Designation: E1954 – 05 (Reapproved 2011)

Standard Practice for Conduct of Research in Psychophysiological Detection of Deception (Polygraph)[1]

This standard is issued under the fixed designation E1954; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice establishes essential and recommended elements in the design, conduct, and reporting of research on psychophysiological detection of deception (polygraph) (PDD). Analog and field research are addressed separately.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E2035 Terminology Relating to Forensic Psychophysiology

3. Terminology

3.1 For full explanations of terminology relating to PDD, refer to Terminology E2035.

4. Summary of Practice

4.1 *Laboratory Research:*

4.1.1 Unless subjects must be individually trained or conditioned to achieve some criterion, subject manipulation procedures shall require minimal human interaction. Those portions requiring human interaction shall be standardized to the extent possible.

4.1.2 All procedures shall be described and reported in sufficient detail that others can replicate them. This shall include logistical factors that may introduce systematic error, such as when subject handling allows them to reveal their programming to one another, or arrival times cue testing examiners regarding programming. All research-related materials shall be retained by the researcher for at least five years from date of publication. Reasonable accommodation shall be made to other researchers for access to research documentation and data. Documentation of procedures shall include, but not be limited to, copies of subject instructions, test questions, testing technique, question sequence, description of circumstances and facilities, raw data, and any tape recordings presented.

4.1.3 So far as possible, the only difference between programmed deceptive and programmed nondeceptive subjects should be their participation in the act to which deception occurs during the PDD testing.

4.1.4 Non-exploratory studies shall test a sufficient number of subjects to obtain a statistical power of 0.80 or higher using a 0.05 significance level. Studies that are exploratory in nature—that do not obtain this power level—shall be clearly identified as exploratory studies.

4.1.5 To the extent possible, when conducting validity and reliability studies, participants performing the testing and evaluating the physiological data shall be unaware as to both the programming of the subjects and the base rates of deception. The degree of knowledge of the participants shall be detailed in the report.

4.1.6 All instrumentation shall be fully reported, including any modification of standard equipment. When using field instruments, researchers shall report the manufacturer, model, types of recording channels, whether the channels are mechanically or electronically driven, and whether the instrumentation is computerized.

4.1.7 Statements of generalization shall be limited to that which the data, procedures, and statistical methodology can support.

4.1.8 A human subject research review shall be performed by a recognized independent entity for all studies involving the participation of subjects.

4.2 *Field Research:*

4.2.1 The process for selecting cases shall be thoroughly reported, including at least the source, method, exclusionary criteria, and subject population. With respect to subjects, the report shall clearly articulate the proportions of the sample that are suspects, witnesses, and victims.

4.2.2 The qualifications of the polygraph testing and chart evaluating participants shall be identified in the report, including formal polygraph training, field experience, and any licensing or certification.

4.2.3 Researchers shall report the degree to which polygraph chart evaluators were kept unaware with regard to

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

extrapolygraphic information. Specifically, they shall report whether the polygraph chart evaluators were aware of base rates, case facts, the study hypothesis, subject verbal behavior, subject gestures, or other extrapolygraphic details. Moreover, researchers shall report whether examiners who participated in the research normally include any of these factors in their decisions during field testing.

4.2.4 All instrumentation shall be fully reported, including any modification of standard equipment. When using field instruments, researchers shall report the manufacturer, model, types of recording channels, whether the channels are mechanically or electronically driven, and whether the instrumentation is computerized.

4.2.5 Statements of generalization shall be limited to those which the data, procedures, and statistical methodology can support. Departures from conventional field practice shall be documented in detail, with an explanation for the nonstandard procedures.

4.2.6 Polygraph chart evaluators shall be informed of the purpose and protocol of the study in advance, so that they are able to provide informed consent for their participation unless such knowledge would influence the performance of the chart evaluators. This requirement shall be satisfied orally and in writing. This standard shall not preclude the use of historical data. Researchers shall not change the purpose or procedures of the study without advising evaluators in advance, and allowing them to reconfirm their agreement to participate in the study. If evaluators withdraw from the study, this shall be reported anywhere the results of the study are published or presented.

5. Validity

5.1 *Evidentiary PDD Examinations*—An evidentiary PDD testing technique shall be considered sufficiently valid if the majority of three or more research articles meeting the minimum requirements set forth in this standard indicate that the average decision accuracy for deceptive and nondeceptive cases is 90 % or greater.

5.1.1 Average accuracy shall be calculated using the following formula:

$$AA = \{(cG/dG) + (cI/dI)\}/2 \cdot 100 \quad (1)$$

where:

cG = number of correct decisions with Guilty subjects,
dG = total number of conclusive decisions with Guilty subjects,
cI = number of correct decisions with Innocent subjects, and
dI = total number of conclusive decisions with Innocent subjects.

5.1.2 The method must also produce conclusive decisions in at least 80 % of the cases. Decisions not considered conclusive are those labeled Incomplete, Inconclusive, Indefinite, No Opinion, Terminated, or others that are not opinions regarding the veracity of a subject's statements.

5.2 *Investigative PDD Examinations*—An investigative PDD testing method shall be considered sufficiently valid if the majority of three or more research articles meeting the minimum requirements set forth in this standard indicate that the average decision accuracy for deceptive and nondeceptive cases is 80 % or greater in the discrimination between deceptive and truthful cases.

5.2.1 Average accuracy shall be calculated using the following formula:

$$AA = \{(cG/dG) + (cI/dI)\}/2 \cdot 100 \quad (2)$$

where:

cG = number of correct decisions with Guilty subjects,
dG = total number of conclusive decisions with Guilty subjects,
cI = number of correct decisions with Innocent subjects, and
dI = total number of conclusive decisions with Innocent subjects.

5.2.2 The method must also produce conclusive decisions in at least 80 % of the cases. Decisions not considered conclusive are those labeled Incomplete, Inconclusive, Indefinite, No Opinion, Terminated, or others that are not opinions regarding the veracity of a subject's statements.

5.2.3 Investigative PDD examinations may use a "successive hurdles" approach to achieve the minimum validity set forth in this standard.

5.3 Other psychophysiological technology used for the purpose of verifying the veracity of statements made by individuals in the field, for either evidentiary or investigative applications, shall be required to comply with the same standards of validity and utility set forth above.

5.4 All polygraph accuracy studies published in peer-reviewed journals shall be considered adequate for estimating the validity and reliability of a polygraph testing and analysis technique.

5.5 Research failing to meet 5.4 shall be eligible for estimating the validity and reliability of a polygraph testing and analysis technique if the following conditions are satisfied:

5.5.1 The samples are representative of the population and purpose for which the technique is normally used.

5.5.2 In field research, the potential for case selection bias has been minimized or accounted for by the methodology.

5.5.3 The scoring method is cross-validated with a sample different from that used to develop the scoring method.

5.5.4 In field accuracy research, ground truth must be established by confessions or reliable forensic evidence. Trial outcomes, prosecutorial decisions, or eyewitness accounts are not sufficiently reliable criteria for this purpose.

5.5.5 The research effort results in a university-grade report.

5.6 There are acknowledged differences in schools of thought in polygraphy that have given rise to variations in techniques in the field. However, the underlying phenomena in polygraphy are sufficiently robust as to tolerate minor variations of procedures without jeopardizing decision accuracy. Therefore, a variant of a validated technique shall be considered sufficiently valid and shall not require separate research to support its validity unless:

5.6.1 The variant reduces the quality or quantity of data required in the validated technique for accurate decision-making.

5.6.2 The variant includes components already known to reduce decision accuracy (that is, unreliable scoring features, surprise questions, permitting examinee movements, etc.).

6. Utility

6.1 The proportion of results that are conclusive shall be considered a measure of utility, and shall be calculated by dividing the number of results that are conclusive by the total number of observations. The utility value obtained by this method shall not be less than 0.80 for validated techniques. If a technique permits retesting when initial results are not conclusive, or when a "successive hurdles" approach is employed, the final result after all testing is completed shall be the prevailing decision, and that result shall be used in the computation of utility.

7. Keywords

7.1 field; forensic psychophysiology; laboratory; PDD; polygraph; psychophysiological detection of deception; research; standards; validation