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A Field Validity Study of the Rank Order Scoring System (ROSS) in Multiple Issue Control Question Tests

By

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and

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Abstract

The Rank Order Scoring System (ROSS) for analyzing physiological detection of deception polygraph charts proposed by Honts and Driscoll (in press) for single issue tests was expanded for use with multiple issue tests. This expanded version of the ROSS was evaluated in comparison with standard numerical scoring on a set of 25 confirmed field cases obtained from a federal law enforcement agency. The ROSS and standard numerical scoring were of about the same validity when subjects either responded truthfully or deceptively to all of the relevant questions on their examinations. However, standard numerical scoring significantly outperformed the ROSS on a subset of cases where subjects responded truthfully to some relevant questions but deceptively to other relevant questions during the same examination. Strengths, weaknesses, and possible applications of the ROSS were discussed.

A Field Validity Study of the Rank Order Scoring System (ROSS)

In a previous report Honts and Driscoll (in press) described a Rank Order Scoring System (ROSS) for the analysis of control question test polygraph charts. They suggested that the ROSS was psychophysically simpler and psychometrically more defensible than standard numerical scoring, and they reported results that indicated the ROSS to be at least as reliable and valid as standard numerical scoring. Honts and Driscoll suggested that even if the ROSS and standard numerical scoring have the same criterion validity, the ROSS is to be preferred for a number of psychometric and pragmatic reasons. One reason the ROSS is to be preferred is that it relies more on objective measurement than does standard numerical scoring. The ROSS is thus likely to be more reliable over a larger number of examiners, and examiners may be less likely to show drift in their scoring over time. The

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ROSS may also have the advantage of being easier to teach to new examiners and it may be simpler to explain to laymen.

In the ROSS, the chart evaluator rank orders the responses within each physiological system from largest to smallest for all of the relevant and control questions on a chart. For a single issue test, all of the ranks to control and relevant questions are summed separately, and then the sum of the ranks for the relevants is subtracted from the sum of the ranks for the controls. The resulting difference in total rank order scores is then evaluated against an inconclusive zone in a manner analogous to the evaluation of a standard numerical score.

Honts and Driscoll (in press) ended their initial presentation on the ROSS with three cautions. First, they noted that the ROSS was developed and evaluated with data obtained from laboratory subjects. Thus, the generalizability of their results to polygraph charts obtained from the subjects of real world polygraph examinations is not known, although it is likely to be high. Second, they noted that their evaluation applied only to single issue polygraph tests, no method was suggested for the application of the ROSS to multiple issue polygraph tests, and no attempt was made to evaluate the validity of the ROSS in multiple issue tests. Finally, they expressed caution about the stability of their empirically derived inconclusive zone. They suggested that additional research was needed to establish an optimal inconclusive zone for the ROSS.

The present study addressed the three points raised by Honts and Driscoll in their initial presentation of the ROSS. A method for expanding the ROSS to multiple issue polygraph test is presented, and then the ROSS is evaluated in comparison to standard numerical scoring with sets of charts obtained in multiple issue real world polygraph examinations.

Method

Subjects and Data Selection

The data for this study were the polygraph charts from 25 confirmed field cases selected from a larger data set that was part of a field validity study of the control question test (Honts, Raskin, Kircher, & Horowitz, 1988). All of the cases in the Honts et al., study were obtained from the files of a federal law enforcement agency. Confirmations were based on confessions that were supported by evidence. All of the cases were criminal investigations, and all of the polygraph examinations were specific issue examinations. Honts et al. obtained a data set of 100 cases by sequential sampling to a criterion number of cases in each of their desired categories.

The 25 cases used in this study were selected from that larger data set in the following manner. The Honts, et al. data set contained 13 cases where individuals were confirmed to be truthful in their responses to at least one relevant question, and they were also confirmed to be deceptive in their responses to at least one other relevant question in the same examination. Honts, et al. reported that the performance of the original examiners and the independent evaluators was the worst on these cases. We selected all of those mixed confirmation cases for this study because we wanted to take steps to insure some potential for error in this data set and thus avoid the possibility that a ceiling effect might obscure any differences in criterion validity between standard numerical scoring and the ROSS. Twelve other cases were also selected at random from a subset of cases where individuals were confirmed as either truthful or deceptive in their responses to all relevant questions asked in their polygraph examinations. The data set formed by those 25 cases contained a total of 74 relevant questions with confirmed responses. Of those 74 questions, 35 were confirmed to have been answered truthfully, and 39 questions were confirmed to have been answered deceptively.

Apparatus and Procedure

All of the physiological recordings were made by field polygraph examiners who were on the staff of a federal law enforcement agency. All recordings were made using standard field instrumentation and techniques. As a minimum, recordings were made of respiration, electrodermal activity, and relative blood pressure. All examinations used a control question test. Several different control question formats were employed according to the standard field practices associated with each. In 19 of the cases, 3 charts of data were collected. In 4 cases, 4 charts of data were collected, and in 1 case only 2 charts of data were collected. In this study, all available charts were evaluated.

The independent evaluator in this study was trained and experienced with both standard numerical scoring and with the ROSS. The independent evaluator performed two evaluations. During both evaluations, the independent evaluator was blind to the confirmation of all relevant questions. The first evaluation was part of a blind scoring of the entire Honts et al. (1987) data set and used the semiobjective numerical scoring procedures developed at the University of Utah (Podlesny & Raskin, 1978; Raskin & Hare, 1978). The following characteristics were utilized to assess the strength of the responses: skin conductance response, amplitude and duration; respiration, decrease in amplitude, slowing, and baseline increase; diastolic blood pressure, increase and duration. For purposes of this study, finger pulse amplitude measures were not scored.

In the standard numerical scoring, each pair of control and relevant questions was assigned a score from -3 to +3 for each of the physiological systems. The magnitude of the numerical score was dependent upon the magnitude of the difference between the physiological responses to the two question types. Positive scores were assigned when responses to control questions were stronger, and negative scores were assigned when the responses to relevant questions were stronger. Zero scores were assigned when the magnitude of the responses to relevant and control questions were equal.

The second evaluation of the charts in this study used a modified version of the ROSS described by Honts and Driscoll. In the Ross, the physiological responses were evaluated by rank ordering the responses within each physiological component so that the largest response in that component was given a rank equivalent to the number of relevant and control questions. For example, if the question pattern contained 4 relevant and 3 control questions the total number of scorable questions was 7. In this example, the largest response in each of the physiological systems on each chart received a rank of 7. The smallest response in each system would received given a rank of 1.

The criteria used for ranking were those that statistical analyses (Kircher & Raskin, 1987) have indicated as having the highest diagnostic value. For electrodermal responses, measurements were made of the response's magnitude to the closest mm of pen deflection. Electrodermal responses were then ranked in order of magnitude, with the largest response receiving a rank equal to the total number of scorable questions. If two electrodermal responses were of the same magnitude, but one was clearly of greater duration or complexity (multiple inflections), the response with the greater duration and/or complexity was given the higher rank. For relative blood pressure responses, the magnitude of the increase in diastolic blood pressure was measured to the closest mm of pen deflection. The question with the diastolic increase of the greatest magnitude was given the rank equivalent to the total number scorable questions. If two diastolic blood pressure increases were of the same magnitude, then the tie was broken with reference to the duration of the diastolic increase. Diastolic blood pressure responses of greater duration were assigned the higher rank. Respiration responses were not objectively measured. Instead, the evaluator mentally estimated the respiration length measure described by Timm (1982). Timm's measure represents the length of the line traveled by the pen during a specified time interval. Any decrease in the amount of respiratory activity (apnea, suppression, slowing of rate, etc.) results in a decrease in the length of the chart line over time. For this analysis, the response that was judged to have produced the shortest respiration length was given the highest rank.

If two or more responses could not be rank ordered by the procedures described above they were considered tied. When ties occurred the sum of the tied ranks was determined, and then that sum was divided by the number of the ranks. The tied ranks were given equal ranking values. For example, consider the situation where there was 6 scorable questions and the measurements of the six skin conductance responses were as follows:

R1 = 46mm; R2 = 43mm; R3 = 40mm;

C1 = 40mm; C2 = 10mm; C3 = 20mm.

In the above example, R1 was ranked 6, and R2 was ranked 5. R3 and C1 were of the same magnitude, and for illustration assume they were of the same duration and complexity. The rank order scores for R3 and C1 were determined by adding the ranks for the two slots they occupied (i.e., 4 + 3 = 7) and then dividing by the number of ranks tied (i.e., 7/2 = 3.5). In this example, both R3 and C1 received the rank of 3.5. C3 received the rank of 2, and C2 received the rank of 1.

Lack of reaction and discounted zones were given the lowest available rank. If there was no response to a question, or if a response was not evaluated because of distortion, the response was given the rank of 1. If more than one question showed a lack of reaction or was discounted because of distortion, the ranks were all tied at the smallest rank available. For example, consider the situation where the measurements of the six skin conductance responses were as follows:

R1 = 46mm; R2 = 43mm; R3 = 40mm;C1 = movement; C2 = 0mm; C3 = 0mm.

In this example, R1, R2, and R3 received the ranks of 6, 5, and 4 respectively. C1, C2, and C3 were considered tied at the lowest rank available and all received the score of 2 (3 + 2 + 1 = 6/3 = 2).

At the conclusion of the scoring, the rankings for each relevant question were summed, and the rankings for each control question were summed. A control question comparison scores (CCS) was then calculated by determining the mean ranking for control questions in the following manner. The sums of the ranks for each of the control questions were summed to give a total of the rankings for all control questions. This total of the rankings for all control questions was then divided by the number of control questions to give the CCS. For example, if there were 4 control questions with the following sums of ranks:

$$C1 = 39.5, C2 = 50, C3 = 34, C4 = 45.5$$

The total of the rankings for control questions was 169 (39.5 + 50 + 34 + 45.5 = 169). The CCS was 42.25, the total of the rankings for control questions divided by the number of control questions (169/4 = 42.25).

A evaluation score was then determined by subtracting the total of rankings for a relevant question from the CCS. The resulting rank order difference score (RODS) was used as a basis for truth/deception decision making. According to the rationale of the control question test, Innocent subjects should produce a positive RODSs, and Guilty subjects should produce negative RODSs. A modification of the ROSS score sheet presented by Honts and Driscoll (in press) was developed for use with single issue tests. An example of a completed ROSS score sheet for single issue tests is given in Appendix A, and a blank ROSS score sheet for single issue tests is provided for the reader's use in Appendix B.

Results

Unless otherwise noted, all statistical computations were performed with SPSS/PC+ (Norusis, 1986). All statistical tests employed a .05 rejection region.

Standard Numerical Scores

The mean standard numerical score for relevant questions with confirmed truthful responses was +1.8, and the mean numerical score for relevant questions with confirmed deceptive responses was -5.23. Analysis of Variance (ANOVA) indicated that this was a significant difference, F(1,72) = 66.01. A point biserial correlation was calculated to test the predictive validity of the standard numerical scores for the criterion of truthful and

deceptive responses. The resulting validity correlation was significant, $\underline{r} = .69$.

Decisions based on the standard numerical scores were examined in a manner similar to that described by Honts and Driscoll (in press). The boundaries of the inconclusive zone for decisions of truthful/deceptive for single questions were systematically varied from 0 to +/-7. The relationship between the resulting trichotomous decisions (truthful, inconclusive, and deceptive) and the dichotomous criterion (confirmed truthful and deceptive responses) were evaluated with the <u>tau c</u> statistics. The resulting percent inconclusive and correct decisions for confirmed truthful and deceptive responses are shown in Figure 1.

Maximum statistical efficiency of the inconclusive zone was indicated by a peak value of the <u>tau c</u> statistic at .70 when the boundaries of the inconclusive zone were set at +/-2. Thus, the most commonly used boundary in the field seems to be well supported in this data set. Using an inconclusive zone of +/-2 the diagnoses for single relevant questions based on the standard numerical scoring were 62.2% correct, 8.1% incorrect, and 29.7% were inconclusive. The false positive rate was 22.7% and the false negative rate was 3%.

Rank Order Difference Scores

The mean rank order difference scores (RODS) for relevant questions with confirmed truthful responses was +2.91, and the mean RODS for relevant questions with confirmed deceptive responses was -11.05. ANOVA indicated that this was a significant difference, F(1,72) = 43.28. A point biserial correlation was calculated between the RODS and the criterion of confirmed truthful and deceptive responses and resulted in a significant validity correlation of r = .61. This validity correlation was compared to the validity correlation derived with the standard numerical scores using the procedures described by Klugh (1970), and the two correlations were found to be significantly different, t(71) = 2.01.

Possible boundaries for an inconclusive zone for the RODS were evaluated in the same way as was described above for the standard numerical scores. Boundaries from 0 to +/- 7 were examined and the resulting percent inconclusive and correct decisions for confirmed truthful and deceptive responses are shown in Figure 2.

The <u>tau c</u> statistic reached a maximum value of 0.64 when the boundary was set at +/-1 but then showed little shrinkage until the boundary was set at +/-7. A plot of the <u>tau c</u> statistic for the various boundaries of the inconclusive zone and the two scoring systems is shown in Figure 3.

An examination of Figure 3 indicates that the <u>tau c</u> statistic give us little information for making the choice of an inconclusive boundary when using the ROSS with single relevant questions. Visual inspection of Figure 2 suggests that +/- 2 seems to offer a reasonable tradeoff between inconclusives and errors when using the ROSS with single relevant questions. When an inconclusive zone of +/- 2 was used, the resulting diagnoses were



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RANK ORDER DIFFERENCE SCORES



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Boundries of the inconclusive Zone

Figure 2. Effects of varying the inconclusive boundaries with the rank order scoring system. (D = Deceptive Correct, T = Truthful Correct, I = Inconclusive)

Percent



Figure 3. Values of <u>tau</u> <u>c</u> for different boundaries of the inconclusive zones for the standard numerical (S) and rank order (R) scoring systems. Polygraph 1988, 17(1)

g

tau c

68.9% correct, 14.8% incorrect, and 16.2% were inconclusive. The false positive rate was 34.6% and the false negative rate was 5.6%.

Mixed versus Pure Confirmations

Honts et al. (1987) reported that both their original examiners and independent evaluators performed more poorly on the subset of examinations where subject answered some questions truthfully and some deceptively (MIXED) as compared to the subset where subjects answered all relevant questions either truthfully or deceptively (PURE). We examined the present data set to see if there were differences between the two scoring system in how they performed on the MIXED and PURE subsets. Mean standard numerical scores and RODS were broken down by truth-deception and type of confirmation (PURE-MIXED) and are shown in Table 1.

Table 1

Mean Standard Numerical and Rank Order Difference Scores for Pure and Mixed Confirmation Subjects

Type of Confirmation	Truthful	Deceptive
Rank Order Difference Scores		
Pure	9.38	-12.03
Mixed	-2.56	-10.37
Standard Numerical Scores		
Pure	3.38	-6.75
Mixed	0.47	-4.17

The data were coded so that each question was considered an independent observation, and Guilt (truthful-deceptive responses) by Type of Confirmation (PURE-MIXED) ANOVAs were performed on the RODS and the standard numerical scores. The ANOVA of the RODS indicated significant main effects for Guilt, $\underline{F}(1,70) = 51.42$, and Type of Confirmation, $\underline{F}(1,70) = 6.28$. The main effect for Guilt indicates that relevant questions with confirmed truthful responses produced more positive RODS than did relevant questions with confirmed deceptive responses. However, the main effect for type of confirmation indicates that when the confirmations are mixed the mean RODS for both truthful and deceptive responses was more negative than the mean standard numerical scores. The ANOVA also indicated a significant two-way interaction between Guilt and Type of Confirmation, F(1,70) = 12.31. The means shown in Table 1 indicated that this effect was primarily due to the RODS mean negative value with confirmed truthful responses in the MIXED condition.

The ANOVA of the standard numerical scores indicated a significant main effect for Guilt, F(1,70) = 74.11. As expected, relevant questions with

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confirmed truthful responses produced more positive standard numerical scores than did relevant questions with confirmed deceptive responses. The Guilt by Type of Confirmation interaction was also significant in the standard numerical scores, $\underline{F}(1,70) = 11.06$. As with the RODS, this effect indicates that the standard numerical scoring system performed poorly with confirmed truthful responses in the MIXED condition.

Point biserial correlations were also calculated between the RODS, the standard numerical scores, and the confirmed truthful/deceptive response criterion within the MIXED and PURE subsets. The resulting validity correlations for the RODS were $\underline{r} = 0.81$ with the PURE sample, and $\underline{r} = 0.43$ for the MIXED sample. The difference between these correlations was tested using the procedures described by Klugh (1970), and they were found to be significantly different, $\underline{z} = 2.84$. The validity correlations for the standard numerical scores were $\underline{r} = 0.85$ for the PURE sample and $\underline{r} = 0.54$ for the MIXED sample. The difference between these correlations was also significantly different, $\underline{z} = 2.78$. The validity correlations for the standard numerical scores were contrasted for the PURE and MIXED conditions respectively, and they were not statistically different.

Discussion

This study provided an extension of the ROSS described by Honts and Driscoll (in press) to multiple issue polygraph tests. Data were obtained from real world cases where the subjects' responses were confirmed by evidence supported confession. The analyses of the ROSS and the standard numerical scoring system developed at the University of Utah indicated that standard numerical scoring significantly outperformed the ROSS, with the greatest difference in performance occurring with truthful responses in MIXED confirmation cases. The performance of the two techniques was very similar for cases where the confirmation indicated the subjects were either answering all of the questions truthfully or deceptively (PURE). The results with the PURE data set fit well with the earlier findings of Honts and Driscoll (in press) obtained with a laboratory data set. However, the results with the MIXED data set suggest that the ROSS may be slightly less useful than standard numerical scoring in mixed issue tests. This loss of utility for the ROSS would be strongest when there is a high cost associated with false positive errors to single questions in a mixed confirmation examination.

This loss of utility for the ROSS may be somewhat mitigated by the finding that while the ROSS produced some more errors than standard numerical scoring, it produced many fewer inconclusives. This results suggests that the ROSS may be more useful in situations were decisions are preferable to inconclusives, even at a small cost in errors. Security screening might be such a situation, since an inconclusive outcome is of no value, and there is a pressing need for developing information at the time of the examination.

With regard to screening, the ROSS may offer a way to score examination formats that are usually evaluated by global techniques. For example, when relevant-irrelevant formats are used in the initial stages of screening examinations the relevant questions could be rank ordered using the

A Field Validation of the ROSS

procedures described above. Then instead of using a control comparison to develop a difference score, the sums of the ranks of the relevant questions could be evaluated directly. The relevant questions that produce the largest sums of ranks should be those relevant questions that are causing the subject the greatest concern. Interrogation could then be focused on those relevant questions with the largest sum of ranks, or those relevant questions with high rank order scores could be further evaluated in a control question test format. Research is needed to evaluate these possibilities.

The finding that a boundary of the inconclusive zone set a +/-2 was optimal of the ROSS in this field data set suggests that the +/-13 inconclusive zone suggested by Honts and Driscoll (in press) for a three relevant question single issue test may be too conservative. The present results suggest that an inconclusive zone for single issue tests in the range of +/-6 or 7 might be more appropriate. Unfortunately, there were an insufficient number of single issue examinations in the present data set to explore this question adequately.

In summary, the ROSS was found to be about as accurate as standard numerical scoring in diagnosing truth and deception when the subjects either answered all questions truthfully or deceptively. However, the ROSS performed less well when with cases where the subjects were truthful to some questions, but were deceptive to others during the same examination. The difference between the performance of the two scoring techniques were statistically significant, but they were of a small magnitude. Examiners are cautiously encouraged to experiment with the ROSS in field situations, particularly where there is a high payoff for reaching decisions.

Finally, the reader should not interpret this study of the relative validity and utility of standard numerical scoring and the ROSS as a field validity study of the control question test. The data selected for this study were selected in a manner that minimized the possibility of a ceiling effect, and maximized the possibility that errors might be generated by the respective scoring systems. Thus, the results of this analysis are likely to underestimate the validity of the control question test. For a complete analysis of the validity of the control question test, please see Honts, Raskin, Kircher, and Horowitz (1988).

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Appendix A: A completed ROSS score sheet

Appendix B: A blank ROSS score sheet

SUBJECT	716			Da ⁻	TE		NA	EXAMINER	NA
REVIEWED BY	lonte	ś			Da ⁻	ге <u></u>	Sep	+ 87	
DECISION R1 Tra	utligul	R2 <u>Tru</u>	terene F	R3TPull	BR RI	+ Truff	Bul R5_	R6	Overall
		~	-		RANK (ORDER \$	SCORING	6	
CHART 1	<u> </u>	R	Ra	<u>Ca</u>	R3	Ry	63		ma 4367
VASOMOTOR	\leq	\leq	\leq	\leq	\leq		\leq		- TOTAL D1 3/0
RESPIRATION	2	6	6	4	2	る	6		- DODS D1 17.67
Electrodermal	4.5	1.5	3	6	1.5	4.5	7		
CARDIOVASCULAR	4	5	2.5	7	1	6	2.5		CCS <u>43.67</u>
SUB-TOTALS	10.5	12.5	11.5	17	4.5	12.5	15.5		- Total R2 <u>23.5</u>
CUNDT 2	(.	R.	R-	()	R 2	R.	()		= RODS R2 <u>20.17</u>
					ns /				
	1.5		$\overline{2}$	4	12	5	1.5		
ELECTRODEDMAL	<u> </u>		2			4	<i>Q. J</i> 7		= DODS DZ . 4 (.)
	5	2	15	15	55	5 5	55		
SUB-TOTAL S	17	10	5 5	95	95	14.5	19		CCS <u>43.67</u>
JUD TUTALS			<u></u>	0.5					- TOTAL R4 <u>32.5</u>
CHART 3	Cı	R.	R2	(2	R3	R4	63		= RODS R4 11.17
VASOMOTOR	\leq	\leq	\leq	\leq	\leq	\leq	\leq		277
RESPIRATION	4	5	3	2	7		6		
ELECTRODERMAL	6	1.5	1.5	5	3.5	3.5	7		
CARDIOVASCULAR	6	7	2	4.5	4.5		3		= KUUS K5
SUB-TOTALS	16	13.5	6.5	11.5	15	5.5	16		CCS
силот п									- TOTAL R6
					1				= RODS R6
									ROS ALL CONTROLS
									- ROS ALL RELEVANTS
									= TOTAL RODS
SUB-TUTALS									
CHART 5							+		<u>WITEN 5</u>
VASOMOTOR									
RESPIRATION									
ELECTRODERMAL									
CARDIOVASCULAR									
SUB-TOTALS									
QUESTION	43.5			37			50.5	(CONTROLS DELEVIANTO
		36 ∣ ∩ ∩⊡⊏	23.5	121	29	32.5			KELEVAN IS
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SUBJECT		D	ATE		EXAMINER	
REVIEWED BY	·		Date			
DECISION R1	R2	R3	R4	R5	R6	OVERALL
			RANK ORDEI	R SCORING		
CHART 1						
VASOMOTOR						
RESPIRATION						
ELECTRODERMAL						- KUUS KI
CARDIOVASCULAR			_	_		CCS
SUB-TOTALS						- Total R2
CHART 2						= RODS R2
VASOMOTOR						CCS
RESPIRATION						- Total R3
ELECTRODERMAL						= RODS R3
CARDIOVASCULAR						
SUB-TOTALS						
CHADT 7						- IUIAL K4
UHART S						= KUUS K4
						CCS
						- TOTAL R5
						= RODS R5
JUD TUTALS			4 4			- TOTAL R6
CHART 4			-+		······	= RODS R6
VASOMOTOR						-
RESPIRATION						- ROS ALL CONTROLS
ELECTRODERMAL						- ROS ALL RELEVANTS
CARDIOVASCULAR						= TOTAL RODS
SUB-TOTALS						
CHART 5						<u>COMPENTS</u>
VASOMOTOR						~
RESPIRATION						-
ELECTRODERMAL						_
CARDIOVASCULAR						+
SUB-TOTALS						-
QUESTION TOTALS			-			CONTROLS RELEVANTS
TOTAL SCORE FOR CO	NTROL QUES	TIONS				
DIVIDED BPOTYERAD	18E R9878 , CON7	T(RO)LS				
FQUALS THE CONTROL	. COMPARISO	V SCORE ((XCS) FOR SIN	IGLE RELEV	ANT QUESTIC	NS

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COUNTER-COUNTERMEASURES IN POLYGRAPH TESTING

Stan Abrams, Ph.D. & Lt. Michael Davidson

Introduction

Evidence for the effectiveness of certain countermeasures employing muscular tension, movements, and self-inflicted pain recently have been reported. While some of these findings have been rather dramatic, it must be recognized that all of these investigations have taken place in a laboratory setting. Because the laboratory subject has little or nothing to lose if his lie were detected as compared to a criminal suspect who faces possible imprisonment, it is likely that the impact of the relevant question will be much reduced. Moreover, the study of the control question technique in the laboratory suffers from a major flaw. Although the volunteer subject would be expected to have little fear related to the relevant question associated with a mock crime, the control question deals with personal and possibly embarrassing material. This might create more of a threat than the relevant item so that, in essence, the control question becomes more relevant than the relevant item. Therefore, countermeasures could be effective in a laboratory situation, but not necessarily in a field setting where the relevant question will pose a greater threat. This writer has found that in his study of hypnosis and polygraphy, hypnotic techniques were partially effective as a countermeasure in laboratory research but not in actual cases (Weinstein, Abrams & Gibbons, 1970).

The only real life situation that has been studied not only lacks scientific objectivity, but completely relies on the veracity of prison inmates for its results. Lykken sent an inmate information on how to defeat the polygraph procedure through countermeasures (Lykken, 1980). He claimed to have taught these methods to 27 convicts who had to be tested for some infraction of prison rules. Reportedly, 23 of the 27 were successfully able to pass the test despite the fact that they were lying (Lykken, 1981).

In a laboratory study, Kubis (1962) investigated a number of countermeasures and found that methods associated with pressing one's toes against the floor were highly successful. He reported that accuracy with the deceptive was reduced from 75 to 10 percent. A replication of this study by More (1966), however did not obtain any reduction in accuracy. In two more recent laboratory studies, Honts and Hodes (1982a, b) not only concluded that, given adequate training, countermeasures were effective but that they could not be detected in the tracings or by an observation of physical movements. In their first experiment they trained and provided practice for their subjects enabling them to relax during the relevant questions and to use self inflicted pain (tongue biting) and muscular movements during the

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Counter-Countermeasures in Polygraph Testing

control questions. In that first investigation examiners were not able to detect the use of countermeasures, but neither the use of tongue biting nor toes pressed against the floor was effective as a countermeasure. In their second investigation, they doubled the time of training from 15 to 30 minutes, included a practice session and utilized both countermeasures simultaneously. Once again the polygraphist was unable to detect those who successfully used the countermeasures. This time, however, while there was complete accuracy in detecting the deception in the non-countermeasure group, 26 percent inaccuracies occurred among those who used countermeasures. Raskin et al. (1985) reported that countermeasures decreased detectability among the deceptive to the extent that 78 percent false negatives were obtained. However, when they employed a measure of electromyography (EMG), they were able to detect the use of countermeasures in 90 percent of the cases. This led Raskin to report that "... unfortunately, the polygraph community thinks it knows how to detect these things. If you read their publications and listen to their statements, they claim that a person trying to beat the polygraph test, it is shown on the recorder; that is absolutely inaccurate."

Employing a somewhat different approach, Stephenson and Barry (1986) specifically directed subjects to move parts of their bodies and observed whether these movements could be detected, and if they could be evaluated on the charts as countermeasures. In addition to this, they employed what Lafayette Instrument Company called an activity sensor to determine if these purposeful movements could be detected through this approach. They reported that the examiner only detected 10 percent of the movements, and an observer whose only role was to watch for these countermeasures was aware of 43 percent of these responses. The activity sensor was able to determine when these countermeasures were employed in 81 percent of the cases.

In our study, an attempt was made to evaluate the impact of movement as a countermeasure upon polygraph testing and to ascertain further if the activity sensor is an effective counter to these attempts to distort the findings.

Method

Three subjects, a male and two females, each carried out 23 specific physical acts. No questions were asked, the examinees simply followed the directions, making a particular movement at the request of the researcher. Nothing was covert, in that the experimenter knew when and which movement was going to occur. Because of that, his attention could be focused on that part of the body involved in the activity. Obviously, this presented him with a distinct advantage over a polygraphist who would be involved with other activities at the same time that he was watching the subject.

A Lafayette four-pen amplified polygraph instrument was used. The measures included an amplified-cardiograph, electrodermal response, respiration, and the activity sensor. Because Stephenson and Barry had reported more success with the Lafayette model in contrast to a similar device manufactured by another company, this particular sensor was chosen for study. It consists of a 28-inch metal strip that is placed beneath the front two legs of the chair and plugs into the auxiliary input of the multifunction

Stan Abrams, Ph.D. & Lt. Michael Davidson

amplifier of the polygraph. The weight of the subject slightly bends the sensor and any change in his weight distribution alters the bend in the sensor which is detected by a transducer. It provides a continuous tracing that can be compared with the other polygraph tracings so that the examiner is not only aware that a movement has occurred, but exactly when as well. In this instance, it was set at a sensitivity level of 7.

Table I lists the specific movements tested.

TABLE I

List of movements utilized as countermeasures

- 1. Right foot
- 2. Left foot
- 3. Right toes pressing down
- 4. Left toes pressing down
- 5. Right calf
- 6. Left calf
- 7. Right thigh
- 8. Left thigh
- 9. Right hand
- 10. Left hand
- 11. Right arm
- 12. Left arm

- 13. Right shoulder
- 14. Left shoulder
- 15. Right chest
- 16. Left chest
- 17. Right buttocks
- 18. Left buttocks
- 19. Tighten anal sphincter
- 20. Back press backward
- 21. Tense jaw
- 22. Step on tack
- 23. Bite tongue

Results

Every movement made by the subjects resulted in a change in the tracings in at least one of the three measures being employed. In 36% of the cases, the tracings demonstrated distortions caused by the movements which were readily interpreted as movements. This was particularly the case when the movement was on the upper portion of the body and on the same side as the blood pressure cuff. Despite concentrating on that part of the body to be moved, only 12% of the movements were actually observed. In 5% of the movements that were seen, no changes in the tracings occurred that would indicate that a movement had been made. Combining both the behavioral reactions not seen in the tracings and those indications of movement present in the tracings, a total of 44% of the countermeasures was detected. The activity sensor, however, was able to detect 92% of these movements. This included both the tongue biting and stepping down on a tack.

Discussion

It is important to be aware that in over half of the purposeful movements that were made, the tracings were very similar to what would ordinarily be described as a deceptive response. Therefore, if the subject were sophisticated enough to be aware of the concept of the control question technique, there is certainly a good possibility that he could create reactions on the control questions that would be greater than his responses to the relevant items. The key word, however, is sophisticated. It would

appear from the higher rates of accuracy reported in the research for deceptive subjects, that the majority of individuals are not employing countermeasures of this nature (Patrick and Iacono (1987); Office of Technology Assessment(1983)). As indicated earlier, it might be that the reactions to the relevant questions in real life testing exceed the reactions of the controls even though purposeful movements are made.

It is quite apparent that in those cases when either pain, muscular tension, or movements are being used, the activity sensor is highly effective in detecting these countermeasures. These findings are clear enough that it is seen as most important, if not imperative, for a measure of this nature to be part of any polygraph examination being administered.

In summary, it was found that countermeasures of this nature could be utilized effectively without being detected by the examiner in over 50 percent of the cases. The activity sensor, however, is extremely effective in detecting these movements. It is strongly felt that very few subjects are actually employing these methods, otherwise, a much greater percentage of false negatives would show up in the literature. Moreover, from informal contacts with private examiners, there is a consistent report of deception being found in 70 to 80 percent of the cases tested. It can be assumed that if a bright sophisticated individual were to be examined, he would read the polygraph literature and, from Lykken's book in particular, learn how to utilize countermeasures. It is with these individuals that an activity sensor is a necessity.

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USE OF A MOTION CHAIR IN THE DETECTION OF PHYSICAL COUNTERMEASURES

By

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and

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Introduction

Countermeasures are deliberate attempts by a guilty examinee to alter his physiological reactions, recorded for analysis on a polygram, to appear non-deceptive.

Countermeasures are classified in many forms, including: Mental countermeasures effectively producing distortion; range from rationalization, dissociation and information processing (i.e., arithmetic progression) to hypnosis, biofeedback and transcendental meditation. Pharmaceutical countermeasures which affect physiological response include depressants, stimulants and hallucinogens. Recent research in the use of drugs "to beat" the polygraph has shown the most a quilty subject can hope to accomplish is to diminish his reactions to the point of their being rendered inconclusive by an examiner administering a Control Question Technique examination. Miscellaneous countermeasures, such as adrenal exhaustion, voodoo charm, talisman and amulet have all been researched and classified as ineffective. Physical countermeasures are the most popular. These are defined as subtle movements of the body for the purpose of creating recordings more significant than those naturally produced by an examinee. Many surreptitious movements do not cause discernible artifacts on the charts; they look like genuine emotional reactions. This is a most disquieting fact to the polygraphist, compounded significantly by the fact that physical countermeasures are easily instructed through the mass media.

Research by Dr. Charles R. Honts and his colleagues since 1981 at the University of Utah reports that very simple physical countermeasures reduced accuracy from 75% to 22% with a C.Q.T. in a mock-crime scenario.

In 1981, David T. Lykken, noted polygraph critic, published <u>A Tremor in</u> the Blood. In his book, Dr. Lykken describes how the most dependable method

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of beating the polygraph is to augment one's reactions to the control questions using physical countermeasures. However disturbed one may be by the relevant questions, the scoring rules require that the examiner cannot diagnose "Deceptive" if the control reactions are just as strong or even stronger. Knowing the principles of the method, an examinee could identify the control questions when the examiner goes over the list in the pretest interview, and subsequently apply physical countermeasures to the control questions during the in-test.

Dr. Lykken was apparently aware of John E. Reid's research in 1945 which concluded that for some time (prior to 1945) it had been known that blood pressure changes could be artificially induced by muscular contraction and relaxation. Apparently unrecognized, however, even within the medical profession, was the possibility that the mere exertion of unobserved muscular pressure could produce a similar effect.

Mr. Reid was so disturbed by the obvious consequences of these spurious muscular distortions that in 1946 he designed the "motion chair". The original model consisted of installing in the arms and seat bottom metal bellows which pneumatically activated a set of recording pens in the Polygraph itself. This instrumentation was effective in identifying physical movements to such a degree that it prompted attorney F. Lee Bailey to offer a \$10,000.00 reward to anyone who could beat the polygraph. Mr. Lykken admits in his book that Mr. Bailey's money is quite safe if the test is administered by a competent examiner utilizing a motion chair.

The motion chair has been refined over the years from a bulky and strictly mechanical pneumatic device to the present-day electrically enhanced strain-gauge transducer type. A strain gauge is a pressure or weight sensitive recording device, typically less than the size of a dime, electronically activated and capable of having its sensitivity calibrated strictly linearly. This weight sensitive device incorporates its own component and recording pen in the polygraph and records any change in pressure upon itself resulting directly from movement by the examinee.

Stoelting markets a "movement sensing chair" whose strain-gauge transducer is mounted near a rear leg and sold as a complete chair package for \$615.00 (U.S.). Lafayette Instrument Company markets an "activity sensor" in the form of a metal bar 28 inches long, which is designed to slip under the front or rear legs of an examinee's chair. The current price of this bar is \$250.00 (U.S.). Testing of both detectors at the Canadian Police College (C.P.C.) Polygraph School showed the Stoelting chair is hypersensitive and virtually duplicates the pneumograph tracing portion of the polygram. The Lafayette bar is capable of filtering out the respiratory distortion and gives a clear indication of extraneous movement associated with physical countermeasures.

Since the Lafayette device was judged superior for physical countermeasure research, all experimentation was conducted using the Lafayette equipment. This consisted of a Lafayette subject chair, model #76871, fitted with the activity sensor bar, model #76871-AS, placed under the front legs.

The Canadian Police College Polygraph School, Suite #3, was utilized for the experiments. The Lafayette motion detection was connected to a Lafayette Factfinder 5 channel polygraph with 10 inch chart. The motion detection was recorded in zone #1 of the polygram, immediately beneath the cardiosphygmograph tracing, utilizing a multi-function component on the auxiliary setting.

Calibration of the activity sensor channel was at maximum, 10.0 sensitivity units utilizing one-pound weights placed in the centre of the seat bottom. One pound of weight increase yielded a one chart marking (1/4 inch) fall in pen deflection. Conversely, a one-pound unit taken off the chair rose the pen one chart marking (1/4 inch). The total pen travel available to the motion component was 2 1/2 inches or 10 vertical chart markings. The one-pound chart marking was consistent if the chair was occupied by a subject or empty, and totally linear throughout pen travel and amplifier sensitivity; i.e., - 5.0/SU yielded 1/8 inch pen deflection per pound. 2.5/SU yielded 1/16 inch.

The type and construction of flooring material on which the subject's chair rests influences the polygram tracings obtained. The Polygraph School is in a 1950s vintage wooden framed two-story house. Suite #3 is situated in the mid-portion of the upper story. The wooden floor joists were obviously elastic in nature as pen deflections of 3/4 of an inch, or 3 vertical chart markings, were observed in the motion component tracing as the 210 pound examiner simply shifted his weight from one foot to the other, side to side, or rocked his weight from the heel to the ball of his foot, front to back and vice versa. The "examiner distortion" is highly undesirable but was impossible to eliminate when the examiner was in a standing position adjacent to the subject being tested. The examiner distortion was controlled when he was sitting in a four-castered chair, but this virtually eliminated any view of the test subject from waist down.

The experiments were also conducted using Suite #3's existing low-pile carpeting then modifying the floor surface by placing the chair and motion bar atop a three-foot by four-foot piece of 3/4 inch spruce plywood. Sharper pen deflections were observed using the plywood under the chair; however, overall length of pen deflections appeared the same. The slightly dampened pen tracing, utilizing the carpeted surface appears self-explanatory due to the cushioning effect of the carpet.

A constant vibration of the pen excursion of approximately 1/16 of an inch could have been the result of the school's wooden frame construction and its inherent design flaw of failing to provide a totally solid and motionless foundation for the activity sensor.

Further research utilizing a concrete and steel fabricated structure would be required to render a true conclusion; however, it is the opinion of these experimenters that a wooden frame structure allows unwanted distortion, and is less than an ideal venue. Such subtle movement as anal sphincter contractions may be detectable is environmental vibration could be reduced to zero.

Motion Chair Detection of Countermeasures

Method

Twelve subjects who had recently completed ten weeks of a twelve-week Polygraph Examiners Course offered at the Canadian Police College in Ottawa were tested. From their training they were well aware of the various countermeasures attempted by examinees during a polygraph examination.

Subjects were seated in a Lafayette chair equipped with a pressure bar at its base. The cardiac, GSR and respiration components were then attached to the subjects. Each subject was instructed that the examiner would announce the numbers one through ten in consecutive order, spaced approximately fifteen seconds apart. At any time during the chart, the examinee was requested to perform three countermeasures (CMS). The CMS performed were restricted to any physical movements of the subject originating from the area of the body between the shoulders and the toes. This excluded such CMS as the control of respiration, thinking of relaxing or exciting thoughts, pain stimuli such as biting the tongue and the taking of drugs, all of which the motion chair is not designed to detect.

The subject was asked to perform the CMs three separate times during the chart and to stop each CM upon or prior to the examiner's announcing the next consecutive number in the series of ten. At the conclusion of the chart, the subject was asked to note which CMs were used and where in the chart they occurred.

The examiner was asked to watch for any CMs used and to note same on the chart, should any be detected. In addition, an observer seated in front of the examinee also watched for any CMs and noted same, if they were detected.

<u>Results</u>

Of the thirty-six CMs reported by the subjects, thirty-three were classified as scoreable. A CM was classified as scoreable if it caused a scoreable reaction on one or more of the GSR, respiration or cardio dimensions.

The various CMs used by the subjects were as follows: i) left or right foot press to floor; ii) left or right toe press to floor; iii) left or right thigh contraction; iv) left or right forearm push into armrest of chair; v) sphincter contraction; vi) left or right palm press into armrest of chair; vii) left or right heel press into floor; viii) GSR plate connected fingers (lt ring and lt forefinger) pressed into armrest of chair.

Eight of the thirty-six CMs used by subjects were not detected by the motion chair. They were as follows: i) One incident of GSR plate connected fingers pressed into armrest of chair. ii) Six incidents of sphincter contraction. iii) One incident of heel push into floor. Two of the six non-detected sphincter contractions produced no scoreable effects on any of the three dimensions. The single non-detected heel push to floor also did not produce any scoreable reactions. Therefore, only five of the

thirty-three CMs producing a scoreable response on the GSR, cardio or respiration dimensions were not detected by the movement chair.

The percentage detection rates for the examiner, observer and movement chair were found to be: 9%, 36%, 85%.

TABLE 1

COUNTERMEASURE USED:	COUNTERME	ASURE DETEC	TED BY:	POLYGRAM AFFECTED: (scoreable tracing)
	<u>Examiner</u>	<u>Observer</u>	Motion <u>Chair</u>	(,
SUBJECT #1				
1. It ft push into floor	no	yes	yes	yes
2. rt ft push into floor	no	yes	yes	yes
3. anal sphincter contra	et no	no	yes	yes
SUBJECT #2				
1. anal sphincter	no	no	no	Ves
2. It toes curled	no	ves	ves	Ves
3. It thigh contracted	no	no	yes	yes
l anal sphincter	no	no	Ves	Ves
2 toes curled-both ft	no	Ves	Ves	Ves
3. rt thigh contracted	no	no	ves	Ves
S. IC ungi conductor	110	ne	100	100
SUBJECT #4				
1. anal sphincter	no	no	no	Ves
2. toes curled-both ft	no	ves	ves	ves
3. It thigh contraction	yes	yes	yes	yes
SUBJECT #5				
1. both it press to 1100	r no	no	yes	yes
2. anal sphincter	no	no	no	no
3. thigh contraction	no	yes	yes	yes
SUBJECT #6				
1. anal sphincter	no	no	yes	yes
2. It foot press	no	no	yes	yes
3. both feet pressed	yes	yes	yes	yes
SUBJECT #7				
1. It foot push	no	yes	yes	yes
2. It forearm push	no	no	yes	ves
3. anal sphincter	no	no	no	yes
SUBTECT #8				
1. anal sphingter	no	no	no	no
2. GSR plates pressed	no	no	no	Ves
3. toes curl - both feet	no	yes	yes	yes

Motion Chair Detection of Countermeasures

SUBJECT #9				
1. right heel press	no	no	yes	yes
2. It palm pressed down	no	no	yes	yes
3. anal sphincter	no	no	yes	yes
SUBJECT_#10				
1. rt toes curled	no	no	yes	yes
2. anal sphincter	no	no	yes	yes
3. It elbow pushed down	no	no	yes	yes
SUBJECT #11				
1. anal sphincter	no	no	no	yes
2. toes curled both feet	no	yes	yes	yes
3. both heels pushed	yes	no	no	no
SUBJECT #12				
1. lt forearm push	no	no	yes	yes
2. anal sphincter	no	no	yes	yes
3. It heel pushed	no	no	yes	yes

TABLE 2

TOTAL NUMBER OF SCOREABLE CMS		PERCENTAGE DE	FECTION VIA:
	<u>Examiner</u>	<u>Observer</u>	<u>Motion Chair</u>
33	9%	36%	85%

Discussion

Results indicate first that many of the physical countermeasures which have in the past been thought to be easily detected by the examiner are, in fact, difficult to detect if the examinee is experienced and knowledgeable in countermeasure techniques.

These results also indicate that in the majority of instances the movement chair is able to detect countermeasures of a physical nature which are not observed by the examiner. The movement chair is even more effective than an observer sitting directly in front of the examinee solely to detect physical countermeasures used by the examinee.

It should be noted that an effort was made to find a setting where the sensitivity of the motion chair would contribute most effectively to the polygraph. Although settings of 8 to 10 sensitivity units readily identified most countermeasures, these settings also detected the examiner's shiftings of weight throughout the testing. These shifts in weight were shown on the polygram to be equal to or greater than most countermeasures detected. It is very possible this effect would not be as pronounced if the polygraph suite were contained within a more stable setting. Sensitivity units were restricted to 5.0/SU during this research due to excessive "examiner distortion".

<u>Conclusion</u>

In summary, the results indicate that the motion chair is a very useful piece of equipment for the polygraph examiner, especially now when there seems to be a trend toward publishing in texts and newspapers various ways to "beat the polygraph".

In short, due to the heightened public interest and controversy surrounding Polygraph, there is a much greater chance the average examinee will enter a polygraph suite with information about the C.Q.T. and various effective countermeasures.

It makes only good sense for the polygraph examiner to utilize the equipment which can assist in identifying an examinee's attempt at swaying a polygraph examination's outcome and the subsequent opinion rendered.

To date, the motion chair is the best anti-countermeasure device available to readily identify physical countermeasures. This research showed the motion chair detects CMs ten times as effectively as does a human observer.

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COUNTERMEASURE STUDY

THE EFFECT OF PAIN ON THE ELECTRODERMAL TRACING DURING POLYGRAPH TESTING

By

W. Roderick Biggs and Patrick J. Codd

<u>PURPOSE</u>: The purpose of this study is to determine whether or not self-inflicted pain at a predetermined padding question can create a GSR reaction which is more substantial than the relevant or "key" question during a polygraph examination.

<u>PROCEDURES</u>: The self-inflicted pain countermeasures of biting the tongue and pressing the toe on a tack were incorporated into a series of peak of tension (POT) tests comprised of thirty separate charts. The study consisted of five POT tests, specifically concerning:

- 1. A number stim
- 2. Month of birth
- 3. Car driven to school
- 4. Spouse's first name
- 5. The year employment began

For each test, two subjects were examined and three charts for each were produced. Each test was comprised of eight questions, the sequence of which was reviewed with the subject. The same two subjects were used for each test. On the first chart no countermeasures were used. The second chart incorporated the countermeasure of tongue biting and on the third chart the subject was instructed to press his toe down on a tack at a predetermined padding question. This sequence was followed throughout the experiment. The placement of the padding question incorporating the countermeasure was randomly selected in relation to the key question on each chart.

SUBJECTS:

Subject No. 1:	Age: 33	Subject No. 2:	Age: 26
	Sex: Male		Sex: Male
	Height: 6'		Height: 6' 3"
	Weight: 160		Weight: 220

EQUIPMENT: All of the examinations were conducted on a Lafayette fourchannel electronic polygraph model #76475-G. The instrument was calibrated according to the manufacturer's specifications using the method described by Pochay (1986). Although all four recording channels were used during the test, only the electrodermal unit was scored for this research.

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With this equipment, at a sensitivity of 2.5, a 1,000 ohm change will produce a quarter-inch change in pen position, which is equal to a single division on the standard chart paper. The 2.5 setting was used throughout all testing. The recording unit was in the d.c. mode. The instrument recorded skin resistance from dry finger-tip electrodes, with a decrease in resistance shown as a pen rise on the chart.

RESULTS:

<u>Examination No. 1</u>: The initial test was a number stim, wherein both subjects selected a number to be utilized as the key. Using no countermeasures, Subject No. 1 elicited a minimal GSR reaction at the key question and Subject No. 2 produced a substantial reaction of approximately 17 chart divisions. The key questions for both subjects showed a greater GSR rection than all but the first padding question.

The first countermeasure, biting the tongue, was employed in the next charts for each subject. Subject No. 1 was instructed to bite his tongue at two padding questions prior to the key. This resulted in a GSR reaction of approximately 3.5 chart divisions as opposed to no reaction at the key. Subject No. 2; however, showed a greater reaction at the key question than at the question employing the countermeasure. It should be noted that Subject No. 2 "pen stopped" after a two chart division rise; therefore, the countermeasure on this particular test could not accurately be measured.

The next countermeasure employed in this test was that of pressing the toe down on a tack. Subject No. 1 elicited a GSR response of eight chart divisions at the key. Subject No. 2 showed similar reactions to both the key and the countermeasure questions; however, the amplitude at the countermeasure measure question was approximately .5 chart divisions higher.

<u>Examination No. 2</u>: This POT test utilized each subject's month of birth with seven other sequential months as padding questions. The charts for both subjects using no countermeasures showed clear and distinct GSR reactions at the key questions.

Subject No. 1, when employment the tongue biting countermeasure, showed a GSR reaction of approximately six chart divisions. They key question on the same chart elicited absolutely no GSR amplitude. Subject No. 2 produced a one chart division reaction to the key question as opposed to a reaction of nine chart divisions at the padding question employing the countermeasure.

<u>Examination No. 3</u>: The topic of this POT exam was the type of car that the subject drove to school that morning. Both subjects showed the greatest reaction at the key question on the charts using no countermeasures.

For the tongue biting countermeasure, Subject No. 1 elicited a five chart division reaction using the countermeasure and only a .5 chart division reaction to the key question. Subject No. 2, when employing the countermeasure, produced approximately a 12 chart division GSR amplitude as opposed to less than one chart division at the key. On this exam, the tack countermeasure continued to follow the same response pattern. Subject No. 1 showed a GSR reaction of approximately .5 chart divisions at the key question and six chart divisions when pressing on the tack. Subject No. 2 elicited a ten chart division reaction when employing the countermeasure with no visible reaction at the key.

<u>Examination No. 4</u>: The topic of this exam was the first name of each subject's spouse. Once again each subject reacted significantly to the key question on the charts utilizing no countermeasures.

The initial countermeasure of biting the tongue produced a GSR amplitude of two chart divisions by Subject No. 1 with less than a .5 chart division reaction at the key question. Subject No. 2 elicited a reaction of approximately four chart divisions at the countermeasure question and 2.5 chart divisions at the key.

When employing the tack countermeasure, Subject No. 1 produced a four chart division reaction as opposed to a one chart division reaction at the key question. Subject No. 2 followed suit with a two chart division reaction while employing the countermeasure with no noticeable GSR reaction at the key.

<u>Examination No. 5</u>: Each subject's enter-on-duty (EOD) year was the key of this POT test. When no countermeasure was incorporated, each subject's greatest reaction appeared at the key question.

When employing the tongue biting countermeasure, Subject No. 1 elicited a GSR reaction of four chart divisions as opposed to approximately one chart division at the key question. Subject No. 2; however, reacted substantially at the key question (11 chart divisions) while showing only a one chart division reaction when biting the tongue at a padding question.

The final countermeasure tests utilizing the tack were similar to the others. Subject No. 1 elicited a 12 chart division reaction at the countermeasure question and a reaction of five chart divisions at the key question. Subject No. 2 produced a two chart division reaction at the key question and a reaction of seven chart divisions when pressing the toe on a tack at the padding question.

<u>CONCLUSIONS</u>: When looking at the results as a whole, it is evident that each countermeasure succeeded in producing a significant GSR response. Attention is invited to the attached graphs wherein the amplitude of the GSR reactions are displayed for each of the 30 charts. There was no attempt made to study the reactions produced in regard to the placement of the specific padding question utilizing the countermeasure. Since the placement of each padding question was randomly selected, it does not appear that it made a substantial difference in reactions strength for either the key or countermeasure question. Of the 20 charts run wherein a countermeasure was used, 18 (90%) produced a reaction greater than that to the key question. the tack countermeasure proved to be particularly effective, producing a greater reaction than the key each time. This appears extremely relevant due to the fact that each subject exhibited the capability of reacting significantly to the key questions when no countermeasure was employed.

W. Roderick Biggs & Patrick J. Codd

What must be taken into account; however, is the fact that no fear of detection was present during the tests. It appears that countermeasures of this type could be effective in a control question test if the subject were to inflict pain at the control question. The countermeasures used in this experiment are particularly difficult to detect by the examiner due to the fact that a great deal of movement is not necessary in order to employ them. However, without an actual field study to examine, it is quite difficult to determine whether or not these countermeasures could be effective in the conduct of an actual polygraph examination.

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Appendix: Amplitude of GSR Reactions (Chart Divisions) Examinations 1 through 5

Countermeasure Study

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REACTION TO COUNTERMEASURE
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CHARTS 3+4
BITE TONGUE
CHARTS 576
TACK ON TOE



Countermeasure Study

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Countermeasure Study

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ABSTRACTS

Base Rates

Kevin R. Murphy, "Detecting Infrequent Deception." <u>Journal of Applied</u> <u>Psychology</u> 72 (4) (1987): 611-614.

Recent proposals for using the polygraph and similar devices in routine screening have been aimed at detecting deception in situations sometimes characterized by low base rates. The author generated equations which purport to show that extraordinarily high levels of accuracy would be needed to detect infrequent deception, an accuracy level which he states far exceeds the levels claimed by the most enthusiastic proponents of detection techniques.

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Recent proposals for using the polygraph and similar devices in routine screening have been aimed at detecting deception in situations sometimes characterized by low base rates. The author generated equations which purport to show that extraordinarily high levels of accuracy would be needed to detect infrequent deception, an accuracy level which he states far exceeds the levels claimed by the most enthusiastic proponents of detection techniques.

However, the base rate theory espoused by the author is utterly simplistic in approach, and considers only the base-rate of deception to the relevant questions. He fails to recognize that polygraph tests are a complex series of tests in which there are different base rates of deception, a very low rate of deception to irrelevant questions, a very high rate to control questions, and varying rates to the relevant questions, depending on the application. [Ed.]

For additional discussion of base-rate theory as it applies to polygraph screening, see "Buckley Refutes Assertions in AMA Journal Letters, <u>APA</u> <u>Newsletter</u> 20 (4) (July-August 1987): 9-13; and Marcia Garwood, "Two Issues on the Validity of Personnel Screening Polygraph Examinations." <u>Polygraph</u> 14 (3) (September 1985): 209-216.

For copies of reprints of Murphy's article write to him at the Department of Psychology, Colorado State University, Fort Collins, Colorado 80523.

Habituation

Muriel Churchill, Bob Remington, and David A.T. Siddle, "The Effects of Context Change on Long-Term Habituation of the Orienting Response in Human." Journal of Experimental Psychology 39B (1987): 315-338.

Four experiments examined the effects of context change and context extinction on long-term habituation of the skin conductance response. In all experiments, subjects received 15 presentations of a target stimulus in each of two sessions. In one experiment with 60 subjects there was a 15 minute interval between training and test sessions. In the second and third experiments the interval was extended to 24 hours. The treatment in each of these studies involved a change in context between the two training sessions.

None of the experiments provided evidence of context-dependency in measures of long-term habituation.

In an experiment with sixty subjects in which they received a period of context extinction during which they remained in the laboratory environment between two series of habituation trials there was again no evidence that long-term habituation was contextually mediated. the results fail to support theories that argue that long-term habituation is context-dependent.

For reprints write to Bob Remington, Department of Psychology, Southampton University, Highfield, Southampton S09 5NH, United Kingdom.

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BOOK REVIEWS

NEVER SAY LIE

By

Scott French and Paul van Houten

CEP, Inc. P.O. Box 865 Boulder, Colorado 80306

Reviewed by

Dr. rer.nat. H. Herbold-Wootten

This book was advertised by CEP, Inc. to enable everybody to pass any polygraph examination by knowing the appropriate countermeasures. It has a chapter about "Kinetic Interviewing" (pictures of a pretty girl in the back of the book show the essential points), "Audio Stress Analyzers", "Handwriting Analysis" and "Drug Testing" besides one about "Polygraph and Countermeasures."

Essentially the authors recommend to be self-confident and never to make any admissions, to practice with a \$250.00 biofeedback type GSR, to use an anti-perspirant on the fingers (with picture in the back), and to make the polygraph examiner believe that everything is going as he thinks it should be using a thumb tack under the big toe in a stim test but not during the actual chart recording. They mention to contract the diaphragm, gluteus maximus and sphincter areas. they state that if the examiner has a pneumatic chair this will not be detected by the chair. The countermeasures described and the countermeasure strategies are all well known and do not pose any problem to the profession.

In the chapter about polygraph, summaries of research and summaries of their own experiments are given, however, an exact bibliographical reference list at the end of the book is missing. Some old rumors are warmed up like stating that psychopaths are not detectable (14-17). Raskin's study of a prison population on this issue is not mentioned.

It makes the reader believe that the authors had some secret access to government unpublished research about countermeasures carried out for the protection of its undercover agents but the revelations are either very old or ridiculous. Here are some examples:

"Here are the test results and recommendations from the Top Secret project on a word by word basis (p. 72).

The testee must do the following:

. . .

6. Absolutely show up ahead of time for your test ... Lateness, cancellations, illnesses are viewed very negatively by correlation studies done by men such as Lykken, David. (p. 73) (Would be helpful if that rumor spreads!)

While in the chair

. . .

Just before giving your answer to this question, take a deep breath, hold it, then reply. This will give a "guilt" response to the control" (p. 73).

There is a chapter about drugs that is quite knowledgeable. There are anti-depressants and beta blockers mentioned as well as cocaine. The authors experimented with cocaine on two subjects in a laboratory setting and state that cocaine made their subjects pass the test because it "stabilizes the amount of involuntary nervous system secretions" (p. 71).

The authors have some serious problems with the physiology of the matter, at another place they talked about the "normal and autonomous ner-vous system" (p. 83).

If intended as a serious scientific publication the book is sloppy. If intended for laypersons looking for information to beat a polygraph examination, it is too packed with unnecessary summaries of research. Besides that, none of the authors suggested countermeasures would work, so one wonders what kind of audience the authors had in mind.

APPLICANT INVESTIGATION TECHNIQUES IN LAW ENFORCEMENT

By

John P. Harlan, Ed.D.

Charles C Thomas 2600 South First Street P.O. Box 4709 Springfield, Illinois 62708-4709 price \$24.50

Reviewed by

Norman Ansley

Because the literature on background investigations is scant, this book serves a practical purpose in providing guidance and suggesting leads for those who have no experience with this type of investigation.

Book Reviews

The book is divided into three parts, one on practical issues, another listed as being about the background investigation which is actually no more than a sample application, report of investigation, case file and annotated report of investigation. These two sections are by Dr. Harlan. A third section of the book, on legal issues, is by Patrick A. Mueller, J.D.

The text of the book is informative, but altogether too brief. Almost every section but one should be expanded. The author's bias against the use of the polygraph in police applicant screening is demonstrated by the 17 lines used to set forth the proponent's position and 5 pages to set forth the opponent's position. Examiners will not be pleased at all with this book. However, the book is worthwhile. Despite the brevity of some important discussions, there is value in the extensive bibliographies, case citations, and appendices. The latter, which take over half of the book, are the most useful part of the book. They contain form letters, addresses of sources of federal and state records, and a sample personal history statement form. As a reference book, it is worth the price, and the utility of the appendices more than compensates for inadequate text.

THE BIOLOGICAL FOUNDATIONS OF GESTURES: MOTOR AND SEMIOTIC ASPECTS

Edited by

Jean-Luc Nespoulous, Paul Perron, and Andrew Roch Lecours

Lawrence Erlbaum Associates, Inc. 365 Broadway, Suite 102 Hillsdale, New Jersey 07642 price \$36.00

Reviewed by

Norman Ansley

This volume is the outcome of a symposium on gestures, cultures and communication, held in May 1982 at Victoria College, University of Toronto. The purpose of the conference was to explore the biological basis of gestures by bringing together investigators working mainly in the fields of anthropology, neurophysiology, neuropsychology and psycholinguistics. The well-known experts in the field of nonverbal communication were not included, but they will be interested in this collection of papers. It is difficult to edit for publication papers prepared for oral delivery at a scientific conference, but the editors have done well in the rewriting. In addition, they expanded the coverage revising the six delivered papers and adding three chapters written by respondents after the conference. Retaining their biological perspective, the editors also invited six other contributors to submit chapters on gestures in areas which only had been touched upon during the meeting. In doing this, they created a useful and comprehensive work.

As with every specialized field, there is dispute as to what is included in their realm. Contributor Adam Kendon opens the book with a history and explanation of this field of study. He establishes classifications. for example, gesticulation covers all gestures that occur in association with speech that is bound up with it as part of the total utterance. The book includes detailed discussions of the analysis of gestural behavior; brain organization underlying orientation and gestures, both normal and pathological; lateral difference is gesture production, with implications for developmental psychology; the function of the eye in the control of attention; and related research. There is a considerable amount of attention given to pathological states, which will be of interest to specialists. But those who have an interest in nonverbal communication will find the book invaluable. Although the narrow application of nonverbal communication involving detection of deception is not mentioned, there are papers in this book that are fundamental to an understanding the biological foundations of the speciality.

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POLYGRAPH BACK ISSUES

The APA Publications Office still has a backlog of <u>Polygraph</u>. Here is a chance to fill in your set if you have missing issues or to get those issues published before you were in the field. Send a postcard to obtain an availability list. APA Publications Office, P.O. Box 1061, Severna Park, Maryland 21146.

REPRINT SALE

The APA Publications Office has a backlog of reprints of original articles from <u>Polygraph</u>. These are useful for schools, people who teach polygraph, and those who write about polygraph topics. This surplus sale is an excellent chance to build up your professional files. For a list of available items with prices, send a postcard to the APA Publications Office, P.O. Box 1061, Severna Park, Maryland 21146.

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PRETESTING PANELIST EXPERTISE FOR VALIDITY STUDIES COMPARING PANEL AND POLYGRAPH JUDGMENTS

By

Dean D. Given

ABSTRACT

An experienced investigator reviewed all of the evidence in 20 criminal investigations, except that the polygraph materials, polygraph reports, interrogation notes, and confessions were removed. The investigator made decisions on the guilt or innocence of the person from the remaining evidence in the file. The decision of the investigator was compared with the decision of the polygraph examiner in each case. The cases selected for the study were all verified by subsequent confession and investigations, so that there was no doubt as to quilt or innocence. Nine of the persons were confirmed as innocent and eleven persons were confirmed as guilty, a mix unknown to the investigator. The independent judgment of the investigator was in agreement with the polygraph examiner's decision in 19 of 20 cases.

This pilot study suggests a method for selecting members of panels used to compare their judgment of case facts (less polygraph information) with polygraph results. If the panelists are selected for their proven accuracy in adjudicating case facts for innocence or guilt, then more weight can be given to the results obtained by comparing the panel decisions with polygraph outcome.

One of the approaches to determining polygraph validity in the field has been to have a panel of attorneys review all of the evidence in a criminal investigation except for the polygraph test results, decide on the suspect's guilt or innocence, and compare the panel's determination with the polygraph results. In the first such study (Bersh, 1969) the experimenters controlled the mix of polygraph techniques, GQT (a relevant-irrelevant test) 50% and zone (a control question test) 50%. They also controlled the mix of calls, deceptive and non-deceptive, eliminating all inconclusive results. They also allowed the military attorneys to eject files that did not have enough evidence for a decision. There was a high degree of correlation between the polygraph results and the panel's decision. Employing the same principle, Barland had a panel evaluate the evidence in criminal cases and compared their decisions with his polygraph results (Barland and Raskin, 1976). Unfortunately, Barland's files didn't contain the extensive evidence typical

The author is a certified examiner in the federal government and a member of the American Polygraph Association.

Dean D. Given

of military files, and the panel was asked to make decisions on all of the cases. Not surprisingly, the attorneys tended to find people innocent when there was insufficient admissible evidence to convict, rather than decide on a preponderance of the available evidence. While the panel approach eliminates some of the problems encountered in comparing polygraph results with judicial outcome (Edwards, 1981; Elaad & Schahar, 1976; Lyon, 1936; Peters, 1982), there has been no attempt to evaluate the accuracy of the panel. It would have been interesting to have put some cases before the panel in which the truth was known, and withheld only the conclusive evidence (i.e., someone else confesses). That might have been a way of evaluating the accuracy of a panel which was being used to evaluate the accuracy of polygraph results. The same problem exists when one person adjudicates the evidence in the files and compares his judgment to polygraph outcome. A psychology student did that in Israel, and his judgment of the evidence matched the polygraph results in 94 percent of the cases (Ben-Ishai, 1962).

In these studies we don't know who has erred when the panel and polygraph examiner results don't coincide. Nor do we know how many errors occur when the panel and polygraph outcomes are alike and they are both wrong. Then there is the problem of skill in making judgment on the evidence. It may be that lawyers (and psychology students) are not the best persons to judge the evidence. Why not try investigators? Throughout an investigation, the agents are constantly evaluating the information and taking positive action on those decisions. One might suppose that investigators would have a tendency to assume every suspect is guilty while the investigation progresses and that bias might carry over. If investigators are accurate judges of investigative results, perhaps future panels should be made up of investigators rather than lawyers. Better yet, there might be a variety of professions from which proposed panelists are drawn, with only the highly accurate being selected. As a means of evaluating an investigator's skill, a pilot project was conducted in which an investigator judged the contents of investigative files as to guilt or innocence. The files were typical of what a panel would see. The investigations, arrest records, and other data was there, but all the polygraph information was removed, and so was conclusive proof, such as a post-test confession. Some would argue that confessions should be left in the file, and there is merit in that view, but in this study we decided not to do that.

Method

A supervisor of polygraph examiners in a U.S. Treasury agency randomly selected the first 20 case files in which a polygraph examination was given and the test results were confirmed by investigation, confessions of the subjects (guilty), or investigation and confessions of other parties (subject innocent). The supervisor removed from consideration files lacking in evidence, and cases in which the polygraph results were inconclusive. In all the cases, the polygraph results were correct in terms of agreeing with conclusive evidence of guilt or innocence. Like the Bersh study, the supervisor then removed from the 20 files all evidence of the polygraph examination, including examiner notes, charts and confessions.

Cases included computer fraud, a breaking and entering compromise case, drug smuggling, theft, bribery, and arson. The breaking and entering compromise case included seven polygraph tests conducted on seven suspects. The theft case included four polygraph tests conducted on four suspects. (See Table 2)

There were seven examiners who were federal Special Agents with an average of three years polygraph experience.

Each case was then reviewed by the investigator who made an independent guilty/not guilty judgment. This decision was then taken by the quality control person and compared to the polygraph examination and case results.

The investigator did not know the mix of guilty or innocent cases. The mix was 11 guilty and 9 innocent.

The polygraph examiners used two techniques for their examinations: Modified General Question Technique (MGQT) and Zone Comparison (ZQT).

TABLE 1

TECHNIQUES AND OUTCOME

Modified General Question Technique		Zone Comparison		
Deception Indicated	No Deception Indicated	Deception Indicated	No Deception Indicated	
4	2	7	7	

Results

The investigator's judgment on the evidence remaining in the file agreed with the polygraph examiner's conclusion in 19 of 20 cases (95%).

TABLE 2

File	#	Polygraph Technique	Type of Criminal Case	Reviewer Decision	Polygraph Decision
	1	MGQT	Computer Fraud	Guilty	DI
	2	Zone	Breaking/Entering Com-		
			promise	Not Guilty	NDI
	3	Zone	Breaking/Entering Com-	-	
			promise	Guilty	DI
	4	MGQT	Breaking/Entering Com-		
			promise	Not Guilty	NDI
	5	Zone	Breaking/Entering Com-		
			promise	Not Guilty	NDI
	6	Zone	Breaking/Entering Com-		
			promise	Not Guilty	NDI
	7	Zone	Breaking/Entering Com-		
			promise	Not Guilty	NDI
i	8	Zone	Breaking/Entering Com-		
			promise	Not Guilty	NDI
1	9	MGQT	Drug Smuggling	Guilty	DI
1	0	Zone	Drug Smuggling	Not Guilty	DI
1	1	MGQT	Theft	Guilty	DI
1	2	MGQT	Theft	Not Guilty	NDI
1	3	Zone	Theft	Not Guilty	NDI
1	4	Zone	Theft	Not Guilty	NDI
1	5	Zone	Informant	Guilty	DI
1	6	Zone	Bribery	Guilty	DI
1	7	MGQT	Smuggling	Guilty	DI
1	8	Zone	Smuggling	Guilty	DI
1	9	Zone	Arson	Guilty	DI
2	0	Zone	Smuggling	Guilty	DI

TABLE 3

Comparison of Reviewer and Polygraph Examiner Decisions

	Investigator	Polygraph Examiner
Guilty/DI	10	11
Not Guilty/NDI	10	9
Total	20	20

Discussion

In this study, the investigator's judgment of the evidence in the files was highly accurate. He did so without benefit of the polygraph results. Because the pilot project involved one person, no general statements may be made about the judgment of investigators. What this study does is suggest

Pretesting Panelist Expertise

that there is a way to test the accuracy of the judgments of proposed panel members before they take part in a study that compares polygraph results and panel judgments. A replication of Bersh or Barland might be useful if it were established beforehand that the panelists were highly accurate in their judgment of evidence in case files, by pretesting them on case files like those they will see in the study, but case files in which the guilt or innocence is known. If the panel is composed of highly accurate people, then the comparison of polygraph and panel results will be more useful.

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