THESIS

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Electrodermal Activity During
Free Imagery, Free Association
and Two Conditions of Autogenic Training

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ELECTRODERMAL ACTIVITY DURING
FREE IMAGERY, FREE ASSOCIATION,
AND TWO CONDITIONS OF AUTOGENIC TRAINING

By

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ABSTRACT

ELECTRODERMAL ACTIVITY DURING
FREE IMAGERY, FREE ASSOCIATION,
AND TWO CONDITIONS OF AUTOGENIC TRAINING

By

Linda Dianne Leigh

The effectiveness of imagery as an uncovering procedure and as a technique to induce relaxation was investigated by comparing a free visual imagery procedure with one that used free verbal association, and by comparing a hypnotic relaxation technique (based on Schultz's Autogenic Training) using imagery with one that used passive concentration. In counterbalanced order, four contiguous 15 minute sessions were presented to 12 male and 12 female volunteer subjects. The effect of these procedures on autonomic nervous system (ANS) activity was determined by measuring skin conductance level (SCL) and skin conductance response (SCR) with a Grass (model #5) polygraph. Significant differences in ANS activity were found between autogenic training and uncovering procedures for SCL and SCR ($p < .001$). Autogenic training reduced sympathetic nervous system activity, and by inference, increased parasympathetic activity; whereas uncovering procedures increased sympathetic nervous system activity. Free association caused a greater increase in SCR than free imagery ($p < .02$), which may have been

due to the subject's greater tendency to focus on interpersonal matters. This study refutes Kilpatrick's (1972) multiple component theory of electrodermal activity and provides further support for the single effector theory (Bundy, 1978; Edelberg & Muller, 1978).

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INTRODUCTION

In the early 1900s, Johannes H. Schultz, a psychiatrist and neurologist became interested in self-regulation. He was inspired by reports of Indian Yogis and intrigued by the clinical value of autohypnotic exercises which could overcome tension and stress. Interested in the self-directed nature of these phenomena, Schultz investigated autosuggestion as a psychotherapeutic technique. Clinical and experimental observations by Schultz and his students suggest that a person need only passively concentrate on certain verbal phrases to bring about relaxation (parasympathetic dominance) (Luthe, 1965).

Gradually, Schultz evolved a number of verbal formulas which formed two series of exercises otherwise known as autogenic training. The six standard exercises of the first series focused on (a) the neuromuscular system for relaxation of the striate musculature, (b) the vasomotor system for relaxation in the vascular system, (c) the heart, (d) the breathing mechanism, (e) warmth in the abdominal area, and (f) cooling of the forehead. The standard exercises were designed to restore the system to homeostatic balance through learning how to self-tranquilize the striate and the autonomic nervous system (Luthe, 1965). The method was based on the development of sensory awareness of ongoing physiological processes.

Autogenic training was designed to bring the biological system into homeostatic balance, from which the individual may learn to react to stresses[1] in a more appropriate manner. It was found that physiological improvements that recurred during the practice of these exercises were stablized by regular practice over an extended period of time (Green & Green, 1975). This is a significant result since prolonged exposure to stressors has been shown to produce the following diseases: stomach ulcers and digestive disturbances, cardiovascular disease and high blood pressure, allergic reactions, connective tissue diseases, kidney disease, emotional disturbances, and headaches (Selye, 1950, 1956; Bassett & Cairncross, 1977). These experimental reports suggest that stress affects individuals differently, depending upon their genetic structure and previous conditioning. For example, in some people blood pressure may drop when there is stress, and in others blood pressure may rise (Luthe, 1965).

The above findings suggest a correlation between physiological symptoms and psychological state, whereas a change in one may be followed by a change in the other. According to Green and Walters (1969), it is possible to influence autonomic processes intentionally

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[1]Stress may be defined as "the nonspecific response of the body for any demand made upon it" (Selye, 1974). The concept of stress includes both a stimulus part, called stressor, and the response part, called stress reaction. Stress in itself is not detrimental, "Complete freedom from stress is death" (Selye, 1974). Furthermore, the body has mechanisms for counteracting stress reactions: the parasympathetic nervous system acts as a counterbalancing influence, the hormonal system releases anti-inflamatory hormones, and the connective tissue liberates negatively charged substances to counteract the damaging effects of histamine and other positively charged chemicals. However, the body's recovery system may not maintain the healthy balance if stress reactions are allowed to occur when they are not appropriate and continue when they are no longer useful.

by directing physiological changes by focus of one's attention. The physiological change is accomplished through passive volition using a casual, detached, and yet expectant attitude known as passive concentration, not by force or active will (Luthe, 1965).

Recent research (Lē Boeuf & Wilson, 1978) suggests that visual imagery may be used effectively to bring about the desired physiological change. Subjects who used visual imagery rather than passive concentration to achieve relaxation were more successful as measured by frontalis EMG. Visual imagery was thought to facilitate the achievement of relaxation; therefore, a system was devised which used a series of images designed to produce the same physiological changes as the standard exercises (Jencks, 1975).

Images, depending upon their content, may either decrease or increase nervous strain and muscular tautness. Reyher and Smeltzer (1968) found that words associated with sex and hostility significantly increased skin conductance response (SCR) rate when subjects were asked to report visual imagery versus verbal associations in response to emotion-ladden words. This effect, however, was confounded by the fact that only subjects in the visual imagery condition were required to close their eyes. The notion that eye closure was responsible for generating increased anxiety and security operations[2] (Sullivan, 1953) led Stern (1974) to compare a visual imagery and a verbal association condition during eye closure.

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[2] According to H.S. Sullivan, security operations are behaviors undertaken by the individual to protect and maintain self-esteem, the loss of which leads to anxiety.

The Stern study suggested that verbal association with eyes closed produced greater sympathetic nervous system activity than visual imagery with eyes closed. However, the difference in findings between the Stern study and that of Reyher and Smeltzer may have been due to methodological differences. Whereas the former study presented subjects with stimulus words to which they responded with an image or verbal association; the latter employed an open-ended approach similar to that used in therapy as an uncovering procedure (Reyher, 1963, 1977).

The Stern study (1974) involved asking subjects to describe whatever thoughts and feelings occurred to them in the verbal association condition and asking subjects to wait for images to appear in their "mind's eye" and then to describe them in the visual imagery condition. The free imagery/free association conditions of the present study are similar to Stern's visual imagery and verbal association conditions. However, the present study uses electrodermal activity (EDA), rather than counting types of symptomatic responses to determine arousal (SNS activation).

The present study was an attempt to integrate various dimensions of these previous studies, as well as to incorporate additional dimensions. The primary focus was the physiological correlates of autogenic training, using either passive concentration or imagery to reduce sympathetic nervous system arousal, and the physiological correlates of free imagery and free association.

The experimental hypotheses were:

(1) Autogenic training procedures would decrease sympathetic nervous system activity by producing physiological changes diametrically opposed to those evoked by stress.

(2) Free imagery and free association would increase sympathetic nervous system activity due to security operations and the uncovering and emerging of repressed drive-laden material.

(3) Order effects would be present for the autogenic training procedures and the uncovering procedures.

(4) The autogenic training procedures using imagery would lower sympathetic nervous system activity to a greater extent than that using passive concentration.

(5) Either free association would produce greater sympathetic nervous system activity due to the prevalence of security operations, or free imagery would produce greater sympathetic nervous system activity due to the uncovering of drive-related material.

(6) Skin conductance level and skin conductance response, though not identical, are both measures of sympathetic nervous system activity. Thus, changes in SCL and SCR across treatment conditions would be in the same direction.

METHOD

Subjects

All subjects were selected randomly from a population of male and female undergraduate volunteers who had signed up to participate in an experiment entitled, "Relaxation Training, Free Imagery, Free Association." All subjects were enrolled in either Psychology 160 or 170 at Michigan State University and received course credit for their participation. Of the total 24 subjects, 12 were male and 12 were female.

Apparatus

A Grass model #5 polygraph and Beckman finger electrodes (Ag/AgCl; 1.77 cm^2) were used to record electrodermal responses. The electrodes were filled with Beckman electrolyte, and they were attached to the proximal phalange of the second and third fingers. An EDR was defined as a deflection of 500 ohms or more. Electrodermal activation was expressed in EDRs/sec.

Setting

The experimental rooms were small, soundproof, and windowless. The first room entered from the hallway, contained a six-channel Grass (model #5) polygraph, a desk, two straight-backed chairs, and a cabinet in which various experimental supplies were kept. In the adjoining room was a vinyl upholstered reclining chair, and a table. Upon the table were two tape recorders and a tray containing cotton balls, alcohol, and electrolyte gel. A straight-backed chair was situated directly in front of the reclining chair, against the wall.

Procedure

Each subject attended a one and one-half hour experimental session in which he/she participated in four conditions: (1) autogenic training using imagery, (2) autogenic training using passive concentration, (3) free verbal association, and (4) free visual imagery. Each condition lasted fifteen minutes. The order of presentation of the four conditions was counterbalanced with one male and one female subject receiving each of twelve possible orders.

Prior to the experiment, the experimenter contacted the subjects by telephone and made an appointment. When the subject arrived at the appointed time, the experimenter conducted him/her into the laboratory room, where the subject was asked to sign a consent form. Afterwards, the experimenter suggested that the subject leave his/her books and coat at the coat rack, and the experimenter led the subject into the next room. There, the subject was asked to sit in the large reclining chair, while the experimenter filled the electrodes with electrolyte gel. The proximal phalanges of the second and third finger of the subject's right hand were cleansed with cotton dipped in alcohol, and an electrode was attached to each finger. For the duration of the session, the subject reclined in the upholstered vinyl chair.

The experimenter sat in an adjoining room, out of the subject's field of vision, in front of the six-channel polygraph. During the first one-half hour of the session, the experimenter calibrated the polygraph. During this time the experimenter occasionally spoke to the subject, i.e., "What program of study are you in?" and, "Have you ever participated in research as a subject before?" Because the subjects had never been monitored by a polygraph before, this allowed them some time to begin to feel at ease and to produce more stable readings before the experimental treatments began. The experimenter entered the second room only at the onset of each condition. For conditions (1) and (2), the tape recorder was made ready to play the prerecorded autogenic training instructions. For conditions (3) and (4), a Rorschach card #6, used as a stimulus object, was placed upright on a chair in front of the subject, and the tape recorder was made ready to record the subject's responses.

Each condition was presented as a package in order to approximate procedures used clinically. Therefore, instructions, rationales, comments, and stimuli vary across conditions. Note that these differences in presentation may have resulted in some confounding. Verbatum accounts of the instructions used during the experimental conditions may be found in Appendices A through D. Briefly, in condition (1) the subject tried to imagine him/herself in the various scenes presented by the experimenter. In condition (2), the subject followed the experimenter's instructions and concentrated sequentially on various body areas, in an effort to bring about the desired changes. Both conditions (1) and (2) were geared toward achieving the goal of relaxation and lessening SNS activation. In condition (3), the subject was asked to report whatever thoughts came to mind, and in condition (4) the subject was asked to describe inward experience, particularly images. In conditions (3) and (4), if the subject began to produce images when thoughts were required or thoughts when images were required, the subject was redirected to the task.

Scoring

One extensively trained undergraduate, blind to the purposes of the experiment, scored the polygraph tapes for skin conductance response (SCR) rate and skin conductance level (SCL). Level means that relatively long periods of time are analyzed (tonic activity) and response refers to short duration changes (phasic activity, lasting only a few seconds). Thus, SCR is always measured in relation to the current SCL. And although they are not interchangeable measures, SCR rate and/or skin conductance level (SCL) indicate activation of the sympathetic nervous system (SNS); whereas decreases indicate a lack of activation of the SNS, and by inference, an increase in the activation of the parasympathetic nervous system (Hasset, 1978). More detail on the scoring procedure may be found in Appendix E.

RESULTS

The original plan for this research included the option to code the tape recorded responses according to the Drive Activation Scale (Reyher & Della Corte, 1983). Upon examination of the responses, however, it became apparent that primary process mentation was not occurring in either condition, that is, responses were veridical, plausible, and not bizarre. Instead, the content of responses reflected the subjects' desires to avoid negative self-evaluations, analogous to Sullivan's security operations (1953).

Thirty-eight percent of the subjects displayed a constrictive manner of responding in the free imagery/free association conditions by uttering responses mainly when questioned by the experimenter at 2" intervals. Some of these subjects admitted that they were censoring and preselecting. Thus, these subjects were not following the instructions designed to reveal primary process mentation. In addition, the tendency to focus on impersonal matters, such as descriptions of natural scenes and the interiors of buildings was found in 58% of the subjects during the free imagery condition. Therefore, the Drive Activation Scale was not used to code responses according to secondary and primary process characteristics.

Initially, an analysis of variance was performed using a mixed factorial design (Kepel, 1982) with sex representing the independent groups (factor A) and conditions representing the repeated measures (factor B). Autogenic training (imagery) represented condition B_1, autogenic training (passive concentration) represented condition B_2, free verbal association represented condition B_3, and free visual imagery represented condition B_4. Following the analyses of variance, confidence intervals of the means were plotted, Tukey tests were performed between treatment means, and t-tests were used for additional comparisons.

The analysis of variance using SCR rate data is presented in Table 1. This analysis used the number of deflections per second for each of the four B conditions. The analysis revealed a significant main effect for factor B, $\underline{F}(3, 66) = 22.75$, $\underline{p} < .001$. The main effect of factor A and the AxB interaction was not significant. Therefore, the data was collapsed across factor A for further analyses.

The analysis of variance using average SCL data for each experimental treatment is presented in Table 2. Similar to the analysis of variance using SCR rate, there was a significant main effect of factor B, $\underline{F}(3, 66) = 13.54$, $\underline{p} < .001$; whereas the main effect for factor A and AxB interaction was not significant. Therefore, data using skin conductance level was likewise collapsed across factor A before further analyses were performed.

Pairwise comparisons using the Tukey test, with the family-wise rate maintained at .05 were performed on the SCR rate and average SCL data and are presented in Tables 3 and 4, respectively. Entries within the body of the table represent differences between any two treatment means. Those entries marked with an asterisk have exceeded the critical value for the Tukey test and were declared significant.

Table 1: Analysis of Variance of Autogenic Training (Imagery), Autogenic Training (Passive Concentration), Free Verbal Association, and Free Visual Imagery for Males and Females, Using SCR Rate Data

Source	df	MS	F
Sex (A)	1	-.0006	-0.20
S/A	22	.0030	
Experimental Treatment (B)	3	.0273	22.75*
AxB	3	.0012	1.00
BxS/A	66	.0012	
Total	95		

* $p < .001$

Table 2: Analysis of Variance of Autogenic Training (Imagery), Autogenic Training (Passive Concentration), Free Verbal Association, and Free Visual Imagery for Males and Females, Using Average SCL Data

Source	df	MS	F
Sex (A)	1	56.43	0.25
S/A	22	225.85	
Experimental Treatment (B)	3	104.28	13.54*
AxB	3	8.75	1.14
BxS/A	66	7.70	
Total	95		

* $p < .001$

Table 3: Tukey Test for Pairwise Comparisons of Treatment Means (SCR/sec. x 10^{-2} mhos) with the Family-Wise Error Rate (α) = .05 and the Critical Value (d_T) = 2.65

	LEVELS (ORDERED BY SIZE OF TREATMENT MEANS)			
	B_2 = auto(passive)	B_1 = auto(imagery)	B_4 = free imagery	B_3 = free association
Means	.63	1.35	3.87	8.09
$\bar{B}_2$ = .63	--	.72	3.24*	7.46*
$\bar{B}_1$ = 1.35		--	2.52	6.74*
$\bar{B}_4$ = 3.87			--	4.22*
$\bar{B}_3$ = 8.09				--

Table 4: Tukey Test for Pairwise Comparisons of Treatment Means Using Average SCL Data Expressed in μ mhos with the Family-Wise Error Rate (α) = .05 and the Critical Value ($\bar{d}_T$) = .212

	LEVELS (ORDERED BY SIZE OF TREATMENT MEANS)			
	B_1 = auto(imagery)	B_2 = auto(passive)	B_4 = free association	B_3 = free imagery
Means	2.62	2.63	2.96	3.00
$\bar{B}_1$ = 2.62	--	.011	.347*	.384*
$\bar{B}_2$ = 2.63		--	.336*	.373*
$\bar{B}_4$ = 2.96			--	.037
$\bar{B}_3$ = 3.00				--

The analysis using SCR rate data revealed significant differences between experimental treatments B_4xB_2, B_3xB_2, B_1xB_3, and B_3xB_4. Although the SCL data revealed a different pattern with significant differences between experimental treatments B_1xB_4, B_1xB_3, B_2xB_4, and B_2xB_3, a visual comparison of Figures 1 and 2 reveals that the configurations are similar.

For SCL treatment conditions (1) autogenic training (imagery), (2) autogenic training (passive concentration), (3) free association, and (4) free imagery, the means and confidence intervals expressed in micro mhos were 2.62 ± .11, 2.63 ± .15, 3 ± .17, and 2.96 ± .16, respectively. Differences between the autogenic training procedures were negligible, as were differences between the uncovering procedures and the figures reveal that within each type of procedure the confidence intervals overlap extensively. There is no overlap between the autogenic training procedures and the uncovering procedures. The baseline[3] was 2.67 μ mhos, which was above the means for autogenic training and below those for uncovering procedures. However, it fell within the confidence interval for autogenic training procedures.

In order, means and confidence intervals (SCR/sec. x 10^{-3} μ mhos) for treatment conditions 1 through 4 were 13.5 ± 6.1, 6.3 ± 3.1, 80.9 ± 15.2, and 38.7 ± 6.1. Similar to the data considering tonic activity, this data reveals no overlap between autogenic training and

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[3]Note that the baselines for both SCL and SCR were not counterbalanced and therefore not included in the ANOVA. They were determined from the 15 minute period prior to the experimental treatments for the purpose of providing an added comparison, specifically, to determine if autogenic training reduced SNS activation. However, even though such a reduction is apparent, the effects of habituation cannot be ruled out since the autogenic training always followed the baseline.

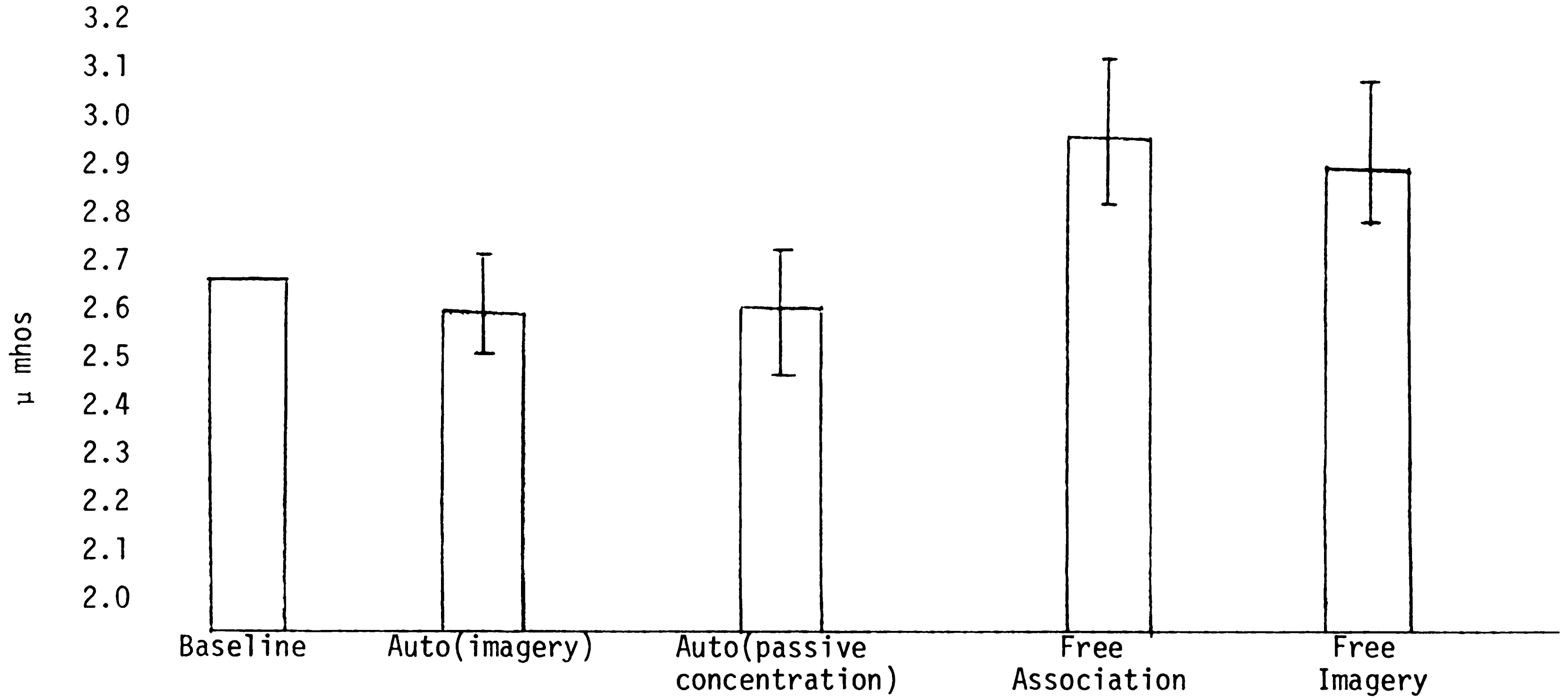

Figure 1. Confidence intervals for treatment means using average SCL. Probability is 95% that the interval includes the population value.

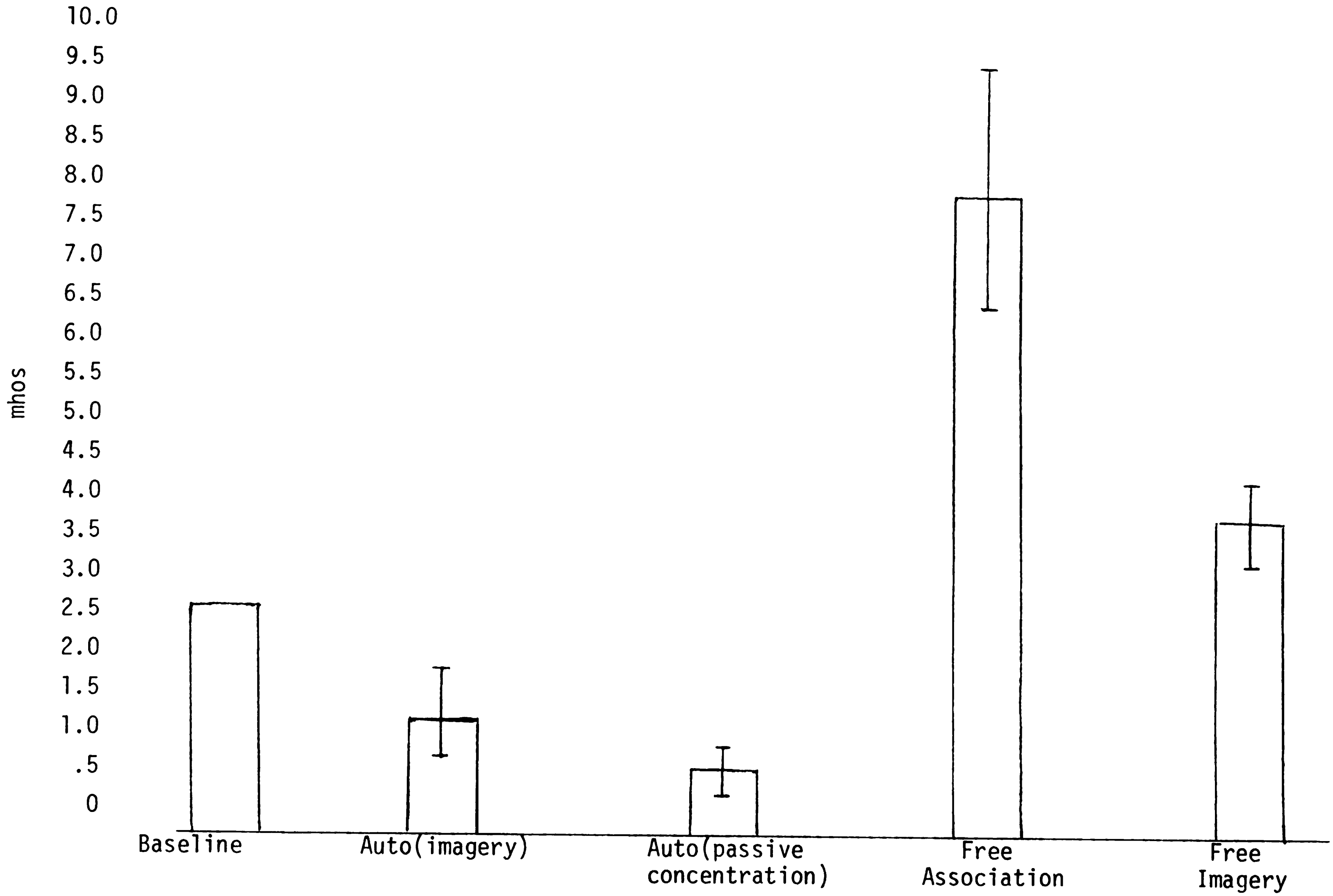

Figure 2. Confidence intervals for treatment means using SCR/sec. x 10^{-2}. Probability is 95% that the interval includes the population value.

uncovering procedures. However, as Figure 2 reveals, SCR rate is considerably higher for free verbal association than for free visual imagery. The baseline was 25.3 μ mhos, which was above the confidence intervals for autogenic training and below those for uncovering procedures.

In summary, autogenic training procedures and uncovering procedures lead to significant differences in SNS activity when these procedures are presented contiguously in fifteen minute sessions to naive subjects. For tonic and phasic measures, respectively, t (23) = 6.13 and 5.96, $p < .001$. This study provides support that autogenic training procedures decrease sympathetic activity, and by inference, increase parasympathetic activity; whereas the uncovering procedures of free association and free imagery increase sympathetic activity. Differences between the two autogenic training conditions using SCR rate and average SCL data, and differences between the two uncovering procedures using average SCL data, were not significant. Significant differences were found between the two uncovering procedures for SCR rate only, with free verbal association producing the greater SCR rate, t (23) = 2.707, $p < .02$.

DISCUSSION

Figures 1 and 2 provide support for the hypothesis that autogenic training decreases and uncovering procedures increase SNS activation when these procedures are presented contiguously in fifteen minute sessions. Using SCR as the criteria, the baseline falls between the confidence intervals for the autogenic training and the uncovering procedures. Moreover, the two uncovering procedures differ significantly from one another. Free association produced the greater SNS response, suggesting that this condition was more psychologically stressful (Hasset, 1978). Data based on SCL shows the baseline to be above the means but within the confidence interval for autogenic training procedures, and below the confidence intervals for uncovering procedures. Thus, differences between the experimental treatments are not as clear with SCL as with SCR.

Generally, the average SCL was lower than baseline for the autogenic training conditions and higher than baseline for the free association/free imagery conditions. However, data for three subjects revealed a progressively increasing SCL, that is, the baseline is lowest, the first experimental treatment is somewhat higher, and each succeeding experimental treatment is higher than the preceding one. Two other subjects, who had received uncovering procedures initially and reacted with increases in SCL, were able to lower their SCL during autogenic training procedures; however, it still remained above baseline.

The data from this experiment provides further support that SCL and SCR are both responsive to SNS activity, that is, activated by psychological stress. According to Kilpatrick (1972) the level of tonic skin conductance is only minimally responsive to the manipulation of psychological stress but increases greatly during cognitive and perceptual activity; whereas phasic activity increases significantly following psychological stress but not following cognitive and perceptual activity. This multiple component theory of electrodermal activity was not supported by the present study.

One possible explanation for Kilpatrick's results is that the seeming independence is due to the uncontrolled effects of skin hydration which may affect SCL more than SCR (Bundy, 1979). By producing a time dependent effect which is not due to the direct action of the electrolyte on the skin, but is due to the fact that the skin is forced to retain the secreted sweat rather than loose it through evaporation, the two electrodermal measures of SCR and SCL may appear to be differentially responsive. Note that this does not invalidate the present SCL results since unlike the Kilpatrick experiment, counterbalancing was used. Furthermore, since recent evidence suggests that EDA may be the result of one effector system (Bundy, 1978; Edelberg & Muller, 1978), it would be difficult to explain how SCL and SCR could operate independently.

Adam's (1982) explanation of the connection between emotions and skin electrical phenomena is supported by data from this experiment. He states that atrichial sweat glands[4] on the human

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[4]Atrichial (or eccrine) sweat glands are located in the dermis. Those on the hand and foot surfaces become active more in response to psychic stimulation than they do to thermoregulatory stress (Adams, 1982).

hand receive nerves only from the sympathetic division of the ANS. Thus, atrichial sweat glands secrete only when the sympathetic nerves are activated. Both water and salt remain in the outer layers of the skin, reflecting current sweating eipsodes and those in the immediate past. Bursts of sweating which fill the gland ducts are reflected in SCR's, and a high concentration of water and salts in the skin due to sweating bursts in the recent past is reflected in a high SCL.

The above findings may explain why SCR appears to be measuring more sensitively than SCL in the present study. That is, since SCL reflects not only immediate but also recent past SNS activity, the SCL data of a particular experimental treatment is likely to reflect not only responses to that treatment but also to the prior treatment. Consequently these findings necessitate caution in interpreting the SCL data. A better approach may have been to provide a rest period between experimental treatments which would allow subjects' SCL to return to baseline. During this period the electrodes could be removed, cleaned, filled with fresh electrolyte gel, and reattached, thus minimizing the possibility of hydration artifacts.

Interestingly, the SCR data corroborates the results of the Stern study (1978) which measures psychological stress by counting the types of verbal responses. Both experiments indicate that subjects found free association more stressful than free imagery. As in the Stern study, there were subjects in the present experiment who experienced feelings of tingling and numbness in the extremities and displayed a constrictive manner of responding, thus evidencing security operations (Sullivan, 1953).

Subjects in the present study responded in diverse ways to the free imagery experimental treatment with 8% of the subjects using it as a vehicle to uncover troublesome material, 38% using it as a vehicle to induce pleasant reverie and relaxation, and 54% using it as a defense against revealing anything of a personal nature. Thus, unlike the free verbal association condition, in which subjects primarily focused on interpersonal matters, free visual imagery produced diverse responses and SNS activity reflected this. Using free imagery the subject could take the focus of attention away from him/herself by describing such things as the interior of a room or a natural scene. Free association seemed less suitable as an interpersonal defense. In this condition, subjects began to focus on interpersonal topics after a short time, or they stopped speaking altogether.

As a further explanatory device, H.S. Sullivan's concept of security operations is useful (Sullivan, 1953). Security operations are undertaken by the individual to protect and maintain self-esteem, the loss of which leads to anxiety. As in the Stern study, subjects in the present experiment seemed to find it difficult to maintain self-esteem in the free imagery/free association conditions. There was a low level of interaction between experimenter and subject; thus subjects could not be certain that they were performing as expected. In this way, self-esteem was threatened.

In this threatening situation, subjects were less willing to reveal anything that might be construed as improper behavior. Some subjects became constrictive in their remarks, uttering as few sentences as possible or speaking in a barely audible voice. For those subjects who tried to maintain and retrieve threatened self-esteem by not revealing anything that might be considered unacceptable, free imagery seemed to be the more successful vehicle.

It may be important to note that an attempt was made by the experimenter to build some rapport initially and to keep the session as nonthreatening as possible. And although some subjects still reacted with interpersonal defenses and symptoms, others took the opportunity to explore, without inhibition, troublesome areas in interpersonal relationships, intimate personal goals, and areas of the self where change was desired. Free association often led to these topics.

Stern concludes in his discussion that free imagery is more effective than free association as an uncovering technique only when the subject's drive strength is high. Indeed, this may be so, for the one subject who did reveal primary process mentation during free imagery, revealed little of significance during free association. A possible conclusion regarding the relative effectiveness of the uncovering procedures is that free imagery is more useful when drive strength is high, and free association is more useful at the level of security operations when interpersonal concerns are more prominent. This could be further investigated using a clinical population.

In conclusion, there were significant differences in SNS activity between autogenic training procedures and uncovering procedures. Autogenic training reduced SNS activity to below baseline, and by inference, it increased PNS activity. Uncovering procedures increased SNS activity to above baseline activity by posing a threat to self-esteem. In particular, free association produced the greatest increase in SCR rate, probably due to the subjects' tendency to focus on interpersonal matters. Interestingly, Stern's (1978) results were replicated using SCR instead of his method of counting verbal responses. In addition, this experimental study provides support that EDA is the result of one effector system: SCR reflects immediate emotional responses, and SCL reflects emotional responses of the present and near past.

APPENDICES

APPENDIX A

AUTOGENIC TRAINING (IMAGERY)

APPENDIX A

AUTOGENIC TRAINING (IMAGERY)

The following prerecorded instructions were given to each subject during the autogenic training (imagery) condition:

> Make yourself comfortable and allow your eyes to close. Then lift your left arm a little, and just let it drop. Let it drop heavily, as if it were the arm of a Raggedy Ann doll, one of those floppy dolls or animals. Choose one in your imagination. Choose a doll, an old beloved soft teddybear, or anything soft which you like. Lift the arm again a little and drop it, and let it rest there a moment...
>
> Now think of your arm again, but don't lift it in reality, just in the imagination. Lift it in the imagination and think that you are dropping it again, and do this while you breathe out. Let the arm go limp like a rag while you breathe out...
>
> And now work with the other arm. Use only your imagination. Do not lift it too high, just enough to feel its heaviness, and let it drop, but gently and relaxedly. Learn to do it in the imagination only. And when you breathe out again, drop it, let it go soft, let it go limp and relaxed...
>
> Next, lift both arms together, in your imagination only, and allow them to drop, simply relax them, allow them to be limp and soft...
>
> Then lift one leg. Lift it only a little, just enough that you can feel its heaviness, and allow it to drop, limp and relaxed, limp and soft...Do this always when you breathe out. Don't lift the leg too high, so that it does not hit too hard. Or better yet, lift it only in the imagination. Do this a few times in your imagination only, and just let it become heavy and relaxed...
>
> Now do the same with the other leg. Lift it a little, and while you breathe out let it relax. Let it go soft like a rag. Let it drop like the leg of a giant rag doll...
>
> Feel free to move your legs or any part of your body to a more comfortable position any time you want to do so.
>
> And now both legs together, lift them in your imagination, and let them relax, limp and soft, like a rag or a bean bag...
>
> And finally, all limbs together, both arms and both legs, in your imagination only, lift them, breathe out and allow them to be limp and relaxed, heavy and comfortable, like a giant rag doll, well supported by the chair.

Next, imagine that you put your rag doll into the sun. Let it be warmed by the sun. The giant rag doll is lying very relaxedly. Feel how the sun is shining on it. Feel it on one arm first, and then on the other. See to it that the head of the rag doll is in the shade and kept cool, but all the limbs are sprawled out in the sun. Feel your arm, warm, soft and relaxed...And then feel the other arm, warm, soft, and relaxed...And then let one leg be nicely warmed by the sun...And then the other leg, nicely warmed, soft, and relaxed...Remember, you are the giant rag doll, and you are lying in the sun; all your limbs are nice and warm, but your head is lying in the shade and is comfortably cool...

And now that you are such a nicely relaxed rag doll, imagine you have within yourself something that is like a little motor, which makes you go all the time, and that is your heart. It just keeps you going all the time, day and night, whether you keep track of it or not. And just as you walk or run, sometimes a little faster, sometimes slower, sometimes skip along, just so that little motor in you sometimes goes a little faster, sometimes slower, and sometimes skips. That is quite normal. And now just feel, if you can, the rhythm of your heart. It does not really matter whether you can feel it or only imagine it, but think of your heart and say "thank you" in your imagination. This organ works all the time for you, whether you think of it or not. So now just stay with it for a while, and say "thank you"...Thank your heart that it does such a good job for you...

Next, for a moment, pay attention to your breathing. The breathing rhythm, just like the heart, sometimes goes fast and sometimes goes slow. Allow it to go as slow or as fast, as shallow or as deep as it wants to. If you have to sigh, that is fine. If you want to inhale deeply, that is fine. Just follow the breathing...And then, for a moment, just imagine that the air which you breathe streams in at the fingers while you breathe in, up your arms, and into your shoulders and chest; and then while you breathe out, down into your abdomen, down into your legs, and out at your toes. And repeat this two or three breaths...Then imagine that you are floating, floating on an air mattress on the ocean, a big river, or a swimming pool. Let slow and gentle waves carry you up and down in the rhythm of your breathing.

Now breathe into the palm of your right hand and feel the warmth of your breath. Such warmth is within you all the time. Repeat it, and then put the hand down again and imagine. Imagine that you breathe this same kind of warmth into your own inside... While you breathe out, imagine that you breathe that warmth down into your throat, down into your chest, down into your abdomen... Just become nicely warm inside...Or you may imagine that you are drinking something which really warms you nicely inside, or even that something like a warmly glowing ball is rolling around within you. Allow it to warm your inside, so that it becomes all soft and relaxed.

Bring one hand to the mouth and lick two fingers. Then stroke the moist fingers over your forehead. Just stroke your forehead and feel the coolness of the moisture. If you want to moisten the forehead again, feel free to do so...And then, while you breathe in, feel the refreshing coolness of your forehead, and imagine again that giant rag doll or rag animal, lying with its head in the cool shade...

Now, just lie there and relax completely for a while, and think of the rag doll with its body warmed comfortably, relaxed in the sun. Feel again the gentle cradling of the waves of the breathing rhythm. And while breathing in feel the cool shade, the coolness on your forehead, and while breathing out feel your comfortably relaxed body.

Now, become more and more aware of being refreshed during inhalations. And when you decide it is time to end the state in which you are now, yawn and breathe in deeply and refreshingly while you stretch and flex arms and legs. And then open your eyes, look around and breathe in once more (Jencks, 1975).

APPENDIX B

AUTOGENIC TRAINING (PASSIVE CONCENTRATION)

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AUTOGENIC TRAINING (PASSIVE CONCENTRATION)

The following prerecorded instructions were given to each subject during the autogenic training (passive concentration) condition:

> It is general knowledge that our bodies are equipped with regulating mechanisms and systems that work automatically--the breathing mechanism, the circulatory system, and so forth. It is also known that such systems can be influenced by various thoughts and experiences. For example, being startled can make you catch your breath...embarrassment may make you blush...thinking of someone squeezing a lemon may make your mouth water.
>
> Research has established that it is possible to influence such processes intentially, volitionally, by directing physiological changes by using one's focus of attention.
>
> In attempting to make a physiological change through the focus of attention, it is important to realize that it is not accomplished by force or active will. It is done by willing the intended change while in a relaxed state. Relaxation is important because it is easiest then to have the casual, detached, and yet expectant attitude that is useful in bringing about the desired change. It has been found helpful to concentrate on the part of the body that is to be influenced while using the self-regulating phrases that I will give you. In this way a contact appears to be set up with that particular body part. This seems to be important in starting the chain of psychological events that eventuate in physiological changes.
>
> The idea is to will and feel that the change is happening, while in a relaxed detached state...and then just let it happen. Do not interfere with the body's tendency to cooperate (Green & Green, 1977).
>
> Now, assume a comfortable position. Close your eyes. Keep the body still. Do not strain the lungs by exhaling or inhaling more deeply than is comfortable. The capacity of the lungs and the control of the breath will increase as you progress.
>
> Take five slow, full breaths, exhaling and inhaling through both nostrils.
>
> Now begin "equalized breathing." Exhale and inhale through both nostrils slowly and smoothly, with no pause between the exhalations and inhalations. Concentrate attention on the flow of breath past the space between the nostrils. If the mind wanders, bring it back to the space between the nostrils. (continue for four minutes.) Breathe slowly, but not so slowly that the diaphragm jerks in order to get more air into the lungs.

Now forget the breathing entirely and focus attention on the phrases for quieting the body. Take time to feel the relaxation of each part of the body as you silently repeat the phrases; then just "let it happen":

I feel quite quiet...I am beginning to feel quite relaxed...My feet, my ankles, my knees, and my hips feel heavy, relaxed and comfortable...The whole central portion of my body feels relaxed and quiet...My hands, my arms, and my shoulders feel heavy, relaxed and comfortable...My neck, my jaws, and my forehead feel relaxed. They feel comfortable and smooth...My whole body feels quiet, comfortable, and relaxed...

As you remain comfortable and relaxed, use the following phrases in the same manner as before, willing, and feeling the warmth:

My arms and hands are heavy and warm...I feel quite quiet...My arms and hands are relaxed and warm...My hands are warm...Warmth is flowing into my hands, they are warm...warm...My hands are warm...relaxed and warm.

On each phrase imagine and feel the quietness and the withdrawal of the attention inward:

I feel quite quiet...My mind is quiet...I withdraw my thoughts from the surroundings and I feel serene and still...Deep within myself I can visualize and experience myself as relaxed, comfortable and still...I am alert but in an easy, quiet, inward-turned way...My mind is calm and quiet...I feel an inward quietness...

(Maintain the inward quietness for about two minutes.) Take five slow, full breaths. Stretch and feel energy flowing through your body (Green & Green, 1975).

APPENDIX C

FREE ASSOCIATION

APPENDIX C

FREE ASSOCIATION

The following instructions were given to each subject at the beginning of the free verbal association condition:

> This Rorschach card is being used only as a stimulus to help you begin to relate thoughts that come to mind. Now, just lean back in the chair, close your eyes, and begin to relate thoughts to the image on the card, or to anything else, and continue in this way, letting your mind wander and describing whatever thoughts come to your awareness without censoring or preselecting them in any way.
>
> (If there was a pause greater than 2") What's happening? Are there any other thoughts associated with this? What else does this make you think of? (If images, feelings, or sensations were produced) What thoughts do you have about this?

APPENDIX D

FREE IMAGERY

APPENDIX D

FREE IMAGERY

The following instructions were given to each subject at the beginning of the free visual imagery condition:

> This Rorschach card is being used only as a stimulus to help you begin to imagine shapes and images. Now, just lean back in the chair, close your eyes, and being sensitive to your inward experience, try to report everything that crosses your mind: feelings, physical sensations, shapes, colors, and most important, images, without censoring or preselecting in any way.
>
> (If S opened eyes) I see that you have opened your eyes. (If there was a pause greater than 2") Are there any more images? What is happening? (If S produced ego-cognitive, secondary process dominated productions) Report _only_ images and whatever feelings and physical sensations come to mind. (Thereafter, if questioned) Now just tell me what images come to mind (Reyher, 1963).

APPENDIX E

SCORING PROCEDURE

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SCORING PROCEDURE

For our purposes, SCR rate equalled the number of deflections, or hill-like rises of the pen, per second. Each SCR deflection was noted by drawing a right angle to the peak of the deflection. Afterwards, the number of millimeters of the vertical leg was determined by counting the number of fine lines transversing the vertical leg. With the sensitivity of the polygraph set at .5, the number of deflections that rose two millimeters or more were counted. At this sensitivity, a rise of two millimeters represented a change of 1000 ohms. Finally, the length of the condition was measured in centimeters, where each centimeter was equal to four seconds in time. Frequency for each condition was subsequently determining by dividing the number of deflections meeting the criteria by the number of seconds for the condition. This figure was used in the statistical analysis.

To calculate skin conductance level, readings began after the first ten seconds and thereafter were taken every 20 seconds throughout the condition. A paper speed of 2.5 mm/sec. was used throughout. Initially, the machine notation was read by totalling the amounts from the MV and 1MV/turn knobs to determine skin resistance. The skin conductance level was simply the reciprocal of skin resistance. Thereafter, if a particular point was above or below the latest machine notation point, the number of fine horizontal lines that separated the two points was counted. With the sensitivity of the polygraph set at .5, each of these fine lines represented a change of 500 ohms. Thus, the number of lines was multiplied by 500.

Since we were dealing with the resistance of the skin, when the penline rose, it indicated a drop in resistance, and when the penline fell, it indicated an increase in resistance. Thus, to determine the skin resistance at a particular point, the change was subtracted from the latest level from the machine notation if the penline had risen, and added, if the penline had fallen. To calculate skin conductance level at each point, the reciprocals of the resistance figures were found. Thereafter, skin conductance level at the various points throughout a condition were averaged. An average SCL was determined for each condition and subsequently used in the statistical analysis.

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