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A COMPARATIVE INVESTIGATION OF THE RELIABILITY
BETWEEN DIFFERING SCORING TECHNIQUES

BY

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MAY 88

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Introduction

Throughout the profession of polygraph examiners, there have been numerous techniques identified which are used in the evaluation of polygraph charts. Cleve Backster was the first polygraph examiner to introduce a system incorporating numerical analysis. (Backster, 1969). Today, most techniques rely on the assignment of numerical scores from which to draw a conclusion. However, it would appear that little has been investigated regarding what effect the assignment of a particular numerical scoring technique may have on the outcome of a given polygraph examination. Most professional polygraph schools stress that numerical scoring removes the subjectivity of determining guilt or innocence. Indeed, a specific study conducted at the University of Utah concluded that higher rates of accuracy and hence, reliability, are encountered when a numerical scoring system is applied to polygraph charts. (Raskin, Barland, Podlesny, 1978). Weaver (1980), reported that numerical evaluation represents a critical improvement towards scientific objectivity in the

interpretation of polygraph charts. This statement notwithstanding, one must consider that the very system of assigning numerical scores may draw the examiner into returning to a process whereby he is applying subjectivity at the same time he is being very careful to avoid this very thing. It is for this reason that the foregoing experiment was undertaken. It was the intention of the researchers to examine differing techniques of applying numerical values to reactions and then comparing the end analysis to a previously determined ground truth. In this study, one examiner-author applied a 3 position scale (+1 0 -1), and the other examiner-author applied a 7 position scale (+3 +2 +1 0 -1 -2 -3). The results were then compared in a variety of ways against ground truth and the results reported herein.

Hypothesis

The 7 position scale of scoring polygraph charts will be more accurate and consistent when rendering a decision than will the 3 position scale of numerical scoring. Further, the 7 position scale will enable the examiner to render more decisive conclusions than when the 3 position numerical scoring system is applied since the 7 position scale will result in a lower inconclusive rate.

Method

A research study was undertaken at the Department of Defense Polygraph Institute, (DODPI) Fort McClellan, Alabama, under the direction and guidance of Dr. Gordon H. Barland, PhD, Director, Research Division, DODPI, during February 1988.

This study utilized certified federal polygraph examiners, all of whom possess significant experience and all of whom are permanent faculty members of DODPI. The stated purpose of this study was to determine the effects of multiple versus single issue testing. The resulting data from this separate study is forthcoming.

A total of 100 subjects were administered polygraph examinations. Subsequently, the collected charts were relinquished to the authors for the preparation of this

study. Care was taken to preclude the researchers from obtaining knowledge of established ground truth. One examiner-author evaluated the previously collected charts exclusively applying a 7 position numerical scale. This particular scale is presently taught at the Department of Defense Polygraph Institute. The other examiner-author utilized a 3 position numerical scale, which is used by many field examiners throughout the federal government.

Both methods employed a comparison between a given relevant question and either of the two adjacent control questions. The control question selected for comparison was that control which displayed the most significant reaction. The parameters of this comparison was extended in that the examiner was permitted to evaluate each component in the relevant question against the strongest component in either of the two adjacent control questions. Thus, it was conceivable that the examiner might evaluate the pneumograph of a given relevant question against the pneumograph of one control question, and then evaluate the GSR of that same relevant question against the GSR of a different, but adjacent control question.

The criteria established in assigning a particular value to a given reaction was as follows:

- +3 = very noticeable difference favoring the control question.
- +2 = considerable difference favoring the control question.
- +1 = minimal, but noticeable difference favoring the control question.
- 0 = no appreciable difference between either control or relevant question, or distorted tracing.
- 1 = minimal, but noticeable difference favoring the relevant question.
- 2 = considerable difference favoring the relevant question.
- 3 = very noticeable difference favoring the relevant question.

The 3 position scale applied similar criteria of comparison, the only exception being the assignment of particular numerical values to any given reaction. In this system, the examiner-author defended the method by stating that it tends to eliminate any objectivity in analyzing the polygraph charts. The specific criteria used in this scoring

system is as follows:

- +1 = any difference favoring the control question.
- 0 = no appreciable difference, or distorted tracings.
- 1 = any difference favoring the relevant question.

The polygraph instruments from which the subject charts were obtained were all Lafayette Factfinders. The instruments were configured, as a minimum, with one electronic pneumograph channel, one galvanic skin resistance recording module, and one electronic cardiograph channel. A cardio activity monitor was added and provided recordings using a multi-function recording module set in the auxiliary mode. A galvanic skin conductance module was added during the conduct of the initial study and replaced one electronic pneumograph. The GSR module was outfitted with a digital counter installed on the centering control.

The questioning technique used was developed by the DODPI Research Division, exclusively for use in this study. Essentially, it was comprised of two relevant questions, both of which pertained to different facets of the same crime (i.e. "did you damage any of that classified equipment?" and "do you know what was used to damage that classified equipment?"). The single issue test was comprised of two "spots", each containing one relevant question, with a total of three separate series. The multiple issue test was

comprised of three "spots", each containing two relevant questions.

One noticeable difference from other chart evaluation techniques which have been the subject of published studies was that in both the original collection phase and the re-examination by the examiner-authors, the theory of spot analysis was respected. Briefly, this theory, which is applied unilaterally throughout the federal government and taught at the Department of Defense Polygraph Institute, considers spot analysis in making an overall decision. In this way, the so-called problem of "splitting calls" was totally avoided.

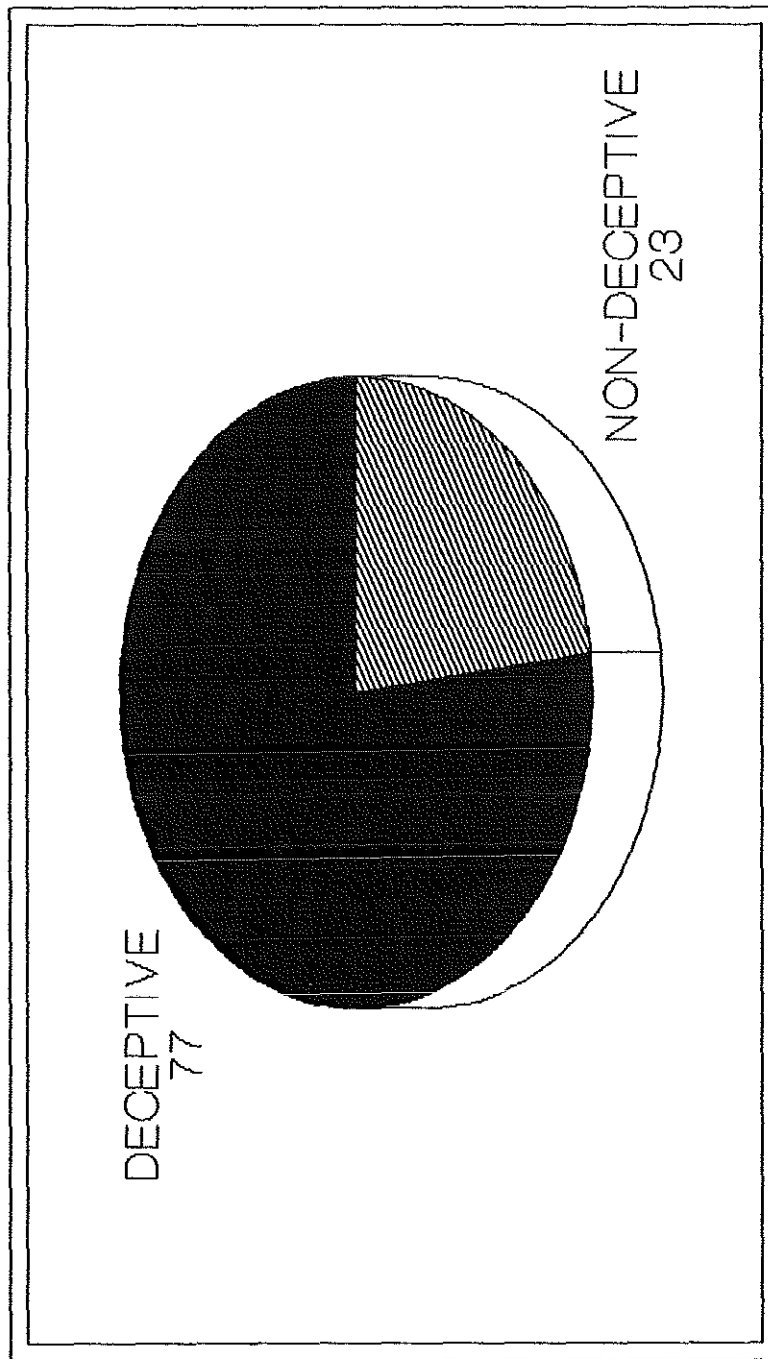
The current teaching at the Department of Defense Polygraph Institute holds that if an examinee displays deception to any one "spot" in the examination, regardless of the technique used, then that examinee is said to be deceptive. If any one spot failed to achieve a numerical score (i.e. +3 +3 0 +3), then that examination is said to be inconclusive. Note the difference from those techniques which use so-called "cut-off" scores to arrive at decisions. This method is reflected on the attached charts and graphs as the examiner's gross decision. Accordingly, if an examinee's scores were +4 +5 -4 +3, then the gross decision of that examination was said to be deception indicated. With this method, federal examiners expect to resolve the DI issue

during post test and then conduct further testing, if deemed necessary, to ensure that the issue had in fact been resolved. If any one spot did not achieve a score of -3, but the overall total of all spots totalled -6 or greater, then the examination was said to have produced a DI result. Note that this approach would only be applicable to the multi-issue testing technique. To produce an NDI result, each spot must contain a "+", with a total of +6 or greater. A sample follows:

+2	+2	+2	=	+6	NO DECEPTION (NDI)
-2	-2	-2	=	-6	DECEPTION INDICATED (DI)
+3	+4	-1	=	+6	INCONCLUSIVE
-3	+5	+5	=	+7	DECEPTION INDICATED (DI)

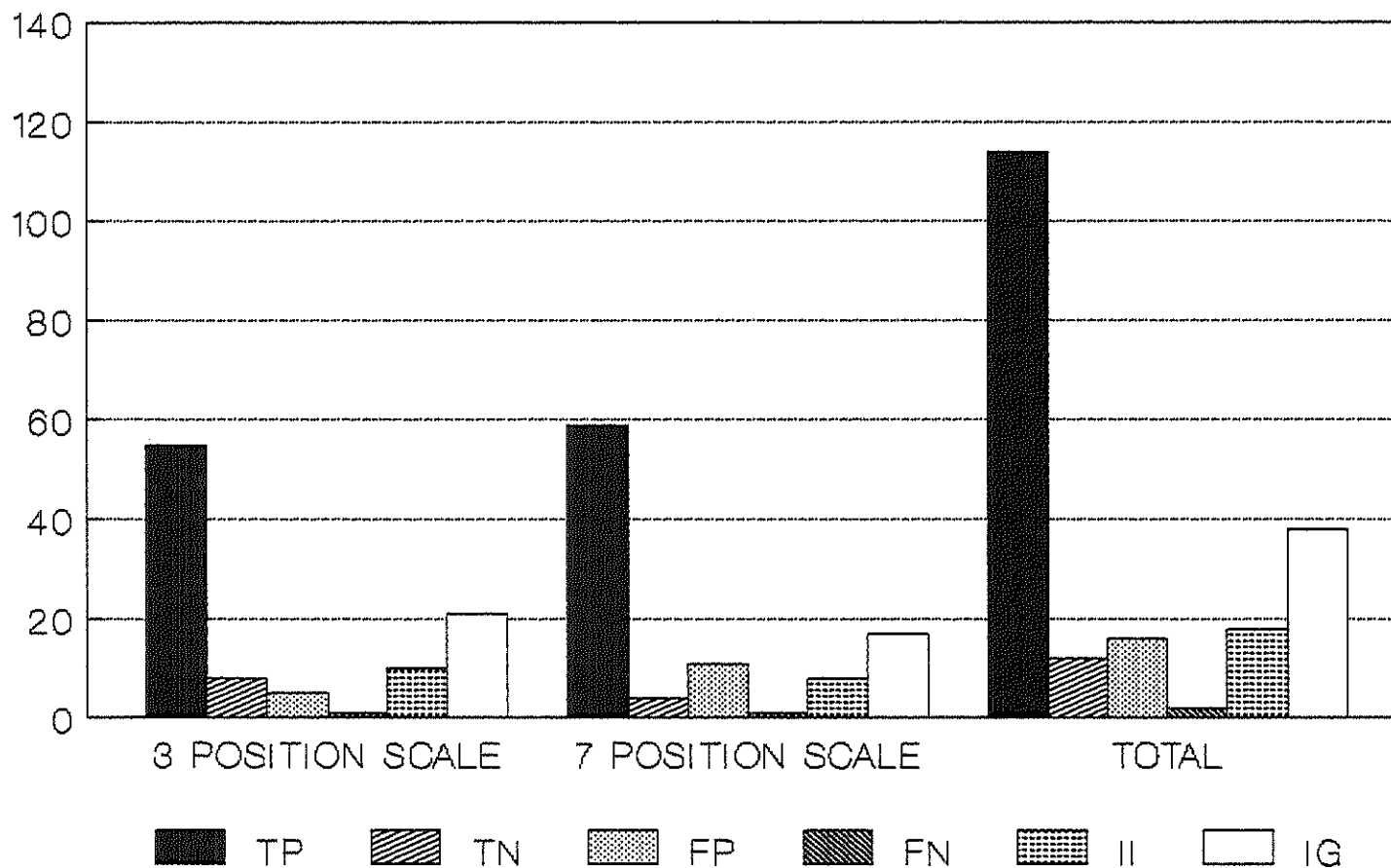
Each category represented in the appended charts and graphs bear explanatory data pertaining to collection methods and preliminary conclusions. When confronted with totals which exceed 100 examinations, the reader is reminded that the study consists of two examiners each evaluating 100 sets of polygrams.

CHART INTERPRETATION RESEARCH SAMPLE POPULATION



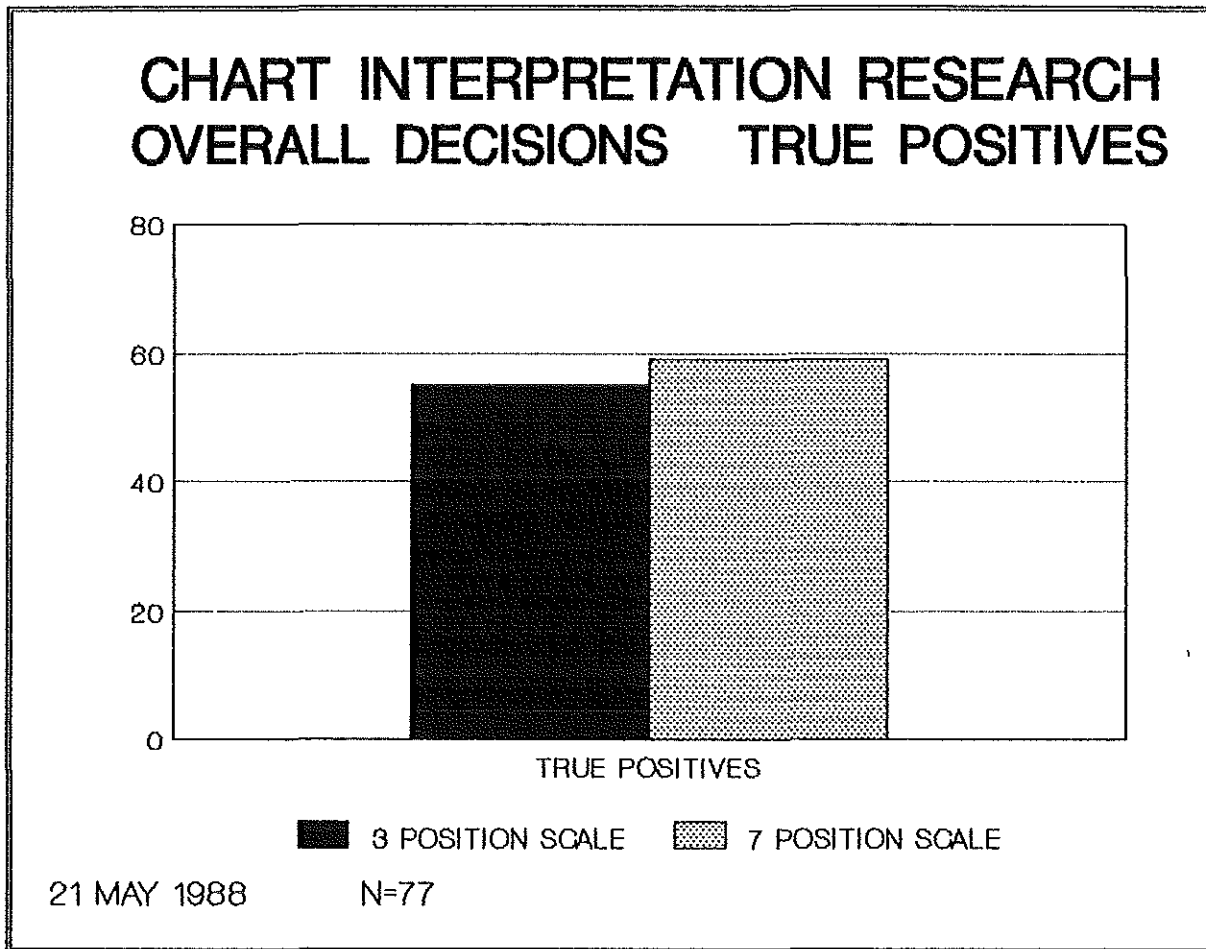
-FIGURE 1-

CHART INTERPRETATION RESEARCH OVERALL DECISIONS-GROUPED



23 MAY 1988 N = 100

-FIGURE 3-



In analyzing the data contained in the above graph, a rather interesting view of a comparison of the two scoring techniques emerges.

The examiner using the 3 position scale, and respecting spot analysis, made his decision based on an overall analysis of all spots. As reflected earlier, the criteria used essentially was that if any spot was scored at -3 or greater, then the examination was said to have produced deceptive results. Anything less than a +4 was deemed to be inconclusive.

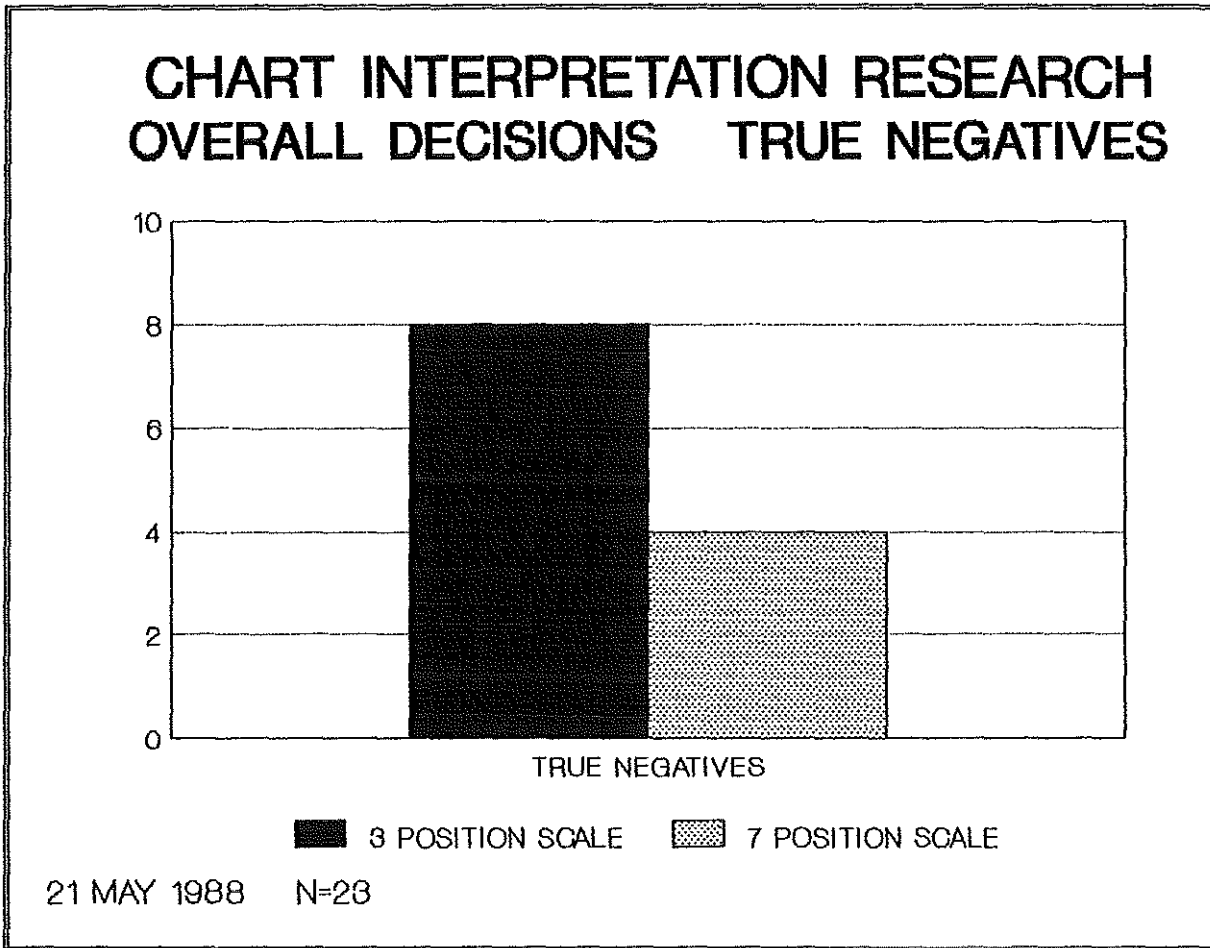
The examiner using the 7 position scale applied identical criteria, the only exception being the numerical scoring values of 0 to +/- 3.

In this instance, of 77 examinations which were identified as ground truth guilty of at least one crime, the following results were obtained:

IN 55 CASES OR 71.4% OF THE TIME, A TRUE POSITIVE
RESULT WAS OBTAINED USING THE 3 POSITION SCALE.
CONVERSELY, IN 59 CASES, OR 76.6% OF THE TIME, A
TRUE POSITIVE RESULT WAS ACHIEVED WHEN APPLYING THE
7 POSITION SCALE.

In analyzing a combination of the two interpretation techniques, a true positive result was achieved in 74% of the cases examined.

-FIGURE 4-



In analyzing the data of the previous category, that analysis suggests a basic agreement with the stated hypothesis.

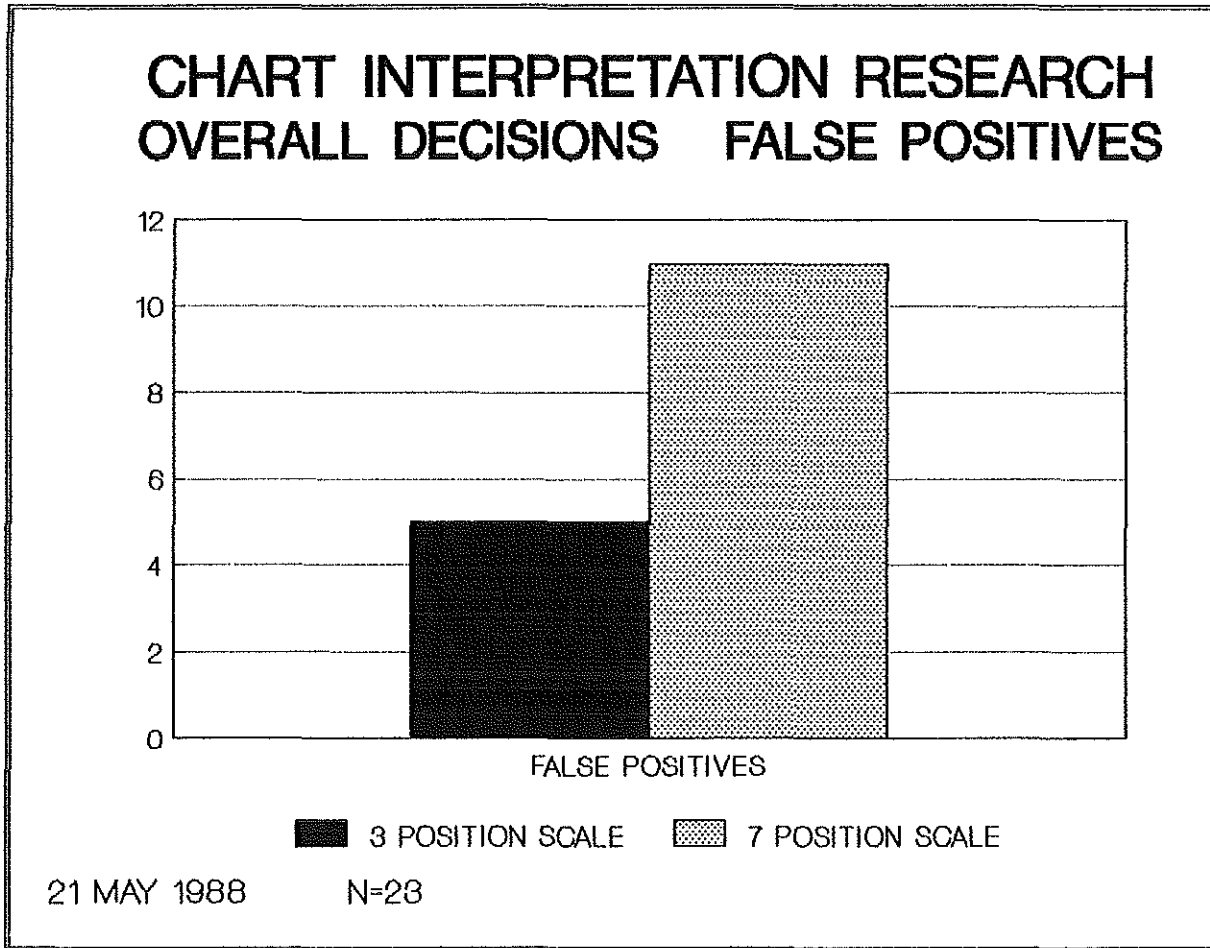
This would be considered adequate if we were only concerned with identifying the guilty participant in any given scenario. Ethically, however, we have an obligation to equally assure the users of the polygraph technique that we are able to identify the innocent.

To this end, the rate of true negatives, or persons not having participated, in any way, in any of the crime scenarios, was examined. As established by ground truth, this number was 23 of the total sample population of 100. This examination provided the following results:

IN 8 CASES, OR 34.8% OF THE TIME, A TRUE NEGATIVE
RESULT WAS ACHIEVED USING THE 3 POSITION SCALE.
CONVERSELY, IN ONLY 4 OF THE 23 CASES, OR 17.4% OF
THE TIME, WAS A TRUE NEGATIVE RESULT OBTAINED WHEN
USING THE 7 POSITION SCALE.

This finding suggests that while the 7 position scale is more likely to identify the guilty participants, it is less likely to exonerate the innocent than is the 3 position scale.

-FIGURE 5-



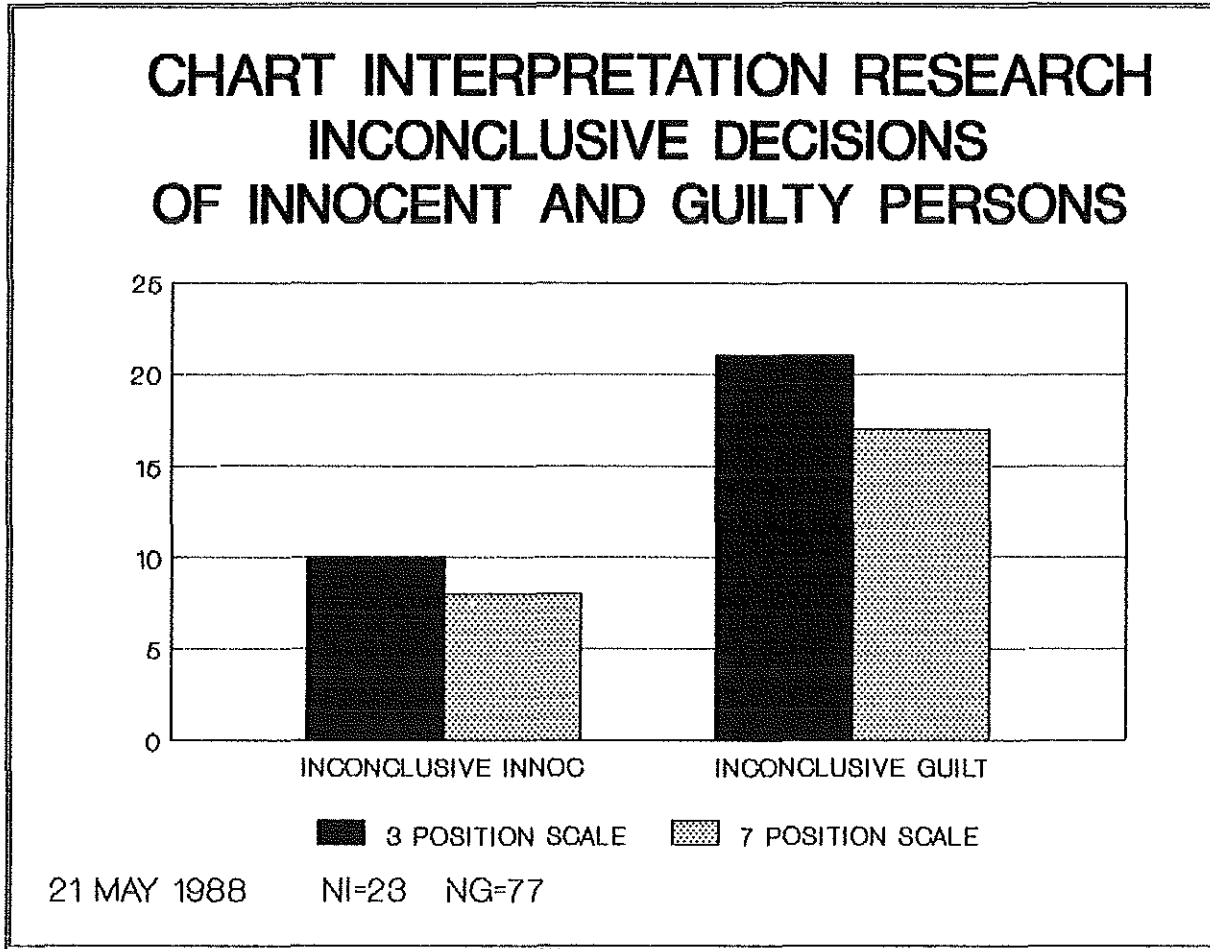
FALSE POSITIVES

Further analysis suggests that the 7 position scale is more than twice as likely to produce a false positive result, or identify an innocent person as guilty as is use of the 3 position scale.

As the above graph demonstrates, of the 23 ground truth verified innocent people, the 7 position scale incorrectly identified 11 or 48.8% as guilty. The 3 position scale incorrectly identified only 5 or 21.7% of the total innocent population as guilty participants.

FALSE NEGATIVES

Utilization of both interpretation techniques resulted in identifying but one guilty person as innocent. This represents a rate of error of only 1.3% in failing to identify any guilty participant, or an overall "hit" rate of 98.7%.



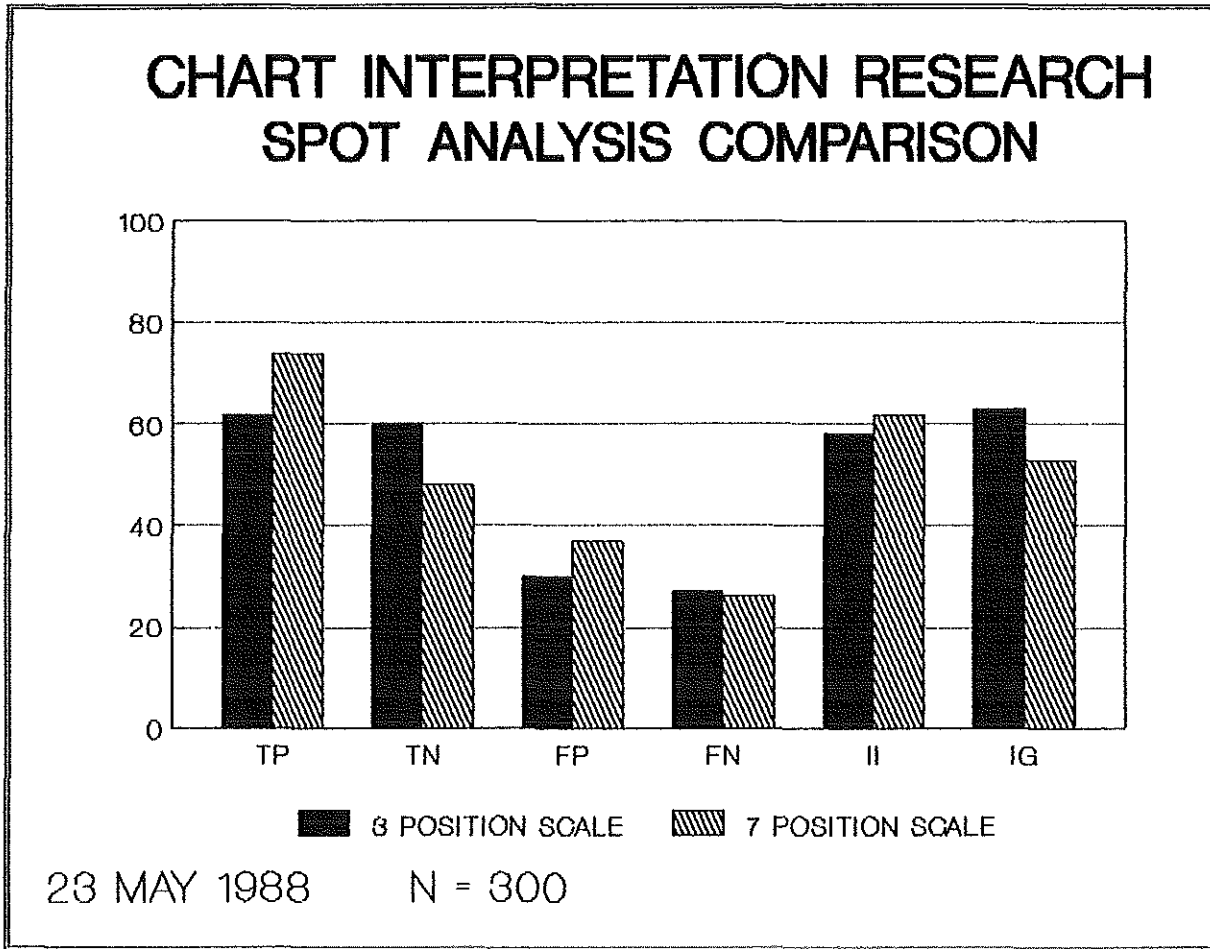
INCONCLUSIVE DECISIONS

As with any chart interpretation technique, there will almost without exception be a reported number of cases upon which no conclusive decision could be achieved.

The authors found that the 7 position scale is less likely to produce inconclusive results in either the innocent or guilty categories. It is felt that this implies that the 3 position scale is more subjective and fails to provide the polygraph examiner with any degree of objectivity in evaluating polygraph charts.

It should be noted though, prior to drawing any definitive conclusion that inconclusive rates can also be the product of distorted tracings, various examiner operational errors in collecting polygrams (i.e. making sensitivity changes between relevant and control questions thereby rendering a question uninterpretable) and numerous other factors.

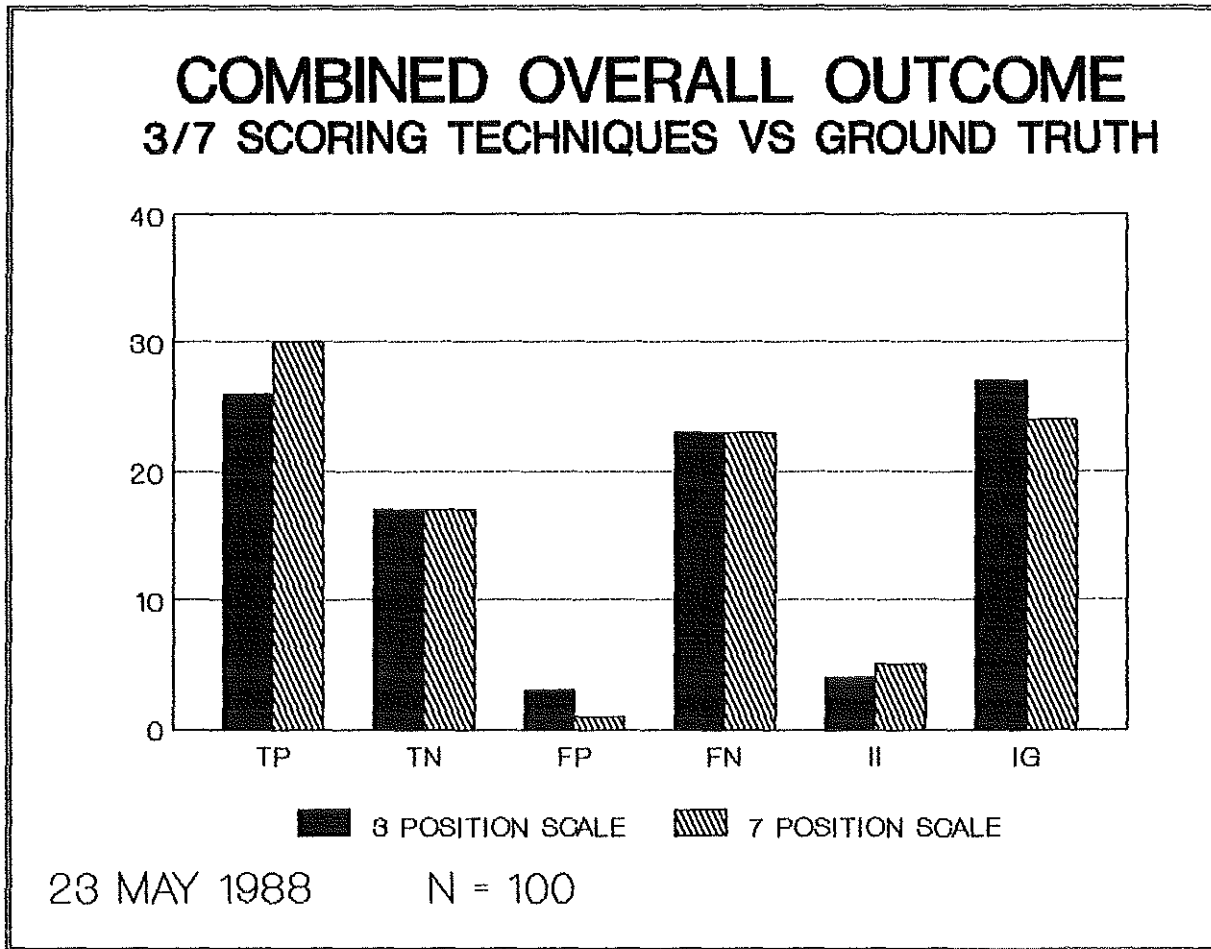
-FIGURE 7-



SPOT ANALYSIS COMPARISON

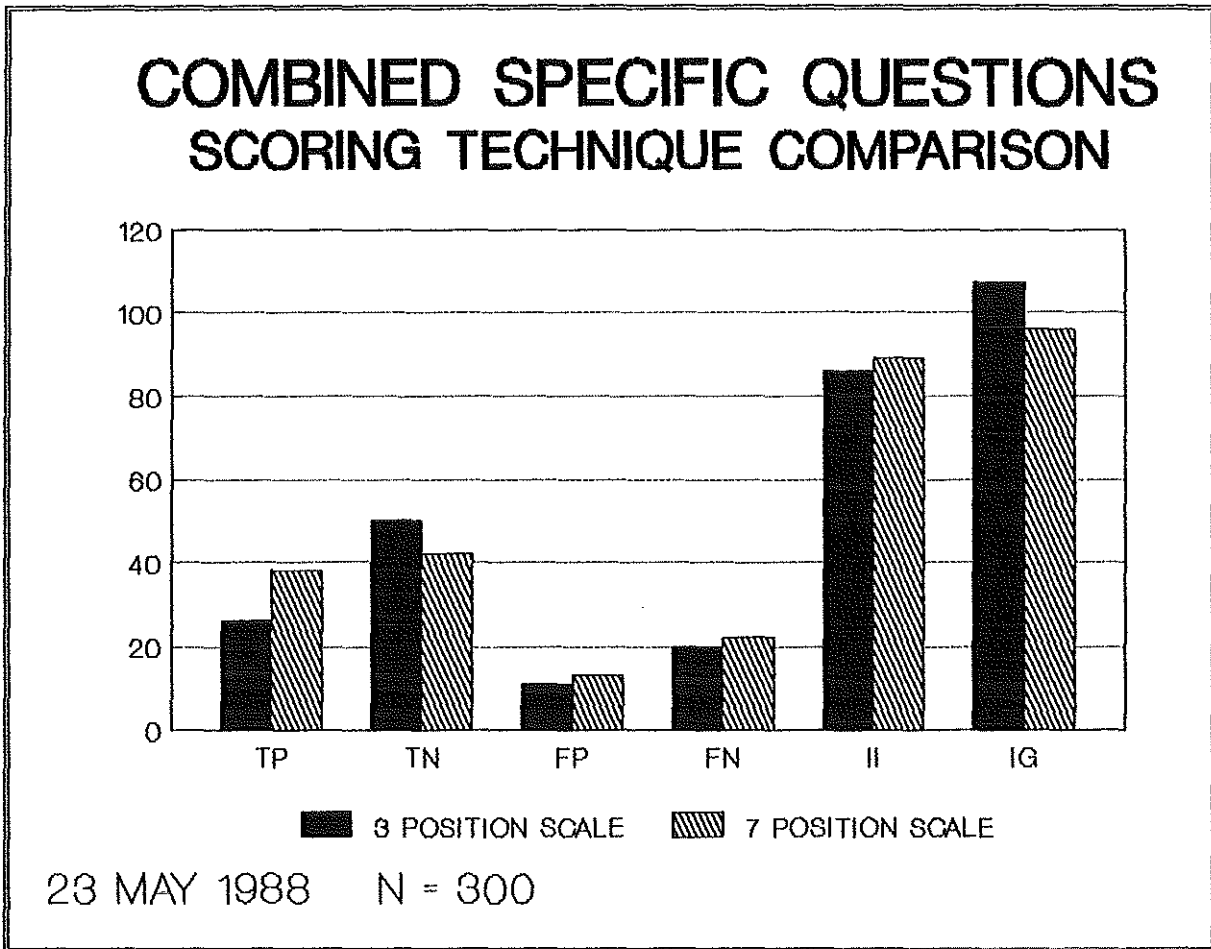
The data represented on this chart, and delineated on Table 2, Appendix A, suggests that it is immaterial as to which scoring technique is utilized when evaluating spots only. As indicated, both the 3 position scale and the 7 position scale disagreed with ground truth a total of 178 times, or 59.3%, when comparing a total of 300 spots. This data would tend to support a contention that the so-called technique of "splitting calls" will increase the error rate of a particular examination.

-FIGURE 8-



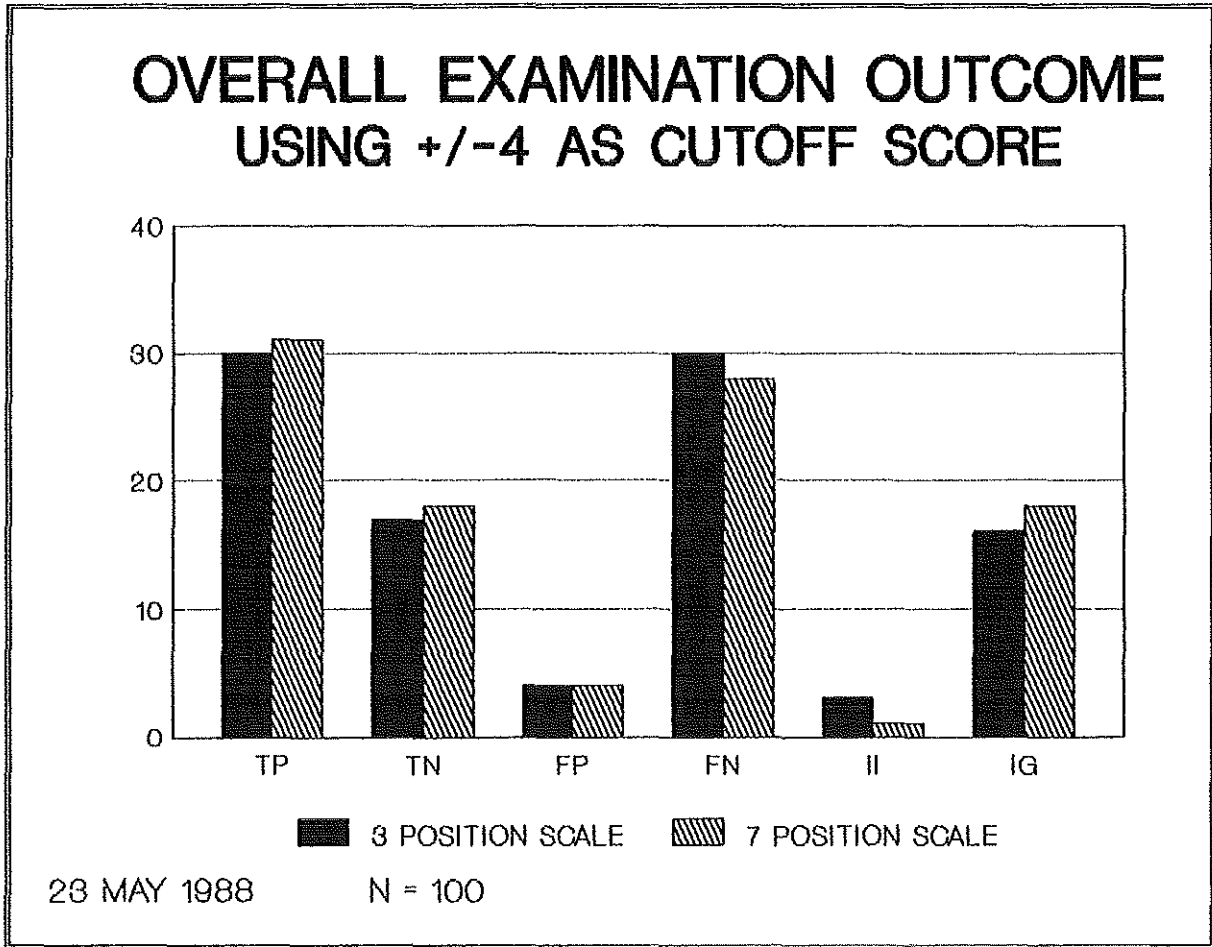
COMBINED OVERALL OUTCOME

This chart and accompanying data shown in Table 3, Appendix A, reflects the result of basing a decision on total numerical score, irrespective of spot analysis. As shown in Figure 2 and Table 1, Appendix A, the overall decision regardless of the numerical score in a particular spot is incorrect only 6% of the time when using the 3 position scale and 12% of the time when the 7 position scale is used. When the decision is based on combined spot totals as shown above, the error rate more than doubles to 26 and 24%, respectively. If inconclusive calls are included as "incorrect", the error rate climbs to a staggering 57 and 53%, respectively. Clearly, the data supports an argument against decisions based on overall outcome.



COMBINED SPECIFIC QUESTIONS

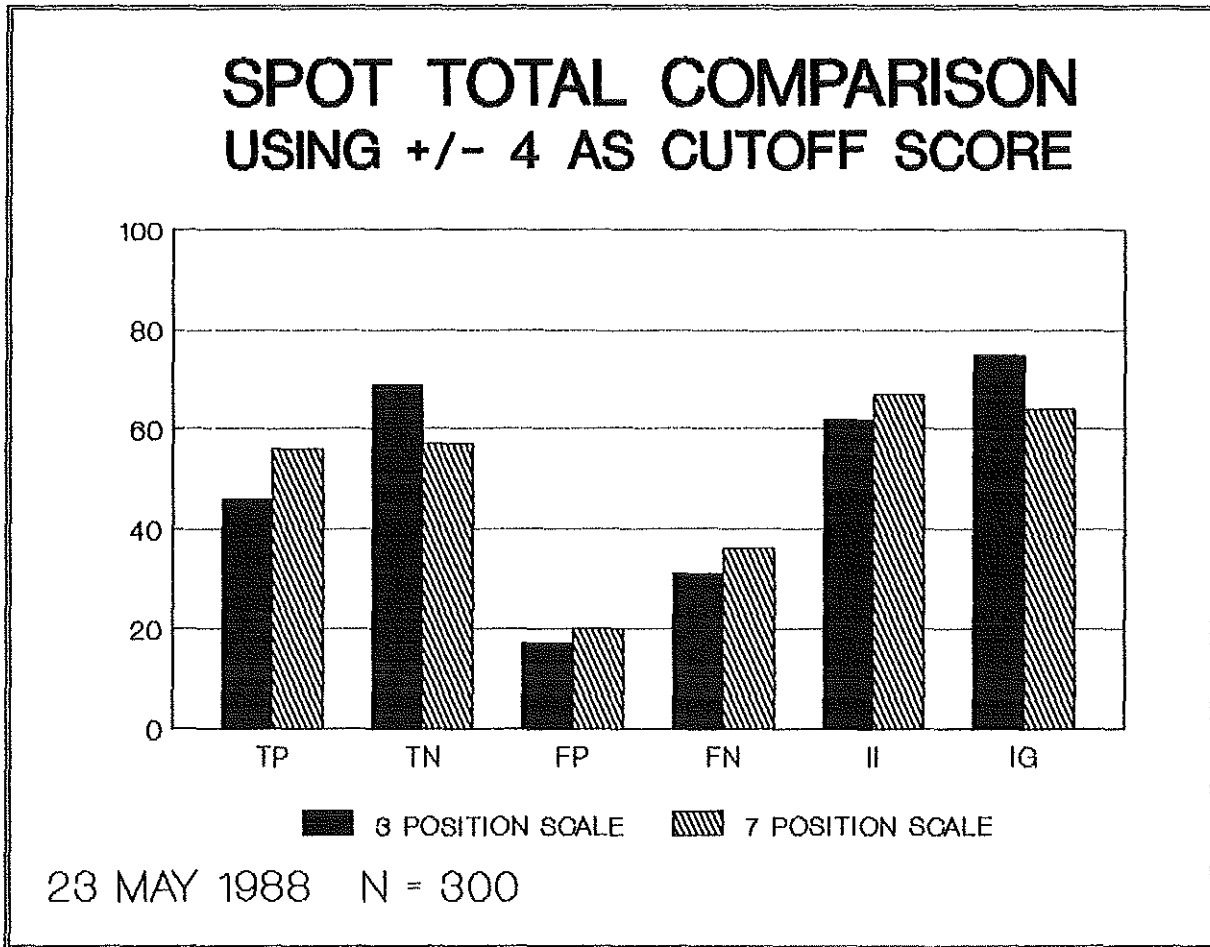
The data reflected in the above graph compares the utility of basing a decision on combining the total numerical score of two relevant questions to the method of strictly adhering to spot analysis. In this example, Tables 2 and 4, Appendix A, contain the specific numerical data. As demonstrated, using the "combined" method, an error rate of 10.3% was experienced using the 3 position scale and 11.6% using the 7 position scale. When respecting specific spot analysis, the error rate increased to 19 and 21%, respectively. It can then be implied that using the combined score of any two relevant questions will produce a slightly more accurate overall decision of that spot only.



OVERALL EXAMINATION OUTCOME (+/-4)

This chart, the numerical data for which may be found in Table 5, Appendix A, represents certain data compared with that which appears in Figure 2 and Table 1, Appendix A. The purpose of this comparison was to examine the benefit, if any, of lowering the "cut-off" score as a means of increasing overall accuracy of chart interpretation. The methods reported in both Tables 1 and 5 establish that if any spot was DI (-3 or greater), the entire examination was opined to be deceptive. In this case, with the 3 position scale, the true positive rate was 39.9% using the +/-4 cutoff score and 71.4% for the +/-6 cutoff score. The 7 position scale produced true positive results of 40.2% and 76.6%, respectively. The only other significant finding was that the +/-4 cutoff produced false negative rates at least 27 times as great as the +/-6 cutoff in either the 3 or 7 position scale.

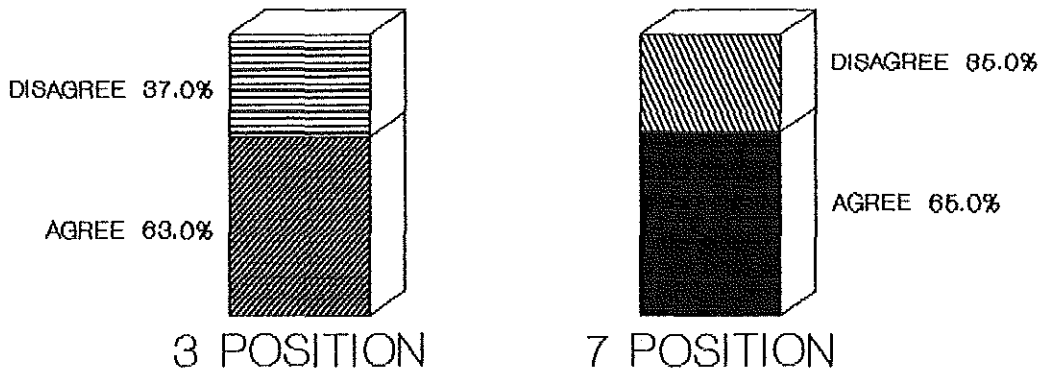
-FIGURE 11-



SPOT TOTAL COMPARISON (+/-4)

The graph above depicts a comparison between comparing spot totals only with +/-4 as a cutoff score with the results achieved using +/-6 as a cutoff score. The accompanying data may be found in Tables 2 and 6, Appendix A, respectively. An analysis of the data shows that the 3 position scale will produce true positive results 20.6% of the time using +/-6 as the cutoff, and 15.3% of the time using +/-4. The 7 position scale produced true positive results of 24.6 and 18.6% respectively. The most significant differences were found in the false positive category. This analysis showed that in the 3 position scale a false positive resulted in 10% of the cases where +/-6 was established as the cutoff, and only 5.6% of the cases when +/-4 was used as the cutoff. In the 7 position scale, the figures were slightly higher (12.3%) with +/-6 as the cutoff and (6.6%) with +/-4 as the criterion.

OVERALL OUTCOME COMPARISON 3/7 POSITION SCALE = GROUND TRUTH



23 MAY 1988

N = 100

OVERALL OUTCOME COMPARISON

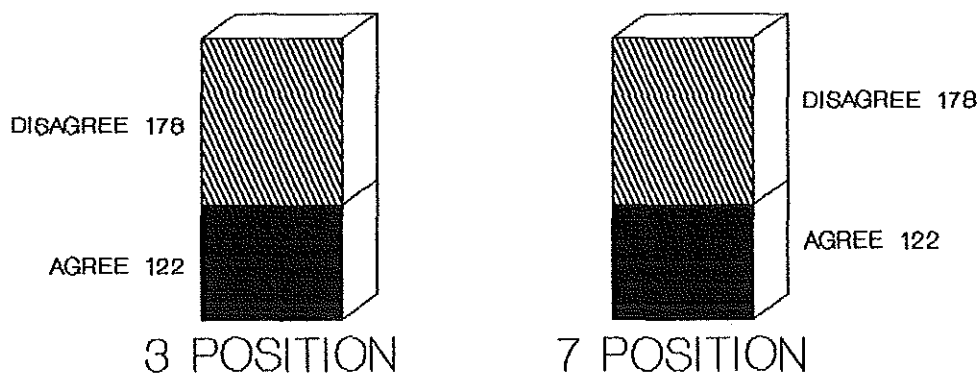
The data shown on this chart indicates the 7 position scale to be slightly more in agreement with ground truth as opposed to the 3 position scale. In a total of 100 examinations, the 7 position scale agreed with ground truth a total of 65 times, while the 3 position scale coincided with ground truth a total of 63 times. Ground truth in this instance included all those participants programmed to be guilty of any or all three crime scenarios or innocent of any crime.

OVERALL OUTCOME COMPARISON - ADDITIONAL DATA

After analyzing which scale was more consistent with ground truth, the examiner-authors thought it might be interesting to analyze how the two scales compared with ground truth when that comparison was accomplished concurrently and then independent of one another. On only one occasion, when the overall decision of the examination was made as to whether a subject was deceptive or non-deceptive, did the two scales disagree with one another. A disagreement in this case meaning one scale resulted in a DI decision, while the other scale resulted in an NDI decision. In only 8 of 100 instances were the parameters of ground truth, the 3 position scale and the 7 position scale in total disagreement (i.e. ground truth being guilty, the 3 position scale indicating innocence and the 7 position scale rendering an inconclusive decision). Of the 100 examinations reviewed, both the 3 position and the 7 position scales rendered an inconclusive call in the same examination a total of 10 times. The final element the examiner-authors compared was how many times did all three parameters agree with one another. Of the 100 examinations reviewed, 49 cases were all in agreement with one another. Of those 49 examinations, 46, or 93.8% were in fact guilty, while 3 of the 49, or 6.12%, were innocent.

OVERALL SPOT COMPARISON

3/7 POSITION = GROUND TRUTH



23 MAY 1988

N = 300

OVERALL SPOT COMPARISON

The data represented on this chart suggests that it is immaterial as to which scoring technique is utilized when evaluating spots only. As indicated, both the 3 position scale and the 7 position scale disagreed with ground truth a total of 178 times, or 59.3%, when comparing a total of 300 spots.

OVERALL SPOT COMPARISON - ADDITIONAL DATA

As with overall outcome, an analytical comparison was undertaken in the area of overall spot comparison. In this instance, the data examined represented the total number of spots contained within the sample examinations. With regard to specific spot analysis, both the 3 position scale and the 7 position scale rendered the same conclusion a total of 115 times out of a total of 300 spots examined. There were only 7 instances wherein the scales were in total disagreement. In looking at the parameters of ground truth, the 3 position and the 7 position scale, differing conclusions were reached in 47 of the 300 spots analyzed. In 59 cases, both the 3 position and the 7 position scales rendered inconclusive opinions to the same spots. The three parameters, identified above, all reached the same conclusion in 83 instances. Of these 83 cases, 48, or 57.8%, were verified as guilty while 35, or 42.2%, were verified as innocent. This analysis seems to making the statement that when decisions are based on spot total analysis only, the accuracy of the overall outcome with regard to ground truth diminishes. Again, the reader is reminded that in this particular facet of the study, the crime scenario consisted on three separate crimes, hence the total of 300 total spots to be examined.

CONCLUSIONS

As with any study, conclusions are both necessary and expected. This study is no exception, and those conclusions are submitted herewith.

The researchers found when looking at a comparison of the two scoring techniques, the incidence of true positives, that is rendering a DI call of a guilty person, the 7 position scale fared slightly better, establishing a "hit rate" of 76.6%, as opposed to 71.4% for the 3 position scale. When these figures were encountered, the result of the next category, true negatives, or correctly identifying an innocent person NDI, was totally unexpected. In that category, exactly twice as many true negatives were reported with the 3 position scale as with the 7 position scale. An interesting comparison was found in the false positive category. That analysis demonstrated that the 3 position scale was far less likely to call an innocent person DI than was the 7 position scale. While it seemed that the trend had begun to turn in favor of the 3 position scale, to the detriment of the stated hypothesis, the next category, inconclusive decisions quickly changed that sentiment. The researchers found in both innocent and guilty categories, the 7 position scale was considerably less likely to produce inconclusive results. As was stated throughout the remainder

of this treatise, the application of spot analysis was clearly the preferred method of chart interpretation. This method rendered significantly more true positive results in both scoring scales than when a combined overall outcome analysis, irrespective of spot analysis, was attempted.

When the researchers attempted to see if the accuracy rate would change markedly by establishing a +/-4 cut off as the determinant, it was found that in most all cases, the +/-6 cut off criteria was best.

In the end analysis, the hypothesis in its stated form was proven to be correct. However, the researchers found that perhaps the hypothesis was incomplete in that there are other areas to be examined when attempting to assess the accuracy of a particular measurement instrument. It is hoped that the areas which present concerns for both the advocates and critics of the polygraph profession, with respect to chart interpretation, have been addressed and they will find this study enlightening. If any one aspect emerged from this study it is that further research regarding chart interpretation methods is necessary and will only serve to further professionalize our chosen field of endeavor.

CHART INTERPRETATION RESEARCH 1988

SUBJ	TYPE	STEAL	DAMAGE	PHOTO	GRD T	E DEC	GR DEC	STEAL	DAMAGE	PHOTO
1	S	10	8	9	I	TN	TN	TNI	TNI	TNI
2	S	8	6	-1	G3SDP	IG	IG	FN	IGG	FN
3	M	-5	2	7	I	FP	FP	FPI	II	TNI
4	M	-3	-2	-11	G3SDP	TP	TP	IGG	IGG	TP
5	M	-2	-8	-6	G1S	TP	TP	IGG	FPG	FPG
6	S	-4	-12	-9	G2DP	TP	TP	IGI	TP	TP
7	S	12	-1	3	G1P	IG	IG	TNG	IGI	IGG
8	M	11	2	-8	G2SD	TP	TP	FN	IGG	FPG
9	S	12	-4	1	G1D	TP	IG	TNG	IGG	IGI
10	S	-2	-9	2	I	FP	FP	II	FPI	II
11	M	10	-1	3	G1P	TP	IG	TNG	IGI	IGG
12	M	5	8	-2	I	II	II	II	TNI	II
13	S	-22	1	-18	G3SDP	TP	TP	TP	IGG	TP
14	M	7	-10	2	G3SDP	TP	TP	FN	TP	IGG
15	M	-8	1	-1	G2SD	TP	TP	TP	IGG	IGI
16	S	-9	-17	-5	G2SP	TP	TP	TP	FPG	IGG
17	S	-1	4	-3	G1P	TP	IG	IGI	IGI	IGG
18	S	-14	-18	9	G2SD	TP	TP	TP	TP	TNG
19	M	18	17	12	G3SDP	FN	FN	FN	FN	FN
20	M	-7	2	-9	G2SP	TP	TP	TP	IGI	TP
21	S	-10	9	11	G2SP	TP	TP	TP	TNG	FN
22	S	33	7	17	I	II	TN	TNI	TNI	TNI
23	M	-4	-8	2	G1D	TP	TP	IGI	TP	IGI
24	M	-7	5	16	G1S	TP	TP	TP	IGI	TNG
25	M	-1	-5	-6	G2DP	TP	TP	IGI	IGG	TP
26	S	-15	-7	17	G3SDP	TP	TP	TP	TP	FN
27	M	-5	9	-17	G1P	TP	TP	IGI	TNG	TP
28	M	18	13	10	I	II	TN	TNI	TNI	TNI
29	S	5	10	6	I	II	II	II	TNI	TNI
30	M	11	-5	-2	G2DP	TP	IG	TNG	IGG	IGG
31	S	-1	-5	12	G1S	TP	IG	IGG	IGI	TNG
32	S	14	22	12	G3SDP	FN	FN	FN	FN	FN
33	S	4	-7	7	G2SD	TP	TP	IGG	TP	TNG
34	M	-1	1	-14	G3SDP	TP	TP	IGG	IGG	TP

CHART INTERPRETATION RESEARCH 1988

SUBJ	TYPE	STEAL	DAMAGE	PHOTO	GRD T	E DEC	GR DEC	STEAL	DAMAGE	PHOTO
35	S	-11	-8	1	G3SDP	TP	TP	TP	TP	IGG
36	S	15	8	-4	G1P	TP	IG	IGG	TNG	TNG
37	M	5	-18	11	G1D	TP	TP	IGI	TP	TNG
38	M	0	16	7	G3SDP	IG	IG	IGG	FN	FN
39	M	-9	10	-8	G2SD	TP	TP	TP	FN	FP
40	S	18	17	-17	G2SP	TP	TP	FN	TNG	TP
41	S	8	-1	17	I	II	II	TNI	II	TNI
42	M	17	8	12	I	TN	TN	TNI	TNI	TNI
43	S	-11	-15	5	G2SD	TP	TP	TP	TP	IGI
44	S	-3	4	-4	G3SDP	TP	IG	IGG	IGG	IGG
45	M	15	4	-5	G1S	TP	IG	FN	IGI	IGI
46	S	6	-2	4	G2DP	IG	IG	TNG	IGG	IGG
47	M	-11	12	-3	G3SDP	TP	TP	TP	FN	IGG
48	M	6	10	7	G1P	IG	FN	TNG	TNG	FN
49	S	-2	-10	-4	G1S	TP	TP	IGG	FPG	IGI
50	M	-2	4	1	G2SP	TP	IG	IGG	IGI	IGG
51	M	11	-2	4	G1D	TP	IG	TNG	IGG	IGI
52	M	1	-1	1	I	II	II	II	II	II
53	S	2	7	17	I	II	II	II	TNI	TNI
54	S	20	-27	6	G2DP	TP	TP	TNG	TP	FN
55	S	13	24	19	G3SDP	FN	FN	FN	FN	FN
56	M	9	-2	12	G3SDP	IG	IG	FN	IGG	FN
57	M	4	10	2	G2SD	IG	IG	IGG	FN	IGI
58	S	0	-3	-11	G1P	TP	TP	IGI	IGI	TP
59	M	-1	-3	15	G2DP	IG	IG	IGI	IGG	FN
60	M	-11	3	-13	G3SDP	TP	TP	TP	IGG	TP
61	S	1	3	-8	G3SDP	TP	TP	IGG	IGG	TP
62	S	-27	24	18	G1S	TP	TP	TP	TNG	TNG
63	M	29	27	34	I	TN	TN	TNI	TNI	TNI
64	S	11	15	21	I	TN	TN	TNI	TNI	TNI
65	M	5	7	4	G2SP	IG	IG	IGG	TNG	IGG
66	M	25	14	11	I	TN	TN	TNI	TNI	TNI
67	S	10	-5	-24	G2SD	TP	TP	IGG	IGG	FPG
68	S	1	-3	1	G3SDP	TP	IG	IGG	IGG	IGG

HART INTERPRETATION RESEARCH 1988

SUBJ	TYPE	STEAL	DAMAGE	PHOTO	GRD T	E DEC	GR DEC	STEAL	DAMAGE	PHOTO
69	S	31	27	21	I	TN	TN	TNI	TNI	TNI
70	M	9	3	-7	G1P	TP	TP	TNG	IGI	TP
71	M	7	-2	-3	G2SD	TP	IG	FN	IGG	IGI
72	S	17	5	-9	G2DP	TP	TP	TNG	IGG	TP
73	S	-3	-9	3	G1S	TP	TP	IGG	FPG	IGI
74	M	-7	9	-2	I	FP	FP	FPI	TNI	II
75	M	7	-3	7	G1P	TP	IG	TNG	IGI	FN
76	S	44	17	15	I	TN	TN	TNI	TNI	TNI
77	S	14	8	12	G3SDP	IG	FN	FN	FN	FN
78	M	19	20	3	G3SDP	IG	IG	FN	FN	IGG
79	S	-18	9	-4	G3SDP	TP	TP	TP	FN	IGG
80	M	30	20	22	I	TN	TN	TNI	TNI	TNI
81	S	-2	2	5	I	FP	II	II	II	II
82	M	4	4	-3	G3SDP	TP	IG	IGG	IGG	IGG
83	S	-14	20	-2	G2SP	TP	TP	TP	TNG	IGG
84	M	5	-1	18	G1D	TP	IG	IGI	IGG	TNG
85	S	2	0	-1	G3SDP	IG	IG	IGG	IGG	IGG
86	M	5	-14	-2	G2DP	TP	TP	IGI	TP	IGG
87	M	3	5	2	I	II	II	II	II	II
88	M	6	13	-1	G3SDP	IG	IG	FN	FN	IGG
89	S	15	6	4	I	II	II	TN	TN	II
90	S	14	-4	16	G1D	IG	IG	TNG	IGG	TNG
91	M	-7	4	-2	G1S	TP	TP	TP	IGI	IGI
92	S	-3	7	-6	G1P	TP	TP	IGI	TNG	TP
93	M	-2	9	1	I	II	II	II	TNI	II
94	S	-1	11	5	I	II	II	II	TNI	II
95	M	-1	-9	0	G3SDP	TP	TP	IGG	TP	IGG
96	S	-9	5	-17	G2SP	TP	TP	TP	IGI	TP
97	M	3	3	12	G2SP	IG	IG	IGG	IGI	FN
98	M	3	-5	-2	G3SDP	TP	IG	IGG	IGG	IGG
99	S	28	-10	19	G1D	TP	TP	TNG	TP	TNG
100	S	17	-18	14	G1D	TP	TP	TNG	TP	TNG

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OVERALL EXAMINATION OUTCOME

USING +/- 4 AS A CUTOFF SCORE

	TP	TN	FP	FN	II	IG	TOTAL
3 POSITION	30	17	4	30	3	16	100
7 POSITION	31	18	4	28	1	18	100
TOTAL	61	35	8	58	4	34	200

TABLE 5

SPOT TOTAL COMPARISON

USING +/- 4 AS A CUTOFF SCORE

	TP	TN	FP	FN	II	IG	TOTAL
3 POSITION	46	69	17	31	62	75	300
7 POSITION	56	57	20	36	67	64	300
TOTAL	102	126	37	67	129	139	600

TABLE 6

OVERALL DECISION

USING +/- 6 AS A CUTOFF SCORE
 ANY SPOT DI RENDERS ENTIRE TEST DI

	TP	TN	FP	FN	II	IG	TOTAL
3 POSITION	55	8	5	1	10	21	100
7 POSITION	59	4	11	1	8	17	100
TOTAL	114	12	16	2	18	38	200

TABLE 1

SPOT ANALYSIS COMPARISON

USING +/-6 AS A CUTOFF SCORE

	TP	TN	FP	FN	II	IG	TOTAL
3 POSITION	62	60	30	27	58	63	300
7 POSITION	74	48	37	26	62	53	300
TOTAL	136	108	67	53	120	116	600

TABLE 2

COMBINED OVERALL OUTCOME
 DECISION BASED ON TOTAL NUMERICAL SCORE
 SPOT TOTALS NOT A CONSIDERATION

	TP	TN	FP	FN	II	IG	TOTAL
3 POSITION	26	17	3	23	4	27	100
7 POSITION	30	17	1	23	5	24	100
TOTAL	56	34	4	46	9	51	200

TABLE 3

COMBINED SPECIFIC QUESTIONS
 2 RELEVANT QUESTIONS PER SPOT - TOTALED

	TP	TN	FP	FN	II	IG	TOTAL
3 POSITION	26	50	11	20	86	107	300
7 POSITION	38	42	13	22	89	96	300
TOTAL	64	92	24	42	175	203	600

TABLE 4