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A Comparison of Skin Conductance During Administration of the Rorschach and Roemer Symbol Test

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Abstract

A user friendly software application was developed to provide psychophysiological monitoring of skin conductance levels during administration of the Rorschach Ink Blot Test and Roemer Symbol Test. Skin conductance levels were continuously monitored during the counterbalanced administration of the Rorschach Ink Blot and Roemer Symbol Test to 30 male residents of a therapeutic residential alternative to incarceration. Skin conductance amplitude levels and range levels were compared for the Roemer and Rorschach. The application of physiological monitoring was demonstrated to be useful for empirical studies and clinical use. Statistically significant differences in the skin conductance levels during administration of the Rorschach and Roemer were not supported. Skin conductance level data can be useful during administration and interpretation of projective instruments.

A Comparison of Skin Conductance

During Administration of the Rorschach and Roemer Symbol Test

The addition of a psychophysiological modality is recommended to provide an objective and quantitative correlate of projective processes. Measures of skin conductance have an early history of being used as an index of cortical activity (Jung, 1907; Neumann and Blanton, 1970; Peterson,1907; Prince and Peterson, 1907).

Neumann and Blanton (1970) describe the conceptual development of early electrodermal research. They describe how Féré, a student of Charcot's, during 1888, explored the relationship between the electrodermal activity and "sensory or emotional stimulation." Féré stated his results were "valuable as external indicators of the excitation of the nervous system" (p. 461). Observations of the relationship between electrodermal activity and psychological stimulation were also reported by Tarchanoff during 1889. During 1904, an engineer E. K. Mueller, invited Veraguth to provide an opinion about his observations that psychological processes seemed to be correlated to changes in body resistance when conducting a galvanic current. Veraguth immediately became interested in the phenomenon and applied the experiments on his wife that evening using "sensory stimuli and arousing unpleasant emotions" (p. 468). Veraguth believed that the discovery of electrodermal phenomena would be important for the "objective study of psychological, psychiatric and neurological problems" (p.469).

Peterson (1907) described the application of electrodermal monitoring for increasing understanding of emotion. The method consisted of presenting stimuli while simultaneously monitoring electrodermal activity. The stimuli were varied and included “sensory, verbal, strong, indifferent intellectual and emotional” words. He mentioned previous attempts by others to observe electrodermal activity only to have their efforts lost in “oblivion” due to “incredulity or lack of interest, probably both” (p. 804). He found electrodermal measures to be more accurate than the pneumograph and plethysmograph. Criticism by peers included assumptions that the results obtained were artifacts from muscular activity and that simultaneous plethysmography would provide the appropriate control. Peterson’s results indicated no relation between plethysmography and electrodermal activity. He believed electrodermal responses to be “directly proportional to the degree of emotion aroused,” (p. 805), which uncovered an emotional complex.

A word association task was coupled with simultaneous monitoring of GSR by Jung (1907) to add to the diagnostic capability of his word association test. Subjects were presented words specifically selected to explore and locate a “complex with strong feelings” (p. 253). Jung looked for elevations in GSR amplitude as an attempt to bring his interpretations closer to science than to art.

A female diagnosed with multiple personality disorder was examined by Prince and Peterson (1907). The subject was hypnotized as the dreams of her three personalities were explored. Specific words taken from the lives of her other personalities were presented. GSR amplitude increased during the hypnosis and word reaction conditions. These increases occurred during presentation of events

that belonged to another personality that the conscious personality did not remember. The technique of pairing GSR measures with exploration of subconscious processes was beneficial in uncovering processes of which the subject was unaware.

Miller (1996) advocates the use of psychophysiological measures to explore mental structures, processes and psychological dysfunction. He contends that psychophysiological data may deliver prefered specificity of measurement over verbal reports of psychological phenomena. Three practices encouraged in the study of internal processes and psychopathology include the following: (1) Investigations of mental processes can use psychophysiological measures even if the biophysics is still not comprehended, (2) Regardless of self report, psychophysiological measures can be used to examine mental processes, and (3) Psychophysiological measures can be used with research of psychopathology.

Skin conductance profiles of subjects with psychopathic symptoms have been observed to be relatively low when compared to other populations. Hare (1965) compared the skin conductance levels of psychopaths to non psychopaths and students during an anticipation of a strong electric shock. Inclusion into the psychopath group was based on a 12 item checklist (Cleckley, 1959). There were 11 participants in each group. The skin conductance levels of the psychopaths were lower than the other groups. Hare postulated that anxiety is insufficient in a psychopath to inhibit impulsive behavior.

Skin conductance levels during the presentation of a series of tones were compared in a sample of 104 male and female teenagers by Loeb & Mednick (1977). The ages of the participants were between 20 to 29 years during 1972 when police records were searched for criminal activity. Skin conductance non responders were more often those with a record of criminal activity.

The ability to maintain a low skin conductance level is thought to be a strategy effective for reducing anxiety (Ogloff & Wong, 1990). Thirty-two male inmate volunteers were administered countdown tasks while skin conductance levels were measured. Two groups were formed based on results of the Psychopathy Checklist (Cleckley, 1982). Participants in the high psychopathy group demonstrated lower skin conductance increases during the tasks.

Skin conductance reactivity is thought to be a biological defense against antisocial behavior (Raine, Venables, & Williams, 1996). This prospective study measured skin conductance half-recovery time to an aversive stimulus of 101, 15 year old school children. The measures were collected between 1978-1979. During May 1993 criminal records of these participants were searched by computer. The participants were 29 years old at this time. Comparisons of skin conductance were performed between groups with no criminal record and those with a criminal record. Those with no criminal record had demonstrated at age 15 faster skin conductance half-recovery. The authors felt this supported the hypothesis that skin conductance responsivity may help deter criminal behavior.

The uniqueness of skin conductance measures in subjects with symptoms of psychopathy has been reviewed by Patrick (1994). Emotional deficits are observed

more frequently in psychopaths and detached offenders. These deficits include a missing potentiation to aversive stimuli when a startle reflex is expected in normals. This potentiation would be an increase in skin conductance level. The increase would indicate an amplification of arousal yet would not determine the valence of such arousal.

A technique to simultaneously measure skin conductance level and verbal behavior was developed by Pennebaker and Uhlman (1994). The technique uses a computer to record skin conductance data while a subject types text at the keyboard. The psychophysiological data is processed with the J&J I-330. The J&J I-330 is a physiological monitoring system that digitizes analog signal outputs from the modality modules. Specialized amplification circuits or modules are designed to process specific types of physiological signals. The digitized outputs are then processed by the computer for display and recording. A software application was developed using the Universal Sensing Environment (USE), (1978) to automate data collection. Data was automatically saved after each word was typed through a programming feature that causes the depression of the space bar between words to save the data.

Hughes, Uhlmann & Pennebaker (1994) utilized skin conductance to measure the body's response to emotional trauma while subjects orally read affectively oriented materials. Their results indicated that increases and decreases in skin conductance amplitude were not an indicator of affective valence but rather an indicator or type of information processing. They measured the skin conductance level of 12 male and 12 female undergraduate students. The students performed a

typing task. Three essays were to be typed. One essay was about a traumatic event, another was a personal agenda for the day and one involved simply copying text. Between each typed word the space bar was depressed sampling and saving the skin conductance data.

Miller, (1992) illustrates how psychophysiological measures may be used as an operationalized indicator of the occurrence of unconscious process. This movement between two poles of subjective and objective constructs requires an objective measure such as skin conductance level. The eccrine sweat glands provide an index of cortical activity with psychological significance. This significance includes the experience of frequency, duration, and intensity of inner experience that mirrors the conscious and unconscious experience of interest to the projective diagnostician.

Galvanic skin response was measured during administration of the Rorschach Inkblot Test to 4 male and 19 female university students (Forrest and Dimond, 1967). Polygraph recordings of the GSR were matched with a tape recording of the subjects verbal responses. Mean GSR was calculated as one group value for location, determinant and content of responses. Increased GSR was inferred to represent heightened anxiety for locations with unusual detail, determinants using shading to give a third dimension and religious content.

Dale (1985) measured skin conductance responses during Rorschach Inkblot Test administration but yielded only averaged comparisons of the stimulus cards to other stimulus cards. Twenty undergraduate students were presented 10 slides of pleasant pictures and slides of the Rorschach Inkblots while monitoring skin

conductance. Mean skin conductance levels for the Rorschach Inkblots were greater than for the pleasant pictures. The results were interpreted as increased anxiety elicited from the defensive response to the Rorschach.

Method

A software application was developed to measure skin conductance levels during administration of a projective instrument (Fels, 1999). This application demonstrates the capacity to mark the temporal location of verbal responses and inquiries. The instruments administered during the pilot study were the Rorschach Ink Blot Test (Rorschach, 1948) and Roemer Symbol Test (Roemer, 1966). Meaningful measures of skin conductance and a useful method of presenting them were obtained. The skin conductance measures appear to increase the utility of these projective tests as they provide quantifiable data about the subject's information processing and affective intensity to the specific projective stimulus.

A power analysis was performed to estimate sample size. In the power analysis, an estimated power level was set 0.80 with an alpha of .05. This yielded a total sample size of an N = 30 (Cohen and Cohen, 1983).

Participants

Participants for this study consisted of 30 participants who were residents of the Dade Bridge, located in Hialeah, Florida. The Dade Bridge was a restrictive residential treatment program. It was offered as an alternative to incarceration for men who suffer from drug abuse problems and have committed criminal offenses. The administration of the Dade Bridge granted a request to utilize the facility for research.

A formal presentation of this research project including the general purpose and activities was described to the residents during their morning meetings. Residents were advised of the voluntary nature of their potential participation. The confidentiality of their responses during participation was described. Potential participants were informed that there will be no compensation, special privileges or rewards as a result of participation. Volunteers were then solicited. Each participant's privacy was protected and the results are available in group format. Each participant was invited to sign two consent forms prior to participation in the study. One consent form was a verification of informed consent to participate. The other form was consent to view the participant's demographic data from the confidential record at The Dade Bridge. Strict compliance with the ethical guidelines for participants of psychological research was maintained according to American Psychological Association guidelines (APA, 1992).

Instruments Used

Each participant was administered a verbal interview including use of the PCL-R (Hare, 1991), the Rorschach Ink Blot Test (Rorschach,1948), the Roemer Symbol Test (Roemer,1966), and, finally, a debriefing. The administration of the Rorschach and Roemer Symbol Tests were counterbalanced.

Skin conductance sensors were attached to the first and third fingers of the left hand. The J&J I-330 system was interfaced with a notebook computer containing a 486 processor with a speed of 33hz. The I-330 system contained a built in optical interface to prevent an electrical hazard. Skin conductance was measured during

the entire process. The method of operating the monitoring instruments while measuring skin conductance during the presentation of a projective instrument is detailed in the manual (Fels, 1999). Sampling rate of skin conductance was 2 samples per second with an average of every 2.5 seconds. Recording of skin conductance began 10 seconds prior to presentation of a projective stimulus. The recording continued 10 seconds after the participant had handed the stimulus back to the Examiner. Each participant's protocol was audio recorded to provide an accurate recording of responses.

Hypothesis I

The Roemer Symbol Test (Roemer,1966) was expected to elicit a greater range and amplitude of skin conductance responses over the Rorschach Ink Blot Test (Rorschach,1948).

Hypothesis II

Skin conductance level response (amplitude and range) was expected to be inversely related to Hare PCL-R ratings (Hare, 1991). When the PCL-R ratings were low then the skin conductance level responsivity would be high. When the PCL-R ratings were high, then the skin conductance level responsivity would be low.

Results

The major focus of this study was to provide a demonstration of two applications of a new method. This method applies psychophysiological monitoring to projective assessment. The Rorschach (Rorschach,1948), Roemer Symbol Test (Roemer,1966) and Hare PCL-R (Hare, 1991) were administered to 30 participants

residing at the Dade Bridge. An alpha level of .05 was used to determine statistical significance. The demographic characteristics of the sample are listed on Table 1. These include age, education, ethnicity, marital status, offspring, previous arrests, religious affiliation and occupation.

Two hypotheses were presented. Hypothesis I stated that the Roemer Symbol Test (Roemer,1966) was expected to elicit a greater range and amplitude of skin conductance responses over the Rorschach Ink Blot Test (Rorschach,1948). The amplitude component of Hypothesis I was not supported yielding t (29) = 1.274, p = .213. Refer to Table 2 for a breakdown of mean, SD. and t results. Figure 1 displays this comparison of amplitude. The range component of Hypothesis I was not supported yielding t (29) = .707, p = .485. Refer to Table 3 for a breakdown of mean, SD. and t results. The comparison of range is displayed in Figure 2.

Hypothesis II stated that skin conductance level response was expected to be inversely related to Hare PCL-R ratings (Hare, 1991). This hypothesis was also not supported in that a negative relationship between skin conductance range level and Hare PCL-R (Hare,1991) did not emerge. When comparing
Rorschach Ink Blot Test (1948) Skin Conductance Range Levels with the Hare PCL-R (1991), ratings the results showed that r = .11 and when comparing the Roemer with the Hare r = -.18. The probability results equaled p = .281 and p = .169, respectively. No significant relationship emerged. The breakdown of results are listed in Table 4. See Figures 3 and 4 for a display of this relationship.

The second part of Hypothesis II stated that there would be a negative relationship between amplitude levels and the Hare PCL-R (1991). When comparing Rorschach (1948) skin conductance amplitude levels with the Hare PCL-R, ratings the results showed that r = .05 and when comparing the Roemer with the Hare r = .01. The probability results equaled p = .378 and p = .464, respectively. No significant relationship emerged. The breakdown of results is listed in Table 5. See Figures 5 and 6 for a display of this relationship.

Table 1

Descriptive Statistics of Sample

Variable	Mean (s.d.)	` %	Range
Age	29.63 (7.87)		18-44
Sex			
Male		100	
Education	11.97 (2.41)		8-19
Race			
Black		33.3	
White, Hispanic		50.0	
White, Non-Hispanic		16.7	
Religion			
Affiliation		76.7	
No Affiliation/No Belief		23.3	
Occupation			
Skilled		70.0	
Unskilled		30.0	
Previous Arrests	4.57 (4.40)		1-25

table continues

Table 1 (continued)

Variable	Mean (s.d.)	%	Range
Marital Status			
Single		56.7	
Married		13.3	
Separated		20.0	
Divorced		3.3	
Widowed		6.7	
Children	1.17 (1.49)		0-7

Table 2

Paired Samples Test of Skin Conductance Amplitude Levels

	Mean	S.D.	t	df	Sig.	95% Confidence Interval of the Difference	
						Lower	Upper
Roemer - Rorschach	.67293	2.89256	1.274	29	.213	-.40717	1.75303

Figure 1

Comparison of Rorschach and Roemer Skin Conductance Amplitude

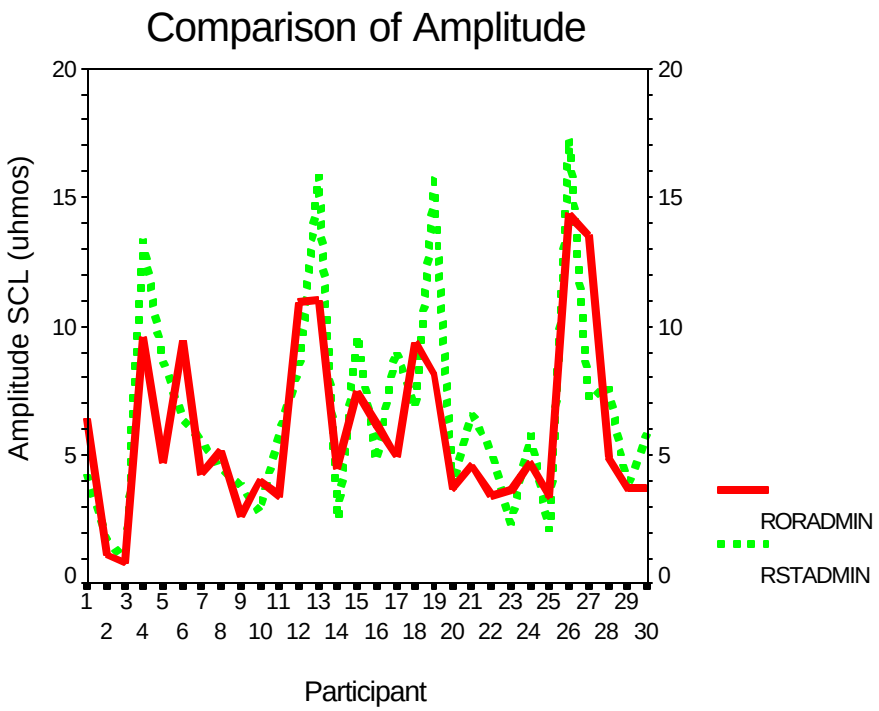


Table 3

Paired Samples Test of Skin Conductance Range Levels

	Mean	S.D.	t	df	Sig.	95% Confidence Interval of the Difference	
						Lower	Upper
Roemer - Rorschach	.11021	.85389	.707	29	.485	-.20863	.42906

Figure 2

Comparison of Rorschach and Roemer Skin Conductance Range

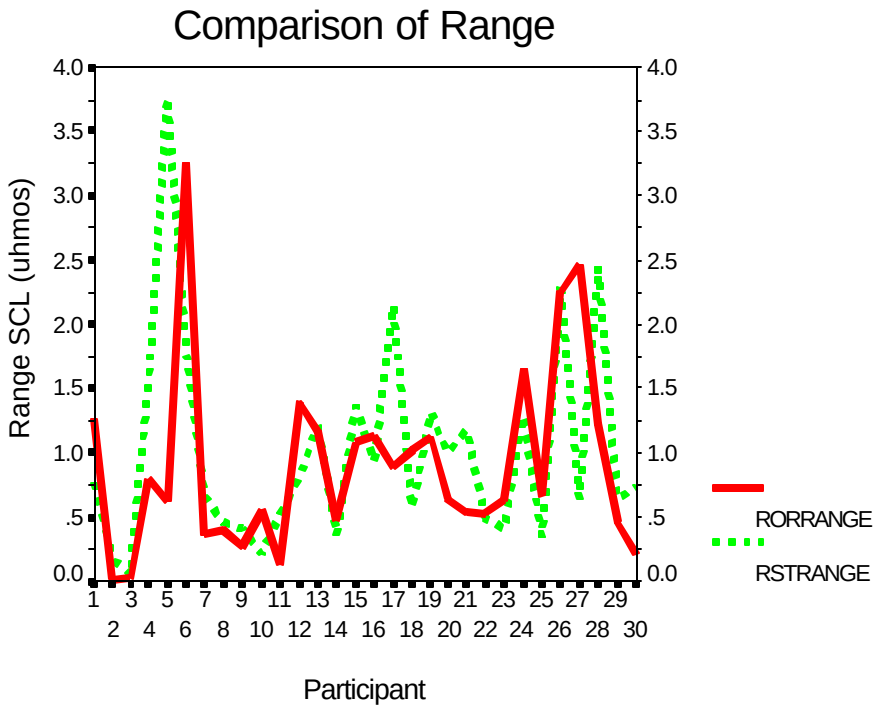


Table 4

Correlations of Skin Conductance Range Levels and Hare PCL-R

		Hare PCL-R
Rorschach SCL Range	Pearson Correlation	.111
	Sig. (1 - tailed)	.281
Roemer SCL Range	Pearson Correlation	-.181
	Sig. (1 - tailed)	.169

Figure 3

Correlation of Rorschach Range and Hare PCL-R

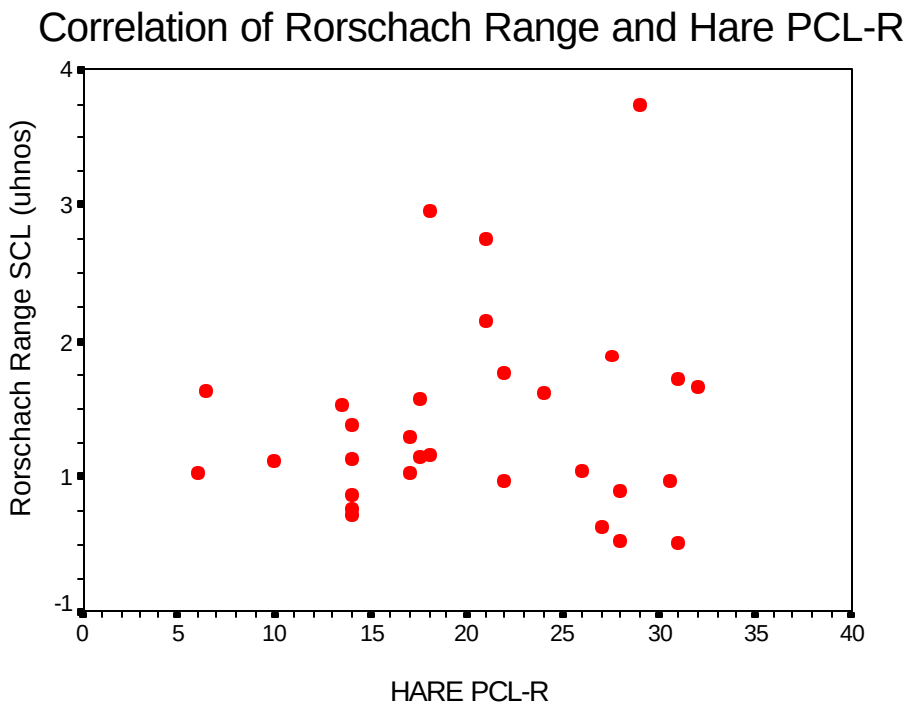


Figure 4

Correlation of Roemer Range and Hare PCL-R

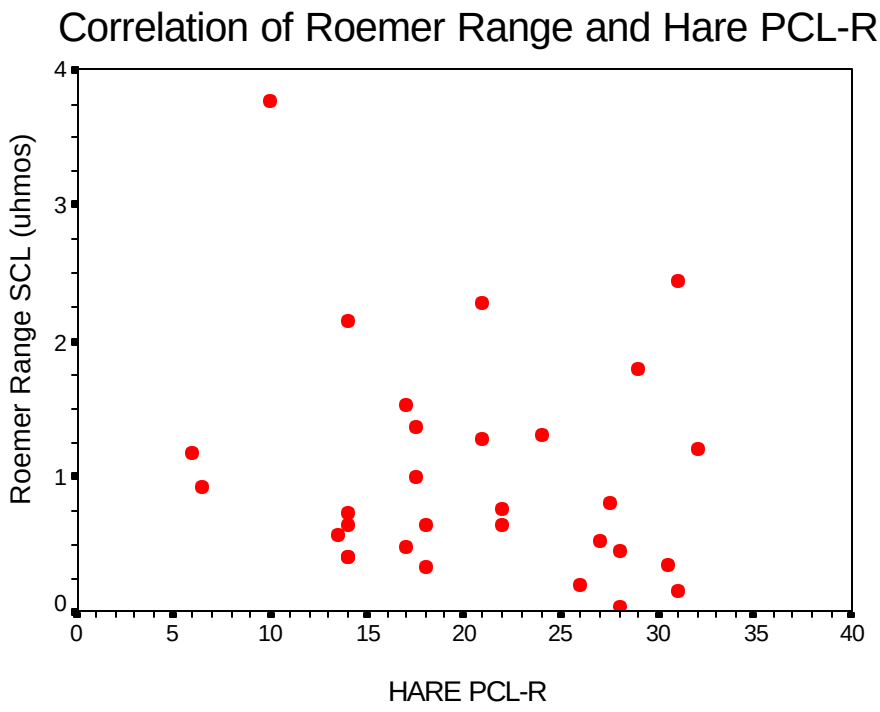


Table 5

Correlations of Skin Conductance Amplitude Levels and Hare PCL-R

		Hare PCL-R
Rorschach SCL Amplitude	Pearson Correlation	.059
	Sig. (1 - tailed)	.378
Roemer SCL Amplitude	Pearson Correlation	.017
	Sig. (1 - tailed)	.464

Figure 5

Correlation of Rorschach Amplitude and Hare PCL-R

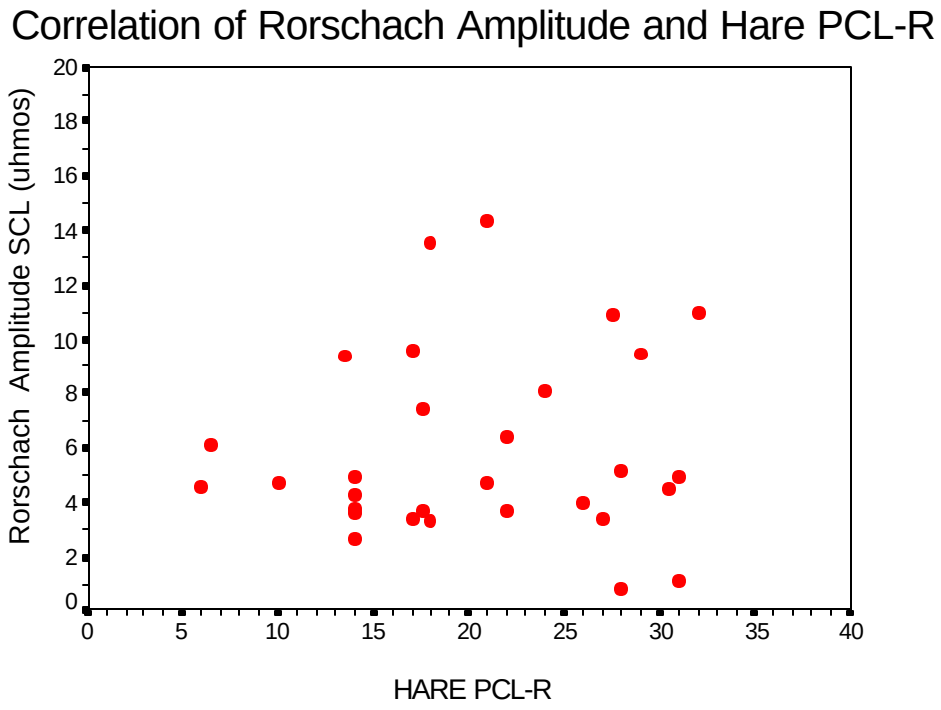
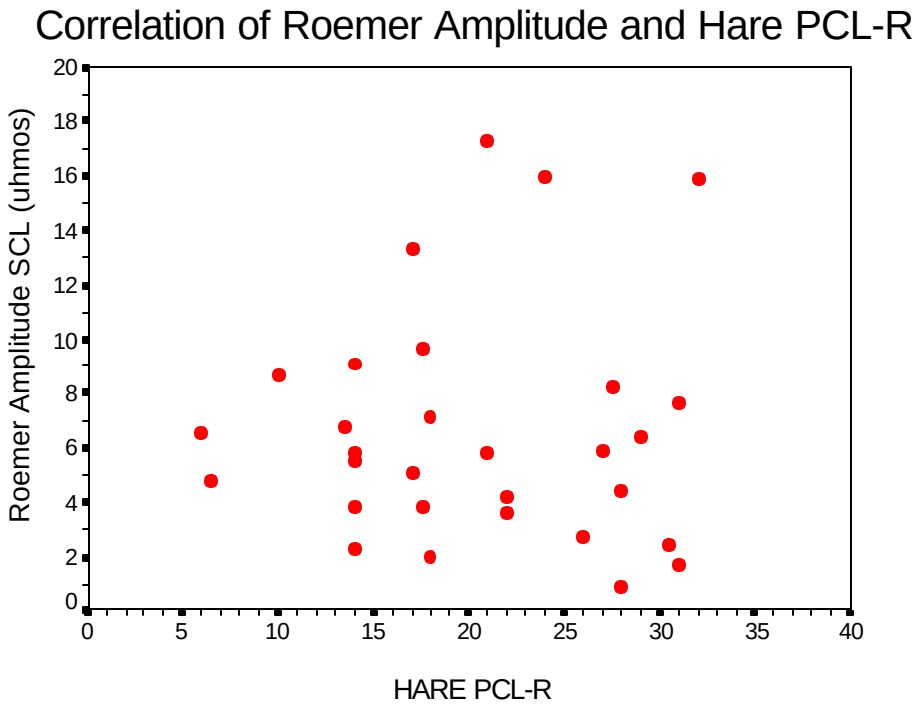


Figure 6

Correlation of Roemer Amplitude and Hare PCL-R



Discussion

The focus of the present research is on the application of a method of monitoring psychophysiology during projective assessment. This method may be helpful when quantifying unconscious events. There has been general agreement that Skin Conductance Level is an appropriate indicator of unconscious phenomena.

The first hypothesis expecting a greater magnitude and range of skin conductance for the Roemer over the Rorschach was not supported. Although group comparisons did not yield significant comparisons, perhaps group comparisons may not be the most advantageous way to view this data. Upon careful scrutinizing of the results the means were greater for the Roemer over the Rorschach. This may be clinically significant although not statistically significant. In other words this difference may be useful when choosing between the two projective instruments.

Hypothesis II expected to discover an inverse relationship between the Hare PCL-R and skin conductance level. A statistical analysis did not sustain this either. One possible explanation for this lack of support may be in the instrument chosen to screen for psychopathy. The Hare PCL-R is an interview with a checklist relying heavily upon self report. It is questionable as to whether its use for this purpose was valid. Perhaps another assessment tool along with the Hare PCL-R would have yielded optimum results. Diminished skin conductance level is an objective measure generally regarded as a reliable and valid characteristic of psychopathy.

Limitations

Although a power analysis yielded an N = 30, perhaps a larger subject pool would have helped in achieving statistical significance. Furthermore, the entire sample came from one location, a therapeutic program for incarcerated adult males. Participants from various locations and programs would have been helpful to decrease sample bias.

Another limitation may be in the application of statistical methods. Are statistical measures sensitive enough to discern differences between the stimulus properties of the projective techniques? In this case they were not and it is difficult to tell whether true differences did not occur and whether a Type II error has occurred. In reviewing the individual responses, it became apparent that clinical differences emerged. A systematic and efficient method of examining the group as well as individual responses was not available.

Recommendations for Future Research

Improvement of data base organization and tools for the analysis of psychophysiological data presents a challenge. A psychophysiological data base containing one participant's results can be enormous requiring expensive human resources. The addition of digitized audio and visual data will provide ample opportunity to examine the projective assessment process more thoroughly. Advances in technology will in time provide these tools at an affordable cost for research and intervention.

Conclusions

A user friendly software application was used to systematically gather psychophysiological data during the administration of projective instruments. Two hypothesis were tested. Skin conductance levels indicate eccrine sweat gland activity. The eccrine sweat glands provide an index of cortical activity with psychological significance. This is significant to the examiner/clinician as it includes the experience of frequency, duration, and intensity of inner experience that mirrors conscious and unconscious experience. The data provides an event marker of meaningful and significant mental events. This systematic method of utilizing psychophysiological data can inform the projective assessment allowing it to become more than an assessment of articulation.

This research supports the compelling need to objectify what was once only considered to be theoretical or speculative. This has been an attempt to further understand the unconscious and to move from basic to applied science.

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