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Commentary on: Horvath F, Palmatier JJ. Critique of Horvath-Palmatier Laboratory Study on Effectiveness of Exclusive v. Non-Exclusive Control Questions in Polygraph Examination. J Forensic Sci 2008;53(4):889–99.

Sir,

The Horvath–Palmatier laboratory study (JFS 2008:53–4) concluded that the accuracy of the Exclusive Control Question and Non-Exclusive Control Question in the identification of guilty examinees was not statistically significant (80% and 85%, respectively). However, the difference in accuracy between Exclusive and Non-Exclusive Control Questions in the identification of innocent examinees was statistically significant (45% and 91%, respectively). A critical analysis of the Horvath–Palmatier study reveals a serious lack of understanding regarding the psychological structure and theoretical concept of the Backster Zone Comparison Technique (ZCT). This is reflected by the test structure and question format of the Zone Comparison Test used in the Horvath–Palmatier study and their failure to employ Backster's "Either-Or" rule that comprises the nucleus of the Backster ZCT for which the Exclusive Control Question was designed to enable. Recent published research (1) revealed that the Backster ZCT's overall accuracy was significantly reduced when its "Either-Or" rule was excluded.

To understand the reasons for the failure of the Horvath–Palmatier study to accurately evaluate the effectiveness of the Exclusive and Non-Exclusive Control Questions, it is imperative that the significant differences in the psychological structure and theoretical concept of the polygraph techniques for which these two types of control questions were designed to be used be fully explained.

The Non-Exclusive Control Question was first introduced in a publication in 1947 authored by John E. Reid for use in what became known as the Reid Control Question Technique. It was considered a major breakthrough in the field of forensic psychophysiology. The Reid Technique used two reviewed control questions for comparison with usually four relevant questions dealing with the same crime but not the same issue. The crime questions included direct involvement, indirect involvement, and guilty knowledge, hence a multifaceted test. The reviewed control questions were in the same crime or offense category as the crime or matter for which the examinee was being tested. Reid's reviewed control questions were all encompassing in that they included the period in which the crime was committed, i.e., "Did you ever steal anything in your life?"

In 1960, Cleve Backster, former Director of the Keeler Polygraph Institute, developed the Backster ZCT. Backster's technique was a significant departure from the Keeler and Reid techniques for several reasons. Backster introduced reviewed probable-lie questions that used time bars to exclude the period in which the crime generating the test was committed. Hence, Backster's control questions were named Exclusive Control Questions versus Reid's control questions that were labeled Non-Exclusive Control Questions. By design, the time bars created control questions structurally less intense than the relevant (crime) questions against which they were to be compared, although they are presented to the examinee as being of equal importance to the outcome of the test. Backster also used only two relevant questions, which dealt with the same relevant act of the crime, but were worded differently, hence a unifaceted single-issue test. Therefore, if the examinee was lying to one of the relevant questions, he would also be lying to the second relevant question. These two relevant questions were flanked by three Exclusive Control Questions for comparison. These control questions would each encompass a different age category and would start with different wording so that the examinee would not be startled by the apparent repetition of a question (Table 1). Furthermore, these differences in each of the three Exclusive Control Questions are intended to inhibit or delay habituation and retain the strength of their stimuli, which are designed to be structurally less intense than the relevant questions to avoid inconclusive results from guilty examinees. It should be noted that the Exclusive Control Questions that Backster labeled as the green zone are separated in time from the relevant questions labeled as the red zone by at least 1 to as many as 7 years or more, depending on the age of the examinee, legal statute of limitations, length of employment, etc. However, some polygraphists/agencies have modified the Exclusive Control Question by eliminating the time separation and excluding only the offense in question, i.e., "Not connected with this case..." This modification hampers the clear separation of the control and relevant test questions because it includes other crimes up to the day of the polygraph examination and renders the control questions of equal if not greater strength and threat than the relevant questions, in violation of the psychological structure of the Backster ZCT. Therefore, to differentiate between the traditional Backster Exclusive Control Questions and its modified version, this author (2) labeled the former as a Non-Current Exclusive Control Question and the latter as Current Exclusive Control Question.

Backster also introduced a Sacrifice Relevant Question, which acts as a safeguard in that it allows for dissipation of excessive general nervous tension or undue anxiety prior to the asking of the primary relevant questions. It is structured as an orienting relevant question specifically related to the single issue covered by the two relevant questions. Therefore, it serves as both a Sacrifice Relevant Question that may elicit an emotionally induced sympathetic response and as a preparatory question for the introduction of the two direct relevant questions, hence a dual-purpose question. Backster further developed and introduced two Symptomatic questions into his test structure to determine whether an outside issue was bothering the examinee and interfering with the examinee's *psychological set* (3), also known as *selective attention*. The Backster Zone Comparison Test structure as shown in Table 1 places a control question on both sides of the two relevant questions. No other test question is inserted between the control and relevant questions in order not to disrupt the flow of the examinee's *psychological set* on the relevant questions if guilty which would enable dampening of neighboring control questions or the Exclusive Control Questions if innocent which would enable dampening of neighboring relevant questions. The two Symptomatic questions as seen in Table 1 are

TABLE 1—*Backster ZCT structure.*

14	Neutral, irrelevant question
25	Symptomatic question
39	Preparatory/Sacrifice relevant question
46	Non-current exclusive control question
33	Relevant question
47	Non-current exclusive control question
35	Relevant question
48	Non-current exclusive control question
26	Symptomatic question

positioned in a manner that encases and frames the control and relevant questions, with the first Symptomatic question preceding the first comparison question and the second Symptomatic question serving as the last test question with orienting value. This allows those examinees who relieve on the last test question to relieve on the Symptomatic question rather than the preceding control or relevant question that are used for a determination of truth or deception.

However, the Exclusive Control Question serves another important role in that it enables the "Either-Or" rule that forms the nucleus of the Backster ZCT. The Quadri-Track ZCT, a derivative of the Backster ZCT, also uses Non-Current Exclusive Control Questions and the "Either-Or" rule on a nonselective basis.

The "Either-Or" rule must be applied in the evaluation, interpretation, and scoring of the physiological data collected from the examinee. According to the "Either-Or" rule, a significant reaction should be present in either the red zone or the green zone but not in both. 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. A timely and significant reaction to both the red and green zone questions being intercompared indicates a serious question defect in the green zone question. In effect, that green zone question is deemed to be defective; therefore, the significantly reactive relevant question is then compared to the other neighboring green zone question that should have little or no reaction if functioning as designed.

Unlike other polygraph techniques that use a fixed scoring threshold to arrive at a determination of truth or deception, the Backster ZCT uses an increasing threshold with the conduct of each polygraph chart. Furthermore, the score threshold for the truthful is significantly lower than the threshold for the guilty because of its less intense structure, e.g., truthful: +3 for one chart, +5 for two charts, +7 for three charts, and +9 for four charts, versus guilty: −5 for one chart, −9 for two charts, −13 for three charts, and −17 for four charts. A minimum of two charts must be collected to make a determination of truth or deception. The Quadri-Track ZCT (4) also uses an increasing score threshold with a comparatively lower threshold for the truthful than the deceptive examinee.

During the past three decades, several modifications have been made to the Backster ZCT, most notably by the Federal government that resulted in a Federal ZCT and the Utah ZCT developed at the University of Utah that bears little resemblance to the Backster ZCT. Unfortunately, a hybrid of the Federal and Utah ZCT rather than the Backster ZCT was used by Horvath and Palmatier to test the effectiveness and accuracy of the Exclusive Control Question versus the Non-Exclusive Control Question. This is unfortunate because the Exclusive Control Question developed and designed by Backster as a Non-Current Exclusive Control Question was specifically intended to enable the "Either-Or" rule that was not implemented in the Horvath and Palmatier study. Furthermore, other departures from the Backster ZCT's psychological test structure were noted, which would have an adverse impact on the effectiveness of the Exclusive Control Questions and the accuracy of the Zone Comparison Test used in the Horvath–Palmatier study, which are discussed below.

1. Horvath–Palmatier failed to implement the "Either-Or" rule in the evaluation, interpretation, and scoring of the physiological data collected in Zone Comparison Tests.

Field Research by Meiron et al. (1) revealed that the overall accuracy of the Backster ZCT employing its "Either-Or" rule and Non-Current Exclusive Control Questions attained an accuracy of 80% with 17% inconclusives and 3% errors. However, when the "Either-Or" rule was not applied, the accuracy of decisions for deceptive cases was only 55%, and the overall accuracy was significantly decreased to 70% and its inconclusives increased to 27% with 3% errors.

2. Horvath–Palmatier used the same introduction wording and age category for each of the Exclusive Control Questions. The Backster ZCT uses different age category and introductory wording to retain anxiety level and delay habituation to the Exclusive Control Questions.

3. Horvath–Palmatier used excessive time bars that seriously weakened the Exclusive Control Question, e.g., "if a subject were 20 years old an Exclusive Control Question would begin as 'Before the age of 17…" The younger the examinee, the less time separation between the relevant and control questions is available; hence in the above scenario, the proper time frame for the Exclusive Control Question would be "Before the age of 19…" which would have the effect of a stronger Non-Current Exclusive Control Question.

4. Horvath–Palmatier used a "mixed question" test as the last test, in violation of the Backster ZCT test format and protocol. The Backster ZCT rotates the position of the two relevant questions with each succeeding chart conducted for comparison with each of the Non-Current Exclusive Control Questions. However, there is no random mixing of the test questions.

5. Horvath–Palmatier used an irrelevant question between a relevant and control question, thus interrupting the flow of the examinee's psychological set, in violation of the Backster ZCT test format and protocol. It further prevented the use of the "Either-Or" rule in the analysis and interpretation of the physiological data collected from the examinee.

6. Horvath–Palmatier used a fixed scoring threshold of ±6 in the scoring of the physiological data to arrive at a determination of truth or deception. The Backster ZCT uses an increasing score threshold with the conduct of each additional chart. Furthermore, the Backster ZCT uses a lower threshold for the truthful (+3, +5, +7, +9) versus the deceptive examinee (−5, −9, −13, −17), in recognition of the structurally less intense Non-Current Exclusive Control Questions.

7. Horvath–Palmatier used a relevant test question as the last question on the test, in violation of the Backster ZCT test format and protocol. The last test question must not be used for a determination of truth or deception inasmuch as the examinee may relieve on the last test question. Therefore, Backster ZCT uses a second Symptomatic question having orienting value as the last test question.

8. Horvath–Palmatier used a Sacrifice Relevant Question that was broad and lacked specificity as required by the Backster ZCT format and protocol. It should have been worded: Regarding whether or not you stole the envelope containing $3.00 from Dr. Horvath's mail slot in Baker Hall: Do you intend to answer truthfully each question about that?

9. Horvath–Palmatier used three relevant questions in violation of the Backster ZCT format and protocol. A third relevant question has the effect of distributing the reactivity of the relevant questions among the three of them thereby reducing their individual responsivity as shown in a pilot study by D. J. Kapohl provided to C. Backster and J. A. Matte on October 11, 2001, via e-mail, rather than a stronger focus on two relevant questions of similar content. Furthermore, in the Backster ZCT format, the three structurally less intense Exclusive Control Questions are better able to cope with two rather than three strong relevant questions. In addition, the "Either-Or" rule requires that the two relevant questions be flanked

by Non-Current Exclusive Control Questions on either side to provide a second neighboring Non-Current Exclusive Control Question to compare with in the event that the first Non-Current Exclusive Control Question is deemed defective.

10. Horvath–Palmatier used a cuff pressure between 40 mmHg and 55 mmHg, which produces cardiograph responses significantly weaker than cuff pressure of 70 mmHg and higher. Barland (June 1984, FL seminar) reported that a cuff pressure at 90 mmHg, and a mean arterial blood pressure of 100 mmHg before reaction, which increases to 120 mmHg during reaction will show a difference in pulse amplitude of 200%, whereas a cuff pressure at 60 mmHg and a mean arterial blood pressure of 100 mmHg during reaction will show a difference in pulse amplitude of only 50%.

Furthermore, cuff pressure of 70 mmHg or more may divert the examinee's attention from his or her breathing to the cuff pressure. The redirected attention away from one's breathing could produce potentially truer, uncontrolled respiratory patterns. In several field studies, respiration was shown to have equal diagnostic value and in some field studies, greater diagnostic value than its neighboring parameters (5–9). An experimental scoring technique proposed and tested by Jayne (10) also supported the pneumograph as providing the most diagnostic information. Furthermore, a study by Elaad et al. (11) revealed that respiration was the only one of the three parameters not affected by beta-blockers. Elaad et al. concluded that "respiration seemed to improve the overall detection rate especially because skin resistance responses have the quality of rapid habituation."

11. Horvath–Palmatier had both the testing examiner and blind evaluator "scored and accumulated in their total scores, the values assigned to each of the two pneumograph tracings." Averaging the scores from the two pneumograph tracings diminishes the contribution of scores to the overall tally of scores from the other tracings.

This procedure is contrary to Backster ZCT procedure. The Backster ZCT employs the most productive pneumograph tracing, and its scores are added to the overall tally.

12. Horvath–Palmatier used a Modified General Question Test (MGQT) format to test the effectiveness of two Non-Exclusive Control Questions against five relevant questions. Within this format that originated from the Reid Technique, a Stimulation Test was administered as the second chart after the first relevant test had been conducted. It is well known and documented (12–14) that in spite of the claim that both relevant and control questions are reviewed with the examinee between charts, the emphasis is clearly on the Non-Exclusive Control Questions. This is a manipulation of the examinee's psychological set toward the Non-Exclusive Control Questions, which has been severely criticized by Abrams (15–17), Matte (18,19), and Matte and Reuss (20). This also devalues the scientific comparison of the two types of control questions. The collection of the data must not be interrupted with any language that would influence the examinee's psychological set toward the control or relevant questions (21).

Horvath and Palmatier cited Amsel's field study (22) to support their findings that the Non-Exclusive Control Questions were more effective than the Exclusive Control Questions. However, they failed to mention a published critical analysis of Amsel's comparative study by Matte and Backster (23), which invalidates the results of his study. The Amsel study suffers basically from the same flaws in study design and lack of understanding regarding the psychological structure and theoretical concept of the Backster ZCT.

The Horvath and Palmatier laboratory study fails to present a persuasive scientific argument on the merits of the Non-Exclusive versus the Exclusive Control Questions. Aside from the significant discrepancies found in the Horvath and Palmatier laboratory study and the Amsel field study cited by them in support of their conclusions, the Horvath and Palmatier study suffers from a very basic defect in that it is a laboratory study that employs mock paradigms that suffer the absence of serious consequences to the deceptive examinee and a total absence of the fear of error by the innocent examinee which in real-life can result in a false positive (an innocent examinee misdiagnosed as deceptive). Furthermore, laboratory studies are based on nonemotional responses generated by the offer of a reward such as additional college credits or a small sum of money and/or by a desire for increased self-esteem if they can defeat the test. Responses in laboratory studies have thus been classified as orienting responses (24–28).

Additionally, the potential for anger is absent because of the fact that the examinee is a volunteer in a mock crime paradigm. Furthermore, guilty examinees are not motivated to employ countermeasures. For the nontruthful examinee in the analog study, the potential for embarrassment or punishment if found deceptive to the relevant questions is nonexistent. The subject sample is not representative of the diverse population that includes the criminal element present in field cases. Therefore, laboratory studies that are based on nonemotional orienting responses absolutely fail to replicate the field conditions that elicit emotional defensive responses wherein both the guilty and innocent examinee's primary emotion is "fear" of the consequences if found deceptive which in criminal cases could result in imprisonment. The argument that laboratory studies offer complete control over subjects used in their study such as the assignment to deceptive and nondeceptive groups and the holding of variables constant to study the variable of interest, is useful in supporting the results of examinations involving nonemotional subjects role playing in a mock crime. However, its results cannot be applied to field situations nor can they be used to validate the use of a polygraph technique or its various components on real suspects of crimes whose results pose a serious threat to the security of the examinee (29).

Interestingly, Horvath (30) in a previously published laboratory study discussed the merits of laboratory studies, which he stated "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."

A research review by Rovner (31) published by the American Polygraph Association regarding the Horvath–Palmatier laboratory study concluded that "we should now abandon the now outdated idea of time bars and use Non-Exclusive Control/Comparison Questions whenever we run a test using a ZCT or MGQT format." This statement and conclusion based on a seriously flawed laboratory study that cited a field study with similar fatal flaws is not only misleading but can have serious consequences for polygraphists in the field. This critique will enlighten and educate polygraphists and researchers regarding the different psychological aspects of the Exclusive and Non-Exclusive Control (comparison) Questions and their individual function and usefulness within the techniques in which they were designed to be implemented.

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