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Comparison of Consequence Locus in Decreasing a Self-Injurious Behavior in a Person with Mental Retardation

Dennis Reiland

COMPARISON OF CONSEQUENCE LOCUS IN DECREASING A SELF-INJURIOUS BEHAVIOR IN A PERSON WITH MENTAL RETARDATION

by

Dennis C. Reiland

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Dennis Nunes
Chairperson

Marilyn A. Jensen

Wayne M. Booth
Dean
School of Graduate and Continuing Studies

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This experiment compares pre-response consequation of a self-injurious behavior to post-response consequation using a 10-sec arm lift consequence. The research compared the two consequence times in an alternating treatments design using a person with profound mental retardation. The dependent variable was the time between self-injurious responses. Although head hitting interresponse times decreased during the sessions, pre-response consequation was more effective than post-response consequation. Pre-response punishment prevented injury from occurring thus adding to its social validity. Additional research is needed to determine the characteristics of pre-response consequation.

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Dennis L. Nunes Chairperson

TABLE OF CONTENTS

Chapter 1

INTRODUCTION

Prevalence and Definition of the Problem

Self-injurious behavior (SIB) is an intransigent problem in institutionalized persons with severe and profound mental retardation. Prevalence estimates of self-injury for all institutionalized persons with retardation, range from 5% to 23%, with the greatest prevalence occurring in persons with severe and profound retardation (Schroeder, Schroeder, Smith, & Dalldorf, 1978; Singh, Beale, & Dawson, 1981).

Although there is overlap in the many definitions of SIBs, there is no one accepted definition for a SIB response class (Wieseler, Hanson, Chamberlain, & Thompson, 1985). A suggested categorization of SIB has been self-striking, biting body parts, pinching, scratching, poking or pulling body parts, repeated vomiting or rumination, and consuming nonedible substances (Favell, Azrin, Baumeister, Carr, Dorsey, Forehand, Foxx, Lovaas, Rincover, Risley, Romanczyk, Russo, Schroeder, & Solnick, 1982). SIBs have been defined as any self-inflicted repetitive action which leads to lacerations, bruising, or abrasions of the client's own body (Singh, Beale, & Dawson, 1981). Self-inflicted injuries have produced blindness, hearing loss, callouses, hematomas, nodules, and

infections (Dorsey, Iwata, Reid, & Davis, 1982; Horner & Barton, 1980; Merbaum, 1973).

Secondary effects have also occurred as a result of SIBs, treatment of SIBs, or the lack of treatment. These have included restricted opportunities for new learning, atrophy of limbs, demineralization of bones, shortening of tendons, arrested motor development, and staff burnout (Hamad, Isley, & Lowry, 1983; Horner & Barton, 1980; Lovaas & Simmons, 1969; Rojahn, Schroeder, & Mulick, 1980).

The most prevalent treatment for SIBs has been the use of intrusive procedures. Intrusive procedures have included, faradic skin shock, mechanical restraint, aromatic ammonia, water mist, lemon juice, and tabasco sauce (Favell et al., 1982; Horner & Barton, 1980). The use of intrusive procedures for the suppression of self-injurious behavior presents a dual problem. The behavior change treatment may be as unpleasant as the self-injurious behavior.

In addition, intrusive procedures have increasingly come under scrutiny from advocacy groups and others concerned with client treatment. Intrusive procedures have also come under legal prohibition and judicial review (Parry, 1986). The need for effective nonintrusive procedures is clear.

Some intrusive SIB treatments have been associated with side effects (Favell, Azrin, Baumeister, Carr, Dorsey, Forehand, Foxx, Lovaas, Rincover, Risley, Romanczyk, Russo, Schroeder, & Solnick, 1982; Horner & Barton, 1980). These have included increased SIB, counter aggressions, escape, avoidance (social withdrawal), muscle

tensing, increased blood pressure, conditioned emotional responses and tissue damage (Harris & Ersner-Hershfield, 1978; Mayhew & Harris, 1979; Rapoff, Altman, & Christophersen, 1980; White & Taylor, 1967).

Failure to treat self-injurious behaviors has also come under judicial review (Romanzcyk, Colletti, & Plotkin, 1980). The use of noncontingent restraint for long periods or psychotropic medications to mask the SIBs has been viewed as a failure to treat the behaviors (Martin, 1975). Legal and ethical considerations demand a change.

Reduction of self-injurious behavior has been primarily achieved through the contingent delivery of an immediate intrusive consequence. By definition, consequences are applied while the behavior is occurring or immediately after the behavior has occurred (post-response). In using immediate punishment, the injury may have already occurred or is occurring. Immediate punishment has been demonstrated to be an effective suppression tactic, but there exists support for the delivery of a consequence earlier (pre-response) in what may be a chain or a sequence of behavior (Johnston, 1972; Millenson & Leslie, 1979). SIB suppression through pre-response consequation may be effective as a result of chain disruption (Carr, Newsom, & Binkoff, 1976; Ferster & Skinner, 1957; Reynolds, 1968; Walters, Parke, & Cane, 1965). This locus of application differs from noncontingent "punishment" (Demetral & Lutzker, 1980; Kamin, 1968) and antecedent stimulus manipulation (Baumeister & Maclean, 1984; Bright, Bittick, & Fleeman, 1981; Carr, Newsom, & Binkoff, 1976; Dorsey, Iwata, Reid, & Davis, 1982; Durand, 1982; Durand & Carr, 1985; Gardner, Souza, Scubbia, & Breuer, 1985; Gaylord-Ross,

Weeks, & Lipner, 1980; Luncioni, Smeets, Ceccarani, Capodaglio, & Campanari, 1984; Locke, 1985; Lockwood & Bourland, 1982; Rojahn, Mulick, McCoy, & Schroeder, 1978; Rojahn, Schroeder, & Mulick, 1980; Schroeder, Kanoy, Mulick, Rojahn, Thios, Stevens, & Hawk, 1982; Silverman, Watanabe, Marshall, & Baer, 1984; Wells & Smith, 1983). Antecedent stimulus manipulation generally involves the removal of stimuli that precede or occasion predictable responses.

The post-response consequation articles not being reviewed here can be found in several general reviews of the SIB literature (Carr, 1977; Favell, Azrin, Baumeister, Carr, Dorsey, Forehand, Foxx, Lovaas, Rincover, Risley, Romanczyk, Russo, Schroeder, & Solnick, 1982; Harris & Ersner-Hershfield, 1978; Hollis & Meyers, 1982; Horner & Barton, 1980; Johnson & Baumeister, 1978; Lovaas, 1982; Schroeder, Kanoy, Mulick, Rojahn, Thios, Stevens, & Hawk, 1982; Schroeder, Schroeder, Smith, & Dalldorf, 1978).

Studies of the effect of a delay of stimulus application have shown a gradient of reduced behavior suppression (Kamin, 1968). The longer a punisher application is delayed, the lower the suppression effect. A similar comparison of pre-response delivery gradients has not been done.

In view of the severity and the prevalence of the SIB problem and the lack of treatments free of side effects, further research needs to be done.

Parameters of Punishment

Consequence timing and intrusiveness are only two of many parameters of the punishment paradigm that have been studied. These

parameters include punisher intensity, timing (locus), schedule, strength, nature of the response punished, nature of the noxious stimulus, relationship between the client and the administrant (staff), and the sequencing of rewards and punishments (Johnston, 1972; Parke, 1969; Parke & Walters, 1967).

The vast majority of the SIB literature reports suppression of SIBs through the contingent delivery of an immediate intrusive consequence. The parameters most often selected are the application of intense, immediate, consistent, noxious stimuli by novel experimenters. In using immediate punishment, the injury has already occurred or is occurring. Post-response punishment is an effective suppression tactic, but there exists support for the delivery of a pre-response consequence in what may be a chain or a sequence of behavior. A possible solution to reduce SIB injury may be the shifting of the locus of consequation to a response that precedes the SIB (Birnbrauer, 1968; Birnbrauer, 1976; Duker, 1976).

Besides preventing injury, early response consequation scheduling may have the benefit of allowing the use of less intrusive consequences (Parke, 1969). Some schedules of punishment may have a greater effect than intense duration punishers (Pendergrass, 1971). This is significant in that most SIB punishers are intrusive (Martin, 1975). The possibility that SIB damage and intrusiveness could be reduced by early consequation would be extremely useful to clinicians and clients. There is also some support for early consequation and prevention of the first SIB response to avoid high rate responding as a discriminative stimulus for additional SIBs (Carr, Newsom, &

Binkoff, 1976; Ferster & Skinner, 1957; Reynolds, 1968; Walters, Parke, & Cane, 1965).

Perhaps with early delivery of a punisher, a very mild consequence could be delivered with less risk of self-injury and less need for scrutiny or review. If pre-response delivery had comparable effects to post-response delivery, it would improve the social validity of the treatment procedure being used (Wolf, 1978).

The punishment locus parameter of early or immediate consequation is in every response contingent delivery interaction. The specification of this parameter, however, is often missing (Johnson & Baumeister, 1978). In one study, early consequation was incorporated into a procedure revision (Romanczyk & Goren, 1975). It may be more likely that pre-response consequation is used when a life threatening behavior is targeted or a very intrusive consequence is used.

Defining Locus

Certain punishment locus parameters are related. The source of locus variability when examining pre-response or post- (immediate) response consequation locus may come from two areas of variability. One source may be the reliability of the point in a behavior definition that the consequence is stated to be delivered. Another source of variability could be implementation errors based on the behavior definition. The implementation errors may occur as a result of inconsistent implementation or as a result of physical limitations on punisher delivery.

Defining pre-response consequation locus requires the specification of microresponses which reliably predict the occurrence of the SIB response being manipulated. Reliability of microresponses is to some degree predicated on reliability of the SIB response definition itself. SIB response definition reliability is usually reported in the literature, but in articles using pre-indicators, the pre-indicator reliability is rarely reported. Terminology for pre-indicators has varied considerably.

Once the behaviors are reliably defined and the locus of punishment is specified, implementation consistency comes into question. In a study by Lutzker (1978), the latency of delivery allowed more than "one" response to occur. This produced intermittent punishment. Often due to the latency of consequence delivery, an "episode" of behavior is consequated and recorded as "one" occurrence since it was "one" intervention applied (Romanczyk & Goren, 1975). Correct use of intermittent punishment can be an effective tool when used in a fading or maintenance procedure (Clark, Rowbury, Baer, & Baer, 1973; Kelly & Drabman, 1977b; Murphy, Ruprecht, & Nunes, 1979).

Articles generally describe a locus, i.e., place or time of punishment delivery. However, punisher locus reliability checks are rarely reported in the literature. It is assumed that the experimenter or staff person is consistent in timing application or that timing is irrelevant. It is also unusual to find a report of the proximity of the implementer to the subject. Latency of consequence delivery will generally increase with distance to the

subject unless remote application is occurring, unless no contact is needed for delivery, e.g., warnings or other verbals. Latency can only be measured reliably if the point of response consequation is operationalized and the point (time) of actual delivery is recorded. In some studies this variability is accepted and verbal bridges are used. In one study a warning was given for attempts of the behavior (Azrin, Gottlieb, Hughart, Wesolowski, & Rahn, 1975). In addition, they delivered a warning if the behavior was occurring. Similar verbal punishers or verbal stimuli have been used effectively to span the latency or intermittent delivery of punishers.

Verbal stimuli can also be used in aiding generalization. SIB studies have frequently incorporated warnings for antecedent behavior (Van Houten, Nau, Mackenzie-Keating, Sameoto, & Colavecchia, 1982).

Generalization

Early response consequation may affect response prevention, prevent injury, and allow less intrusive procedures to produce suppression. It is also important that the procedure enhance generalization. Generalization of response suppression to new stimuli has occurred with the use of early consequation (deCatanzaro & Baldwin, 1978; Duker, 1976; Taylir, 1963). Similarly, "self-control" may occur with early consequation (Aronfreed & Reber, 1965). Specific cases and proposed generalization methods for the present experiment are detailed in the following literature review and the section on selected parameters.

Review of Pre-response Consequation Literature

A comparison of pre-response and post-response consequence delivery needs to be done. In a review of the SIB literature by Schroeder, Schroeder, Rojahn, and Mulick (1981), only four studies using early intervention in a possible chained sequence were reported. Schroeder et al. suggested pre-response consequation would be an important research area for SIBs other than the reported rumination. In view of the number of authors suggesting early consequation, it would be important to review the literature in which this procedure was used.

There appears to be three types of manipulations of early consequation. They have been (1) the use of early consequation only, (2) early and late consequation without a comparison, and (3) early and late consequation with a comparison of the two loci.

Pre-response delivery is usually employed when the researcher uses one or more of the following terms in describing the procedure: attempt(s/ed), approaching, reaching, pressing, releasing, picking up, accelerating, preparatory responses, intrinsic cues, precursors of the act, commencement of movement, initial components, initiated, onset, beginning, behavior sequence, behavior chain, or antecedent behavior.

The first group of articles to be reviewed used only early application of a consequence. deCatanzaro and Baldwin (1978) consequated a rapid movement of a closed fist that would make contact with the client's head unless contact was prevented. One

unrestrained arm was first consequated in the sessions. The consequence was a repeated arm up and down exercise with staff holding the wrist. Two subjects were conditioned, one received 3 arm pumps and the other 25 arm pumps. It was felt 25 pumps for the high rate SIB client would have been too aversive and continuous. After some suppression had been achieved, a differential reinforcement of other behavior (DRO) for 30 sec of nonemission was paired with the consequence. The order of experimental conditions was a baseline, arm pump, reversal, DRO and arm pump, and generalization training. Generalization consisted of changing staff, settings, activities, session times, session length, and fading of restraints. The research design demonstrated the effect of an early arm pump.

Early consequation consistency was not reported. In one condition with reinforcement alone, it was not reported how, or if they prevented SIB contacts and if nonemission meant attempts were consequated. Although there was a report of generalization procedures, it was unclear how session implementer proximity was varied during this phase.

In an article by Hamad, Isley, and Lowry (1983), a knee to the eye area was suppressed. Attempts were consequated and defined as simultaneous movement of the knee toward the head and the head toward the knee. No baseline was taken due to the high rate of occurrence and the intensity. Fifteen min sessions were used. Sessions were expanded contingent on session success. Close supervision prevented most hand-to-knee contacts. Consequences consisted of reinforcement removal, guiding an incompatible response, and holding the ankle down

until no resistance occurred. Although most consequences were delivered early, there were no data as to the consistency or proximity of the implementers.

In a study by Kohlenberg (1970), persistent vomiting was targeted. The pre-vomiting response of abdominal movement (tensioning) was checked for correlation to the eventual vomiting response. This related response was then consequated in sessions by using shock. Neck bibs caught vomitus and were also used to record the effect of the procedures. In the session they would observe and consequate stomach tensioning while the subject sat stomach exposed. Interobserver reliability was not reported. The research design was a baseline followed by the treatment condition. Session stimuli were faded by using evidence of emesis on the bib to determine that a 1-hr observation session needed to be conducted. Maintenance of suppression continued for 1 year with only occasional booster sessions needed. This study was the only early consequence study that tried to correlate the early response with the end response of a possible sequence.

In a study by Lang and Melamed (1969), early consequation of vomiting was targeted. The subject was a normal 9 month old baby. An electromyograph (EMG) was used for early detection of a response sequence. Operant conditioning was a last attempt to increase the weight on the 5.4 kg subject. Due to the critical nature of the subject, the setting was a medical hospital. EMG recordings indicated muscle potentials under the chin and on the throat muscles of the neck. These EMG changes occurred reliably before vomiting and

concurred with nursing observations. Shock was administered for either vomiting or EMG high-amplitude activity and concurrent nurse observations of reverse peristalsis. Unspecified reinforcement, in conjunction with the shock procedure, followed a baseline. Following vomiting suppression, the procedure was carried out in varied positions, places, activities and times. After discontinuing the shock, three booster sessions were needed. One month after discharge from the hospital the subject weighed 9.5 kgs. The author did not report what percentage of the consequations were for early signals or for vomiting. Suppression was accompanied by an increase in responsiveness to people, a weight gain, and physiological functioning.

In a study by Saposnek and Watson (1974), sessions of head-slapping were suppressed by blocking a hit and requiring an alternative response of hitting the experimenter's hand. The subject sat on the experimenter's lap during the sessions. Measurement consisted of the time between responses. Responses were defined as bursts of head-slaps. Suppression was generalized to the ward routine. The ward routine differed in the proximity that the subject would be to the experimenter. It was unclear how the treatment procedure was implemented on the ward. It would not appear likely that a normal routine would have included having the client on their lap for early blocking of hits.

In an article by Singh, Dawson and Gregory (1980), blows to the jaw were targeted for change. Fist-to-jaw movement was caught before contact occurred and the subject's arm was pumped up and down 25 times.

Reinforcers were given for 30 sec of nonemission with the time being increased for success. The design was a combined multiple baseline and a reversal with a generalization phase after the reversal. It would be hard to expect catching a fist-to-jaw response before contact was made in the ward routine. The authors suggested that a mildly aversive technique can produce rapid and sudden suppression of SIBs to near zero levels. The suppression may have been the result of the arm manipulation, but the maintenance of the suppression may have been due to the differential reinforcement of other behavior.

In a study by White and Taylor (1967), rumination gestures were shocked in two subjects. Gestures were described as throat, eye and coughing gestures. It was also found that other distractors functioned as well as electrical stimulation. After one month, one subject had reduced akinetic seizures, increased liquid intake, and increased weight by 15%. The other client had increased weight by 1.7 kgs. However, the use of multiple consequences and the lack of a research design and reliability measure prevented conclusions from being made.

In a study by Zehr and Theobald (1978), chin hitting in one subject and face scratching in another client were targeted. A 5-min manual hand and arm guidance treatment was used in an ABAB research design. The manual guidance was implemented for attempts. However, attempts were never operationally defined. No reinforcement was paired with the treatment procedure. The implementer remained close to the subject. Suppression was obtained but maintenance and generalization were not determined as a staffing problem prevented

implementation.

In several experiments reported by Zlutnick, Mayville and Moffat (1975), preseizure behavior was consequated resulting in seizure suppression. Both contingent interruption and reinforcement of incompatible behavior were examined. Subject selection criteria included (1) a reliable behavior (90% agreement), (2) minimum rate of one seizure per day and (3) a formal diagnosis of epilepsy. Interobserver reliability was taken on both seizure and preseizure behavior. The interruption procedure consisted of shouting, "No," and grasping the subject by the shoulders and vigorously shaking the subject once.

In a pilot study for the experiment, a fixed gaze at a flat surface was reliably identified as preseizure behavior. Preseizure behavior was eliminated along with seizures. A short reversal suggested a relationship existed. Since part of the consequence required contact with the client, the only seizures that occurred were the ones where staff were unable to get to the subject to apply the contingency. The authors said that seizures were within 10 to 15 sec after the onset of staring. The procedure was easily generalized to the home setting.

A second subject to which preseizure consequation was applied was moderately retarded. The reliable preseizure behavior exhibited was a lower activity level. Although interobserver reliability for observations was at 100%, the predictability that it would occur prior to a seizure was at 60%. The reduction of seizures was transitory and was reported to be independent of the experimental

operations. It was felt that the preseizure behavior was itself a seizure and it was not an operant at the point and could have only been manipulated by the use of even earlier consequences. This observation by the experimenters was unique in that no other authors have reported this or have studied this in applied settings. Perhaps early consequation is the only locus for treatment of organic seizures.

A third subject, who was retarded, had preseizure arm raising targeted for reduction. Arm raising predictably occurred before each seizure. The experimenters reported the use of a differential reinforcement procedure (DRO), rather than an interruption procedure to suppress seizures. The procedure, however, still interrupted the subject by placing the arms back down to the subject's side. A reversal design demonstrated the procedures to be effective. Proximity of the staff was reported to affect staff's ability to precede a seizure. Seizures remained near zero during a 9 month follow-up without treatment, except for one booster session.

The experimenters recorded only the frequency of seizures and not the number of consequations or preseizure behaviors. They noted, however, that if the number of preseizure behaviors was unaffected, then the number of interruptions remained constant. Also in the cases where the overall frequency of preseizure behavior decreased, the number of interruptions proportionately decreased. The authors noted that although the seizures always decreased, the consequated behavior did not always decline.

The following three articles used both early and late consequation but did not conduct a valid comparison. Different consequations and timing were in one comparison. Different classes of responses were in another comparison. And one comparison lacked a valid experimental design.

In a study by Azrin, Gottlieb, Hughart, Wesolowski and Rahn (1975), subjects were consequated initially for actual SIBs. A DRO and a differential reinforcement of incompatible behavior (DRI) plus a 2-hr required relaxation procedure were delivered for SIBs. Staff observed from an arms length. The response consequated was shifted from SIBs to any emotional or agitated conduct that was found to be a usual precursor to self-injury. These included excited pacing or rocking, muttering, screaming or cursing. Several modifications of the procedure occurred during the experiment. During hand-awareness training procedures, clients were consequated for any upward hand movement. Actual SIBs were consequated by either required relaxation or hand control procedures. As a client complied with the procedures, staff decreased their proximity to the client. As SIBs decreased, staff decreased the duration of the procedure until only a warning remained. In the final stage, a warning was given for any attempt at self-injury.

Data for the subjects were grouped together. A 99% reduction from baseline levels occurred. Although the initial reduction may have been affected by the long duration of the procedure, or by client fatigue, the later stages suggested behavior suppression.

Maintenance and generalization varied considerably with staffing and contingencies on staff behavior. The lack of data separation for early and late procedures prevented evaluation. The experimental design was an A-B design across multiple subjects simultaneously.

Duker (1976) remotely applied shock for early head banging and for late head hitting. Both behaviors were suppressed by early consequation, but the study did not compare consequations on the same response sequence. Head banging had a longer chain or sequence than head hitting. Response selection bias may have occurred. Early consequation also was subject to order effects since it was only conditioned after the subject had been consequated for responding and then escaping the stimuli.

Duker stated that early consequation can only occur when anticipatory behaviors are observable. Duker was not able to demonstrate experimental control in a reversal design. After each treatment condition, the reversals did not recover to baseline levels and the behaviors outside the session had also been suppressed. After suppression and the reversals, success was generalized toward staff and other times of the day.

Crying and screaming were reported during the first sessions of the escape-avoidance training. Although no reinforcement conditions were in effect, social and object contact developed during the procedure.

The last group of articles reviewed are the critical comparison studies. These articles compared early consequence delivery with late consequence delivery using the same consequent stimulus.

An article by Romanczyk and Goren (1975) reported suppressed SIBs in experimental sessions but failed to obtain generalization. Response suppression was greatest during the early shocking of arm raising for head hits. Although the experimental conditions go from late consequation to early consequation to late consequation, other multiple changes plus timing of changes prevented any conclusions. Interobserver reliability was unreported and data from 10 sessions were unplotted and unreported. Due to the missing information about switching conditions, no conclusions could be drawn.

In a study by Azrin, Besalel, and Wisotzek (1982), the subject was consequated early during seven sessions. The responses were head hits and hand bites. Staff remained close and blocked hits and bites before they occurred. A differential reinforcement of incompatible behavior was also in effect. No comparison was made of the data with respect to the early or late consequation. The data showed no change at the point where approximately the condition change would have occurred. Order effects would have been suspect even if the change had been marked. The procedures were introduced in random order but were only introduced once and then for long periods. The authors suspected some differences between implementers, and they withheld judgment on the rank ordering of the procedures.

The following four studies will be briefly reviewed for their early or late consequence delivery. They used normal subjects, statistical analysis, and targeted behaviors other than SIBs.

An article by Aronfreed and Reber (1965) reported examining suppression of responding with normal 9 and 10 year olds. Subjects

were punished for either reaching for a specified toy or for playing with a specified toy. Statistical analysis showed significant differences. The subjects receiving punishment at the initiation of responding showed fewer trials of incorrect responding.

Timing of punishment was investigated by Walters and Demkow (1963). Kindergarten students were consequated by a loud noise for either initiating toy play or for actual play with the toy. Analysis of the data showed a difference in the data, demonstrating support for the use of early delivery.

In a Walters, Parke and Cane (1965) study, timing of punishment and modeling were examined. Kindergarten subjects observed a film in which early consequences or late consequences occurred. Subjects which had observed the early model punishment showed more resistance to emitting the incorrect behavior.

Although timing of punishment is the critical variable being examined here, it is also important to identify variables interacting with timing to improve effectiveness. The next two articles have included variables interacting with timing variables.

Cheyne and Walters (1969) investigated intensity of punishment, timing of punishment, and cognitive structure, as determinants of response inhibition. Before punishment training, high cognitive structure groups were given reasons why they should not deviate. They were consequated by both a low-intensity noise and a verbal signal. Low cognitive structure subjects received only a statement not to do the response and a low-intensity tone punishment. Eighty-four first grade boys participated in the study. Data were

statistically analyzed for significance. Their findings suggested that if low cognitive structure and early consequation were used, response suppression would occur. High intensity punishment was more effective with all conditions. They also found that with high cognitive structure and late consequation response suppression would occur.

Parke (1969) examined the effectiveness of punishment as an interaction of intensity, timing, agent nurturance, and cognitive structuring. Agent nurturance was defined by the frequency and quality of subject interactions. Low agent nurturance subjects received objects with which to interact and experimenter interactions were avoided. High agent nurturance subjects received positive and encouraging comments frequently. Parke's study suggested that early timing of punishment was more critical when the clients were of low cognitive structure and when high agent nurturance existed. He also found support for use of early timing only when the intensity of the punishment was low. Under high intensity conditions early and late timing groups did not differ.

Parke's 80 subjects were first and second grade boys. This allowed the use of receptive language skills much higher than would be possible with people with severe and profound mental retardation. Low cognitive structure and low agent nurturance environments are frequently reported in the SIB literature. Selecting a toy is a response that may not need to be consequated early to prevent injury. In several of the studies done on these interactions, toy interaction was targeted. Toy interaction timing principles may not generalize

to SIB responses.

Parke stated that although timing of punishment was less important than cognitive structuring or intensity of punishment, timing should be manipulated where the other two conditions are not variable. This may be the case in many low or untrained staffing situations. He also suggested cognitive inputs be used over intensity escalations.

The last study reviewed is very similar to the critical comparison needed. A study by Reid, Tombaugh, and Heuvel (1981), examined locus of punishment in a rocking response. Rocking had not progressed to the point of skin break down, but this study had similarities that have not yet been studied with SIBs. The authors reported that the degree of effective suppression was dependent upon where in the behavioral sequence restraint was applied. The seven subjects had profound retardation. The subjects that were held for 1-min in the down position of a rocking motion, demonstrated a faster rate of suppression and greater suppression, than subjects held in the upper position at the end of a rock. However, there were no subjects included that began a rock in the lowered position. Varying the position variable would have decreased the position bias in the holding procedure. The hold was in the middle of the sequence, but discomfort in the lower position may account for the effectiveness. It has been demonstrated that some intense punisher levels will override timing of application variables (Cheyne & Walters, 1969; Parke, 1969). Due to the position differences in the same holding, they do not appear to be equal in intensity. Fatigue

may also have been a factor in the suppression, as minimal assistance and pressure were used in bending over and holding the position. Brief restraint, however, was shown to be an effective suppresser through the reversals for at least six of the seven subjects. No escape or avoidance was seen. Generalization was not included in the study.

It has been noted that topographically dissimilar consequences were just as effective as topographically similar overcorrection procedures. Reid et al. (1981) selected a consequence in the sequence of behavior for their subjects. To avoid the bias of position, it would be best to consequate with the same procedure exactly but in different loci or sequence locations of the response. Reid recommended solving this topography versus behavior chaining problem.

The results of the studies reviewed indicate pre-response consequation has had an effect on changing the targeted behaviors. However, additional research is needed to compare pre-response consequation to other loci and to identify when its use would be most effective.

Summary

The present study relates to previous research in its use of both early and late consequation. It is also similar to some of the studies reviewed, in that the subject was retarded and exhibited SIBs. It is also comparable to some of the studies with regard to single subject evaluation designs. On the other hand, this study differs from previous research. Very few studies have done a comparison

of early or late consequation. Generally they have let speed of consequation, timing, and consistency be uncontrolled variables. Timing has rarely been treated as the independent variable in the applied literature. Evaluation of SIB consequence timing has not been reported in the applied literature.

The unique features of this study are the comparison done, use of the same mild consequence across conditions, reliability on attempts and actual hits and use of a procedural detail to enhance a mild potential punisher.

The purpose of this study was to compare the efficacy of two different loci of a consequence delivery. If the efficacy was similar or early consequation suppression greater, then early consequation should be considered for use in punishment paridigms or under similar conditions as in effect here.

Selected Stable Parameters and Generalization

The consequence selected was based on the least intrusiveness model (Gross, Wright, & Drabman, 1980; Rapoff, Altman, & Christophersen, 1980) and a literature review of effective stimuli.

A clear continuum of intrusive procedures has not been agreed upon. However, a rough order of intrusiveness has been suggested (Gross et al., 1980; Harris & Ersner-Hershfield, 1978; Killebrew, Harris, & Kruckeberg, 1982; Schroeder et al., 1981). Gross et al. sequenced their continuum of intrusiveness from contingent icing to mouth wash to lemon juice with that being the most intrusive. Killebrew et al. published a survey of rank ordering of restrictiveness

for 10 treatment procedures. The generalized rank order was from differential reinforcement of incompatible behavior the least restrictive to response cost, exclusion time-out, differential reinforcement of other behaviors, extinction, overcorrection, seclusion time-out, contingent restraint, psychotropic medication, and contingent aversive stimulation. Harris and Ersner-Hershfield placed the procedures they reviewed in the rough order of intrusiveness of differential reinforcement of other behavior, time-out and extinction, overcorrection, and electric shock. It would seem likely that by reducing the force, duration, repetition or distance of a consequence's movement, its perceived intrusiveness would be decreased (deCatanzaro & Baldwin, 1982). Consequence intrusiveness should be decreased as injury decreases or as the predictability of an SIB chain or sequence decreases.

A review of the effective stimuli for SIB suppression suggests an arm raise may be the least restrictive and effective procedure. Harris and Romanczyk (1976) used arm exercises for head-banging. Arm holding has been used successfully for a variety of behaviors (Azrin, 1972; Azrin & Wesolowski, 1980; Bitgood, Crowe, Suarez, & Peters, 1980; Henriksen & Doughty, 1967; Kelly & Drabman, 1977a; Kelly & Drabman, 1977b; O'Brien, Bugle, & Azrin, 1972; Richmond & Bell, 1983; Saposnek & Watson, 1974).

Arm holds have been easily faded. Fading has consisted of shortening the duration, changing the response topography and the DRO to adaptive behavior (Homer & Peterson, 1980), and fading to only verbal prompts (Azrin, Besalel, & Wisotzck, 1982; Azrin,

Bottlieb, Hughart, Wesolowski, & Rahn, 1975; Birnbrauer, 1968; Singh, Dawson, & Manning, 1981; Wacker, Berg, Wiggins, Muldoon, & Cavanaugh, 1985; Zehr & Theobald, 1978).

Generalization plans included the techniques reported in Stokes and Baer (1977). Generalization and normalization plans included adding instructional control to the hand raising (Parke, 1969; Richmond, 1983). This would allow more staffing distance, intermittent consequation, and self control conditioning to be programmed (Azrin et al., 1982; Browder & Shapiro, 1985; Singh, Dawson, & Manning, 1981; Taylor, 1963). Client hand raising would serve as the alternative reinforced response once the reinforcement schedule for nonemission was thinned out. Other alternative and incompatible responses would be added as restraints were faded, similar to deCatanzaro and Baldwin (1978). Transfer of learning would also be aided by varying the session locations, times, staffing and positioning (Kelly & Drabman, 1977a; Lang & Melamed, 1969; Rincover & Koegel, 1975; Romanzcyk, Colletti, & Plotkin, 1980; Walker & Buckley, 1972). Generalization is aided by the ease of consequence implementation (Baumeister & Maclean, 1984; Kelly & Drabman, 1977a; Kelly & Drabman, 1977b). Booster sessions would be added for relapses in behavior suppression (Durand & Carr, 1985).

In conclusion, pre-response consequation with an arm raise consequence appears to be a combination of a punishing stimulus and an application parameter that may enhance its effectiveness. Pre-response consequation would appear to be very appropriate for

the suppression of SIBs. However, there has not been a comparison of pre-response consequation to post-response consequation suppression of SIBs.

Chapter 2

METHODOLOGY

This experiment compares the delivery of a consequence prior to the emission of a self-injurious behavior (SIB) to the delivery of the same consequence after a self-injurious behavior. This research examines whether there is a difference between pre-response consequation interresponse times and post-response consequation interresponse times (IRT). The procedure specifically compares the effect of an arm lift consequence delivered contingent on a hand raising off a table to the effect of an arm lift consequence delivered for the subject's hand hitting his head (SIB). In conjunction with the arm lift consequence, a DRO 40 s was implemented.

Subject

The subject was a profoundly retarded institutionalized 26-year-old male with a long history of SIB. The subject had no sensory impairments and enjoyed reinforcers of hair brushing and vibration to his head. The subject had received more intrusive consequences (faradic skin shock and facial screening) for the SIB but their effects had not maintained. The SIB was severe enough to cause tissue damage and require the subject's arms to be restrained. Solid formed plastic arm restraints prevented the subject from bending an

arm to make hand to head contact. The subject's rate of SIB was high enough that alternative responses rarely occurred. The subject had been exposed to video taping prior to the experiment.

Consent

Guardian consent and authorizations were obtained in accordance with the ethical standards of the American Psychological Association, federal hospital standards, state laws, and state standards. In addition, an on-site Special Studies Committee reviewed the procedure.

Setting and Materials

The procedure was carried out in a 5m x 7m room connected to the subject's living room and next to his bedroom. The subject sat in a chair with his arms on the table with his right arm unrestrained. The table and chair were centered along a wall and facing away from windows. A video camera was in front of the subject about 3m away. On the table, 50cm in front of the subject was a red 40-watt light bulb and a white 60-watt light bulb in a junction box. The implementer was located to the right of the subject within reach of the subject's wrist. The implementer sat except when doing the arm lifts. On the same table to the right of the implementer's arm was a data sheet, a digital timer (Casio MLBO), a hair brush, and a hand held vibrator (Polynex). The video tape began first, then the timer and the condition light went on and the subject's hand was released. The implementer consequated according to the condition in effect. The Casio timer recycled every 10 minutes to mark the

condition changeovers. The video camera also had a digital timer read out for timer reliability checking.

Session-nonsession Time and Precautions

A nurse observed the subject during nonsession times for abrasions, tissue breakdown, bruising, swelling, or other potential damage as a result of SIBs. Due to a 0.8 sq cm cheekbone abrasion after 44 conditions, protective pads were applied to the sides of the subject's head to prevent any further damage. The pads were on for both conditions and did not inhibit access to the reinforcer applications. Nonsession time was varied and included walks, toileting, sitting in a lounger, seeing a nurse, receiving an ice pack, and lunch and dinner in the cafeteria. All nonsession time was outside the session room. Significant events did not follow or precede the sessions or conditions.

Response Definitions

The response definition of early or pre-response consequation in condition A (white light) was a hand including the heel of the hand, raised off the table. Distance off the table was irrelevant. The response in condition B (red light) was hand or fist contact to the head, neck, or to a protective head pad, but did not include scratching, rubbing, or nose wiping. Contact may also be referred to as late consequation, post response consequation, or immediate consequation. Scratching, rubbing, or nose wiping were viewed as acceptable responses. Intensity of the condition B

contacts was not measured. The subject's right arm was the only one out of the arm restraints.

Research Design

During the 6 months prior to the experimental comparison of two consequation times, only the hand raise responses were consequated with a hand lift, thus preventing SIBs from occurring. A 40 s differential reinforcement of other behavior (DRO) was in effect during this period. Two previously demonstrated reinforcers, vibration to the head and hair brushing, were alternated in their delivery for reinforcement. Reinforcers had been determined by presentation for nonemission of an SIB with all five senses being sampled. This was done over 6 months, using an alternating treatments design, similar to Wacker et al. (1985). The DRO 40 s was continued into the experimental consequation times.

Conditions A and B occurred in an alternating treatments design, allowing comparison of the two procedures over six days (Barlow & Hayes, 1979; Barlow & Hersen, 1984; Hersen & Barlow, 1976; Kazdin & Hartmann, 1978). The A and B conditions were alternated within the sessions and as to which began the session (i.e., session 1: A-B-A-B; nonsession time: session 2: B-A-B-A; nonsession time: session 3: A-B-A-B, etc.). Condition switching aids consequation timing discrimination but prevents sequential confounding (Barlow & Hayes, 1979). The red (post-response consequation) and white (pre-response consequation) light switching would also aid discrimination (Barlow & Hersen, 1984; Rollings & Baumeister, 1981). The conditions

were 10 min in duration to minimize contrast and induction (Barlow & Hayes, 1979). Each session was 40 min (four conditions per session). The time of consequation and the staff consequating were counterbalanced across conditions to minimize carryover effects and control order effects (Barlow & Hersen, 1984).

The implementation setting was held constant across conditions. In 84% of the conditions more than one of the three implementers were available. Staff were rotated after 2½ min in the first condition of a session and then every 5 min thereafter. This was done to control for any implementer differences and to avoid incorrect discrimination on the response timing and light changeovers. Over 80% of the implementer switches did not occur during a condition switch. In both conditions when a response occurred, the implementer lifted the subject's unrestrained right arm to a vertical position while stopping the timer to end the interresponse time. The arm was held up for 10 s then returned to the table. The time was recorded and the timer returned to zero s. The subject's hand was released and the timer started again. When the 10-min condition timer went off in the session, the present condition stopped and the next condition began. Conditions were noted on the data sheet. The stimulus light was also changed at this time. After the fourth 10-min condition, the restraint was replaced for 20 min of nonsession free time. After free time, the procedure was started again. To provide sufficient trials for comparing treatments, there were five to eight 40-min sessions per day over 6 days, totaling 76 conditions (Barlow

& Hayes, 1979; Iwata, Dorsey, Slifer, Bauman, & Richmond, 1982).

Data Analysis/Measurement

The dependent variable was the time between the implementer lifting his/her hand off the subject's hand to the time the subject emitted the response as defined in that condition. In condition A, the interresponse time stopped and was recorded each time the subject's hand raised off the table. In condition B, the interresponse time stopped each time the subject's hand came in contact with his head, neck, or protective pad.

Measuring IRTs instead of frequency eliminated the artifacts of implementer behavior. Artifacts occur from holding the subject's hand longer in condition A than in condition B and from differences in time duration for the procedure (Kelly & Drabman, 1977b; deCatanzaro & Baldwin, 1978). Interresponse time reliability was checked in 12 of the 76 conditions over the 6 days. IRTs were considered in agreement if they were within 2.5 s of each other. IRTs were in disagreement if the discrepancy was 2.6 s or more. The percentage of agreement was computed by dividing the number of agreements by the number of agreements plus the number of disagreements, then multiplying by 100. Interobserver reliability was 92%.

Data Display and Analysis

The mean IRTs and the cumulative mean IRTs for each condition (A and B) were plotted. Clear separation or divergence in the lines indicates a difference in the effects of the procedures (Barlow & Hersen, 1984).

Results

The data were displayed in Figure 1 and Figure 2. Figure 2 displays the mean IRTs for each condition. A difference in the two data lines is not clear although there appears to be slightly more area under the hand lifts curve. Figure 1 displays the cumulative mean interresponse times for the hand lifts on the same graph as the cumulative means for the hits. Figure 1 shows an initial long interresponse time followed by only a slight divergence in the two data series. The cumulative IRT mean for the hand lifts was 405.4 seconds. The cumulative IRT mean for the hits was 296.5 seconds. The difference in levels is evident. The divergence between the two lines is 59.1 seconds.

Both figures display an initial long mean IRT which may be a carryover from previous nonexperimental conditions. As soon as the comparison began very few similar IRTs occurred.

Both figures also display a spike in the data at the time of the introduction of the safety pads to the side of the subject's head. The pads had an effect under both condition A and B as shown by the figures. The data returned to previous means suggesting that the novelty may have worn off.

Other nontargeted data are reported in tabular form in the Appendix. Colateral behaviors were recorded in both conditions as was pre and post pads application data. The changes are discussed in the conclusions.

Chapter 3

DISCUSSION AND CONCLUSIONS

Discussion of the Results

The results of this experiment suggest there was a difference between pre-response and post-response consequation. Differences as defined by Furlong and Wampond (1982) existed in both the level and the trend of the two data lines (Figure 1). The degree and speed of suppression from early consequation was slightly greater than late consequation. A gradual divergence occurred after the first datum point, lending support to early consequation efficacy. Interpretation of the divergence would be that there were longer periods of nonemission of SIBs under early consequation. Caution is needed when interpreting the difference in the first plotted means on both Figure 1 and Figure 2. The first data points do not reflect alternation. They are under the same stimulus conditions as previous programming described in the research design. The conditions included early consequation and a DRO 40 s. The drop in interresponse time at the beginning of the experiment presents a data change of interest. Although the objective of this experiment was to compare two treatment delivery times, it was not expected that the IRTs would substantially drop from preexperimental operations with the introduction of the comparison. In fact a secondary objective would

be to lengthen the IRTs. The unexpected drop deserves further study.

The separation between the two conditions was actually greater than Figure 1 reflects. Two data artifacts or measurement procedures contributed to the underestimation. One artifact occurred as a result of dropping any nonemission time accumulated if nonemission seconds were at the end of the 10-min interval. The remaining partial time was dropped since the interval was not terminated by the response being recorded. A comparison of the summations of the time remaining for each condition revealed a difference between the two. There were 907 s left for all condition As and 208 s left for all condition Bs. The uncompleted trials of nonemission of hand raising were generally longer than the trials for hitting.

The other artifact contributing to the underestimation was the unequal latency for each response. It took the subject a minimum of 0.4 s to raise a hand versus 0.8 s to hit. This artifact underestimated the condition A data since the latency to a hit was longer than the latency to a hand raise. This inflated all the hit IRTs, but not as a result of pre or post response consequation.

The number of hand raises that occurred in all the sessions was 728. The number of hits in the sessions was 755. The lower number of hand raises supports the efficacy of early consequation. However, frequency of responding would not be an accurate comparison. The unequal latency of the responses could have allowed more hand raising responses to occur in its 10-min condition. Therefore, the gap between the conditions may be actually greater than the frequency would suggest.

Some of the hand raises came upward faster and with more force than others. After observing a videotape of the sessions, a tally was made as to the number of the raises that would have been hits if they would have been unblocked. Forty-nine occurrences were observed. There were an additional 16 raises that were missed blocks and resulted in an actual hit. This totals 65 responses that were possibly intended as immediate hits.

During the hits condition, the subject on 27 occasions used a slap for head contacts. The subject was more likely to try or achieve two hits when he would slap.

Prior to the use of the first late consequation, escape and avoidance had not been seen. This changed with the first exposure to the late condition. The subject showed avoidance behavior by sliding his chair back, attempting to stand up, or turning away from the table.

Although escape, avoidance, anxiety, aggression, withdrawal, and conditioned emotional responses have been associated with some aversive consequences (Aronfreed & Reber, 1965; Cheyne & Walters, 1969; Parke, 1969; Walters & Demkow, 1963; Walters & Parke, 1965), they were not reported with brief and simple correction procedures as used in this experiment. An arm lift had not generated withdrawal until it was used in the self hitting condition. Ninety-one percent of the 105 withdrawals occurred in the late conditions. The early conditions were rarely marked by withdrawal behaviors. The consequence would not appear to be painful since 91% of the escape and avoidance was observed during the late condition and only 9%

during early consequation.

In addition to head hitting, the subject exhibited a low frequency stereotypic behavior of raising his shoulder up to his jaw and cheek area. The repeated jabbing motion did not cause any apparent damage. The significance of this behavior was that 79 (9 episodes) of the 80 occurrences occurred in the hand raising condition. Jabs generally occurred after a staff had replaced the hand back to the table surface, while staff were recording the data.

A total of 42 reinforcements were delivered out of a possible 1,140. Thirty-eight of these were in the hand raising condition and four were in the hitting condition. The rate of reinforcement earned appears to support the efficacy of early consequation in addition to the reported IRT differences. The unequal reinforcement between the two compared conditions may also be viewed as having caused the outcome of a IRT difference. The absence of a reinforcement component would have caused an ethical dilemma.

The introduction of protection pads to the sides of the subject's head at the 45th condition appeared to cause or correlate with an increase in the durations of the IRTs. After one exposure to each response condition the behavior reverted back to short IRTs.

Other changes were correlated with the addition of the pads. These changes were in the frequency of withdrawal and the number of raises that would have been hits. Withdrawing substantially dropped. In contrast, the number of attempted hits during the hand raising condition doubled.

The first 10-min condition of early consequation had a mean IRT of 49.8 s of nonemission. The remaining 75 conditions never approached that initial condition suppression. After exposure to a late condition, consistent long IRTs were never seen again.

The single occurrence of long IRTs in the first early consequation may have occurred due to a transition from pre-experimental operations. The pre-experimental operations were exactly like early consequation. The procedures were an arm lift, DRO 40 s, and pre-response consequation. Prior to the comparison of consequence times, the majority of the nonemission of SIB IRTs were longer than the experimental IRTs.

Several theoretical explanations exist for any difference in suppression between pre-response and post-response consequation. It may be that early consequation breaks the chain or sequence, preventing response escalation (Birnbrauer, 1968; Singh, Dawson, & Manning, 1981; Thvedt, Zane, & Walls, 1984). Early consequation may work because pre-response consequation prevents sensory consequences (Rincover & Devany, 1982).

Longer IRTs might be expected in the hitting condition since the subject is less restricted in movement before a consequence is applied. Even with this potentially more reinforcing condition, the subject had longer IRTs in the more restrictive condition of holding his hand down.

Post Experimental Conditions

The results of the experiment were not extended to post experimental conditions. The durability of early consequation remains

open to further investigation. Plans for naturalizing and normalizing the environment were unable to be carried out due to changes in staffing availability. Loss of staff is not an uncommon occurrence reported in the literature (deCatanzaro & Baldwin, 1978; Hamad, Isley, & Lowry, 1983; Kohlenberg, 1970; Lang & Melamed, 1969; Saposnek & Watson, 1974; Zehr & Theobald, 1978). Hollis and Meyers (1982, p. 107) reported even after staff training, generalization is often undermined by staff time, turnover, and consistency. Staffing ratios in one case had to be 2.5 staff to one client in order to continue.

Initially, generalization would have included conditioning trials for both hands. Fading would have consisted of reducing the arm hold to just a few seconds and reducing the amount of assistance needed for responding (Azrin, Besalel, & Wisotzck, 1982). Additional fading to only a gesture would have followed and follow-up sessions would have been used to aid in maintenance. The reinforcement schedule would have been switched from a DRO 40 s to a Differential Reinforcement of Incompatible Behavior and Differential Reinforcement of Alternative Behavior (DRI/DRA) at the table (Singh, Dawson, & Gregory, 1980). Singh et al. (1980) generalized response success from a table to the subject's lap. The next step would have been the generalization to other client positions and to other settings. The next steps would have included all other daily living activities and the introduction of communication programs. Maintenance would have included booster sessions or program reintroductions at previously successful steps in the fading procedure.

Relation to Previous Research

Results of this experiment appear consistent with the results of previous research. Early consequation has had an impact in different settings (Aronfreed & Rober, 1965; Cheyne & Walters, 1969; Lang & Melamed, 1969; Parke, 1969; Walters & Demkow, 1963; Walters, Parke, & Cane, 1965), on various behaviors and subjects (Aronfreed & Reber, 1965; Azrin, Besalel, & Wisotzek, 1982; Azrin, Gottlieb, Hughart, Wesolowski, & Rahn, 1975; Cheyne & Walters, 1969; Hamad, Isley, & Lowry, 1983; Kohlenberg, 1970; Lang & Melamed, 1969; Parke, 1969; Reid, Tombaugh, Heuvel, 1981; Walters & Demkow, 1963; Walters, Parke, & Cane, 1965; White & Taylor, 1967; Zehr & Theobald, 1978; Zlutnick, Mayville, & Moffat, 1975), and with varied punishers and research designs (Aronfreed & Reber, 1965; Azrin, Gottlieb, Hughart, Wesolowski, & Rahn, 1975; Cheyne & Walters, 1969; deCatanzaro & Baldwin, 1978; Duker, 1976; Lang & Melamed, 1969; Parke, 1969; Saposnek & Watson, 1974; Walters & Demkow, 1963; Walters, Parke, & Cane, 1965; White & Taylor, 1967; Zehr & Theobald, 1978; Zlutnick, Mayville, & Moffat, 1975). The research presented here combined the use of a subject with mental retardation, an SIB response, a living unit setting, with a valid experimental comparison of the two consequation times. Previous research had used a single locus of consequation or uncontrolled loci, intense consequences, normal subjects, and statistical correlations (Aronfreed & Reber, 1965; Azrin, Besalel, & Wisotzek, 1982; Azrin, Gottlieb, Hughart, Wesolowski, & Rahn, 1975; Cheyne & Walters, 1969; deCatanzaro & Baldwin, 1978; Duker, 1976; Hamad, Isley, & Lowry, 1983;

Kohlenberg, 1970; Lang & Melamed, 1969; Parke, 1969; Reid, Tombaugh, Heuvel, 1981; Romanczyk & Goren, 1975; Saposnek & Watson, 1974; Singh, Dawson, & Gregory, 1980; Walters & Demkow, 1963; Walters, Parke, & Cane, 1965; White & Taylor, 1967; Zehr & Theobald, 1978; Zlutnick, Mayville, & Moffat, 1975).

Limitations

Although the goals of this experimental comparison were socially significant and the procedure was socially appropriate, the effects of the consequences were not clinically significant in themselves (Wolf, 1978). Early consequation is best viewed as a socially acceptable parameter used to enhance punishment efficacy. There may be side effects from early consequation if non-SIB chains or sequences are consequated.

Hand raising would be a socially appropriate behavior for getting assistance in many situations. Hand raising was a stimulus preference determined by the subject in an assessment procedure (Pace, Ivancic, Edwards, Iwata, & Page, 1985).

Major weaknesses of this study that the reader should consider are: the unequal delivery of reinforcers across conditions, the narrowness of the subject characteristics, limitations of the setting, and the lack of objective physiological measures. Threats to the validity of the comparison may be the use of pads. Due to the high rate of SIB, there may be a lack of generality to other populations. Clients with a lower rate of SIB may improve as a result of the ability to use a DRA versus a DRO procedure for

reinforcement. Previous studies examining gradient around punishment timing have also tested for empirical demonstration of discrimination between two compared conditions. This study does not have a demonstration of discrimination other than having followed recommended procedures to produce discrimination. Discrimination may be suggested by the differences between behaviors displayed in Table 1 and Table 2, but design flaws could have also produced these differences.

Previous studies have used stronger punishers to suppress SIBs. The use of a mild consequence in the present study may have resulted in a lack of behavior suppression across both conditions being compared. The lack of suppression forces both data lines to the bottom of the graph not allowing a valid comparison to occur. Comparison of a punisher parameter can only occur if by definition a punisher is being used. A mild consequence may have underestimated the divergence and separation of the two data lines.

Early consequation success may depend on the ability to predict the direction of the continued movement toward an SIB. Prediction errors may punish adaptive responses, waste staff time, and may diminish the effectiveness of the punisher. This was not discussed in the literature. The direction of hand raises was assumed in this study.

Implications

Based on the results of this experiment, future treatment should consider the use of early consequation. Azrin et al. (1982) suggests

pre-response consequation should be used if great injury would occur from the behavior.

Future research should examine the specific situations in which to use early consequation. Early consequation may only be possible when longer identifiable chains exist, or if remote delivery is possible. Future research also needs to determine if early consequation should be used in conjunction with fading of procedures or used prior to other procedures.

Future research will need to evenly distribute reinforcements, select effective punishers, and examine pre-response selection and chain predictability.

The need for quick, portable, easily trainable, less restrictive treatment methods is clear (Martin, 1975). Complicated or high response effort treatments prevent their use and delay treatment.

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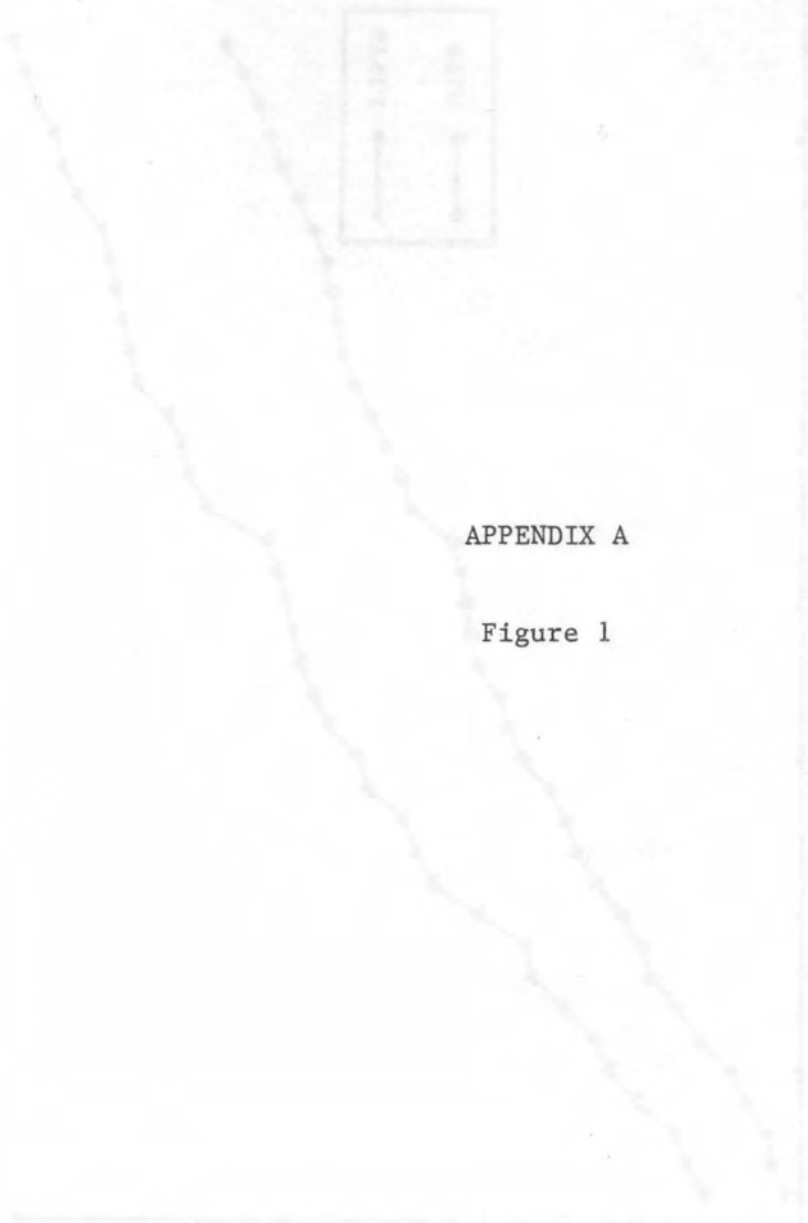
APPENDIXES

APPENDIX A

Figure 1



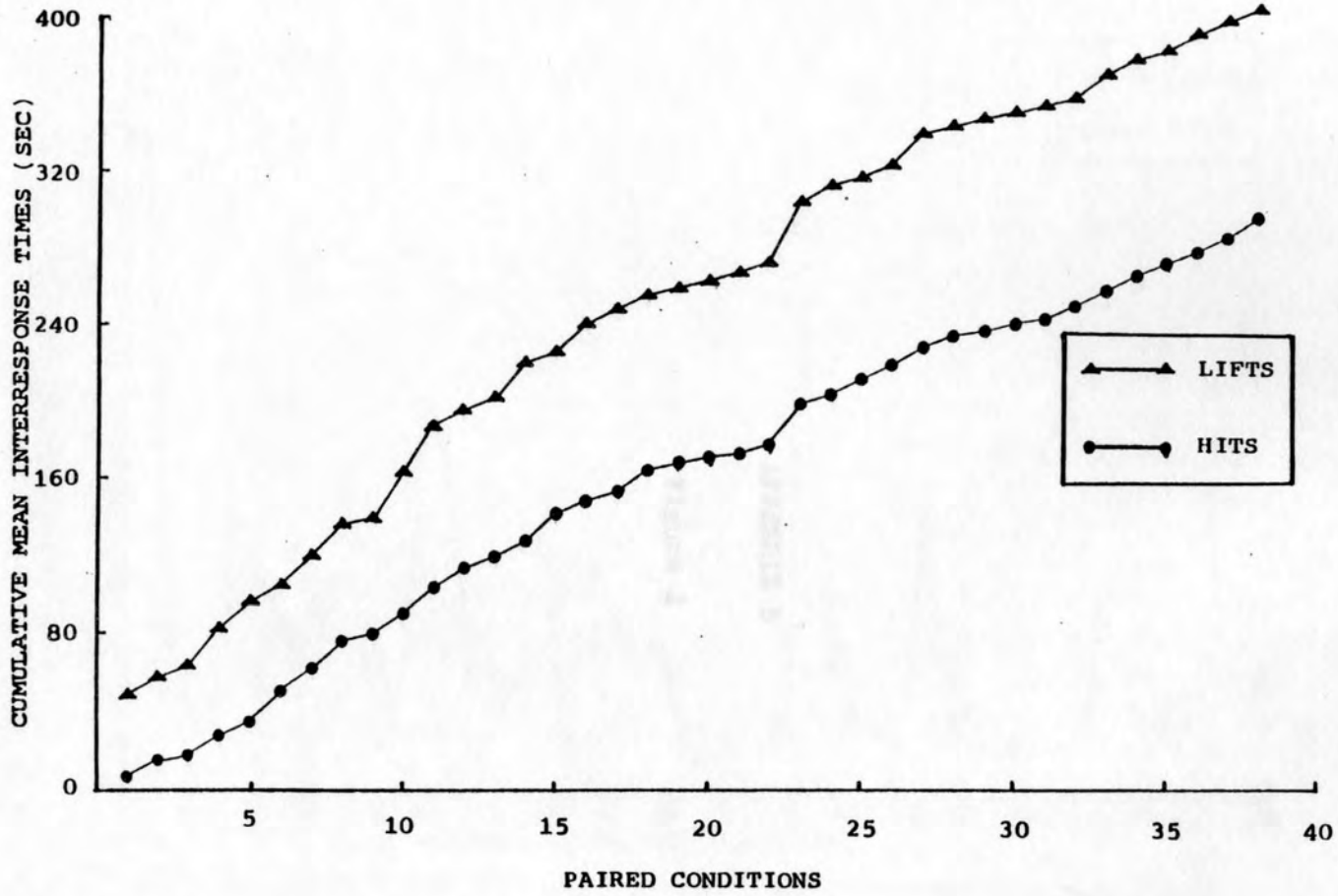
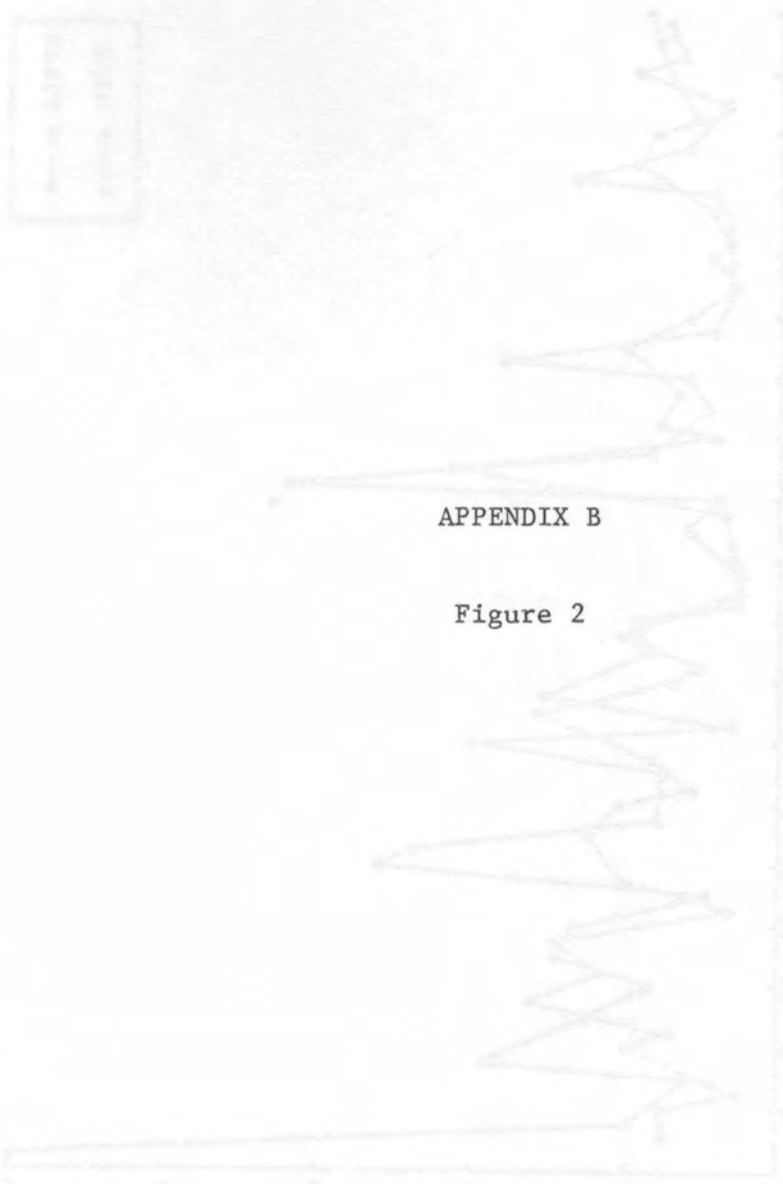


Figure 1. Cumulative mean interresponse times (seconds of nonemission) for each response condition during alternating conditions of pre-response consequation and post-response consequation.

APPENDIX B

Figure 2



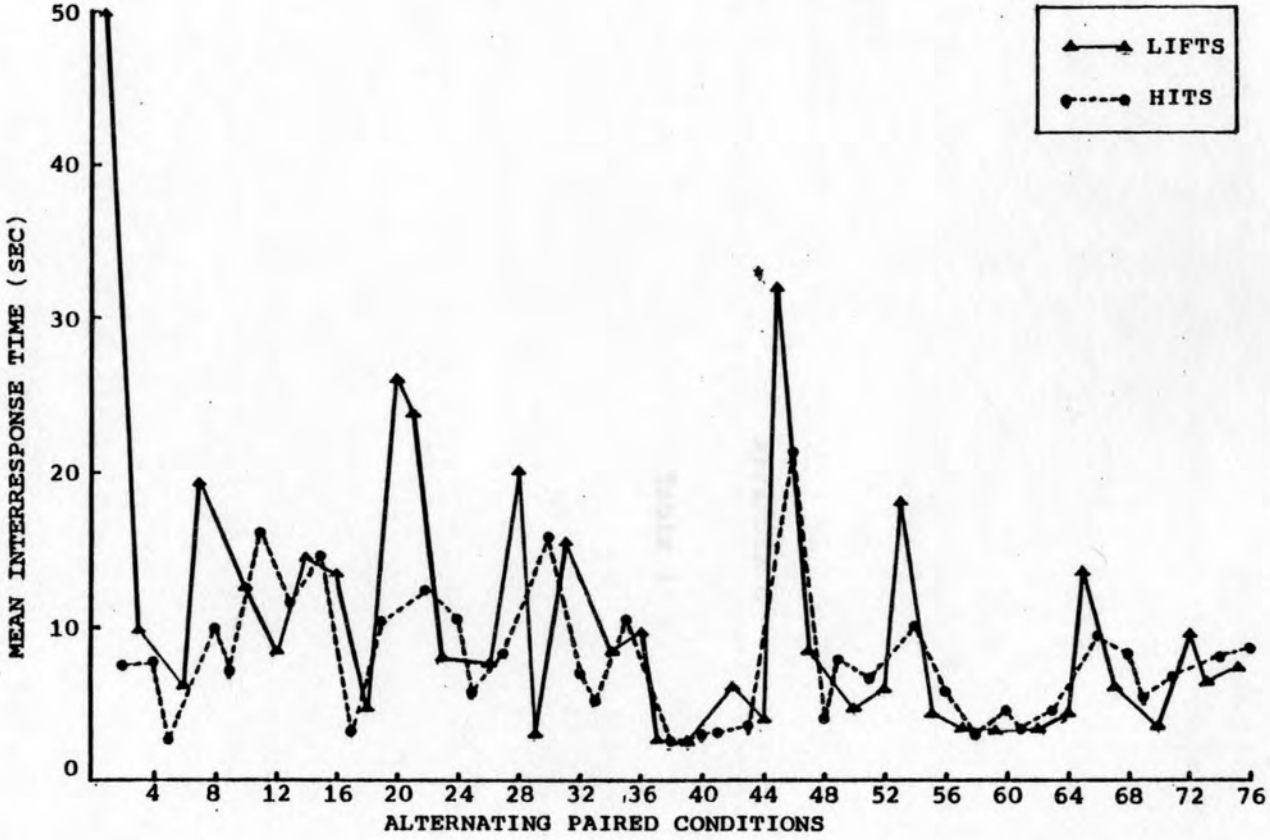


Figure 2. Mean interresponse times (seconds of nonemission) for each condition in an alternating treatments design.

*Protective pads were added in condition 45.

APPENDIX C

Table 1

Table 1

Collateral Behavior Distribution

Behaviors for Each Locus	Pre-response	Post-response
Slaps vs Hits	21	6
Shoulder to Chin	79	1
Hand Reaching	3	12
Withdrawal/Pull Away	9	96
Struggle	24	11
Reinforcement	38	4

APPENDIX D

Table 2

Table 2

Rate of Behavior per Condition for
Prepads versus Post Pads

	Prepads	Post Pads
Slaps vs Hits	1.00	0.36
Shoulder to Chin	3.60	0.00
Hand Reaching	0.50	0.07
Number of Raises that Would be Hits (Condition A)	1.18	2.78
Withdrawal/Pull Away (No. in Each Condition A/B)	A 0.41 B 4.05	A 00.0 B 0.50
Struggle (Arm Up and Down)	A 1.00 B 0.50	A 0.14 B 0.0
Reinforcement (A/B Condition)	A 1.36 B 0.09	A 0.57 B 0.14