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## The Connection between Score Threshold, Rate of Inconclusives and Minimum Number of Charts Required for Decision of Truth or Deception

**Key Words:** truth or deception decision, polygraph chart evaluation, validity and reliability of polygraph examination

A comprehensive study on Validity and Reliability of Detection of Deception conducted by D.C. Raskin, G.H. Barland, and J.A. Podlesny (1978) for the National Institute of Law Enforcement and Criminal Justice that included field studies and laboratory experiments concluded that the optimal score threshold using the Utah Zone Comparison Technique format was a fixed<sup>1</sup> threshold of +/-6 which would result in an accuracy rate from 88 to 90 percent with an inconclusive rate of approximately 9 percent. Further, the study shows

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<sup>1</sup> A fixed score threshold is one wherein the score threshold does not increase with each chart collected as in the Quadri-Track ZCT, the Backster ZCT and the Integrated ZCT.

that as the scores increase, there is a moderate increase in accuracy reaching approximately 98 percent, particularly from +/-9 to +/-12, but at the expense of an increase in inconclusives. Furthermore, in the Matte, Reuss 1989a<sup>2</sup> field study, tables 10a1, 10a2, 10b1, 10b2 and 10c show that as the scores increase the probability of error decreases, hence an increase in accuracy.

The Raskin et al study provides a graph that shows that as the score threshold increases, the inconclusive rate also increases and when the threshold reaches +/-6, the inconclusive rate rises dramatically to 50 percent at +/-12, hence the cut-off score threshold of +/-6 with an inconclusive rate of 9 percent and 90 percent accuracy was chosen in that study as the most utilitarian score threshold. Figure 1 shows the graph from the aforementioned Raskin et al study, which was modified to include the inconclusive rate of the Quadri-Track Zone Comparison Technique whose inconclusive rate, based on three published field research studies (Matte, Reuss 1989a, 1989b; Mangan, Armitage, Adams 2008; Shurany, Stein, Brand 2009) was a low 2.4 percent at the high score threshold of +/-12. This exceptionally low inconclusive rate permits the use of the high score threshold of the Quadri-Track ZCT that requires a +3 or -5 per charts (+6 or -10 for two charts, +9 or -15 for three charts, +12 or -20 for four charts for truth or deception respectively with an overall accuracy of 98.8 percent and inconclusive rate of 2.4 percent. Interestingly, the average score per chart for the truthful and deceptive in the Matte-Reuss 1989 study was +6 and -9 per chart and in the Mangan, et al study was +7.1 and -10.0 respectively. This means that when two charts are collected the sum total would be +13 and -19, with an accuracy exceeding 98 percent, justifying the technique's minimum two chart decision requirement (Matte 2012).

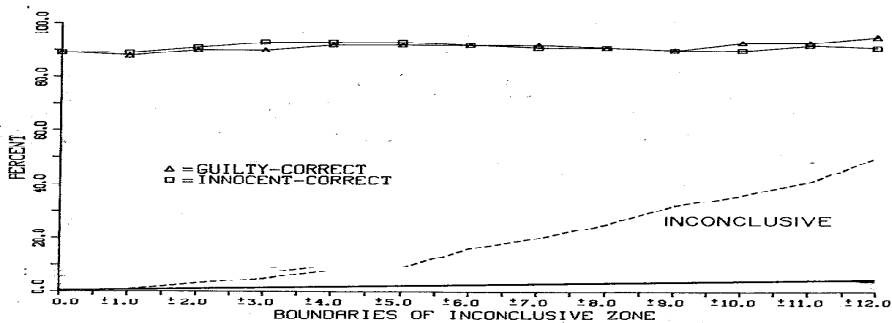


Figure 1. Rates of accuracy and inconclusives with different boundaries of the inconclusive zone. The above Figure 1 from Validity and Reliability of Detection of Deception study by D.C. Raskin, G.H. Barland, J.A. Podlesny June 1978, has been modified to include the Inconclusive Rate for the Quadri-Track Zone Comparison Technique studies by Matte, Reuss (1989); Mangan, Armitage, Adams (2008); Shurany, Stein, Brand (2009).

FIGURE 1

<sup>2</sup> Matte, Reuss 1989a 220-page doctoral dissertation and 1989b abridged version of same field study published in *Polygraph*, 18(4) 1989 are available for review and download at [www.mattepolygraph.com](http://www.mattepolygraph.com).

It becomes evident that the accuracy of decisions regarding truth and deception is directly connected to the overall score attained from the collection of the physiological data in uni-faceted single-issue tests. The higher the score threshold, the more accurate the decision making process. However, as required by the standards of the American Polygraph Association for evidentiary techniques, the inconclusive rate must not exceed 20 percent.

The Quadri-Track Zone Comparison Technique is not the only polygraph technique with a high score threshold. The score threshold in the Integrated Zone Comparison Technique is +/-13 for three charts and +/-18 for four charts (N.J. Gordon, personal Communication, January 4 and 5, 2013). The score threshold in Backster Zone Comparison Technique is +5 and -9 for two charts, +7 and -13 for three charts (Backster 1979),<sup>3</sup> and +9 and -17 for four charts (G.C. Adams, personal communication, January 28, 2013).

The use of a low fixed score threshold such as +/-6 or even +/- 4 (Cushman 2010) may be necessary in some techniques to avoid an excessive inconclusive rate, but the accompanying consequence can be a reduction in accuracy that requires the collection of additional charts to augment its total score (Matte 2011, 2012), hence the minimum 3 charts requirement (Criswell 2012).

The lowest inconclusive rate in the Quadri-Track Zone Comparison Technique's is primarily due to its Inside-Track containing a *Fear of Error* Control Question and a *Hope of Error* Relevant Question whose scores are added to the other two control/relevant question pairs for a total score that is used for a determination of truth or deception. The data in the Matte, Reuss 1989a study tables mentioned above show a significant difference in the error rate when the Inside-Track is omitted or added to the total score of the Primary and Secondary tracks. The Matte, Reuss 1989a, 1989b field study found that with the confirmed Truthful the Inside-Track reduced the Inconclusives from 52 percent to 9 percent, and the confirmed Guilty from 17 percent to 3 percent.

Overall accuracy 100% with 6% Inconclusives.

In the Mangan, et al 2008 field study, the Inside Track reduced the Inconclusives for the Truthful from 32% to Zero, and the Deceptive from 12.3% to 2.2%. Overall accuracy was 100% with 2.2% Inconclusives.

In the Shurany, et al 2009 field study, the Inside Track reduced the Inconclusives for the Truthful from 31% to Zero and the Deceptive from 71% to Zero. Overall accuracy was 96.5% with Zero Inconclusives.

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<sup>3</sup> Backster's Standardized Polygraph Notepack and Technique Guide (1969 and 1979) reflect score threshold for 3 charts. However when a fourth chart is required, the threshold continues to climb to +9 and -17. (G. C. Adams, personal communication, January 28, 2013).

In the Matte & Reuss 1989a field study, the Fear of Error increased the total scores for the Truthful from +341 to +762 thus increasing the score by +421 points. The Fear of Error control question generated an adjustment to the 58 Innocent case scores by increasing the score by an average of +7.3 per case. The average total score per Innocent case without the Fear of Error adjustment was +5.89 and with the Fear of Error adjustment was +13.1. This shows that the “Fear of Error” factor is extremely significant and cannot be ignored in the scoring of Innocent cases. It also increased the average score per case for the Guilty from -19.7 to -25.1.

In the Mangan, et al 2008 field study, the Fear of Error increased the scores for the Truthful from a mean of +4.0 per chart to +7.1 and the Deceptive from a mean of -6.9 per chart to -10.0. When applied to the traditional case of 3 charts the score is NDI +21.3 and DI – 30.0.

In the Shurany, et al 2009 field study, the Fear of Error increased the total score of the Truthful from a mean +3.39 per chart to +5.39 per chart, and the Deceptive from -3.54 per chart to -6.08 per chart. When applied to the traditional case of 3 charts the score is NDI +16.1 and DI -18.24.

The significant increase of scores for the truthful examinees confirms the Fear of Error hypothesis by Dr Ekman and the National Research Council of the National Academies of Science. Furthermore the presence of the Inside Track within the construct of the technique addresses that variable listed under Category A, Identification of Variables (Matte 1996). Importantly, its presence for comparison with the Hope of Error relevant question addresses another variable concerning the legitimacy of reactions to the direct relevant questions in the Primary and Secondary tracks that often raises the issue of false positives.

Another factor that also contributes to the low inconclusive rate is the technique’s Dual-Equal Strong Reaction Rule, an evolutionary and progressive modification of Backster’s Either-Or rule (Matte 1996, 2010, 2011). The Dual-Equal Strong Reaction Rule demands that when the red (relevant) and green (control) zones being inter-compared both contain timely, specific, and significant reactions of maximum and equal strength, a minus one (-1) score is assigned to that spot. The rule is based on the premise that both zone questions appear to be equally threatening to the examinee, the degree of threat being proportionate to the degree of the responses, which indicate that while the examinee may be attempting deception to the relevant question, its neighboring control question may be too intense due to faulty structure, embraces a more serious crime, or a countermeasure attempt was made. A sophisticated guilty

examinee may be able to cause a reaction on the control question but cannot control an oncoming reaction to the relevant question.

The aforementioned Dual-Equal Strong Reaction Rule can significantly reduce the rate of inconclusives that hide the use of physical and mental countermeasures. Dr David Lykken (1998) in his book *A Tremor in the Blood* stated that “A much more effective method of beating the lie detector, however, is to augment one’s reactions to the control questions. 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 about as strong or even stronger.”

Using the Lykken scenario, the Quadri-Track Zone Comparison Technique would not assign a zero score but a -1 score in the pneumo and cardio tracings on all three track totaling a Minus -6. The electrodermal tracing is excluded from the Dual-Equal Strong Reaction Rule due to its volatility and sensitivity to extraneous stimuli. The score threshold for Deception is -5 per chart and since this minimum -6 score would apply to all charts, a Deceptive result would ensue. Furthermore, since the reaction to the relevant question must be significant to qualify under the Rule, it would be most difficult for the reaction to its neighboring control question to be twice as large in order to meet the 2 to 1 ratio required for a +1 score.

Furthermore, both the Quadri-Track and the Backster Zone Comparison Techniques employ the *Examination Reliability Rating Table* (ERRT) that uses a five-point system to determine which issue has the greatest likelihood of producing conclusive results, on the basis of its combined *Adequacy of Information*, *Case Intensity*, and *Distinctness of Issue* (Backster 1969, Matte 1980, 1996). After 41 years of experience in the use of the ERRT by this author which has been taught at the Backster School of Lie Detection since 1969, this author is convinced that compliance with this case evaluation system can minimise inconclusive results with the assurance that tests are conducted only in those cases where there is ample and accurate case information from which to formulate the test questions, and that the issue being covered is sufficiently distinct and intense to elicit the examinee’s psychological set without offering an opportunity for rationalisation.

The importance of a low inconclusive rate affects more than just its utility, and common sense logic suggests that it can also reduce the successful use of physical and mental countermeasures that are often the cause of inconclusive findings.

## References

Backster C. (1969), *Standardized Polygraph Notepack and Technique Guide*, New York, NY, Backster School of Lie Detection.

Backster C. (1989, September), *Backster Zone Comparison Technique: Chart Analysis Rules*, San Diego, CA, Backster School of Lie Detection.

Criswell E. (2012, July), Quality Control, *The Police Polygraphist*, Journal of the American Association of Police Polygraphists.

Cushman B. (2010), *Technical Questions*, Presentation at the American Polygraph Association Annual Seminar and Workshop.

Lykken D.T., (1998), *A Tremor in the Blood – Uses and Abuses of the Lie Detector*, New York, Plenum Publishing Corporation.

Mangan D.J., Armitage T.E., Adams, G.C. (2008), A Field Study on the Validity of the Quadri-Track Zone Comparison Technique, *Physiology & Behavior* 95 (1–2), pp. 17–23.

Matte J.A. (1980), *The Art and Science of the Polygraph Technique*, Springfield, IL, Charles C. Thomas.

Matte J.A., Reuss, R.M. (1989a), Validation Study on the Polygraph Quadri-Zone Comparison Technique, *Research Dissertation Abstract*, LD 01452, Vol. 1502, Proquest Information and Learning (formerly: University Microfilm International).

Matte J.A., Reuss, R.M. (1989b), A Field Validation Study on the Quadri-Zone Comparison Technique, *Polygraph*, 18 (4), pp. 187–203.

Matte J.A. (1996), *Forensic Psychophysiology Using the Polygraph: Scientific Truth Verification – Lie Detection*, Williamsville, NY, J.A.M. Publications.

Matte J.A. (2010), A Field Study of the Backster Zone Comparison Technique's Either-Or Rule and Scoring System Versus Two Other Scoring Systems When Relevant Question Elicits Strong Response, *European Polygraph*, Vol. 4, 2(12), pp. 53–70.

Matte J.A. (2011), Psychological Aspects of the Quadri-Track Zone Comparison Technique and Attendant Benefits of its Inside Track, *European Polygraph*, Vol. 5, 2 (16), pp. 41–60.

Matte J.A. (2012), Minimum Number of Polygraph Charts Required to Reach a Conclusion of Truth or Deception in Psychophysiological Veracity Examinations. *European Polygraph*, Vol. 6, 2 (20), pp. 95–102.

Raskin D.C., Barland G.H., Podlesny J.A. (1978, June), *Validity and Reliability of Detection of Deception*, National Institute of Law Enforcement and Criminal Justice, Law Enforcement Assistance Administration, US Department of Justice.

Shurany T., Stein E., Brand E. (2009), A Field Study on the Validity of the Quadri-Track Zone Comparison Technique, *European Polygraph*, 1 (7), pp. 5–23.