carr, 1977). The theories which will be presented are: (1) self-stimulation hypothesis; (2) negative reinforcement hypothesis; and (3) positive reinforcement hypothesis.

Self-stimulation hypothesis. The self-stimulation hypothesis maintains that when adequate levels of tactile, vestibular, and kinesthetic input are absent, an individual may

engage in SIB as a means of providing sensory stimulation (Baumeister & Forehand, 1973; Cain, 1961; Kulka, Fry, & Goldstein, 1960). Kulka et al. (1960) claimed that a kinesthetic drive exists and that self-injury could result from over-restriction of motoric activity. Reports of several observations support this presumption (Collins, 1965; Dennis & Najarian, 1957; Levy, 1944). Although a number of studies offer support for the self-stimulation hypothesis, they are based on anecdotal or correlational accounts and do not provide strong empirical support (Carr, 1977).

There have been some experiments with mentally retarded persons which are relevant to the self-stimulatory hypothesis. The inference that a nonstimulating environment is more conducive to establishing and maintaining self-injury than an environment where opportunities for stimulation are provided appears to be supported from the findings of Berkson & Davenport (1962), Berkson & Mason (1963), Davenport & Berkson (1963), and Favell, McGimsey, & Schell (1982). A negative correlation between the frequency of object manipulation and frequency of self-stimulation was found in all studies. In the Favell et al. (1982) study, eye-poking, hand-mouthing, and pica were substantially decreased when the subjects were provided with toys. In the experimental condition where toys were available, all six profoundly retarded, multiply-

handicapped individuals switched to self-stimulating with the toys and interestingly, the self-stimulation with the toys was of the same topography as the previous self-injury. Berkson (1967) concluded that in some cases stereotyped behaviors, including self-injury, are no longer needed as a source of stimulation and disappear when adequate stimulation is provided. The recent Favell et al. (1982) investigation appears to add support to this argument.

Negative reinforcement hypothesis. In the negative reinforcement hypothesis, SIB is viewed as a learned operant, one that is maintained by escape or avoidance of an aversive stimulus or event (Carr, 1977; Carr, Newsom & Binkoff, 1976). The literature almost exclusively deals with this topic in respect to the role of escape motivation as the primary reason for maintaining self-injury.

There have been several reports regarding individuals who injure themselves, possibly to escape an aversive situation. Cases have been cited by Jones, Simmons, & Frankel (1974), Myers & Deibert (1971), and Wolf, Risley, Johnston, Harris, & Allen (1967) which suggest that demands were likely to induce SIB. These reports imply that demands are aversive stimuli for some individuals and the ability to terminate them by self-injuring maintains the aberrant behavior.

The idea of self-injuring as escape-responding may be relevant to the control of self-abuse through the use of

restraints (Carr, 1977). Many self-injurious individuals are placed in some form of restraint to prohibit them from harming themselves. In many instances there are frequent or severe episodes of self-injury immediately following the removal of restraints. It is possible that being restrained becomes associated with few demands being placed upon the individual. Consequently, access to restraint may become a reinforcing event for the SIB which, by engaging in SIB, some individuals are escaping a situation where demands might be placed upon them (Carr, 1977; Favell, McGimsey, & Jones, 1978).

Demands might not be the only negative reinforcers which can maintain SIB. A case of a girl who beat her head against the bars of her crib when put to bed, presumably to escape being put to bed at that time, was reported by Freud and Burlingham (1944). Therefore, self-injury could occur to avoid or escape a variety of situations perceived as unpleasant.

Positive reinforcement hypothesis. The positive reinforcement hypothesis asserts that SIB is a learned operant which is maintained by positive reinforcers (primarily social) delivered contingent upon performance of the behavior (Lovaas, Frietag, Gold, & Kassorla, 1965). Lovaas and Simmons (1969) attempted to isolate some of the controlling environmental conditions of three severely retarded and psychotic children. When self-injury resulted in attention to the individual displaying it, the frequency steadily increased. These results appear to lend support to the positive reinforcement hypothesis. A

further implication of the positive reinforcement hypothesis is that the frequency and/or duration of self-injury should decrease when the positive social consequences maintaining the behavior are discontinued. There is a substantial amount of literature which indicates that complete removal of attention for SIB can greatly reduce or entirely eliminate the behavior (Bucher & Lovaas, 1968; Lovaas & Simmons, 1969; Wolf et al., 1967; Wolf, Risley, & Mees, 1964).

Treatment Procedures

There have been five major treatment procedures which have been used in attempting to eliminate SIB. The procedures reviewed in the literature are: (1) use of drugs; (2) extinction; (3) timeout; (4) punishment procedures; and (5) reinforcement procedures. Studies using the various methods will be examined, as well as the positive and negative aspects of each procedure.

Use of drugs. Drugs have not proven successful in reducing SIB unless given in doses that completely debilitate the individual (Cooper & Fowlie, 1973; Frith, Johnstone, Joseph, Powell, & Watts, 1976; Varga & Simpson, 1971). Tranquilizers have been administered and shown to decrease overall activity by 33%, but self-injury was not found to be selectively affected (Davis, Sprague, & Werry, 1968; Hollis, 1968).

Extinction. Extinction is an operant procedure used to decrease the probability of occurrence of a target behavior by discontinuing social (i.e., attention) or sensory (i.e., auditory, visual, or proprioceptive) consequences for the behavior.

Extinction is a procedure which has been documented in the literature as being successful in reducing some cases of SIB. Allen and Harris (1966) reported success in eliminating vicious self-scratching in a five year old female by instructing the mother in withholding social reinforcement when self-injury occurred.

Bucher and Lovaas (1968) also published a study whereby withholding attention from a seven year old retarded boy who beat his head when restraints were removed proved to be successful in extinguishing that behavior.

Sensory consequences, as opposed to social consequences, have also been found to be reinforcers of self-stimulation in four developmentally disabled children (Rincover, Cook, Peoples, & Packard, 1979). After isolating auditory, visual and proprioceptive reinforcers in the first phase of the investigation, withholding these consequences in the second phase of the study extinguished the self-stimulation responses.

Some unsuccessful results from the use of extinction have also been reported in the literature. Lucero, Frieman, Spoering, and Fehrenbacher (1976), and Corte, Wolfe, and Locke (1971) reported that extinction was not effective in reducing SIB. Lucero et al. (1976) found that withholding attention actually increased self-injury in two of their three subjects.

There are several major problems associated with the use of extinction in attempting to eliminate SIB. First, the effects of

this procedure are usually slow (Bucher & Lovaas, 1968; Lovaas & Simmons, 1968). Due to the possibility of high frequency and intensity of self-injury, the slow course of extinction could result in extreme danger to the individual (Smolev, 1971). Further, instead of a steady decrease in the injurious behavior, the use of extinction typically results in an initial increase in the rate of behavior (e.g. Lovaas & Simmons, 1969). Therefore, in light of these problems, extinction, when used alone, may not be ethically or legally defensible as a technique when attempting to eliminate self-injury in many individuals (Picker et al., 1979).

Timeout. Timeout from positive reinforcement (timeout) is a procedure which involves a signalled period of time in which no reinforcers are available following the occurrence of a given behavior (Kauffman, Boland, Hopkins & Birnbrauer, 1978).

Timeout has been shown successful in reducing and eliminating SIB. The use of timeout to control SIB was initially reported by Wolf et al. (1964) who eliminated head-banging, hair pulling, and facial slapping and scratching in a male autistic child by isolating him in a small room contingent upon self-injury.

The effectiveness of timeout in controlling self-injury was also demonstrated in two additional studies (Hamilton, Stephens, and Allen, 1967; Tate and Baroff, 1966). Hamilton et al. (1967) eliminated head and back-banging in a severely retarded female within five weeks of implementing a timeout consequence for SIB. The behaviors prior to treatment had been severe enough to warrant daily medical treatment. A follow-up study conducted nine months

after the termination of treatment indicated continued suppression of SIB. Some reported positive side effects following the elimination of SIB were that the subject became more observant of her surroundings, more socially interactive and participated in ward activities for the first time.

Though proven to be effective in reducing and eliminating SIB, there are disadvantages associated with the use of timeout. Although typically more rapid than extinction, the problem of gradual reduction in self-injury still exists (Hamilton et al., 1964). Due to the length of time it usually takes timeout to bring self-injury under control and the nature of the timeout procedure of ignoring the individual, it is often impractical or unsafe to use with severe cases of SIB.

Punishment procedures. Punishment is a response-suppression procedure which involves the delivery of a stimulus following the target behavior (Picker et al., 1979). Whether or not the stimulus is a punisher is defined by whether future probability of the target behavior decreases (Favell & Greene, 1981).

There have been a variety of events which have been demonstrated to be punishers with some cases of SIB. Those reported as successful in decreasing or eliminating self-injury have been contingent: aromatic ammonia (Altman, Haavik, & Cook, 1978; Tanner & Zeiler, 1975); facial screening (Lutzker, 1978); water spray (Dorsey, Iwata, Ong, & McSween, 1980); forced exercise

Wesolowski, 1975; Barnard, Christopherson & Wolf, 1976) and electrical shock (Lovaas & Simmons, 1969; Risley, 1968).

The most widely used and successful form of punishing stimulus in eliminating severe cases of SIB has been contingent electric shock (Bucher & Lovaas, 1968; Lovaas & Simmons, 1969; Risley, 1968; Tate & Baroff, 1966). Indeed, shock has proven successful when other procedures have failed to decrease or eliminate SIB (Lovaas & Simmons, 1969; Tate & Baroff, 1966).

Corte et al. (1971) conducted a comparison study of three procedures for eliminating SIB in four profoundly retarded adolescents. There was a relatively high stable rate of self-injury in all four subjects. The extinction procedure attempted was not effective in reducing the self-injury in either of the two subjects upon which it was tried. The differential reinforcement of other behaviors (DRO) procedure of presenting food after specified periods of time in which self-injury did not occur reduced SIB in one of the two subjects with whom it was tried, but did not affect the behavior of the other. The final procedure tried was the use of contingent electric shock. This procedure was used for all four subjects and consisted of the application of a painful electric shock following each episode of self-injury. This punishment procedure rapidly decreased the rate of self-injury to zero or near-zero levels with all four subjects. However, when a follow-up study was done two months after the procedure was discontinued, the effects of the punishment had disappeared.

Although most cases involving the use of contingent shock have found it to be an effective procedure, there have been several reports of unsuccessful attempts to reduce SIB with this treatment (Cautela & Baron, 1973; Jones, Simmons, & Frankel, 1974). In the study published by Jones et al. (1974), an electroshock program failed in suppressing the high rate of multiple self-injurious behaviors in a nine year old severely mentally retarded and autistic child. A shock program had been successfully implemented when the subject had been five years old, therefore, an attempt using the previously effective procedure was made. Though the prior use of shock eliminated a variety of topographies of SIB, these behaviors were accelerated under this program when attempted the second time. Not only did these damaging behaviors increase in both intensity and frequency as a result of the shock program, the subject also resisted eating and finally had to be restrained and fed intravenously. An important consideration is that not all parameters (e.g. intensity or duration of electrical impulses) were explained for cases where shock was not effective in decreasing SIB, therefore making it unclear as to why it was unsuccessful.

Although shock has been reported in the majority of studies as being extremely successful in drastically and rapidly reducing or eliminating self-injury, and a good argument can be made that a small number of painful shocks are "inconsequential compared to the physical damage imposed by persistent self-abuse" (Picker et al., 1979, p. 446), legal and ethical questions arise from its

use. An ethical consideration with the use of electric shock is that shock stimulators cannot be given to all staff members. This is due to the possibility of abuse to the self-injurious individual. Therefore, discrimination of when the self-injury will be punished takes place and might limit generalization of improvement (Bucher & Lovaas, 1968; Tate & Baroff, 1966). Concern also exists regarding the practice of inflicting pain, especially to developmentally delayed individuals and has led many administrators to ban the use of shock (Lucero, Voil, & Scherber, 1968).

Both positive and negative side effects have been documented results from the use of shock and other punishment procedures (Newsom, Favell, & Rincover, in press). An increase in crying, screaming and aggression have been a few of the negative side effects noted with some subjects (Carr, Newsom, & Binkoff, 1976; Lovaas & Simmons, 1969; Foxx & Azrin, 1973). Another reported negative side effect has been response substitution whereby, the reduction or elimination of one response is correlated with an increase in an alternate undesirable behavior (Baroff & Tate, 1968; Duker, 1975; Foxx & Azrin, 1972; Risley, 1968).

Positive consequences resulting from the use of punishment have also been reported in the literature. Generalized suppression of behaviors other than the one targeted for punishment (i.e. crying or whining), or of the targeted behavior across settings or people, have been documented with some subjects (Birnbrauer, 1968; Lovaas & Simmons, 1969; Risley, 1968). In

contrast to decreases in inappropriate behavior, increases in smiling, laughing and positive social interactions have been reported (Baroff & Tate, 1968; Simmons & Lovaas, 1969; Tate & Baroff, 1966).

Controversy exists over the use of punishment, whether it be water spray or electric shock. The success of punishment in rapidly decreasing self-injury in the majority of cases may encourage its use when it is unnecessary. The effectiveness of punishment may consequently produce failure "to consider and attempt alternate treatments and diminish motivation to correct conditions which created the problem" (Newsom et al., in press, pp. 40-41).

Reinforcement procedures. In contrast to presenting aversive stimuli, the presentation of reinforcement following the occurrence or nonoccurrence of specified behaviors has also been documented as successful in decreasing SIB. Differential reinforcement of behaviors which are incompatible with the self-injury (DRI) has been used with positive results (Lovaas et al., 1965; Tarpley & Schroeder, 1979). In the Lovaas et al. (1965) study, appropriate responding to music (i.e., clapping hands, rocking in rhythm and singing) was reinforced, resulting in a reduction of SIB to an almost zero level. Tarpley and Schroeder (1979) also succeeded in reducing SIB in three profoundly mentally retarded individuals by reinforcing incompatible behaviors.

Another reinforcement procedure which has been reported effective in reducing and/or eliminating self-injury is Differential Reinforcement of Other behaviors (DRO). DRO is a behavioral technique which involves the presentation of a positive reinforcer after a pre-determined amount of time during which the individual has not engaged in the targeted behavior, i.e. self-injury (Favell, 1977). This procedure has been successful in a number of cases (Favell et al., 1978; Frankel, Moss, Schofield, & Simmons, 1976; Luiselli, Helfen, Colozzi, Donellon, & Pemberton, 1978; Ragain & Anson, 1976). Interestingly, Favell et al. (1978) used the physical restraints which had been employed to prevent self-injury as the positive reinforcer for three profoundly retarded self-injurers. The restraints were applied contingent upon specified periods of time during which self-injury did not occur and were withheld if SIB did take place. The results with all three subjects were a rapid and complete elimination of SIB.

In the Frankel et al. (1976) study a variety of treatment procedures were tried in an attempt to bring the headbanging behavior of a six year old profoundly retarded child under control. SIB decreased when an extinction procedure was employed, however, the decrease was not to a clinically significant level. When a timeout procedure was employed the rate of SIB was initially decreased but later increased. DRO was the final procedure used and was found to be successful. Headbanging was near zero after the first day of treatment and thereafter steadily decreased to zero.

Another example of the effectiveness of a DRO procedure when attempting to eliminate SIB was reported by Ragain and Anson (1976). Their DRO procedure used food reinforcement during evening meals to treat the behavior of a severely retarded female who engaged in scratching and/or headbanging one hundred percent (100%) of the time. The duration of SIB decreased, however, the behaviors were not totally eliminated.

Although there have been many successful demonstrations of the use of positive reinforcement procedures to decrease and/or eliminate SIB, there have also been some cases reported where it has been ineffective when used alone (Corte et al., 1971; Tate, 1972). Tate (1972) reported no decrease in SIB when a DRO procedure was attempted. Corte et al. (1971) reported a decrease of SIB in only one of the two subjects upon which it was tried. Both Corte et al. (1971) and Tate (1972) had success using alternate behavioral procedures.

There have been some documented problems arising from the use of differential reinforcement procedures. One problem involves the slow and gradual nature of response suppression (Azrin et al., 1975; Weiher & Harmon, 1975). This presents an ethical problem for cases of SIB in which the rate and intensity are high. Another problem which may occur when using a reinforcement procedure centers around the concept of satiation/deprivation. After having been reinforced repeatedly an individual may become satiated and thereby cease responding to the reinforcement given. During that period, self-injury is likely to increase to non-

treatment levels and could be harmful to the individual. However, following a period when the individual is deprived of that reinforcer it usually resumes its reinforcing qualities again (Favell, 1977). Finally, in order to be effective a potent reinforcer must be identified (Favell, 1977). However, sometimes it becomes difficult to find something which has strong reinforcing qualities to individuals who are severely or profoundly mentally retarded.

Combinations of treatment procedures. For cases in which a treatment procedure used alone did not prove effective in dealing with SIB, or where it was not desirable to use one by itself, a variety of behavioral techniques have worked in conjunction to reduce and eliminate SIB.

In the majority of cases where procedures have been combined in an attempt to eliminate SIB, one of the procedures has invariably been a reinforcement procedure (Adams, Klinge, & Keiser, 1973; Duker, 1975; Measel & Alfieri, 1976; Repp & Deitz, 1974). The attempt is usually made to fade out the procedure other than reinforcement and to continue with the use of reinforcement so that success can be maintained.

Duker (1975) used timeout paired with DRI to substantially suppress headbanging in a 15 year old retarded female. In this study, the subject was confined to a small room immediately following a self-injurious response and left there for ten minutes. If she did not stop injuring herself by the end of the

ten minutes she was not allowed to leave the room until the behavior ceased for two consecutive minutes. Initially, there was a substitution of inappropriate behaviors such as vomiting, self-biting, and elbow-hitting. However, these also resulted in timeout and were eliminated. The subject was given attention and the opportunity to manipulate plastic and suede items on an intermittent schedule when on the ward and engaging in activities incompatible with her SIB.

Impressive results were reported by Azrin, Gottlieb, Hughart, Wesolowski, and Rahn (1975) in a study where reinforcement was given for displaying non-injurious behavior. When SIB occurred, they were either sent to their room for a period of required relaxation or were required to perform incompatible postures (positive practice/overcorrection). The mean number of self-injurious episodes was reduced by 90% after the first day of treatment, 96% at the end of the first week, and 99% at the end of three months.

Adams et al. (1973) used a social extinction procedure combined with positive reinforcement for appropriate behaviors. The result was the elimination of SIB.

Mild punishers have also been used with reinforcement techniques in successfully decreasing SIB. These punishers have included physical exercise (Peterson & Peterson, 1968); overcorrection (Measel & Alfieri, 1976); and verbal reprimand (Repp & Deitz, 1974).

Reinforcement methods have also been successful when used in conjunction with the severe aversive stimulus of electric shock (Tate, 1972; Young & Wincze, 1974). In the Tate (1972) experiment, the use of positive reinforcement for not engaging in SIB did not decrease the behavior when it was used alone. However, when the subject was reinforced for not engaging in self-injury and shocked when SIB began, with the electrical impulses being terminated when the SIB ended, the rate and intensity of the behavior almost ceased completely.

Summary

Various hypotheses as to why individuals self-injure as well as a variety of treatment procedures have been examined. The results of research studies have supported in varying degrees the self-stimulation, negative reinforcement, and positive reinforcement theories concerning the motivation of SIB. Investigations concerned with eliminating self-injury have had success using social and sensory extinction, timeout, punishment and positive reinforcement procedures. Combinations of the different procedures have also been reported as being beneficial in the reduction of self-injury. All of the behavioral techniques mentioned above have also had documented failures with some subjects. The reasons for self-injuring differ as do the maintaining variables. Therefore, what may work with one person may not work with another. There is also the problem of variability in procedural parameters (i.e. intensity and duration of treatment components) when carried out by different

investigators. These differences across individuals and procedures are important. They are important factors because not only does a procedure sometimes not work, there are times when it worsens the behavior, thereby putting the individual into danger. A more comprehensive approach recommended in attempting to find an effective treatment is to use combinations of the behavioral procedures as opposed to applying individual techniques (Favell et al., in press). In this way improvement resulting from treatment is more likely to be maintained.

In conclusion, there is not a single type of procedure which has been successful in eliminating SIB in all individuals. Each self-injurious person must be looked at individually and a procedure decided upon after examining possible causes, maintaining factors, and the rate and intensity of the behavior.

Chapter 3

Methodology

The present investigation focused on examining the efficacy of a reinforcement procedure in attempting to treat self-injurious behavior. The study examined not only whether or not self-injury could be significantly and rapidly reduced when a reinforcement procedure was used alone, but also whether appropriate on-task behavior could be significantly increased.

Subject Selection

Thirteen residents of a state residential center for the mentally retarded in North Carolina were screened as possible subjects for this study. Two of the thirteen individuals examined met the selection criteria of: (1) exhibiting a high rate of self-injurious behavior; (2) the self-injury being mild enough to allow for uninterrupted baseline without putting the individual into danger; and (3) the self-injurious responses being easily observable for reliability purposes.

Subjects

The two individuals who participated in this experiment exhibited high rates of mild self-injurious behavior. Both subjects were profoundly mentally retarded males who reside at a state residential MR center. Their level of retardation was

derived from scores on the American Association on Mental Deficiency's Adaptive Behavior Scale (Nihira, Foster, Shellhaas, & Leland, 1974). The scores for the individuals in this study were not obtainable.

Subject One was a 19 year old who had been institutionalized for 7 years at the time of the present study. He had no physical disabilities, was ambulatory, could follow simple instructions, and verbalized a few single words. The behaviors which were recorded for this subject and how they were defined for data collection are listed in Table 1. Subject 1 exhibited a mean of 43% of recorded self-injurious responses per session during the initial baseline sessions and an average of 67% during the reversal sessions. He had up to 46 recorded self-injurious responses in one 15-minute nontreatment session. The motivation for self-injuring for Subject 1 did not appear to be definitive. At times it appeared to be self-stimulatory in nature and at others it seemed to be an escape or avoidance of work tactic.

Subject Two was 18 years old and had resided in a state institution for 10 years when this study was conducted. He was ambulatory, had no physical disabilities, did not demonstrate any functional expressive language; however, he could follow a few simple commands. The behaviors which were recorded for this subject and how they were defined for data collection are listed in Table 2. Subject 2 exhibited a mean of 80% of recorded self-injurious responses per session during the initial baseline sessions and an average of 68% during the reversal sessions. He

Table 1

Response Definitions for Subject One

Self-Injurious

Hand/finger biting: when a part of the hand or finger(s) came into observable direct contact with his mouth.

Head-hitting: when palm or heel of hand came into direct contact with any part of the head as a result of a rapid motion of his hand and/or arm.

On-Task Behavior

On-task behavior: active engagement with task in front of subject, holding something only counted if it was moving as a result of contact with the individual.

Table 2

Response Definitions for Subject Two

Self-Injurious

Hand/finger biting: when a part of his hand or finger(s) went past his lips into his mouth.

Eye poke: any time any part of a finger came into observable direct contact with the front or side of his eye--rubbing his eyes was excluded.

Tongue pulling: any time his hand(s) came into direct contact with his tongue on the outside of his lips.

Tongue bite: when his tongue was seen on the outside of his lips with his teeth biting down into it--it was a separate behavior rather than occurring simultaneously with tongue pulling.

On-Task Behavior

On-task behavior: active engagement with task in front of subject, holding something only counted if it was moving as a result of contact with the individual.

had up to 108 self-injurious responses recorded in one 15-minute non-treatment session. The motivation for self-injuring for Subject 2 appeared to be due to the self-stimulation it provided.

Setting

This investigation was conducted in each subject's school classroom. Experimental sessions were carried out during school hours of 9:15 a.m. to 4:30 p.m., Monday through Friday.

In Subject One's classroom during experimental sessions were the subject, his teacher, a health care technician, an undergraduate student intern, three to four other students, and the author who served as experimenter and primary observer. A graduate student intern served as an independent reliability observer and was present in the classroom during reliability sessions. A variety of school and Center staff came into the room frequently but inconsistently during the experimental sessions.

Subject Two's classroom was located in a residential cottage at the Center. During experimental sessions the subject, his instructor, a health care technician, three other students, and the experimenter were in the classroom. The independent reliability observer was in the room when reliability was being assessed. Other school and Center personnel entered and exited the room inconsistently during the experimental sessions.

Materials and Equipment

Subject One's task was to sort objects which were: washers; screws; small chains; metal light bulb components; plastic computer pieces; golf tees; and small colored plastic squares. A

plastic cafeteria tray with separate components was utilized to sort each object. Subject Two's task entailed putting one-inch high colored plastic pegs into a rubber pegboard. The tasks chosen were those used by the classroom teacher with that individual and could be completed without physical assistance.

Data collection materials consisted of a Norelco, type N.T.-1, 2 x 4 inch tape recorder which used 30 minute mini-cassettes. Two PW-80 Casio pocket watch electronic calculators with an audible timer were used. Also used by the reliability observer during those sessions in which reliability was assessed was a portable FM stereo and cassette recorder with headphones.

A variety of primary reinforcers were used interchangeably for sessions due to the fact that both subjects became satiated quickly when only one type of reinforcer is used. The reinforcers were chosen following a preliminary investigation to find which were preferred. The edibles used in this study were: raisins; M&Ms; Reeces Pieces; and chocolate chip flavored cereal.

Data Collection

The occurrence and non-occurrence of each subject's various topographies of self-injury as well as appropriate engagement with task were recorded during all experimental sessions using a 15 second time-sample method. For the first 3 seconds of each 15 second interval, the occurrence of each type of self-injury or on-task behavior was recorded if it took place during that 3 second period of time. The experimenter served as data collector and recorded data by speaking into a small tape recording device

placed on the table with an audible timer indicating each 15 second interval. Each session was later transcribed onto data sheets (see Table 3).

Reliability

Reliability on the intervals in which each behavior was recorded was measured during random reliability sessions throughout the experiment for both subjects. A total of seven reliability sessions were taken with Subject One and eight with Subject Two. Reliability was taken by the independent reliability observer while she wore stereo headphones with music playing so as not to hear the experimenter talking into a tape recorder to record data. The reliability observer also had an audible timer which was synchronized with the one used by the experimenter. Data was recorded directly onto a data sheet (see Table 4).

The method of assessing interobserver reliability was that of percent agreement (Kelly, 1977; Yelton, Wildman, & Erickson, 1977). Percent of agreement was calculated using the following formula:

$$\frac{\# \text{ of Agreements}}{\# \text{ of Agreements} + \text{Disagreements}} \times 100 = \text{Percent of Agreements}$$

An agreement for occurrences was derived from comparison of the total sum of intervals with the designated behavior (e.g. self-injury or on-task) recorded by each observer. The difference between the two sums was recorded as the number of disagreements. The average percent of agreements calculated for the occurrence of intervals with self-injury was 97% with Subject One and 96% with

Table 3

Example of Data Sheet Used by Data Collector

Subject's Name: _____ Date: _____ Time: _____
 Setting: _____ Session #: _____ Sheet #: _____

Head Hit (HH)		Hand/ Finger Bite (HB)		Tongue Bite (TB)		Tongue Pull (TP)		Eye- Poke (EP)		Engagement (E) (E*)		
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*
+	-	+	-	+	-	+	-	+	-	+	-	*

TOTALS

HB= _____ TB= _____ TP= _____ EP= _____ HH= _____
 E= _____ E*= _____ SIB= _____

RELIABILITY

HB _____ HH _____ EP _____ TB _____ TP _____ E _____ E* _____ SIB _____

Table 4

Example of Data Sheet Used by Independent Reliability Observer

Subject's Name: _____ Setting: _____
 Date: _____ Time: _____ Session #: _____

HB = Hand Biting EP = Eye-poking TP = Tongue Pulling
 HH = Head Hitting TB = Tongue Biting E* = Cued Engagement
 E = Engagement (not cued or prompted)

1.	15.	29.	43.
2.	16.	30.	44.
3.	17.	31.	45.
4.	18.	32.	46.
5.	19.	33.	47.
6.	20.	34.	48.
7.	21.	35.	49.
8.	22.	36.	50.
9.	23.	37.	51.
10.	24.	38.	52.
11.	25.	39.	53.
12.	26.	40.	54.
13.	27.	41.	55.
14.	28.	42.	56.

TOTALS

HB = _____ EP = _____ TP = _____ E* = _____
 HH = _____ TB = _____ E = _____ SIB = _____

Subject Two. All percentages of agreements were 92% or better. The average percent of agreements calculated for the occurrence of intervals with on-task behavior was 97% for Subject One and 98% for Subject Two.

Procedure and Design

Each experimental session was 15 minutes in duration with between one and four sessions carried out per day for each subject.

A single subject withdrawal research design was used in this investigation for both subjects who participated (Hersen & Barlow, 1976). There were five back to baseline (A^2) probe sessions within the treatment conditions for Subject Two due to his extreme fluctuation in rates of behaviors. This was done in order to demonstrate experimental control by analyzing the effects of experimental controls and the consequences of their removal (Hersen & Barlow, 1976).

Criteria for changing conditions were based upon the stability and direction of change of the recorded behaviors during each phase of the study.

Baseline A¹: Non-treatment. Eight initial baseline, i.e. nontreatment, sessions were carried out for each subject prior to implementing any treatment. These observations were scheduled randomly across a 10-day period. In each observation the subject was observed in his daily routine within the school classroom. The experimenter observed and recorded behaviors from across the room. No systematic reinforcement or other procedures

were in effect during these sessions, neither were materials always available.

Treatment B: Prompting and social reinforcement, VI:15 seconds. The first treatment procedure was implemented following the initial baseline. During this condition, the experimenter sat beside the subject who was sitting at a table with his designated task in front of him and an initial cue was stated. Verbal cues of "(name) get to work," was used with Subject One and "(name) get to work," or "put a peg in" were used interchangeably with Subject Two during this treatment. Verbal cues for both individuals were given in conjunction with a prompt of tapping the tray with the materials in it. Cues were given when needed but no more than one cue per 15 second interval was given. Social reinforcement was provided on a variable interval 15-seconds schedule (VI:15) for engagement with task, i.e. the first on-task response following each 15 second interval was reinforced. Reinforcement was never given immediately following a self-injurious response. The range of intervals in which reinforcement was given was from one to three intervals. The average reinforcement was once every interval. Social reinforcers consisted of descriptive praise and smiling combined with squeezing gently or patting arm or shoulder, or rubbing head.

Baseline A²: Non-treatment. During these sessions, the proximity of the experimenter remained the same as in the treatment condition, and the task remained in front of the

subject. An initial cue to start working was given at the beginning of the session; thereafter no more interaction was provided.

Treatment C¹: Prompting and social + primary reinforcement, VI:15 seconds. In this treatment condition everything remained the same as in treatment condition B except that social reinforcement was paired with an edible.

Treatment C²: Prompting and social + primary reinforcement, VI:30 seconds. This treatment was similar to treatment C¹ except that the schedule of reinforcement was extended from 15 seconds to 30 second intervals.

Treatment C³: Prompting and social + primary reinforcement, VI:45 seconds. The only difference in this treatment from the procedures in C² was that the schedule of reinforcement was extended another 15 seconds to a 45 second interval.

Chapter 4

Results

Five research questions were investigated in the present investigation: (1) can self-injurious behavior be significantly reduced when a reinforcement procedure is used alone; (2) if self-injury is reduced, will the rate be clinically significant; (3) if self-injury is decreased, will the reduction be rapid enough to be clinically significant; (4) will the use of a reinforcement procedure not only decelerate the inappropriate aberrant behavior, but also increase appropriate on-task behavior, and finally; (5) if this procedure does increase on-task behavior, will the increase be enough to be clinically significant?

The results for Subject One are presented in Figure 1 and the results for Subject Two in Figure 2. The percentage of intervals with self-injury and appropriate on-task behavior for each session are plotted on the ordinate. The consecutive sessions are plotted along the abscissa.

During the initial baseline condition (Sessions 1 to 8), Subject One had a variable range of intervals with self-injury per session (4-70%). Intervals with appropriate on-task behavioral

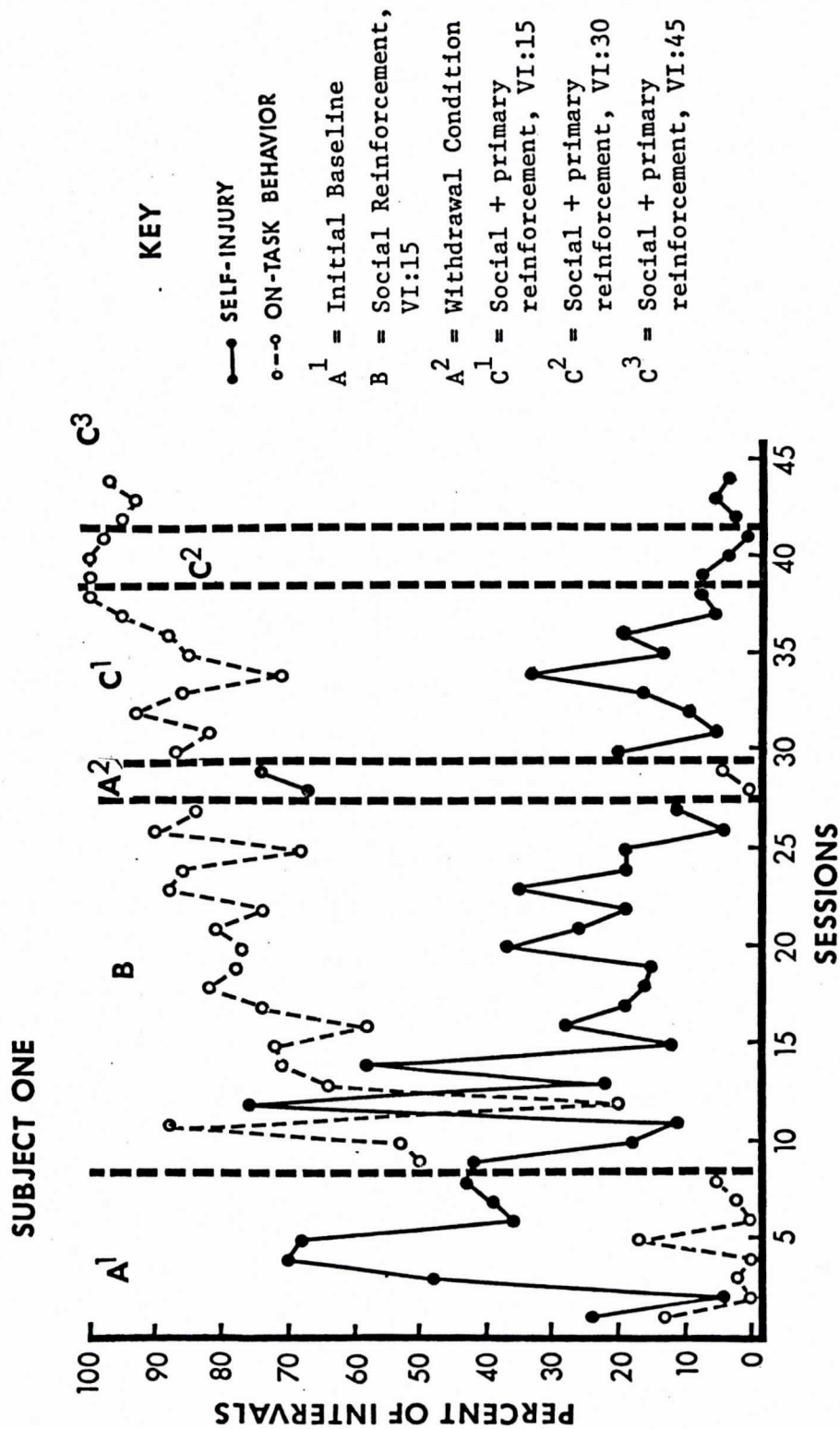


Figure 1. Percent of Time-Sample Intervals in Which Self-Injurious and Appropriate On-Task Behaviors Occurred for Subject One per Session During Each Phase of the Investigation.

SUBJECT TWO

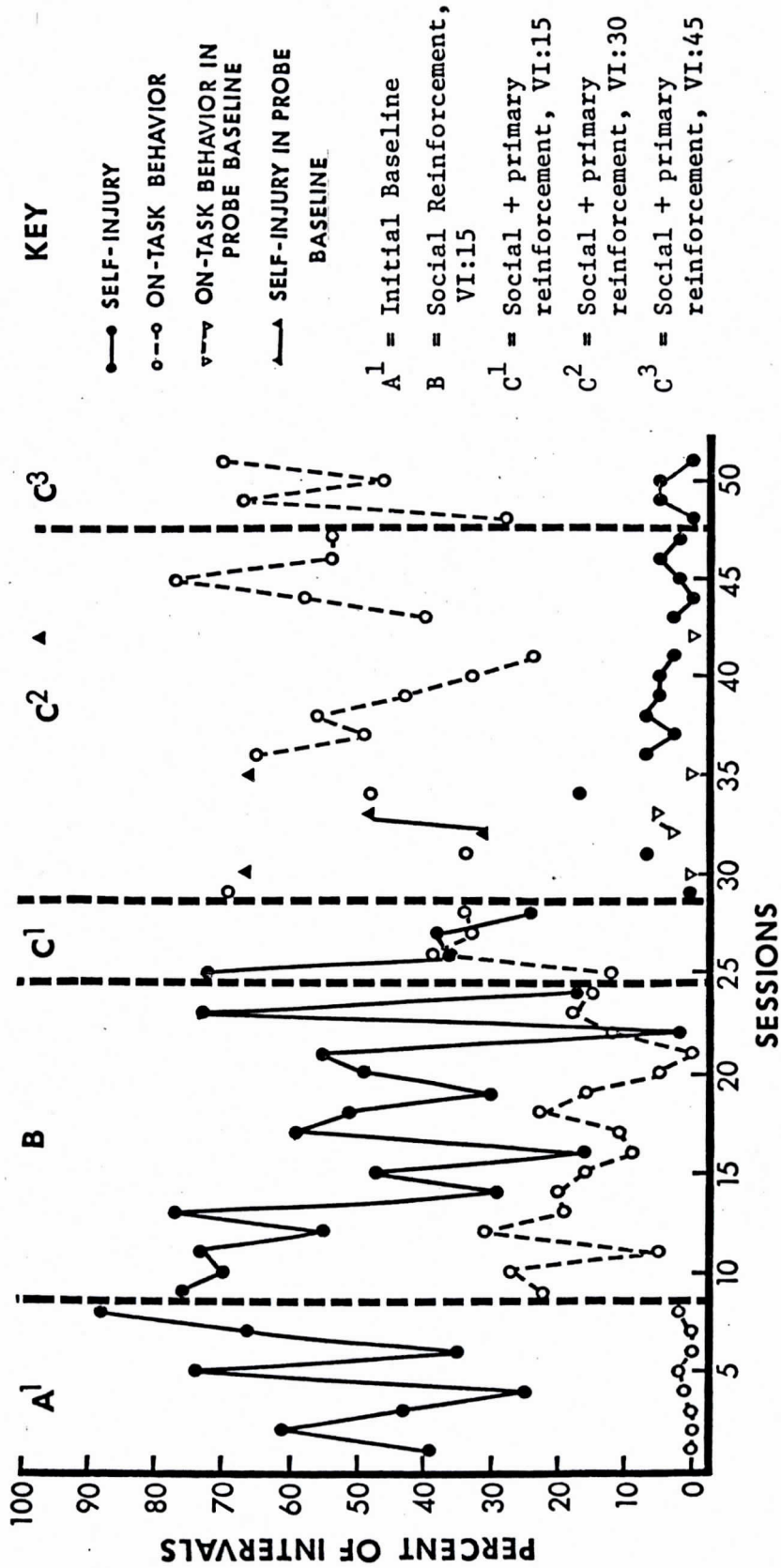


Figure 2. Percent of Time-Sample Intervals in Which Self-Injurious and Appropriate On-Task Behaviors Occurred for Subject Two per Session During Each Phase of the Investigation.

responses were low, the range being 0-13%. The mean percentage of intervals with self-injury per session during the first non-treatment condition was 42% compared to the mean of 5% for intervals with engagement with task. Subject Two had a high but variable percentage of intervals with self-injury (25-88%). In contrast, the percentage of intervals with on-task behavior per session was very low and stable (0-2%). The mean percentage of intervals with SIB during this condition was 54% compared to the mean of 1% of intervals with on-task behavior.

Subject One demonstrated a wide range (4-76%) of intervals with SIB during the treatment condition of prompting and social reinforcement (Session 9-27) with the mean being 25%. He exhibited a range of 20-90% of intervals with on-task behavior with a mean of 72%. The difference between this treatment and non-treatment was 17% less in the mean of SIB and 67% greater for the mean of on-task behavior. The percentage of intervals with SIB remained widely varied (2-76%) during this treatment condition (Sessions 9-24) for SIB for Subject Two. In contrast to the percentage of intervals with on-task behavior in the initial baseline, the range of percentages were 0-31 with a mean of 16%. An increase of 15% in the percentage of intervals with engagement was observed. The decrease of intervals with SIB was 5%.

During sessions 30-38, in which social reinforcement was paired with primary reinforcement on a variable interval schedule of 15 seconds, the percentage of intervals with SIB remained low for Subject One. The mean percentage of sessions with SIB was 14%

which was 28% lower than during the initial non-treatment condition. The mean percentage of intervals with on-task behavior was 87% compared to the initial baseline figure of 5%. Subject Two demonstrated a large change in the percentage of intervals with both SIB and engagement with task. His mean percentage of intervals with SIB decreased from 54% in the initial non-treatment phase to 35% in this social plus primary reinforcement condition. In contrast to the decline of SIB there was an incline in the percentage of intervals with on-task behavior. An increase of 28% was demonstrated from the initial calculation of 1% during the baseline condition.

Percentage of intervals with both the inappropriate and appropriate behaviors remained stable during the treatment condition of social + primary reinforcement, VI:30 seconds (sessions 30-39) for Subject One. The percentage of intervals with SIB remained low with a mean of 3% while the percentage of intervals with on-task behavior remained high with a mean of 99%. This treatment procedure lasted from sessions 29 to 41 excluding the probe baseline sessions of 30, 32, 33, 35, and 37 for Subject Two. The percentage of intervals with SIB remained stable throughout this procedure with a mean of 5%. However, the interval percentages with on-task behavior were highly variable (24-70) but with an improved mean of 54%.

During the treatment consisting of social + primary reinforcement, VI:45, the percentage of intervals with SIB and engagement with task remained stable during this treatment

condition (sessions 42-44) for Subject One. The mean of 3% was as low as that of the last treatment condition. The percentage of intervals with on-task behavior remained high with a mean of 93%. Subject Two's SIB remained stable while on-task behavior remained variable during this treatment condition (sessions 48-51). The mean percentage of intervals with SIB decreased from 5% during the preceding treatment condition to a low of 3%. The intervals with on-task behavior remained near 50% with a mean of 52%.

A back to baseline or reversal condition was used for both subjects, however it was used differently for each. The back to baseline condition was carried out for Subject One in between the two treatment conditions of B and C¹ (sessions 28 and 29). The mean percentage of intervals with SIB increased from 14% to a mean of 72% during the non-treatment phase. On the other hand, the mean of intervals with on-task behavior decelerated from 87% during the treatment condition to the non-treatment mean of 2%. This reversal condition was implemented as separate probe sessions within the treatment phase for Subject Two. A sharp contrast between treatment and non-treatment percentages were noted. An increase from 35% to 62% was measured for percentage of intervals with SIB. A reduction from 29% during treatment to 2% during non-treatment occurred for the mean intervals with on-task behavior.

Summary

Results indicate that during non-treatment conditions, a high percentage of SIB and a low percentage of appropriate on-task

behavior occurred. Treatment, consisting of social reinforcement and social paired with primary reinforcement decreased the percentage of SIB rapidly and substantially and increased the percentage of on-task behavior to high levels. Brief returns to non-treatment conditions produced complete reversals in both SIB and on-task behavior demonstrating the functional relationship between treatment and behavioral improvements.

Chapter 5

Discussion

In this research, the self-injurious and appropriate on-task behavioral responses of two profoundly mentally retarded individuals were investigated using an applied behavioral analysis research design. A design which utilized a withdrawal of treatment condition was employed. The self-injury of both subjects were substantially reduced when they were provided with reinforcement for engagement with task. Not only did the reinforcement procedure when used alone decrease self-injury, but it also significantly increased the on-task behavior of both individuals. These changes were both substantial and rapid. Thus, a benign procedure, which was neither restrictive nor intrusive, proved successful in decreasing self-injury while increasing a more appropriate behavior both rapidly and effectively.

Setting

This investigation was implemented in the natural setting as opposed to a clinical laboratory setting. There were both advantages and disadvantages to conducting the study in the classroom. One drawback related to the fact that there were

many uncontrollable extraneous variables in the classroom which could have been minimized, if not completely eliminated, in a laboratory setting. School and Center staff entered and exited the room inconsistently; the noise level varied from very quiet to extremely loud; what the other students and instructors were doing varied; and what the subject had been doing prior to the experimental session was not consistent. On the other hand, there was an advantage to having uncontrolled factors. The advantage centers around the concern of practicality and generalization of results. All of the variables mentioned above exist daily within each subject's classroom. Therefore, if they were all eliminated and the procedure implemented was successful, it would not be known if that same procedure would be as effective when the individual was returned to his natural situation in which all of those variables would be present. The fact that the variables remained extremely inconsistent throughout the sessions, while the behaviors stabilized suggests that it was the treatment implemented, not those variables, which affected the behaviors of the subjects to a significant degree.

Procedures

There were several procedural differences in the nontreatment sessions. In the initial nontreatment phase the experimenter (observer) positioned herself across the room; whereas in subsequent returns to baseline, the proximity of the experimenter stayed the same as it was for the experimental conditions of the study. Further, in some of the initial baseline sessions the

subjects did not have any opportunity to engage in a task, while in other sessions the subject was engaged in a reinforcing activity. As a consequence of engaging in a reinforcing activity the self-injury remained low (example: Subject One, Session #2). Due to these facts, the reversal condition (A^2) is a more accurate demonstration of non-treatment data since the proximity of the experimenter and availability of task remained the same as during the various treatment conditions.

The use of short return to baseline sessions was justified in the present case since even mild intensities of SIB may have serious cumulative effects. This was a particular risk with the present individuals, given their extremely high rate of self-injurious responses when no treatment was in effect. Since the change in behaviors was so immediate and significant when the treatment was withdrawn and then initiated again, this ethical consideration did not seriously affect the demonstration of experimental control.

The procedures used in this study were decided upon after determining what would be applicable in the classroom when there were other students who also needed attention. The final phase of the research for both subjects was the social paired with primary reinforcement on a variable interval schedule of 45 seconds. However, the end of the experiment represented in this paper is not the end of the intervention. This program will be carried out further by continuously fading the schedule of reinforcement and the cues given. After this is done to a practical level

applicable within a classroom setting, the classroom teacher will gradually be phased into the procedure while the experimenter is faded out. Once this has occurred, a variety of individuals will be introduced to enhance generalization across people. This generalization process will also take place across tasks and materials and then settings, e.g. in the cottage environment.

Results

Five research questions were investigated in the present study. Each will be answered according to the results of the investigation and implications discussed.

SIB significantly reduced. The first question asked in this study was whether SIB could be significantly reduced when a reinforcement procedure is used alone. The results of this experiment demonstrate a 39% decrease in the mean percentage of intervals with self-injury from pre-treatment to the final phase of treatment for Subject One. A 69% reduction was exhibited from the reversal nontreatment condition to the final treatment phase. For Subject Two a 51% decrease in the mean of intervals with SIB occurred between initial baseline and the final treatment. A 59% reduction was noted in the average intervals with self-injury per session from the reversal nontreatment condition to the final phase of this study. Therefore, it was found that a reinforcement procedure used alone could significantly reduce SIB in the two individuals upon which it was tried.

SIB rate clinically significant. Another question asked prior to the implementation of treatment was if SIB is reduced, will the rate be clinically significant? The final mean of two recorded self-injurious responses per session for both subjects are clinically low rates of behavior. A dramatic decrease in self-injury was demonstrated in both individuals.

Reduction of SIB rapid. If self-injury was decreased was the reduction rapid enough to be clinically significant? The reduction of SIB displayed by Subject One took place immediately following the initiation of the reinforcement procedure. On the other hand, Subject Two did not significantly respond to the treatment which involved social reinforcement when it was used alone. However, immediately following the onset of the social paired with primary reinforcement procedure, SIB decreased.

Increase in on-task behavior. The fourth research question at issue in this investigation was whether the use of a reinforcement procedure would not only decelerate the inappropriate aberrant behavior but also increase appropriate on-task behavior. The results indicated that the on-task behavior was immediately increased in both subjects. The initial baseline means of intervals with recorded on-task behavior was 5% per session with Subject One and 1% per session with Subject Two. The mean percentage increased to 99% for Subject One and 54% for Subject Two during treatment. During the reversal sessions, the intervals with the appropriate behavior decreased to pre-treatment

levels. When treatment was reinstated it immediately increased to treatment levels.

Significant increase in on-task behavior. The final research question examined in this investigation was that if this procedure proved successful in developing higher levels of on-task behavior would the increase be clinically significant? A 94% increase was demonstrated in the mean percentage of intervals with on-task behavior per session for Subject One. A 53% increase for Subject Two was noted for percentage of intervals in which the appropriate behavior was recorded. Subject One consistently displayed appropriate on-task behavior for nearly 100% of the time for each session. Subject Two's on-task behavior remained variable during treatment conditions. Although variable, on-task behavior remained at a substantially higher level during treatment as opposed to non-treatment sessions.

Possible explanation. A plausible explanation exists as to why the present reinforcement procedure proved to be significantly and rapidly effective when most studies in the past have not had similar success when treating SIB solely with a reinforcement procedure (Azrin et al., 1975; Weiher & Harmon, 1975). The reinforcement in this study (e.g. social and primary) was given on an extremely dense schedule. In most of the previous studies which utilized a reinforcement procedure, a delay in reinforcement was implemented following each episode of SIB (Corte et al., 1971;

Ragain & Anson, 1976). For example, every time the subject engages in self-injury the timer is reset, thereby thinning out the actual schedule of reinforcement considerably. Since there was no delay employed with this procedure, the density of reinforcement was much greater than in previous studies.

The apparent motivations for self-injuring by the two individuals who participated in this study may also relate to implications as to why this procedure was successful. If Subject One self-injured in an attempt to escape or avoid working, then it is possible that the density of reinforcement made engagement with the task less aversive. If the major reason Subject Two self-injured was for self-stimulation, the possibility exists that the reinforcement procedure shaped a functional alternative to SIB.

Difference from types of reinforcers. It has been determined from the results that the use of a reinforcement procedure proved to be highly effective in decreasing self-injury and increasing on-task behavior. On-task behavior was increased significantly and rapidly in the two subjects with whom it was used. What has not been presented is the difference in the effects of the various reinforcers. The treatment phase in which social reinforcement alone was used was effective with Subject One in reducing the mean percentage of intervals with self-injury per session by 17% from the initial baseline condition and was 47% lower than the mean during the reversal phase. It also proved effective in increasing the mean percent of intervals with on-task

behavior per session by 67% from the initial baseline and was 70% more than during the reversal condition.

Although proven to be significantly effective with Subject One, the social reinforcement alone condition did not substantially change the self-injurious responses of Subject Two. Though SIB was not as variable during the second condition as during initial non-treatment for Subject One, SIB remained as widely varied for Subject Two as it had in the previous condition. The difference in the mean percentage of intervals with self-injurious behavior was 6% less than during the initial baseline. The mean percentage of intervals with engagement with task increased from 1% to 15%.

Although social reinforcement used alone only changed the mean percentage of intervals with the recorded behavioral responses minimally for Subject Two, the implementation of social paired with primary reinforcement VI:30 for on-task behavior immediately reduced SIB and increased on-task behavior. This procedure was first attempted using a VI:15 but it was found that the subject became satiated quickly with that high density of a reinforcement schedule. As a result, it was decided to lower the schedule prior to establishing a stable rate of behaviors. The use of social paired with primary reinforcement assisted in stabilizing both the inappropriate and appropriate behaviors at their respective levels.

The increase of on-task behavior during the social paired with primary reinforcement conditions are not as clear with

Subject Two as with Subject One. Engagement with task became stabilized with Subject One near the 100% mark. However, the on-task behavior remained variable with Subject Two throughout all of the social + primary reinforcement conditions. The probe withdrawal sessions were inserted to assist in demonstrating experimental control (see Figure 3) over his behaviors even though variability in on-task behavior existed. The probe non-treatment sessions were recorded in the 15 minutes directly preceding or following a treatment session in order to demonstrate the immediate consequences of removal or initiation of treatment. In all of the probe reversal sessions there was an immediate return to pre-treatment behavior levels. Each time treatment was reinstated, the data revealed an immediate positive change in both of the recorded behavioral responses.

Summary of results. In contrast to the predominant use of punishment to effectively deal with self-injury, this benign procedure proved successful without the use of intrusive or restrictive components. The documented problem of taking too great a time to be effective (Azrin et al., 1975; Weiher & Harmon, 1975) was not found in this study. The reinforcement procedures were found to be effective immediately and to have established strong stimulus control over both of the recorded behaviors.

Although generalization was not demonstrated during times in which there was no treatment, this was not surprising due to the high schedule of reinforcement. It is probable that toward the

SUBJECT TWO

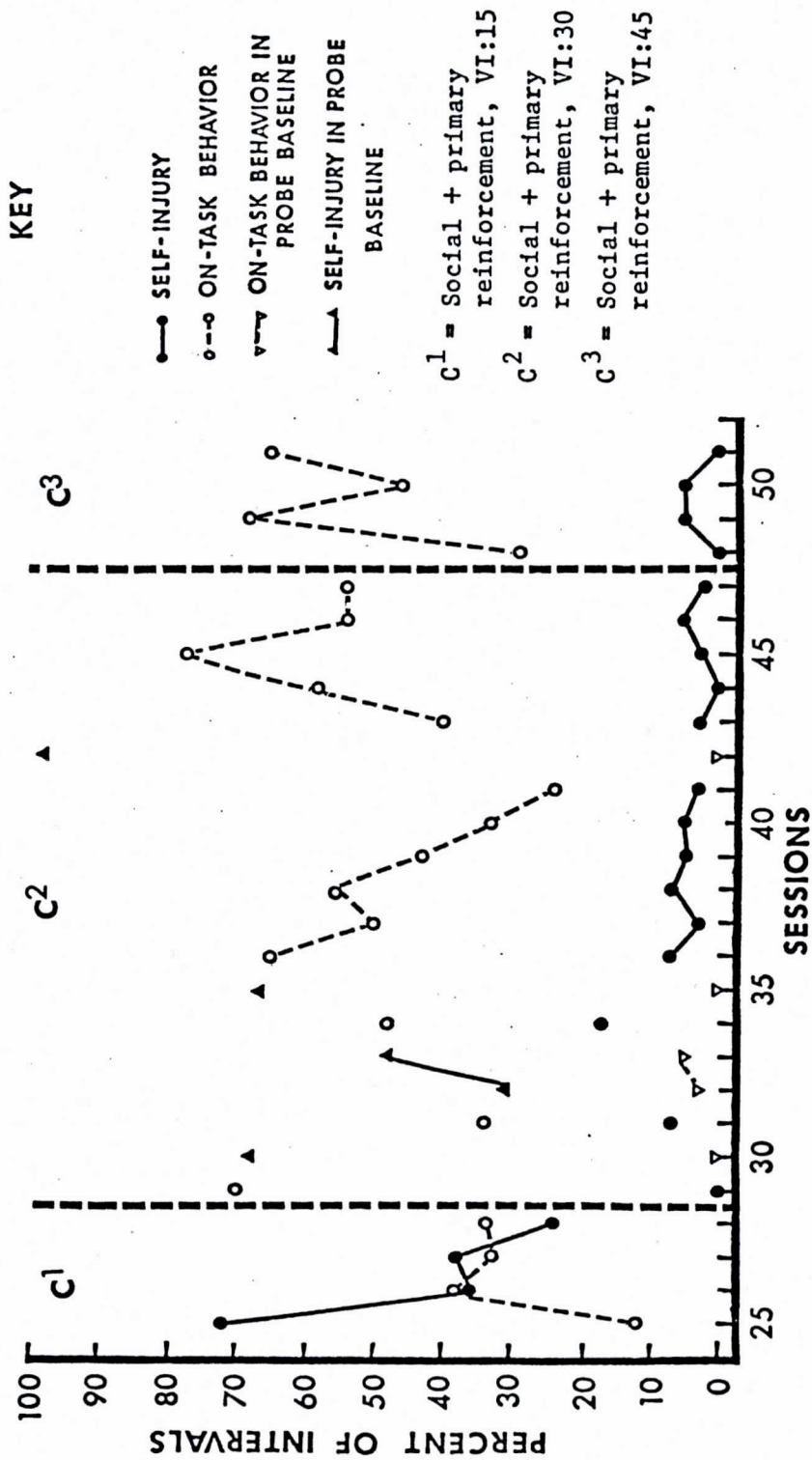


Figure 3. Enlargement of a Portion of Figure 2 Illustrating the Treatment Condition of Social Paired with Primary Reinforcement, VI:30 With Probe Withdrawal Sessions.

conclusion of this investigation, after the reinforcement schedule has been lowered considerably, generalization will take place.

The findings of this study lend support to previously documented results indicating that when one behavioral response is changed through direct manipulation, another non-manipulated behavior is also affected (Baumeister & Rollings, 1976). This took place in this experiment with on-task behavior manipulated. There was no consequence employed for self-injury, however, it decreased substantially as engagement with task increased. Thus, appropriate engagement and SIB were shown to be functionally incompatible. The implications of this are discussed later in this chapter.

A possible explanation for the decrease in self-injury without direct manipulation may be due to a covariance relationship with on-task behavior (Baumeister & Rollings, 1976). During all baseline sessions the self-injury remained high for both subjects in contrast to the minimal level of engagement with task. However, a relationship was demonstrated between the increase in on-task behavior and decrease in self-injury. Even with Subject Two whose engagement with task remained variable, it continued to be at a much higher level than what was previously recorded. This relationship with both subjects may have been due to the possibility of physical incompatibility between some of the self-injurious responses and the responses required to engage with task.

Implications for Further Research

Lovaas (1982) has suggested that when attempting to decrease an undesirable behavior, another program should be put into effect to increase a desirable behavior to take the place of the inappropriate behavior. In the current study, the correlation between the aberrant and appropriate behaviors was observed only when the appropriate behavior was directly manipulated through positive behavioral techniques. Further research is needed to examine the effect of the reinforcement activities which require different types of motoric functions and their subsequent relationships with various self-injurious responses. This needs to be done to determine if a direct relationship exists between the type of activity which needs to be reinforced to decrease certain types of topographies of SIB.

Another area for further research concerns the practicality of treatment procedures. Too often the experimenter isolates the subject and has success, but, when the subject returns to the natural environment, the behavior is not maintained. This has been true even with the highly effective use of punishment (Bucher & Lovaas, 1968; Corte, Wolfe, & Locke, 1971). If the procedure involves techniques which are not easily carried out after the study is completed, then it is neither practical nor ethical when dealing with behaviors that are harmful to the individual. Therefore, when doing research as important as decreasing the debilitating behavior of self-injury, one should keep in mind the final goal and the procedures need to be viable ones.

Following an examination of daily anecdotal reports during research sessions, some differences in what was going on in the classroom were found to affect the subjects' behavior. Although these extraneous variables produced some change in behavior, they were not found to do so to a degree that stimulus control over self-injury was lost. However, in some instances variables appeared to alter control over on-task behavior. Interestingly, music playing during experimental sessions affected engagement with task of each subject differently. Apparently due to its reinforcing qualities, music served as a major distractor for Subject One. Consequently, when it played in the classroom, on-task behavior was reduced. On the other hand, music appeared to have a calming effect on Subject Two which resulted in an increase in his on-task behavior. Levels of noise affected both individuals behaviors similarly, with the higher the noise level the greater the distraction. Further research to systematically examine the numerous variables which exist in the environment and their effects on engagement with work may be helpful to instructors of the severely/profoundly handicapped.

Anecdotal reports, as well as the recording of aggressive acts during experimental sessions, document some related behaviors which affected results during some experimental sessions. A correlation between masturbation and aggression was found with Subject One. The experimenter remained in close proximity in order to prevent masturbation. Consequently, in reaction to not being allowed to masturbate, aggression against the experimenter

occurred. The aggression was not severe and was ignored when it took place. Aggression was also a behavior exhibited by Subject Two but for a different reason and at a greater intensity than had been displayed by Subject One. Subject Two became extremely aggressive during some of the reversal sessions in which no reinforcement of any kind was given. He started out rubbing the experimenter's hand and leg but after no response was awarded he became progressively more aggressive. Aggression was ignored during these instances. These differences in behaviors illustrate a possible area for further research. Individual differences exist between these two subjects, as do characteristics across all individuals. In depth subject descriptions other than level of retardation are rarely given when research studies are documented. Perhaps other behaviors exhibited by individuals who engage in self-injury should also be given attention in order to further differentiate the concept of self-injurious behavior. Significant characteristics of individuals differ and perhaps research which quantifies these differences will be helpful in the future treatment of self-injurious behavior.

Implications of Study for the Practitioner

This investigation has some implications for teachers who deal with self-injurious individuals. To begin with, the procedures employed were designed to be applicable within a classroom setting. Even with the dense schedule of reinforcement at the beginning, it is still possible to carry out the procedure within a small group setting. This can be accomplished by giving

reinforcement to the self-injurious individual in between reinforcement of each of the other students within the group. Although a variety of apparatuses were utilized, these are not necessary in order to implement the procedure described. They were used for the purpose of carrying out the research project, however are not needed or are easily modifiable for the classroom teacher.

An important implication of the success of this study centers around a possible reason for the effectiveness of the procedure employed. A plausible explanation for the significant effectiveness of the reinforcement procedure utilized may be the underlying structure inherent in the procedure. Prior to this investigation, there was not any type of structure within the subjects' classrooms. The immediate positive responses to treatment by both subjects is believed to be partially due to the structure imposed upon them.

A final consideration for the classroom teacher is the importance of graphing, especially when dealing with aberrant behaviors. The experimenter interacting with these students on a daily basis came out of experimental sessions feeling like there had not been any positive change in behaviors. However, once graphed, a significant change was demonstrated. This is of vital importance for appropriate programming to take place. It also helps the morale of teachers, especially those who work with individuals in which a large change in behaviors is generally an extremely slow process.

Limitations of Study

A major limitation of this study is that the research was done with only two subjects; therefore, it is not known if the results obtained are relevant to other cases of self-injury (Hersen & Barlow, 1976). Setting, material, and therapist generality will be attempted to be accomplished of in the extension of this project. However, whether this procedure would be equally effective if applied to individuals portraying similar behavioral disorders cannot be inferred. The only way in which generality across subjects could be established would be through direct and systematic replication of the procedure implemented (Hersen & Barlow, 1976).

Summary

In summary, the current investigation examined the efficacy of a reinforcement procedure in decreasing the self-injurious behavior of two profoundly mentally retarded individuals. The purpose of the study was to establish whether a benign procedure, which was neither intrusive nor restrictive, could significantly decrease self-injury and increase on-task behavior.

Using a withdrawal research design, the on-task behavior of both subjects was directly manipulated. Occurrence of self-injurious responses and on-task behavioral responses were recorded using a time-sample method. Results indicated a substantial decrease in self-injury while also indicating a significant improvement in on-task behavior. These results were documented for both subjects involved in the study. An important fact was

that not only were both behaviors significantly and positively affected, but they were changed immediately; contradicting findings that reinforcement techniques take a great amount of time before having a positive effect. A withdrawal of treatment condition indicated that strong experimental control was in affect over both self-injury and on-task behavior.

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VITA

Stacey Ann Cacace was born in Beaufort, South Carolina on May 21, 1959. Stacey attended many different schools overseas and in the United States. She attended high school for three years in Naples, Italy prior to attending and graduating from Lejeune High School, located at Camp Lejeune, North Carolina in May, 1977. The following year she entered the University of Massachusetts in Amherst, Massachusetts. In September, 1978, Stacey transferred to Appalachian State University located in Boone, North Carolina where in December, 1981 she graduated Magna Cum Laude with a Bachelor of Science degree in Special Education and was elected into Who's Who Among Students in American Colleges and Universities for 1981. The semester subsequent to graduating Stacey started an experimental classroom for moderately mentally retarded adolescents with severe behavior disorders in Norfolk, Virginia.

In August, 1981 Stacey re-entered Appalachian State University to work toward her Masters degree. In May, 1982 she earned her Masters of Arts degree in Special Education with concentrated study in the area of the severely and profoundly handicapped.

Ms. Cacace has accepted employment for the 1982-83 school year. She will be the lead teacher in a classroom for autistic and severe communication handicapped children in Belmont, North Carolina.