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An Examination of the Functionality of Self-Monitoring under External Reactive Conditions

Richard Scott Montier
Western Michigan University

AN EXAMINATION OF THE FUNCTIONALITY OF SELF-MONITORING UNDER EXTERNAL REACTIVE CONDITIONS

by

Richard Scott Montier, M.A.

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Richard Scott Montier

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INTRODUCTION

Recently, self-monitoring (S-M) has been the focus of an increased number of inquiries that have been concerned either with its nature on a theoretical level and/or with its potential as a technique for inducing behavior change. As defined by Kazdin (1974), S-M is the observing of one's own behavior. Analyzing self-observation, Thoreson & Mahoney (1974) discerned three classes of behaviors. First, an individual must discriminate whether or not a particular response has been emitted. Second, the target behavior must be systematically recorded. Finally, the recorded data must be examined and evaluated by the individual.

As a therapeutic behavior change procedure, the success of S-M has been spotty. When behavior has been altered through the use of S-M, it is not clear that the result was not due to the subject's knowledge that his/her behavior was being assessed by an external agent (external reactive conditions). It should be noted that from a therapeutic viewpoint, it makes no difference whether the behavior change is properly attributed to S-M or external reactive conditions, either of which might alter behavior, since the objective is strictly to modify a client's response. However, from a theoretical standpoint it is certainly worth determining if S-M which in published literature has usually been initiated concurrently with external reactive conditions, plays a functional role in behavior change.

There have been a number of studies employing a S-M technology

in which no modification of behavior was noted. Many unsuccessful investigations have centered upon the reduction of cigarette smoking (Chapman, Smith & Layden, 1971; Axelrod, Weis & Rohrer, 1974) and weight reduction (Stollak, 1967; Hall, 1972; Mahoney, Moura & Wade, 1973). Other behaviors for which S-M failed to produce a change in response frequency or subjective ratings are obsessions (Mahoney, 1971) and depression (Jackson, 1972).

Self-monitoring has ostensibly been credited as the agent of behavior change in a number of experiments. Among those responses S-M has been reported to alter the frequency of are auditory hallucinations of a schizophrenic (Rutner & Bugle, 1969) smoking (McFall, 1970), eating-weight reduction (Stuart, 1971), attentive behavior (Broden, Hall & Mitts, 1971), talking out in class (Broden et al., 1971) and oral classroom participation (Gottman & McFall, 1972).

Kazdin (1974) has commented that self-monitoring is a reactive measurement procedure while assessment by an external agent may be either reactive or non-reactive. According to Kazdin, S-M may be conceptualized as two concurrent procedures: the subject both assesses his/her own behavior (as contrasted to assessment by an external observer) and engages in a reactive measurement because he/she is aware that he/she is assessing his/her own behavior. It may, therefore, be stated that S-M is inherently reactive while assessment conducted by an external agent need not be.

Kazdin (1974) has further observed that it is not yet clear on the basis of existing published research whether the behavior change achieved in successful S-M studies should be attributed to the var-

iance in the assessment agent (self or external) or the variance in reactivity. This state of affairs is the result of research which has been characterized by the comparison of unobtrusive measurements conducted by an external agent (baseline) to reactive observations (both self-reactive and externally reactive) made following the imposition of S-M contingencies.

The issue is further clouded by studies demonstrating that external reactive conditions may alter behavior. Surrat, Ulrich & Hawkins (1969) placed an elementary school student in a classroom as a behavioral engineer. The presence of the student and a control console resulted in a reduction of time spent working by the four students observed during baseline. Reid (1970) recorded parent-child interactions on video tape and analyzed them according to 33 criteria. The observers obtained 50% greater reliability when they were aware that reliability was to be calculated. Romancyck, Kent, Diament & O'Leary (1973) in an in vivo situation, expanded upon the findings reported by Reid (1970). During overt reliability assessment, observers were told that reliability was being performed by one of two people. In the covert condition, it was not known to the observers that reliability was being assessed. During overt checks, greater reliability was achieved with the identified observer than with the unidentified one. Lower reliability scores were obtained during the covert assessment.

The following analyses of successful S-M studies illustrate the spurious comparison of an S-M condition imposed by an external observer to an unobtrusive baseline or pre-baseline period. Rutner &

Bugle (1969) subjected a hospitalized patient to a self-monitoring procedure requiring the recording of hallucinations. Since it was a private event, observation by an external observer was not possible before the advent of the S-M condition and then only indirectly so through the client's data. The S-M procedure was suggested by the authors and data were turned over to them; thus the S-M period was externally reactive and was compared to a non-reactive pre-baseline condition. McFall (1970) requested that students record the smoking frequency of classmates, an unobtrusive observation since the smokers were unaware that they were being watched. It was then announced that certain rows of students were to monitor the number of times they smoked during the class period and others were to record the number of times they considered smoking in class but did not. Data were collected at the termination of the S-M period. The baseline period was unobtrusive and externally non-reactive. However, the S-M condition was made externally reactive by the professor requesting the recording of smoking or "considered smoking" behavior. Behavior was altered by the S-M condition. Overweight married female volunteers were asked by Stuart (1971) to monitor their weight and food intake for five weeks. The two groups of subjects (weight vs. food intake) each lost weight during this period. Conditions prior to the study were not externally reactive. By requesting the women to record data and collecting them, Stuart imposed external reactive contingencies. Two children in a class were unobtrusively monitored by Broden et al. (1971). The attentive behavior of one child and the talking out behavior of a second child were the two responses recorded.

When S-M was imposed, the frequencies of the two responses were altered. Although the change was attributed to S-M, the controlling variable, external reactive arrangements or S-M, was not isolated. Gottman & McFall (1972) placed an observer in a classroom before the start of baseline and announced that the O was to aid the teacher. During S-M, students received index cards with their names typed at the top, and were asked to return them at the end of the period. One group of students individually checked the card each time they made a comment in class. The second group recorded instances they wished they had participated in class but did not. The two groups later reversed conditions. The frequency of class participation increased above baseline levels each time a group self-monitored it.

Nailbiting is a convenient response with which to investigate the relationship of external reactivity and S-M due to several factors. First, it is an easily recognized response so that subjects need not be given training on this aspect. It is also a common response among college students. According to a survey conducted by Coleman & McCalley (1948), 29.3% of the males and 19.3% of the females attending college bite their fingernails. Finally, subject reports of S-M may be corraborated with quantifiable data through the measurement of nail length.

Previous investigators who have applied behavioral methodologies to the problem of nailbiting have commented upon the relationship between their results and therapist effects (i.e., reactivity and demand characteristics). Bucher (1968) studied the effect of a pocket-portable shock device upon nailbiting. Twenty subjects were

divided into six groups that received different instructions. Of great importance were the results obtained from three control groups. One group consequated nailbiting on one hand through the use of contingent shock and on the other hand by note taking. A second group consequated nailbiting and nail picking in different manners. The final control involved the withdrawal of shock before complete suppression of the nailbiting response occured. Following the discontinuation of the shock, the subject was required to note instances in which shock would have been needed. In the case of the first control, suppression occured at about the same rate on both hands for three of the four subjects. Nailbiting was less resistant to suppression than nail picking in the second control group. In the final control, nailbiting increased following the termination of the shock. The obtained results did not allow the author to rule out the therapist as a causative factor for the resultant behavior change. In terms of the present investigation, external reactive conditions were not separated from the various self-control procedures utilized.

Stephan & Koenig (1970) employed a contingency contract procedure which involved the threatened loss of money. Three treatment groups were placed under different contingencies which all included receiving money back after passing bi-weekly inspections of nail length. A control group was informed that all money would be returned regardless of the inspection results. The nail length in all groups increased with no significant differences between groups. The authors remarked that the factors which caused the behavior change were not

those varied within the study. For present purposes, the results are consistent with the data obtained from external reactivity studies which demonstrate that awareness of assessment by an external agent may lead to behavior change.

In a study highly similar to the present one, McNamara (1972) investigated the effects of different S-M procedures on nailbiting. Due to the inclusion of a group that self-monitored in the manner employed by the present study as well as having their nail length regularly measured, a statement on reactivity is possible. Since a two-factor repeated measure analysis of variance suggested no significant differences between groups but a treatment effect over time, results were consistent with the hypothesis that behavior change was caused by external reactive conditions. An important corollary of these results was that no self-observation effect was evident.

The present study utilized three groups: a non-reactive non-S-M group, an externally reactive non-S-M group, and an externally reactive S-M group. Each group was divided into low, medium and high frequency nail destroyers. An unweighted means analysis of variance was performed to determine possible differences between groups, and a correlated t-test was used to examine within group treatment effects over time. In short, the study sought to investigate in a systematic manner 1) the effect of experimentally induced external reactivity upon nail destruction behavior 2) the possible effect of self-observation beyond that produced by external reactivity.

METHOD

Subjects

The services of 23 persons were successfully solicited through a campaign that included announcements in all sections of a large undergraduate psychology course (see Appendix A) and an advertisement in the student newspaper. Eighteen of the 23 recruits attended the first measurement session and were subjects for the duration of the study. Seventeen of the subjects participated with the understanding that they were to earn bonus points for their psychology class. The remaining subject rendered her services solely on the basis of the newspaper advertisement. Ten of the eighteen subjects were males and eight were females; all were undergraduate students at Western Michigan University. The two criterion specified for participation in the study were 1) the person bite his/ her fingernails 2) the person be available for measurement between the hours of 6 and 7 P.M.

Apparatus

Metric vernier calipers were utilized to measure the fingernail lengths of all subjects. The calipers were accurate to tenths of a millimeter. Common plastic golf scorers were supplied to those subjects who were required to self-monitor.

Procedure

Obtaining the subjects. Subjects volunteered either in response to a class announcement or a newspaper advertisement. Volunteers were required to complete a questionnaire pertaining to their nail destroying behavior (see Appendix B). Volunteers in the psychology

class were handed the sheet and asked to return it at the end of the class period. Data from those people responding to the newspaper advertisement were obtained orally during a telephone interview. Included in the questionnaire were a pair of questions which asked the individual to estimate how often he/she bit and picked his/her fingernails on a daily basis. Additional items inquired about which fingernails the subject bit and how embarrassed, according to a five point scale, the subject was about his/her fingernail biting.

Obtaining the recorders. Two sets of recorders were used. One was responsible for intervening measurement sessions and the other for pre-post-measurement sessions. Those who measured subject nail lengths during the intervening sessions were volunteers from the same psychology course as the subjects. They also received bonus points contingent upon their participation. The second group of recorders were student volunteers from different university departments.

All recorders received individual lessons on how to properly measure with and read a vernier caliper. The task was considered mastered when a recorder correctly read four successive measurents set by the experimenter. A response was correct if it was within one tenth of a millimeter of what the experimenter perceived the figure to be.

Assigning subjects to treatment groups. On the basis of subject estimates as to how often they picked at and bit their fingernails daily, each person was classified as a low, medium, or high nail destroyer. Estimates on the frequencies of nail biting and picking were added to obtain a total frequency labeled nail destroying

frequency. The eight volunteers with the highest nail destroying frequencies were classified as high frequency nail destroyers. The persons owning the next nine highest nail destroying frequencies were assigned to a medium frequency group. The seven remaining volunteers were designated as low frequency nail destroyers. All persons in each frequency classification were then rar .nly and independently assigned to one of three experimental treatment groups. The quota allowed for the reactive non-self-monitoring group was greater than the other two treatment groups since a pilot study had suggested that subject mortality was more likely to be a problem in that group than the others.

The experimental treatment groups. Members of the non-reactive group had their fingernail lengths measured once at the start of the three week study and once at the termination. During the initial session, these subjects were read and given a statement informing them that they were potential substitutes who would be called should someone drop out of the study and that their bonus points were not in jeopardy due to their status (see Appendix C). Conditions imposed upon this group were considered non-reactive since members were unaware that their nail destroying behavior was to be assessed. Several days before the termination of the study, these subjects were sent a letter requesting that they make a second visit to have their nail lengths measured a final time.

During the first measurement session, members of the reactive non-self-monitoring group were handed and read a statement (see Appendix D) that 1) their bonus points were contingent upon having

their nails measured twice a week on Mondays and Wednesdays 2) on these days, they would receive feedback sheets which would describe in millimeters lost or gained any change in their total nail length between the two previous visits (see Appendix E). The condition constituted an external reactive arrangement since the subjects were made aware that their nail destroying was being assessed by an external observer.

As was the case with the two previously described treatment groups, the subjects in the reactive self-monitoring group were read and given a statement (see Appendix F) during the initial measurement session. The subjects were informed that 1) in order to receive their bonus points, it would be necessary for them to have their fingernails measured twice a week on Mondays and Wednesdays 2) on the two designated days they would receive feedback sheets which would describe in millimeters lost or gained, any change in their total nail lengths between the two previous visits 3) they were to hand in self-monitoring data sheets (see Appendix G) at least three days a week such that information on the frequency of their self-monitored nail destroying would be obtained for all seven days of the week 4) they were to record each single nail destroying response. Nailbiting was defined as bringing the fingernail into contact with the teeth. The operational definition of nail picking was described as picking or filing a fingernail with another fingernail or object. All subjects within this treatment group were given plastic golf scorers with which to self-monitor.

Pre-post-measurement sessions. During the first and final

measurement sessions, each subject's fingernails were independently measured by two recorders. The length of each fingernail, from where the cuticle met the skin to the centermost portion of the top of the nail, was added to obtain a total nail length for each subject.

Three recorders were stationed in different sections of a classroom. All subjects were informed that it was necessary to be measured by any two recorders of their own choosing. The recorders were not aware of treatment group assignments. After having their nail lengths measured twice, the subjects were individually read the statements pertaining to their treatment group assignments. The experimenter read the statement to all subjects in the reactive non-self-monitoring group and half of the volunteers in the non-reactive group. One of the intervening session recorders read the statements to members of the reactive self-monitoring group and the remainder of the non-reactive group. During the final session, all subjects received a notice explaining the aims of the study.

Intervening measurement sessions. The intervening measurement sessions were the bi-weekly fingernail examinations between the first and final measurement sessions. During the intervening sessions, each subject's total nail length was measured by only one recorder. These recorders were not the same as the original three and were aware that everyone they measured belonged to the same treatment group i.e., each treatment group had its own set of recorders for these sessions. Within each treatment group, the Monday recorder and Wednesday recorder were not the same person. No attempt was made to calculate reliability on these measures. Also, the two reactive

groups were assigned to rooms on different floors. The primary purpose of the intervening measurement sessions was to impose external reactive arrangements upon the subjects. Feedback scores were calculated on the basis of these measurements. There were five intervening measurement sessions.

Reliability

Reliability scores were based upon the results of the first and final measurement sessions only. Scores were calculated for all three pairwise comparisons possible between three observers. First, it was determined which subjects were measured by the same recorders, then the total nail lengths as measured by each recorder were added for the subjects in common. A percentage was obtained by dividing the lower sum measured between a pair of recorders by the higher one.

Experimental Design

The present study was of a group design. The three experimental treatment groups constituted one factor and a second factor was composed of the three frequency classifications of nail destroying behavior. Due to the disproportionality among the nine cells, an unweighted means analysis of variance was resorted to in order to determine possible differential treatment effects. The unweighted means analysis was based upon pre and post-experimental measures of nail length. During both the first and final measurement sessions a mean total nail length score was derived for each subject. It was achieved by averaging the total nail length scores as independently measured by two recorders. Thus, although each subject was measured twice at both the initial and final measurement sessions, a

single score was derived for each session. The change between the pre-treatment and post-treatment measures of mean total nail length for each subject was the figure tested for significance.

In addition, three correlated *t*-tests were calculated to determine possible treatment effects over time for each condition. Pre-experimental and post-experimental nail length scores were compared in each treatment group.

In summary, two separate hypotheses concerning treatment effects were tested. An unweighted means analysis of variance was used to examine possible significant differences between treatment groups. Within group treatment effects over time were examined by the use of a correlated *t*-test for each treatment group.

RESULTS

An unweighted means analysis of variance was utilized to detect possible significant changes in pre and post-experimental measurements of nail length across both treatment and frequency factors. The results of the analysis are presented in Table 1. No significant differences were found for either treatment effects across groups ($p=.69$) or frequency classifications ($p=.70$). An interaction between the two factors did not reach significance ($p=.80$).

The mean changes in nail length for all three levels of each factor are presented in Table 2. The mean changes in nail length for the non-reactive control group, the reactive non-S-M group and reactive self-monitoring group were .98mm, 4.86mm and 7.4mm, respectively. The mean changes in nail length obtained for the three frequency classifications, low, medium and high frequency nail biters, were 3.02mm, 2.94mm and 7.19mm. Excluding the control group scores, the mean changes in nail length for the three frequency classifications were 2.15mm, 6.16mm and 7.98mm.

Table 3 presents three separate correlated *t*-tests calculated to determine if there existed a treatment effect over time i.e., a significant difference between pre and post-experimental measurements for any of the three treatment groups. An acceptable level of significance was obtained for the reactive non-S-M group only ($p=.003$). Changes in the control group ($p=.67$) and the S-M group ($p=.24$) proved insignificant.

Tables 4 and 5 present the results of a pair of one way anal-

TABLE 1

Unweighted Means Analysis of Variance on
Treatment and Frequency Classification Effects

SOURCE	DF	SS	MS	F	PROB
Treatment Groups	2.00	56.05	28.03	0.39	0.692
Frequency Classifications	2.00	53.87	26.94	0.37	0.701
Treatment Groups by Frequency Classifications	4.00	113.64	28.41	0.39	0.809
Within	8.00	580.02	72.53		
Total	16.00	843.96			

TABLE 2

Treatment Group and Frequency Classification Sizes,
Mean Changes in Nail Length and Standard Deviations

			Frequency Classification		
	Level	- - - - - - -	Low	Med.	High
		Mean - - -	3.02 (mm)	2.94	7.19
		Size	2.00	2.00	1.00
	Control	0.98 Mean	4.33 (mm)	-3.50	3.25
		St Dev	2.86	3.25	0.00
Treatment		Size	2.00	2.00	3.00
Group	Reactive	4.86 Mean	3.13	5.23	5.77
	Non-S-M	St Dev	1.87	1.94	4.55
		Size	1.00	2.00	2.00
	Reactive	7.40 Mean	0.20	7.10	11.30
	S-M	St Dev	0.00	5.94	21.85

TABLE 3

Correlated t-tests for the Three Treatment Groups to Determine Experimental Effects Over Time

Var vs. Var	t-value	df	Prob.
NON-REACTIVE NON-S-M CONTROL GROUP			
Pre-exper vs. Post-exper	-0.453	4	0.674
REACTIVE NON-S-M GROUP			
Pre-exper vs. Post-exper	-4.73	6	0.003
REACTIVE S-M GROUP			
Pre-exper vs. Post-exper	-1.357	4	0.246

TABLE 4

One Way Analysis of Variance on Mean Number of Fingernails Bitten per Subject in All Three Experimental Groups

SOURCE	DF	SS	MS	F	PROB
Between	2.00	3.025	1.512	0.69	0.520
Within	14.00	30.857	2.204		
Total	16.00	33.882			

TABLE 5

One Way Analysis of Variance on Subject Ratings of Embarrassment of Nailbiting in All Three Experimental Groups

SOURCE	DF	SS	MS	F	PROB
Between	2.00	0.907	0.453	0.40	0.677
Within	14.00	15.857	1.132		
Total	16.00	16.764			

ysis of variance tests completed to insure that there were no significant differences in the mean number of fingernails bitten per subject between the three treatment groups and that there were no significant differences on the five point scale individual ratings of embarrassment of nail biting between the three groups. The group differences on both the mean number of fingernails bitten ($p=.52$) and embarrassment ratings ($p=.67$) were found to be insignificant.

In addition, a Bartlett's Test was performed to determine the homogeneity of variance among the changes in total nail length obtained for the three treatment groups. The grouped scores were revealed to be heterogeneous ($X^2=8.793$, $df=2$, $p=.02$). The variances for the non-reactive control group, the reactive non-S-M group and reactive S-M group were 21.61, 9.58 and 148.78, respectively.

Figures 1-6 illustrate the daily frequency of self-monitored nail destroying responses as recorded by the six subjects in the reactive self-monitoring treatment group. Also presented is the self-monitoring data of the single subject who clipped his nails

during the course of the study and whose nail length measurements were not included in any statistical analyses. Figures 1-4 clearly demonstrate a decrease in the frequency of self-monitored nail destroying responses. However, the records of Subjects 5 and 6 in in the self-monitoring group indicate that the frequency of self-monitored nail destroying responses increased as a function of time.

The change in nail length between the pre and post-treatment measurements for all subjects is presented in Table 6. An increase in nail length between the two measurements did not always correlate in a positive manner with a decrease in the frequency of self-monitored nail destroying responses. The subjects whose records are illustrated in Figures 1 and 2 are similar in that their nail length increased between pre and post-experimental measurements while the frequency of their self-monitored nail destroying responses decreased. Subjects 3 and 4 in the self-monitoring group demonstrated a decrease in the frequency of self-monitored nail destroying responses but a decrease in nail length between the two measurements. In regard to Subject 3, it was necessary to drop his measurements from the final results. It was discovered that he had clipped all ten fingernails during the course of the study because he felt that they were too long. Subjects 5 and 6 in the S-M group showed an increase in nail length over the term of the study as well as an increase in the frequency of daily self-monitored nail destroying responses.

Reliability between the measurements of Recorders A and B during the pre and post-experimental sessions was found to be 94.4%

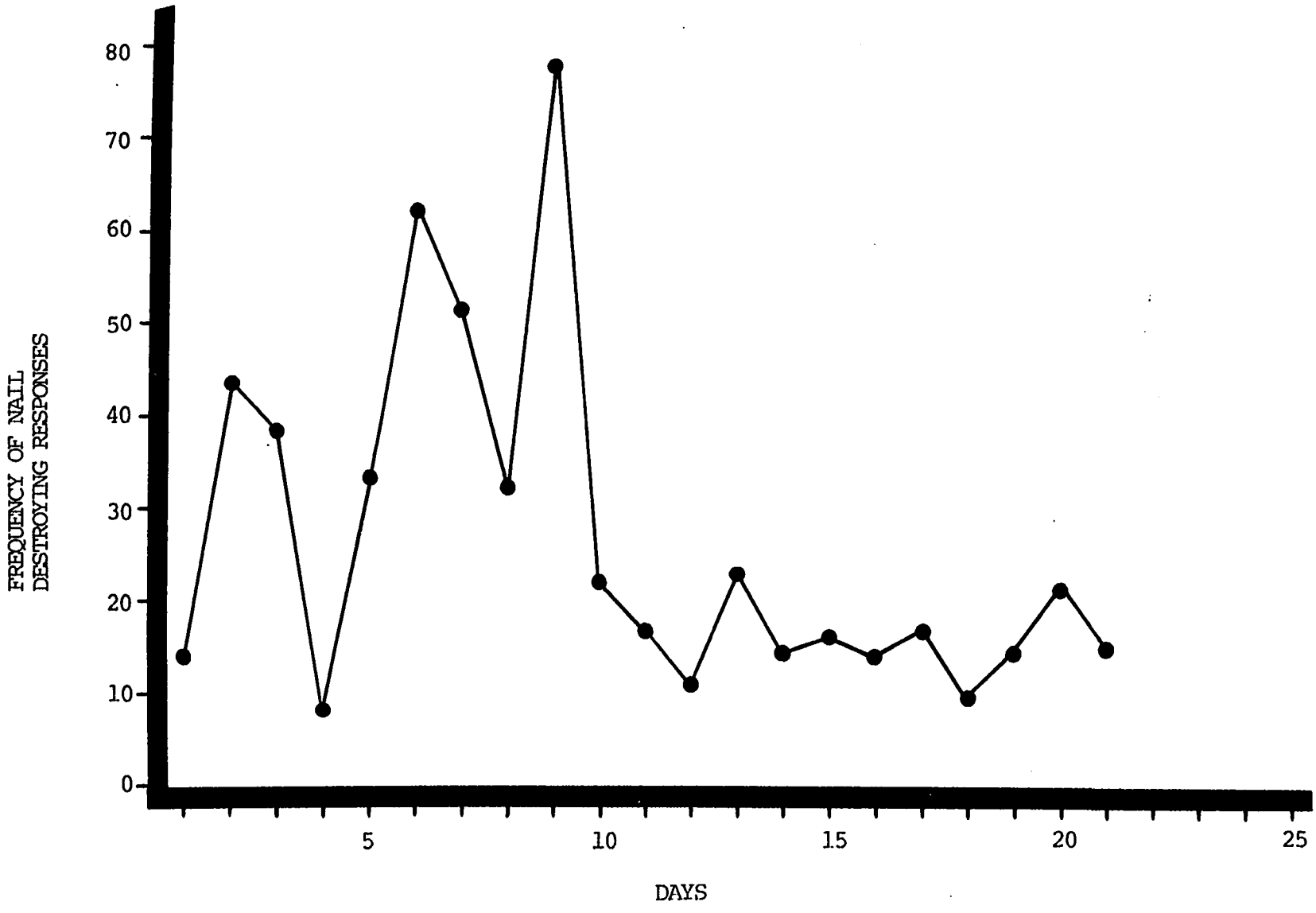

Fig. 1. Daily frequency of self-monitored nail destroying responses recorded by Subject 1 of the S-M treatment group.

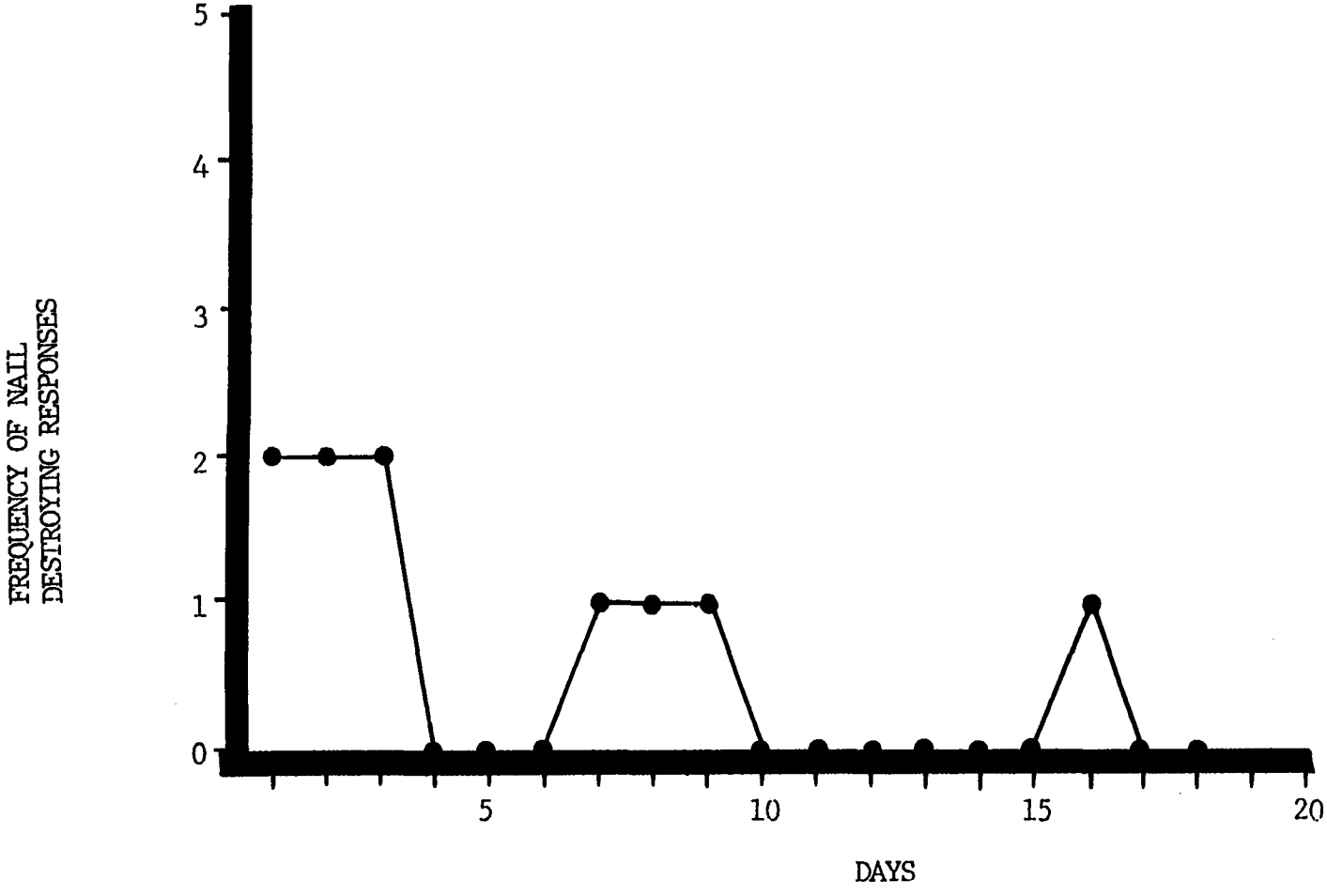

Fig. 2 Daily frequency of self-monitored nail destroying responses recorded by Subject 2 of the S-M treatment group.

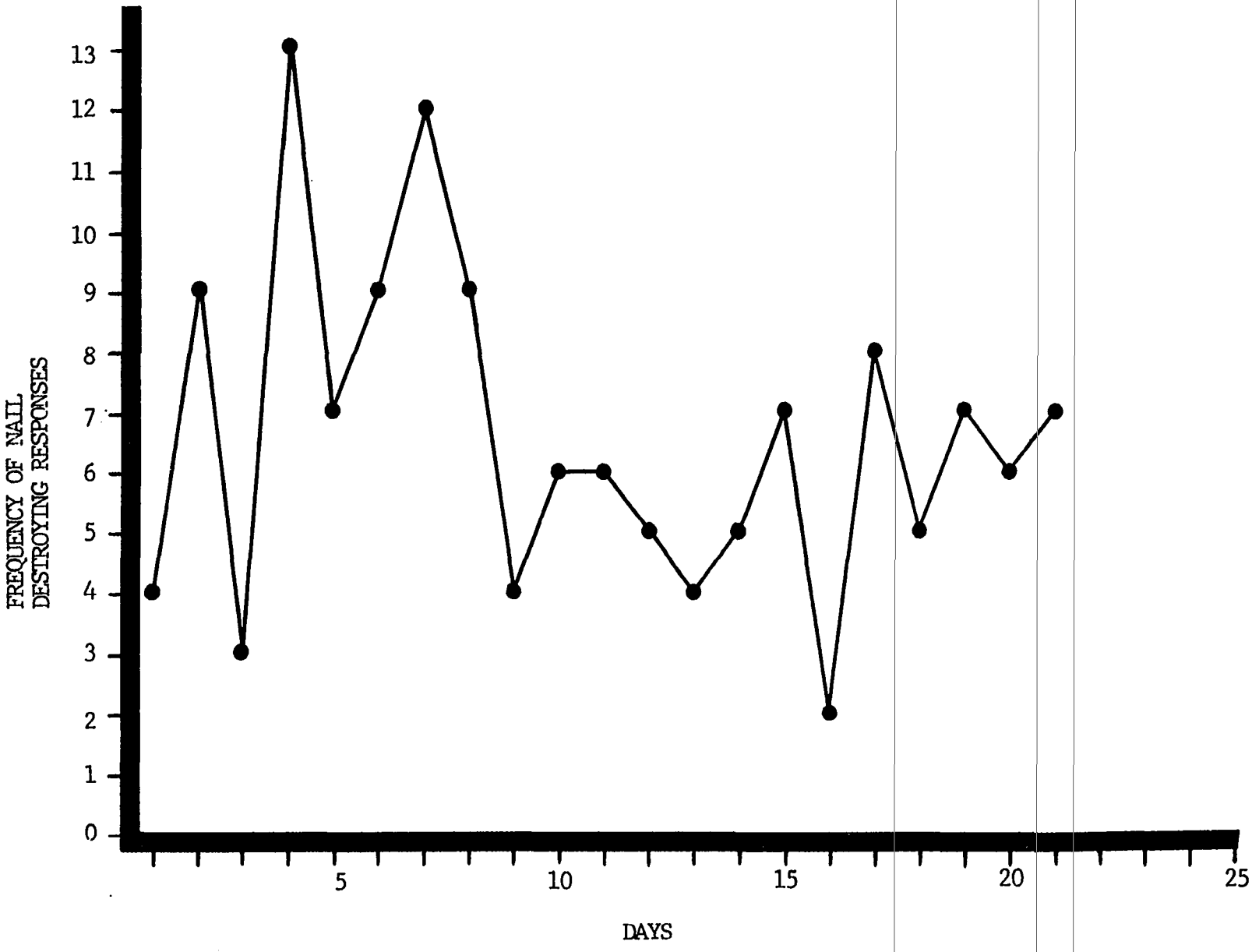

Fig. 3. Daily frequency of self-monitored nail destroying responses recorded by Subject 3 of the S-M treatment group.

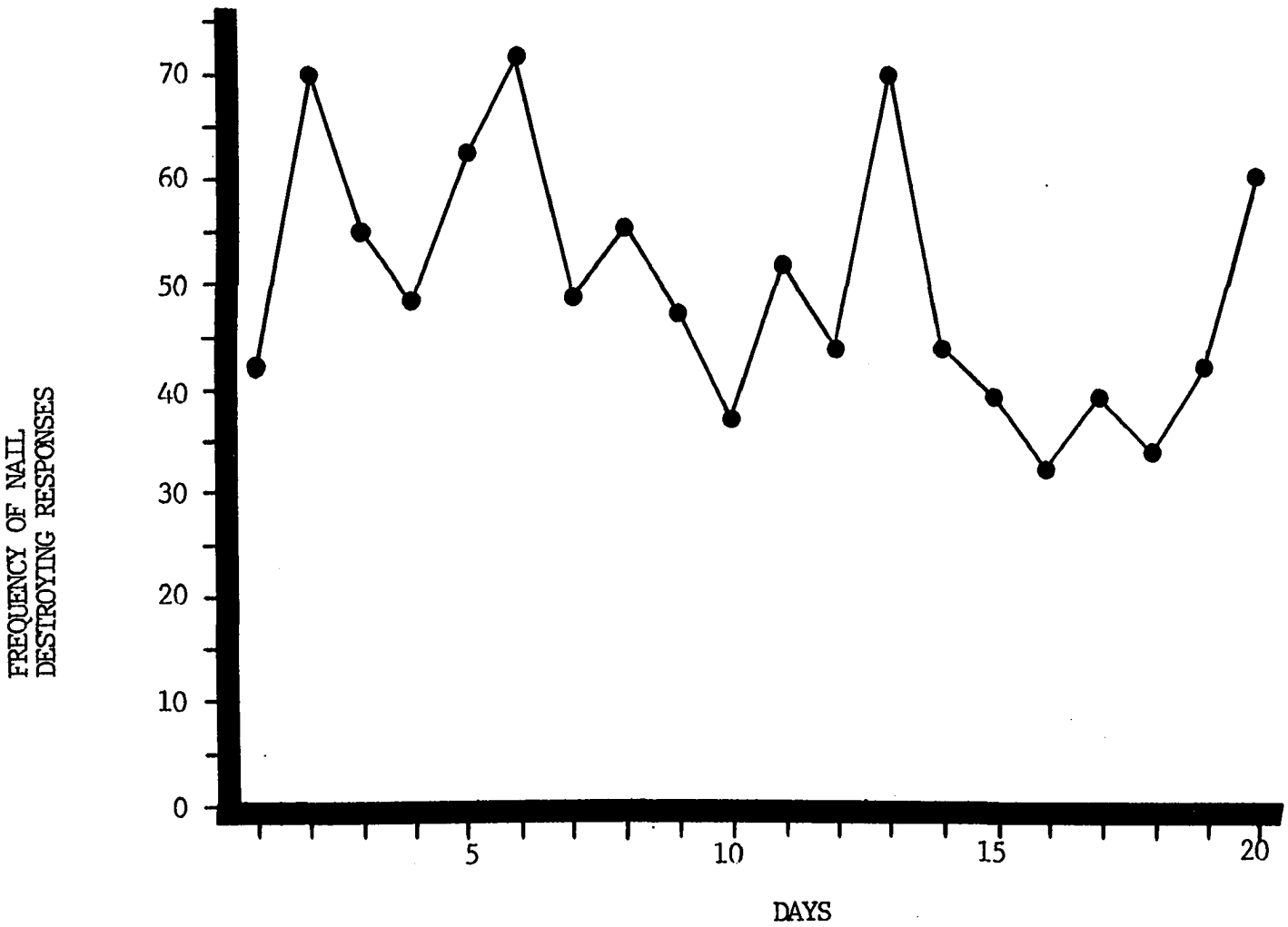

Fig. 4. Daily frequency of self-monitored nail destroying responses recorded by Subject 4 of the S-M treatment group.

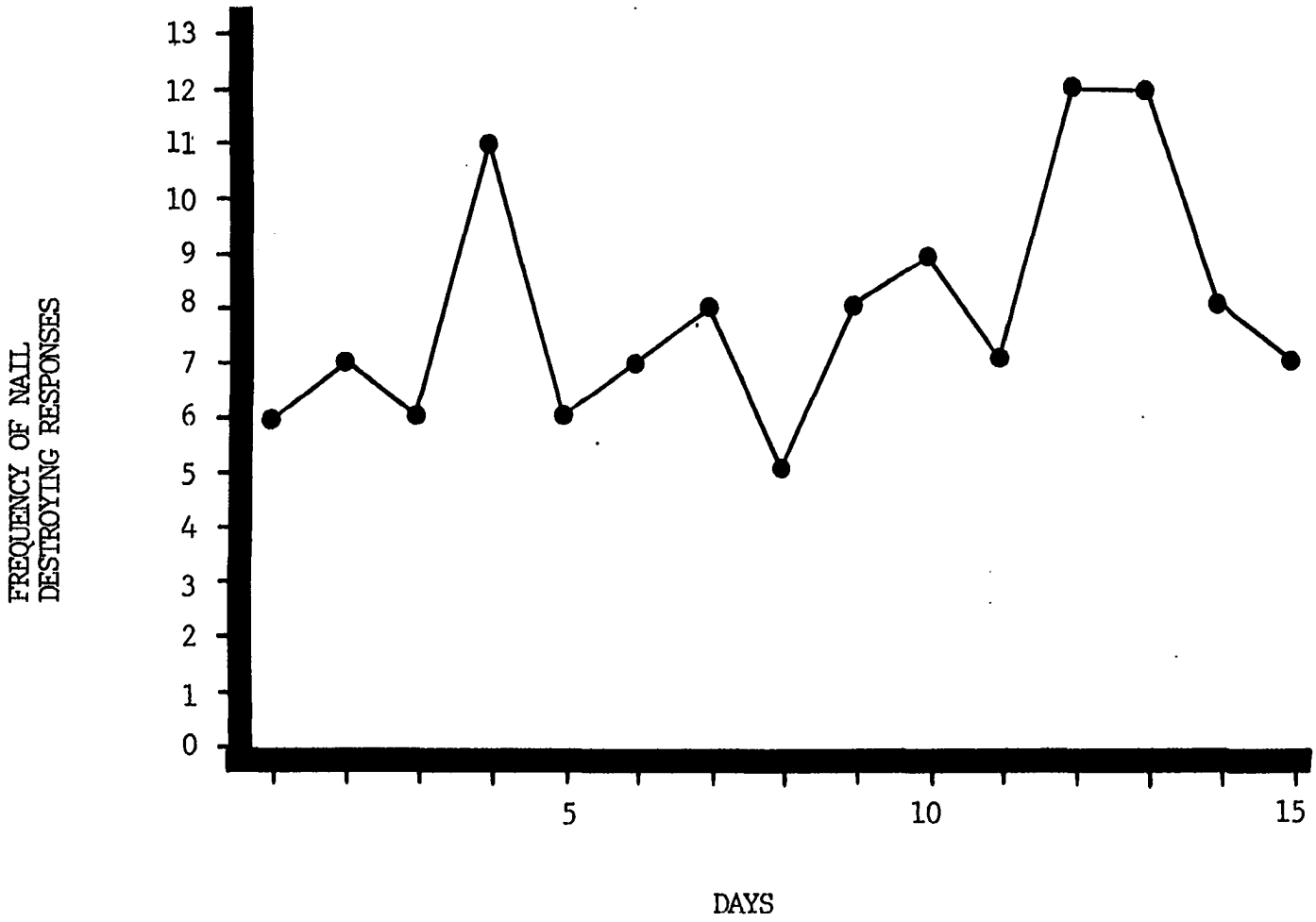

Fig. 5. Daily frequency of self-monitored nail destroying responses recorded by Subject 5 of the S-M treatment group.

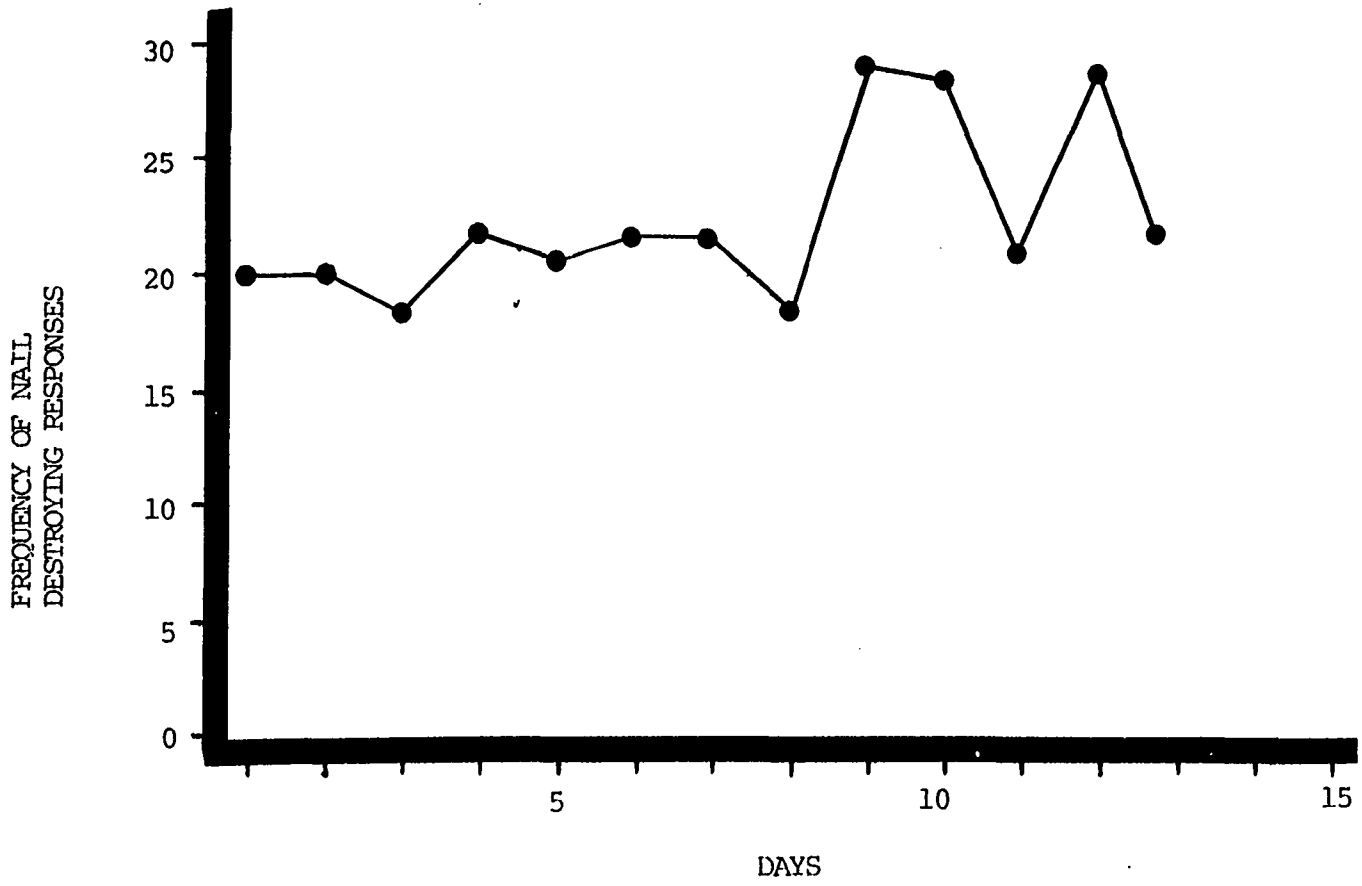

Fig. 6. Daily frequency of self-monitored nail destroying responses recorded by Subject 6 of the S-M treatment group.

TABLE 6

Nail Length Changes of All Individual Subjects Across Treatment Groups and Frequency Classifications

		Frequency Classifications		
		low	medium	high
Treatment Group	non-reactive control	6.35mm 2.30mm	-5.80mm -1.20mm	3.25mm
	reactive non-self monitoring	1.80mm 4.45mm	6.60mm 3.85mm	6.35mm 10.00mm 0.95mm
	reactive self-monitoring	0.2mm (S2)	11.30mm (S1) 2.90mm (S6)	-4.15mm (S4) 26.75mm (S5)

Recorders A and C had a reliability count of 97.0%. 98.8% represented the degree of reliability between the measurements of Recorders B and C.

DISCUSSION

In an evaluative review of S-M literature, Kazdin (1974) reached a series of tentative conclusions. The results of the present study are ostensibly related to two of his assertions 1) S-M does not always produce behavior change 2) it is not clear that self-monitoring leads to any behavior change beyond that managed through reactive assessment by an external agent.

The experimental design of the study permitted the use of two methods of analysis to determine an external reactivity effect. Although each method tested for a similar effect, the hypotheses were different. The unweighted means analysis of variance measured treatment effects between groups, i.e. it compared the mean change in nail length of the externally reactive group to the control and reactive S-M groups as well as comparing the latter two groups to eachother. The correlated t-tests measured a within group change over time for each of the three groups. In the case of the externally reactive treatment group, the pre-experimental scores for each subject were compared to the post-experimental scores. Thus, although different hypotheses were tested, one comparing treatment effects across groups and the other determining a within group treatment effect over time, evidence of an external reactivity treatment effect could be obtained in two ways. However, an S-M effect could be determined only by calculating the unweighted means analysis of variance for treatment effects across groups and if the null hypothesis was rejected, then comparing the externally reactive non-S-M treatment

group to the S-M group using a pairwise comparison procedure. The correlated t-test on the S-M group would not allow the experimenter to determine if any change over time was due to the S-M alone since external reactive conditions were simultaneously imposed upon this group.

For the most part, statistical analysis suggested little experimental effect of any kind. An unweighted means analysis of variance yielded an insignificant difference in the comparative effects produced by the three experimental conditions. The correlated t-tests on both the control and S-M groups indicated no significant changes between pre and post-treatment measures for each group. Only the correlated t-test on the reactive non-S-M group proved significant. The last result is consistent with previously cited studies which demonstrated that external reactive conditions may change behavior (Surratt et al., 1969; Reid, 1970; Romanczyk et al., 1973). The points wished to be made thus far are that statistically S-M failed to produce an alteration in nail destroying behavior of the subjects in that particular treatment group and external reactive assessment produced behavior change in the reactive non-S-M treatment only despite the fact that the S-M group was exposed to what were assumed to be the same external reactive conditions.

Interestingly, despite the inability of the unweighted means analysis of variance to detect any significant differences between treatment effects, an inspection of Table 2 shows a hierarchial arrangement of the three treatment group mean changes in nail length. The stratification suggests an external reactivity effect in the case

of the reactive non-S-M group and a supplementary S-M effect in the reactive S-M group.

In regard to the lack of significant differences between the stratified scores, it is possible that a greater number of subjects in the study would have helped obviate the problem as the power of statistical tests increases as a positive function of number of subjects. In short, the inclusion of more subjects may have produced statistically significant differences where none were found in the present study.

As to the question of why there was such a great variance in the change in nail length scores for the reactive S-M group, a pair of hypotheses proved fruitless. Since the number of fingernails bitten or picked by each subject would affect the degree of overall change in nail length, a one way analysis of variance was completed to determine if there was a difference in the number of fingernails destroyed by the subjects in each treatment group. The results proved insignificant. In addition, subjective ratings of embarrassment of nailbiting along a five point scale comparing the subjects in the three treatment groups were put to a one way analysis of variance test. Results indicated no significant differences.

No hard evidence exists to explain the great variance and lack of significance of the scores in the third treatment group. One would have expected that at the very least the scores would be similar to the reactive non-S-M group since the two groups were exposed to external reactive conditions which have been shown to produce behavior change. A possible explanation lies in the expectations of the subjects in the

S-M group with regard to what effect the treatment was "supposed" to have. Orne (1969) has devised a preinquiry technique as a means of determining the possible effect of demand characteristics of which subject expectations are a type. In the preinquiry procedure, a group of subjects are required to predict the results of the experiment without actually being exposed to the conditions. These results are then compared to the measures obtained from the subjects who were exposed to the experimental procedure. Demand characteristics can be ruled out as a factor only when preinquiry and actual measures differ. Since a preinquiry technique was not utilized in the present study, it is not possible to rule out demand characteristics as an explanation for the variance in scores in the reactive S-M group. It is possible that the subjects in this group may have had varied expectations of an experimental effect.

Also, in regard to the lack of a significant S-M effect, it should be noted that a number of studies in which it was decided that S-M was successful have been of a non-statistical individual organism design (Rutner & Bugle, 1969; Broden et al., 1971; Stuart, 1971). However, as Bandura (1969) has elucidated, it may be asked at what point is the behavior change produced by different treatments dramatic enough to be considered significant? It is suggested that an overall evaluation of S-M research may be flawed by the use of different yardsticks to measure behavior change.

An additional result which bears discussion is the apparent lack of a hierarchy in the mean changes in nail length for the three frequency classifications (see Table 2). The original hypothesis had

been that the low frequency group would register the least change and the high frequency group the greatest with the middle group falling in between. The rationale had been that a cellar effect would prevent low frequency nail destroyers from reducing the frequency of their nail destroying responses to any great extent in absolute terms. It is believed that a truer measurement is obtained by excluding the control group members since these subjects were not exposed to experimental conditions which would change behavior. Such a tactic results in the expected hierarchy.

Kazdin (1974) has suggested that while reliability of S-M data is important when S-M is used as an assessment technique, such is not necessarily the case when S-M is used as a behavior change procedure. In the present study, it was expected that if the subjects self-monitored their nail destroying responses with a high degree of reliability, a decrease in self-monitored nail destroying responses would be associated with an increase in nail length and vice versa. The S-M data obtained from only two of the five subjects was consistent with the above expectations. It is interesting to note that the subject in the S-M group who showed the greatest positive change in nail length collected S-M data which indicated an increase in nail destroying behavior and the only S-M subject whose overall nail length decreased turned in S-M data which showed a decrease in nail destroying responses. The general lack of reliability of S-M data is consistent with a series of studies investigating the use of S-M with a number of different responses including verbal reports of preschool activities (Risley &

Hart, 1968), attentive behavior and talking out (Broden et al., 1971), vocal tics (Thomas, Abrams & Johnson, 1971), cleanliness (Fixsen, Phillips & Wolf, 1972) and contingent attention (Herbert & Baer, 1972). Kazdin (1974) has noted that the direction of distortion of S-M data appears to be towards underestimating socially undesired behaviors (Thomas et al., 1971; Bolstad & Johnson, 1972) and overestimating the performance of socially desired responses (Risely & Hart, 1968; Fixsen et al., 1972). Unfortunately the gross check of S-M reliability used in the present study does not allow a statement concerning Kazdin's (1974) observation.

In summary, statistical analyses did not support the hypothesis that S-M made a contribution to behavior change beyond that produced by external reactive conditions. To some extent, however, a S-M effect was suggested by the hierarchial arrangement of mean change scores in nail length for the three treatment groups. Previous claims that external reactive conditions may alter behavior were partly substantiated as one of two null hypotheses related to such an effect was rejected.

Because of its potential usefulness as a behavior change procedure in a therapeutic sense, further research in the area of S-M is clearly warranted. Future researchers should find it worth their efforts to isolate new variables. It is only recently that experimenters have become aware and attempted to correct the condition in which S-M effects have been confused and confounded by external reactive arrangements or experimenter instructions. Use of a preinquiry technique may allow demand characteristics to be

ruled out as the agents of behavior change in S-M studies.

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APPENDIX A

Statement read to all sections of
the undergraduate psychology course

TA's: Please read this notice to your class.

Bonus points will be given to anyone participating in a short-term study which will start at the end of January or beginning of February. Participants may serve as either subjects or recorders dependent upon the following qualifications.

Subjects must bite their fingernails and be available for 5-10 minutes Mondays and Wednesdays between the hours of 6PM and 7PM. In addition, subjects should fill out the questionnaire obtained from the TA and return it to him (her).

Recorders must be available for one hour on Mondays and Wednesdays between 6PM and 7PM. Although this may seem like a great deal of time, it is unlikely that a recorder will have to stay the entire hour on all occaissions and this is a short-term study. Volunteers for data recording should complete the top portion of the questionnaire obtained from the TA and return it to him (her).

Once again, bonus points will be given to anyone participating in this short-term study.

APPENDIX B

The questionnaire administered to all volunteers

Name

Address

Tel. #

I am taking the following Psychology courses this semester--list below (If you wish bonus points, this question ought to be answered.)

I would like to be a data recorder and will be available Mondays and Wednesdays between 6PM and 7PM.

Yes___ No___

If you are volunteering to be a data recorder, you need not fill out the following questions. However, please read the statements at the bottom of the page.

I bite my fingernails and would like to be a subject. I will be available for 5-10 minutes on Mondays and Wednesdays between 6PM and 7PM.

Yes___(Please complete the questionnaire.) No___

---

1) How long have you been biting your fingernails? ___years
2) How many times per day do you bite your fingernails? ___(estimate)
3) Have you ever attempted to quit? ___ How often? ___
4) How often do you cut or trim your nails? ___/year
5) Do you pick at your nails with other fingernails? ___
   How many times per day do you do so? ___(estimate)
6) When are you most likely to bite your nails? (studying, etc.)
   (list three conditions)

7) How embarrassed are you about your nail biting behavior?

1	2	3	4	5
very embarrassed		neutral		not the least bit disturbed

8) Do you bite all ten fingernails? ___ How many?___

(circle the fingernails that you bite)

If you received this questionnaire from your Psy 150 TA, please return it to that individual.

If this questionnaire was taken from the folder outside Rm 281 WH, please place it back in the folder behind the remaining stack.

Participants will be chosen on the basis of this questionnaire. If you are selected as either a subject or data recorder, you will be contacted by the end of January. Thank you for your cooperation.

APPENDIX C

The statement read to the non-reactive group members

For the purposes of this study, you have been placed in an alternate category. You will receive your bonus points contingent upon:

1) the termination of the study should you not be required to replace anyone

<u>or</u>

2) participation in the study until its completion should you be required to replace a subject

APPENDIX D

The statement read to the reactive non-self-monitoring group members

In order to receive your bonus points, you will be required to have your fingernails measured twice a week (Monday and Wednesday) at the time and place assigned.

During the visit, you will receive a feedback sheet which will provide information on any change in total nail length between the two previous measures. For example, on your third visit you will receive a sheet which will state the change in nail length as measured during the first two visits. The second visit will be compared to the first and total nail length gained or lost will be stated. Similar information will be provided on all following visits.

Remember, this is a short-term study and bonus points are being given for your participation. An appointment time has been assigned so that there will be no wait when you arrive at the room.

Appointment: Time_____ Room____Wood Hall

APPENDIX E

Sample of 5" x 4" feedback sheet given to all subjects in the two reactive groups

Name_____

The following change was
measured in your nail length
between the dates ____ and ____.

_____

APPENDIX F

The statement read to the reactive self-monitoring group members

In order to receive your bonus points, you will be required to:

A. Have your fingernails measured twice a week (Monday and Wednesday) at the time and place assigned
Time_____ Room____Wood Hall

B. At least three times a week you are to slip a piece of paper into an envelope marked "S-M" which will be hanging outside of Room 261 Wood Hall. This paper should contain:

1. Your name
2. Dates for which you are turning in self-monitoring data
3. The number of nail destroying responses recorded on each of those days

---

In addition to having your nail length measured during your visits to Wood Hall, you will receive a feedback sheet which will provide information on any change in total nail length between the two previous measures. For example, on your third visit you will receive a sheet which will state the change in nail length as measured during the first two visits. The second visit will be compared to the first and the total nail length gained or lost will be stated. Similar information will be provided on all following visits.

HOW TO SELF-MONITOR

Behavior to be recorded: nail destroying
A. bringing your fingernail into contact with your teeth
B. picking or filing a fingernail with either another fingernail or another object

---mere contact, picking or filing is considered a nail destroying response and should be recorded as such

---each single response should be recorded

---it makes no difference whether or not you "intended" to bite, pick or file your fingernail, it is the response which is important

The recording apparatus provided is portable. THE APPARATUS SHOULD BE ON THE PERSON AT ALL TIMES. It should be placed in an easy to reach readily available position such as being hooked around a belt.

RECORD ALL INSTANCES OF THE NAIL DESTROYING RESPONSE

IMMEDIATELY RECORD THE RESPONSE AS IT OCCURS

APPENDIX G

Sample of 5" x 4" S-M data sheet turned in three times a week by subjects in the reactive self-monitoring group

S-M Record

Name_____

Date	Day	Number of Responses
____	____	____
____	____	____
____	____	____

Please place in orange folder marked "S-M" outside of Rm 261WH.