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Psychological Aspects of the Quadri-Track Zone Comparison Technique and Attendant Benefits of its Inside Track

The Quadri-Track Zone Comparison Technique is a psychological test that *infers* deception or truthfulness to the target issue by the elimination of variables identified in Chapter 9, Forensic Psychophysiology Using the Polygraph (Matte 1996) that could have caused the autonomic responses other than a deliberate attempt at deception. These variables fall into four categories: (a) Emotionally induced sympathetic response, (b) Non-Emotionally induced sympathetic response, (c) Emotionally induced parasympathetic response, and (d) Factors affecting strength of emotional and non-emotional response.

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The Quadri-Track Zone Comparison test structure (Fig. 1) shows a Primary Track and a Secondary Track, that includes a non-current exclusive control question[1] and a direct relevant question regarding a single issue. A third track labeled Inside Track contains a *Fear of Error* control question and a *Hope of Error* relevant question. Each relevant question is compared with the control question preceding it within the same track. The scores attained from the comparison of the control versus relevant question in each track is tallied for a total score from the three tracks which is then married to a conclusion table that employs a score threshold based on a statistical predictive table for estimating error rates (Matte 1989a), to wit: +3 and -5 for 1 chart, +6 and -10 for 2 charts, +9 and -15 for 3 charts, +12 and -20 for 4 charts. A minimum of 2 charts must be used to arrive at a decision of truth or deception. Scores below the aforesaid threshold fall into the Inconclusive category.

Figure 2 shows the Quadri-Track ZCT's test question format and the order in which the questions are asked during the administration of the test and collection of the charts, except that with each chart collected, the two direct relevant questions (33 & 35) are switched in their position so that each direct relevant question is compared with the other two control questions (46 & 47).

Figure 3 provides an example of test question formulation regarding a larceny where the exact amount of deposit money stolen is known. Otherwise the prefix "approximate" would have been used.

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[1] The non-current exclusive control (comparison) question, also known as the Backster control question, is formulated to be in the same category of offense or matter as the relevant question or issue. However, this control question is separated in time from the relevant issue with the use of a *time bar*, thus it is considered an earlier-in-life (non-current) control question. Hence this control question excludes the period in which the crime was committed. The term "control" question has been replaced with the term "comparison" to conform to the scientific literature. Nevertheless, in this thesis the term "control" is still used to avoid duplication of the term comparison in succession which could cause confusion, such as comparison of the comparison versus relevant questions.

Figure 1. Quadri-Track ZCT Test Question: Structure & Format

MATTE QUADRI-TRACK ZONE COMPARISON TEST STRUCTURE

Legend:
- 14J Neutral Irrelevant Question
- 39   Preparatory/Sacrifice Relevant Question
- 25   Symptomatic Question
- 46   Non-Current Exclusive Control Question
- 33   Relevant Question
- 47   Non-Current Exclusive Control Question
- 35   Relevant Question
- 23   Fear of Error Control Question
- 24   Hope of Error Relevant Question
- 26   Symptomatic Question

Figure 2. Quadri-Track ZCT Test Question: Sample Format

Type	No.	Question
Y	14J	Were you born in the United States?
YR	39	Regarding whether or not you stole that $5000.00 deposit discovered missing from the safe at ABC Market, 999 Sunset Avenue, Buffalo, New York on 4 July 2003: Do you intend to answer truthfully each question about that?
B	25	Are you completely convinced that I will not ask you an unreviewed question during this chart?
G	46	Between the ages of (18) and (24) – Do you remember ever stealing anything?
R	33	Did you steal that missing $5000.00?
G	47	During the first (18) years of your life – Do you remember ever stealing anything from someone who trusted you?
R	35	Regarding the $5000.00 deposit discovered missing from ABC Market on 4 July 2003, did you steal that money?
Gw	23	Are you afraid an error will be made on this test regarding the target issue?
Rw	24	Are you hoping an error will be made on this test regarding the target issue?
B	26	Is there something else you are afraid I will ask you a question about, even though I told you I would not?

Figure 3.
It should be noted from figure 3 that the Sacrifice Relevant Question is introduced as a Preparatory Question that fully identifies the relevant issue, so that the first direct relevant question (33) can be short, succinct and not elicit mental effort or exercise that could cause an autonomic response. The second direct relevant question (35) is slightly longer but still shorter than the Preparatory/Sacrifice Relevant Question. The Preparatory/Sacrifice Relevant Question must NOT exceed the scope of the two direct relevant questions. Inasmuch as the Preparatory/Sacrifice Relevant Question is necessarily lengthy, it is expected to elicit mental effort and an autonomic response from both the Innocent and Guilty examinees. Therefore, the Preparatory/Sacrifice Relevant Question fully identifies the relevant issue, allows both the truthful and deceptive examinee to react and relieve their anxieties on that first relevant question, a variable listed under Category B (Matte 1996), and prepares

them for the introduction of the two direct relevant questions (33 & 35) that are used for a determination of truth or deception.

Clarence D. Lee in his 1953 book *The Instrumental Detection of Deception* cautions that in the formulation of relevant questions "on the mental side all effort must be avoided except that involved in the deception syndrome. In a number of experiments with students, it was found that even doing very simple mental problems in arithmetic caused a rise in blood pressure, the magnitude of which rise was probably proportional to the effort, indicating that those skilled in mathematics would react less than those unskilled. Also in an actual case when suspect was asked if he was at a certain place at a date long past, his effort to remember the date resulted in increased blood pressure despite the fact that he answered truthfully." Since then, several studies on the effects of mental exercise or effort have been conducted confirming C.D. Lee's tested hypothesis that mental exercise or effort can generate an autonomic arousal which would be indistinguishable from deception. [(Boiten F. 1993); Bongard S., Pfeiffer J. S., Al'Absi M., Hodapp V., and Linnenkemper G. (1997); Fokkema D. S. (1999); Ring C., Carroll D., Willemsen G., Cooke J., Ferraro A., Drayson M. O. (1999); Winzer A., Ring C., Carroll D., Willemsen G., Drayson M., Kendall M. (1999)].

There have been questions regarding the value and effectiveness of the sacrifice relevant question citing research by Capps (1991) and Horvath (1994). Capps investigated the value of the sacrifice relevant question in predicting the overall results of a polygraph examination in terms of "deception indicated" versus "no deception indicated." Capps found that using the sacrifice relevant to determine truth and deception was correct in 71% versus examiners who rendered an opinion on the overall examination who attained an accuracy of 93%. Capps does not show the wording of the sacrifice relevant question used, hence we do not know whether its scope was restricted to the relevant questions, nor do we know the length of the sacrifice relevant question. However, the sacrifice relevant question is not designed to predict the results of the examination and the above results of Capps study fail to support that notion when comparing its accuracy (71%) to the results of the overall examination's accuracy at 93%.

To this author's knowledge, only the Backster ZCT and the Quadri-Track ZCT include an *intent sentence* following the sacrifice relevant question that formulates into a Preparatory/Sacrifice Relevant question that is introduced in that

manner during the review of the test questions prior to the collection of the physiological data recorded on the polygraph charts.

Horvath (1994) conducted a laboratory study on the merits of the sacrifice relevant question "to explore further the issues raised by Capps' (1991) research. The sacrifice relevant question used in this study was: "Do you intend to answer truthfully each question about the stolen envelope?"

The aforesaid sacrifice relevant question fails to fully identify the matter under investigation and the specific issue being tested, Furthermore, its length does not approach that used in the Quadri-Track ZCT's Preparatory/Sacrifice Relevant Question which fully identifies the issue being tested, which has been raised in a court proceeding in which this author testified. Equally important is the fact that the Horvath study is a laboratory study based on responses caused by a set of stimuli that are significantly different from those set of stimuli present in field studies. To his credit, Horvath acknowledges the limitations of laboratory studies, stating "This general conclusion, however, must be interpreted with some caution. These data were collected in a laboratory environment where motivational and other differences may make it unlikely that the results can be generalized to real-life testing situations. Of course, this caveat would apply to all laboratory studies and indeed there are some who maintain that results in that environment should not ever be extended to actual testing situations." That opinion by Horvath is supported in a thesis by Matte & Reuss (2010).

The Quadri-Track ZCT employs Cleve Backster's "Either-Or" rule (Matte 2010) which dictates that:
To arrive at an interim spot analysis tracing determination of (+2) or (-2) there must be a significant and timely tracing reaction in either the red zone (relevant) or the green zone (control) being compared.

If the red zone indicates a lack of reaction, it should be compared with the neighboring green zone containing the larger timely reaction. If the red zone indicates a timely and significant reaction it should be compared with the neighboring green zone containing no reaction or the least reaction. Presence of response to one or both green zone questions in addition to red zone question indicates serious green zone question defect (see Fig. 4).

Figure 4.
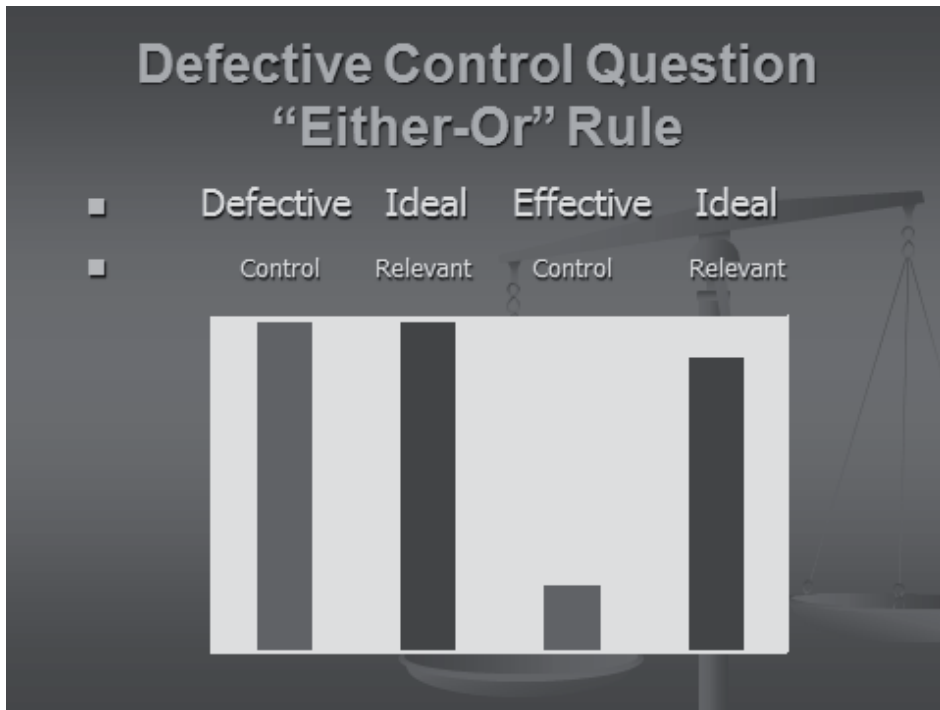
The "Either-Or" rule[2] is aided by the use of non-current exclusive control questions that distinctly separate the time frame embraced by the control questions from the time frame of the relevant questions. This provides the examinee with a clear choice between the threats posed by the red and green zone questions creating a double-bind effect[3] (Bateson et al. 1956).

However, unlike the Backster technique, the Quadri-Track ZCT restricts the comparison of each relevant question to the control question preceding it within the same Track (non-selective approach) and the assignment of a minus one score rather than a zero (in the Pneumo and Cardio tracings only) when the relevant question elicits a significant reaction equal to its neighboring control

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[2] The "Either-Or" Rule is unique to the Backster ZCT and the Quadri-Track ZCT (Research by Meiron et al 2008) showed that the "Either-Or" rule was an essential element of the Backster ZCT and its high accuracy.

[3] Double-bind: A situation in which a person must choose between equally unsatisfactory alternatives; a punishing and inescapable dilemma. American Heritage Dictionary.

question, inasmuch as Backster's "Either-Or" rule deems that control question to be defective. The electrodermal tracing is excluded from the Dual-Equal Strong Reaction Rule due to its volatility and sensitivity to extraneous stimuli. Furthermore, the increasing score threshold required for a determination of truth of deception does not diminish with the addition of charts collected and scored.

The Quadri-Track ZCT's Dual-Equal Strong Reaction Rule demands that when the *red* and *green* 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 unknown 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 ZCT would not assign a zero score but a Minus One (-1) score in the pneumo and cardio tracings on all three tracks totaling a Minus -6. The threshold for Deception is Minus -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, 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 plus +1 score.

However, the *inference process* that is used to determine truthfulness from deception in the Quadri-Track ZCT depends largely on the Inside Track con-

taining the *Fear of Error* control question which is compared with the *Hope of Error* relevant question. It should also be understood that every test question and their position within the test contributes to its final result.

In the Matte & Reuss 1989b field study, the Inside Track reduced the Inconclusives for the Truthful from 52% to 9% and prevented 5% false positives. The Inside Track further reduced the Inconclusives for the Deceptive from 17% to 3% and prevented 2% false negatives. 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 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 7.1%. Overall accuracy 96.5% with Zero Inconclusives.

It becomes quite obvious from aforesaid field research studies that the Inside Track had a major impact on the reduction of Inconclusives which can hide the use of countermeasures. However its impact goes much further in that it addresses known variables identified by Dr. Paul Ekman, professor of psychology at the University of California and by the Committee for the Review of Scientific Evidence on the Polygraph in the 2003 report by the National Research Council of the National Academies of Science.

Dr. Ekman, in his 1985 book *Telling Lies* discusses the elements of "fear" in his chapter on the 'Polygraph as Lie Catcher' and states:

"The severity of the punishment will influence the truthful person's fear of being misjudged just as much as the lying person's fear of being spotted – both suffer the same consequence." Dr. Ekman felt that the polygraph examination, like behavioral clues to deceit, is vulnerable to what he terms the 'Othello Error', because the Shakespearean character Othello failed to recognize that his wife Desdemona's fear might not be a guilty adulterer's anguish about being caught, but instead could be a faithful wife's fear of a husband who would not believe her. Both cause an autonomic nervous response.

The National Research Council of the National Academies of Science's 2003 report stated:

"Gustafson and Orne (1963) suggest that an individual's motivation to succeed in the detection task will be greater in real-life settings (because the consequences of failing to deceive are grave), and this elevated motivational state will also produce elevated autonomic activation." "This Theoretical argument also leaves open significant possibilities for misinterpretation of the polygraph results of certain examinees. It is plausible, for instance, that a belief that one might be wrongly accused of deceptive answers to relevant questions – or the experience of actually being wrongly accused of a deceptive answer to a relevant question – might produce large and repeatable physiological responses to relevant question in non-deceptive examinees that mimic the responses of deceptive ones."

The National Research Council of the National Academies of Science further stated "examinees who fear being falsely accused have strong emotional responses that mimic those of the truly deceptive. Under this hypothesis, field conditions might have more false-positive errors than are observed in the laboratory and less accuracy."

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 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 (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 (33 & 35) that often raises the issue of false positives.

Significant, consistent and specific reactions to the Inside Track's Hope of Error relevant question with a comparative lack of reaction to the Fear of Error control question provides confirmation of the legitimacy of reactions to the two direct relevant questions. The above scenario can be of great assistance in overcoming objections by a guilty examinee during the post-test interview and in court proceedings. In this regard, the Inside Track provides indispensible evidence in the defense of a Deceptive result in a court of law.

Recently, it was suggested (Cushman 2010, 2011) that the score threshold used in the Quadri-Track ZCT of +3 and -5 *per chart* was too high and that using the traditional scoring threshold of +/- 4 *per case* (fixed threshold) on the first two tracks containing control/relevant question pairs, without the use of the Inside Track scores, there would be no difference in accuracy if inconclusives are omitted from the data, opining that inconclusives are not errors, hence made no difference in accuracy. Therefore the Inside Track served no useful purpose. This implied that the Inside Track questions had no influence on the direction of the examinee's psychological set and resultant salience and scores of the preceding control/relevant questions. It also excluded the important role that the Inside Track plays in addressing the Fear of Error variable and the Hope of Error's confirmation of the legitimacy of reactions to the relevant questions in the two previous tracks. The Hope of Error relevant question also adds valuable scores to the scores produced by the relevant questions in the primary and secondary tracks that were weakened by defective control questions that embraced unknown serious crime(s) of equal or greater significance or by the implementation of countermeasures.

This author presented a very strong case in a recently published thesis (Matte & Reuss 2010) against viewing and reporting Inconclusives as errors. However, the Office of Technology Assessment (OTA 1983) and the National Research Council of the National Academies of Science (NAS 2003) reported Inconclusives as errors. At least one research staff member of the National Center for Credibility Assessment and Associate Editor of *Polygraph*, Journal of the American Polygraph Association also considers inconclusives as errors,

citing the OTA and the NAS for support (Pollina in Krapohl, 2 Oct 08 and 3 Mar 09). While this author concurs with Cushman that inconclusives should not be viewed and reported as errors, there remains serious challenges to that viewpoint from academia.

The review of the Inside-Track's Fear and Hope of Error questions with the examinee during the pretest interview can have a positive influence and effect on the salience of the control/relevant questions in the Primary and Secondary tracks. It is therefore incorrect to reach a conclusion based solely on the scores of the Primary and Secondary tracks without considering the psychological influence and effect that the Inside-Track questions had on the examinee and ensuing pairs of control/relevant questions contained in the Primary and Secondary tracks whose scores could have been weaker without that Inside-Track influence.

The suggested +/-4 fixed threshold was applied by this author to the 58 Innocent confirmed cases in the 1989 field study which resulted in 3 false positives and 17 inconclusives (29.3%), whereas the higher increasing threshold of +3 and -5 per chart threshold with the Inside Track resulted in Zero errors and 5 inconclusives (8.6%). Interestingly, the American Society for Testing and Materials (ASTM 2010) and the American Polygraph Association (APA 2007) both require that a technique attain an accuracy rate of at least 90% with no more than a 20% inconclusive rate to qualify as an evidentiary examination.

It should also be noted that the use of the traditional score threshold of +/- 4 per case is a fixed threshold that can be severely challenged with devastating results in a court of law. For instance, a decision of deception could be rendered with a total score of -4 for 4 charts. An attorney could show that the polygraphist could have attained a score of -18 per chart yet found his client deceptive on the basis of only a -1 score per chart. He could further show that a total of -72 points could have been scored but his client only scored 4 points, which hardly supports a finding of deception. A compelling example of such a cross-examination can be found in chapter 9, Examination and Cross-Examination of Experts in Forensic Psychophysiology Using The Polygraph (Matte 2000). The suggestion to lower the score threshold even further to -3 or even -2 for the guilty in order to avoid usage of the Inside Track, which according to Cushman (2009) is just extra work that doesn't pay any dividends, is further invitation for challenge in court, and deprives the technique of the ability to address the Fear of Error variable and the Hope of Error's capability to confirm the legitimacy of reactions to the relevant questions, an issue that is certain to be raised in court.

Conversely, the average score per case for the truthful and deceptive in the Matte & Reuss 1989a field study was +13.1 and -25.1; the Mangan et al. 2008 field study with the traditional 3 charts is +21.3 and -30.0; the Shurany et al. 2009 field study with the traditional 3 charts is +16.1 and -18.24. These scores, supported by the statistical predictive tables for estimating error rates (Matte Reuss 1989a) are scientifically supported and legally defendable.

Research data (Raskin et al. 1978, Matte & Reuss 1989a) show that as the scores increase so does the accuracy, but at the expense of an increase in inconclusives. The Raskin, et al study provides a graph that shows that as the score threshold increases, the accuracy and inconclusive rate also increases. However when the threshold reaches past +/-6, the inclusive rate rises dramatically to 50% at +/-12, hence the cut-off score threshold of +/-6 with an inconclusive rate of 9% and 90% accuracy was chosen as the most utilitarian score threshold. Had they been able to maintain an inconclusive rate below 9% until a score threshold of +/-12 had been attained, a 99% accuracy could have been achieved. The score threshold used in the Quadri-Track ZCT was developed from statistical data acquired from 122 confirmed field cases and this threshold was used in three published field studies that attained an overall average accuracy of 98.8% with less than a 3% Inconclusive rate. The aforementioned research data shows that the Inside Track is largely responsible for that achievement.

The pretest interview is most important in that it prepares the examinee psychologically for the collection of the physiological data. The Quadri-Track ZCT's pretest interview is non-accusatory and standardized. It is composed of 6 phases as described below:
1. Acquisition of background information from examinee.
2. Acquisition of examinee's version of the incident.
3. Explanation of polygraph instrument and physiology recorded.
4. Review of studies validating Quadri-Track ZCT and numerical scoring accuracy.
5. Review of all test questions in Test A only. But examinee apprised of other issues to be covered in separate tests.
6. Explain importance of examinee cooperation. Truthful are cooperative, follow directions. Deceptive are uncooperative, Do Not follow directions. The former does not want an error to be made. The latter does want an error to be made (Reinforced clarification of Fear/Hope of Error). (Anti-countermeasure has been set).

A detailed explanation of the pretest interview for the Quadri-Track ZCT is published in Chapter 8, Forensic Psychophysiology Using The Polygraph (Matte

1996) and Part II, 2002 Supplement to Forensic Psychophysiology Using the Polygraph (Matte 2002). A critical part of the pretest interview is the introduction of the earlier-in-life control questions which must be presented as having equal importance as the relevant questions. Furthermore, the fear-of error control question which is ultimately compared with the hope-of error relevant question, must be presented in accordance with the procedure contained in the technique's protocol which requires feedback from the examinee as assurance that those test questions were correctly interpreted by the examinee.

The Quadri-Track ZCT uses a Control-Stimulation Test (Matte 1996) which is administered as the first chart prior to the collection of the charts pertaining to the relevant issue. The role of the Control-Stimulation test goes beyond its original purpose of assuring the innocent and stimulating the guilty. The stimulation test also serves as a *control test* to establish the examinee's capability and manner of response to a known lie under controlled conditions. It is also important that the examinee perceives the control-stimulation test as the means by which the polygraphist acquires a *known deception exemplar* from the examinee, thus will not relate that role to the non-current exclusive control questions, which are used for comparison with their neighboring relevant questions. Otherwise the control questions can become as strong or stronger than their neighboring relevant questions if a guilty examinee perceives the control questions as the means by which a *known deception exemplar* is obtained for comparison with the relevant questions thus producing a greater threat from the control questions and an invitation to use countermeasures. The control-stimulation test should be administered before any of the relevant tests related to the target issue so that each succeeding tests will have been subjected to the same psychological influence.

The two symptomatic questions, developed by Cleve Backster, are used in the Quadri-Track ZCT to reassure the examinee that no unreviewed questions will be asked during the test. The first symptomatic question is strategically positioned between the Preparatory/Sacrifice relevant question and the first non-current exclusive control question to absorb the expected strong reaction from the examinee, whether innocent or guilty as previously explained, prior to the introduction of the first control question. The second symptomatic question is strategically positioned as the last test question immediately following the last relevant question. It has been noted that examinees often show relief on the last test question. Such relief should not be permitted to occur on a question (control/relevant) used for a determination of truth or deception. The symptomatic questions have orienting value with logical purpose

to the examinee who after the first chart has been collected, will realize that the polygraphist kept his promise and thus will narrow his focus to the green or red zone questions. A neutral question that has no orienting value may be disregarded by the examinee who will then relieve on the previous question having orienting value, namely the last relevant question. There has been some controversy regarding the effectiveness of the symptomatic questions. Capps, Knill, Evans (1993) found support for the symptomatic questions' ability to reduce inconclusives, but others (Honts, Amato, Gordon 2000; Krapohl, Ryan 2001) found no evidence of its ability to detect the presence of outside issues or reduce inconclusive results. It should be noted that the Honts, et al study was a laboratory study using a mock crime design. However, the overall opinion of its critics was that there is no apparent danger in including the symptomatic questions. In the final analysis, the symptomatic questions have served their intended purpose in the Quadri-Track ZCT since 1977 when the technique was first developed. The published research provides no evidence that they should be abandoned. On the contrary, the current psychological test structure of the Quadri-Track ZCT which includes symptomatic questions is fully supported by the results of its related research.

Investigation into the validity and effectiveness of technical questions such as the preparatory/sacrifice relevant question, the symptomatic question, and the fear/hope of error questions have been uni-dimensional when in fact they are multi-dimensional which has led to misguided evaluation of their full purpose, function, effectiveness and validity.

The aforementioned published field research studies on the Quadri-Track Zone Comparison Technique have yielded high quality chart interpretation results through manual scoring of the physiological data. However, the time has come for the development of an algorithm that will embody all of the chart interpretation rules of the Quadri-Track Zone Comparison Technique (Matte 1996) which will enable the polygraphist and quality control reviewers to focus on the adequacy of target selection, question formulation and pretest interview which have an impact on the validity of the physiological data that forms the basis of the test results.

The protocol described in this thesis pertains to the Quadri-Track Zone Comparison Technique, and is not a critique of other polygraph techniques which have their own protocol and psychological test structures supported by published research.

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