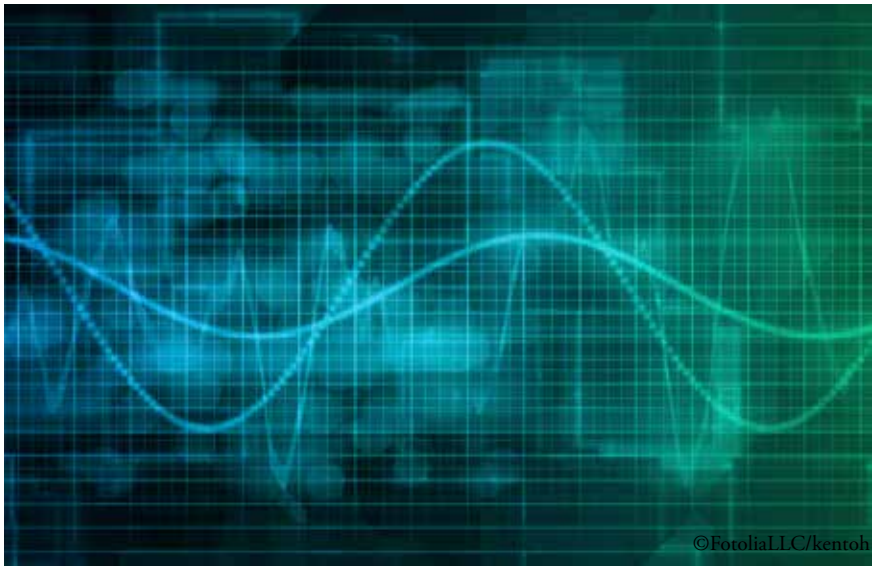
Practical Polygraph: FAQ on Electrodermal Activity and the Electrodermal Sensor



by Raymond Nelson , Mark Handler and Brent Smitley *

Electrodermal activity (EDA) is an important source of recorded physiological information during polygraphic credibility assessment testing. Standardized polygraph field practices require the use of the EDA sensor, along with cardiovascular, respiration, and activity sensors. Whereas scientists involved in basic science research in psychophysiology will be interested in both electrodermal level and electrodermal responses, applied psycho-

- Raymond Nelson is a polygraph examiner in the private sector who is an elected Director and past President of the American Polygraph Association. Mr. Nelson is one of the developers of the ESS and OSS-3 polygraph scoring algorithms and has published numerous papers on many aspects of the polygraph. Mr. Nelson is employed as a research specialist with Lafayette Instrument Company. Mr. Nelson can be reached at raymond.nelson@gmail.com

- Mark Handler is police polygraph examiner who has published numerous studies on many aspects of the polygraph test. Mr. Handler teaches regularly at several polygraph training programs, and is employed by Converus, Inc., a company that markets credibility assessment technology. Mr. Handler currently serves as the editor-in-chief for the APA.

- Brent Smitley is the Engineering Manager for Lafayette Instrument Company, a company that develops and markets polygraph and life-science technologies.

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physiology in the evaluation of recorded polygraph data involves primarily electrodermal responsess. A number of studies have shown that EDA data has a stronger correlation with the external criterion compared to other data recorded during comparison question testing (Capps & Ansley, 1992; Harris & Olsen, 1994; Honts et al. 2015; Kircher & Raskin, 1988; Krapohl & Handler, 2006; Krapohl & McManus, 1999; Nelson, Krapohl & Handler, 2008; Raskin, Kircher, Honts, & Horowitz, 1988; Kircher, Kristjansson, Gardner, & Webb, 2005).

Successful administration of a polygraph test, including recording and analyzing the test data will require that polygraph professionals have some fundamental knowledge about EDA and the technology used to acquire and record the data. To assist field practitioners in being prepared to communicate with and provide correct information to others on the matter of EDA – potentially including examinees, referring investigators, program administrators, other professionals, court officials, legislators and policy makers, media correspondents and members of the scientific community – we have attempted to provide answers to common questions about EDA data and the polygraph test.

What is EDA?

EDA is an umbrella term (Johnson & Lubin, 1966) that refers to electrical phenomena associated with the skin. EDA can be recorded through *exosomatic or endosomatic* means. Exosomatic refers to the fact that the electrical source originates outside the body, while endosomatic refers to the use of an electric potential within the body (e.g., skin potential). Exosomatic recording has been more commonly used.

EDA has been described as *electrodermal level* (EDL), also known as *skin conductance level* (SCL), which describes tonic EDA, and electrodermal response (EDR) or *skin conductance response* (SCR), which describes phasic responses (Venables & Martin, 1967). EDA is typically measured through the eccrine sweat glands that become filled with sweat as a function of sympathetic nervous system activity associated with cognitive and emotional arousal. Sympathetic arousal is associated with affective and cognitive activity involving attention, memory and learning theory [Refer to Kahn, Nelson and Handler (2009), Handler, Shaw and Gougler (2010), Handler *et al*., (2013) and Nagai *et al*., (2004) for more discussion and information.][For an introduction to the published literature on EDA, the reader is directed to textbooks by Andreassi, (2000); Boucsein, 2012; Cacioppo, Tassinary, and Berntson (2007); Edelberg, R. (1971); Prokasy and Raskin (1973), and and Venables and Christie (1980).]

What is the difference between EDA and GSR?

Galvanic skin reflex (GSR), also referred to as *galvanic skin response or galvanic skin resistance* is an arcane term that is now regarded as unsatisfactory and is no longer used to describe EDA recorded during polygraph testing (Bouscein, 2012; Critchley, 2002). The term GSR implies that the skin functions as a galvanic cell, which involves the production of an electrical current from the interaction of dissimilar metals through a salt bridge. Galvanic processes are unrelated to polygraph testing. Additionally, the term *reflex* does not apply to the polygraph test because reflexes are behaviors intrinsic or neurologically based and are observed to occur without any prior learning experience, whereas EDRs during polygraph testing are based psychologically in emotional and cognitive activity relative to prior behavioral experience described by the test stimuli. Although still visible in older publications, the term GSR has been supplanted in recent years with the more general term EDA.

How is EDA measured?

Exosomatic EDA can be measured using a combination of fundamental and derived measurements[1], related to Ohm's Law (Shedd & Hershey, 1913), and the measurement of electricity[2]. Ohm's law states that V = I * R, which means that the amount of voltage in a circuit is equal to the electrical *current* multiplied by the resistance of the circuit. Ohm's Law includes three terms: *Volts, Current,* and *Resistance*. Volts is the unit of electromotive force. Current is the quantity of electrical current, for which the unit of measurement is the *Ampere*. Resistance describes the degree to which substances in the circuit will resist the conduction of an electrical current. It is a simple matter of algebraic rearrangement to isolate any of the three terms alone on one side of the = sign such that R = V / I and I = V / R. And of course, when we know any two of the values we can easily compute the third term.

Ohm's law allows us to measure EDA in terms of either skin resistance or skin *conductance.* The unit of mea-

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1 Derived measurements are those for which standardized computational definitions have been established. Derived measurements are computed from base units or fundamental measurements that have been established by the International System of Units (French: *Système international d'unités,* abreviated as SI). SI base units from which other derived measurements are obtained include the following: the meter as a measurement of length or distance, the kilogram as a unit of mass, the second as a unit of time, the ampere as a unit of electric current, the kelvin as a unit of temperature, the candela as a unit for luminosity, and the mole as a unit for the quantity of a substance. The volt is the SI derived unit for electric potential or the difference in electric potential between two points. The *volt* is also used as the unit of electromotive force.

2 Ohm's experiments involved a device called a *galvenometer* which measured electrical current in a circuit.

surement for resistance is the Ohm, for which we can use either R or Ω. The unit of measurement for conductance is the *Siemens*, for which we use *S*. Older publications may also refer to the *Mho* (Ohm spelled backwards) as the unit of measurement for conductance, but this was changed by the General Conference on Weights and Measures in 1971 in order to reduce potential confusion that could result from inattentiveness when reading and typing the same three letters (O, H, M) to refer to the different measurements Ohms and Mhos.

Whereas resistance is a derived measurement that describes how well a material or circuit can resist the conduction of electricity, conductance can be thought of as a derived measurement that describes how well a substance or circuit can conduct electricity. Conductance is the reciprocal or inverse of resistance such that S = 1/R. If we know the resistance we also know the conductance. Conversely, if we know the conductance we also know the resistance. The mathematical relation is this: 1 microSiemens of conductance is equal to 1 million Ohms of resistance.

What are constant-current and constant voltage circuits, and why do we care about this?

EDA can be measured and recorded using either a constant-current or constant-voltage circuit design. A *constant-current* circuit involves the application of a fixed quantity of electrical current to the skin. Changes in EDA will result in measurable and recordable changes in the voltage in the circuit. In contrast, a *constant-voltage* circuit involves the application of a fixed voltage to the skin, for which changes in EDA will result in measurable and recordable changes in current (measured in microAmperes). Boucsein and Hoffman (1979) reported no difference in EDA measurement sensitivity in a direct comparison of both circuit designs and both measurement units. Kircher, Packard, Bernhardt and Bell (2003) found no difference in detection efficiency coefficients when comparing resistance and conductance units that were collected using a constant-voltage circuit. Later, Honts and Barger (1990) had similar findings regarding EDA sensitivity for constant current and constant voltage systems, but noted that examiners made substantially fewer centering adjustments using a constant-voltage circuit. In practical terms this means that regardless of the type of circuit, EDA can be measured in either resistance or conductance units because there is a mathematical relationship between the two values.

Should EDA be measured as resistance or conductance?

Because resistance and conductance are mathematically inverse it makes no real difference which unit of measure-

ment is used. If resistance is known, then the corresponding conductance can be easily calculated and is therefore also known. Conversely, resistance can be easily calculated if conductance is known. Whereas polygraph systems have traditionally displayed resistance units, psychophysiologists have standardized on the communication of conductance units because these offer a more intuitive monotonic relationship[3] with the number of active sweat glands. Related to discussion about the use of resistance or conductance units, and perhaps more important, is whether the EDA data is within the normal range for skin conductance and skin resistance.

What is the normal range of skin resistance and skin conductance?

The normal range for skin resistance is from 50KΩ to 500KΩ. The normal range for tonic EDA conductance has been reported as 2µS to 20µS, which is equivalent to 50KΩ to 500KΩ of resistance (Dawson, Schell, & Filion, 2007). Because they are inverse, and because 1 microSiemens corresponds to1 M-Ohms, a 500 K-Ohm (1/2 million Ohm) device or circuit will conduct twice as much electrical current as one with 1 M-Ohms. Therefore a 500 K-Ohm upper limit of normal skin resistance is equal to a lower limit of normal skin conductance of 2 microSiemens. The lower limit of the normal range of skin resistance (50 K-Ohms) corresponds to 20 microSiemens, which is the upper limit of the normal range for skin conductance.

Why should field polygraph examiners care about the normal range of skin resistance and skin conductance?

EDA data that are within the normal range can be expected to be easier to work with in terms of management of data quality and test data analysis. EDA data that are within the normal range are presumed to be well-represented by available published studies and normative data. While circuit design and engineering for modern polygraph instruments can easily extend well beyond the normal range for skin resistance and skin conductance, signal processing methods used to acquire, record and display the data are optimized for data within the normal range. EDA data that are not within the normal range may have unexpected response characteristics. In practical terms this means that EDA data may be unproductive or difficult to interpret for persons whose skin con-

3 A monotonic relationship is one between two sets (e.g., the number of active sweat glands and EDA measurements) such that as one increases the other always increases – though the relationship may not be specified and the slope angle or degree of change may differ for the two. Monotonic relationships can also be in the reverse (e.g., the number of active sweat glands and skin resistance).

ductance or skin resistance is outside the normal range.

This tech stuff is nice but what is actually happening to the skin and EDA during polygraph testing?

Changes in EDA can be thought of as changes in the number of eccrine sweat glands that become hydrated or filled with fluid in preparation for the eventual release of fluid at the surface of the skin (Boucsein, 2012). If we think of the skin and sweat glands as a resistor, then the collection of sweat glands can be thought of as a lot of resistors wired in parallel. Because each of the parallel sweat glands will add to the total current path in the EDA circuit, more active sweat glands will lead to lower total resistance[4]. Because resistance and conductance are mathematically and conceptually inverse, lower resistance is synonymous with increased conductance.

Although sweating is a useful metaphor, sweating is not itself synonymous with EDA, and changes in EDA can be recorded in the absence of observable sweating activity. EDA observed during polygraph testing may be more clearly thought of in terms of changes in hydration of the skin, and may also involve other complex phenomena. [See Handler, Nelson, Krapohl & Honts (2010) for more information about EDA and the polygraph test. More detailed and general information on EDA can be found in Boucscein (2012).]

The simple resistance model for EDA describes the skin as part of a circuit in which resistance and conductance are a function of skin hydration and sweat gland activity. In the resistance model, the sweat glands are like resistors wired in parallel, and changes in EDA are a function of the number of active sweat glands. In a capacitance model for EDA, cell membranes of collections of cells are thought to store electrical potentials like capacitors wired in parallel and release their potential through a process called *depolarization* that occurs when the cells are stimulated neurologically. Edelberg (1972) suggested that skin capacitance may play an important role phasic EDRs. Both capacitance and resistance models involve the interface between the sweat gland and the sympathetic division of the autonomic nervous system. Resistance models are easier for many people to understand and for this reason have been more commonly described. Also, resistance models are amenable to direct current (DC) circuit designs that are commonly available and easily described, whereas recording and extraction of capacitance information

4 For which the total resistance can be calculated as the reciprocal of the sum of the reciprocals of the individual resistors.

requires an alternating current (AC) circuit design.

What is the difference between EDA and skin potential?

Skin potential refers to the measurement of voltage between 2 electrodes when no external current is applied (Burstein, Fenz, Bergeron, & Epstein, 1965). Skin potential is an *endosomatic* measurement, referring to electrical signals that originate with the physiology. This is unlike EDA – an *exosomatic* measurement – that is measured by applying an electrical current to the skin from an external source. Skin potential is measured by amplifying the electrical voltage that is obtained from the electrodes attached to the skin. Like EDA, skin potential has been shown to vary with the emotional and cognitive state of the subject. Skin potential has been studied for use in detection of deception (Yamaoka, 1976), and has been described as highly correlated with EDA (Jabbari, Grimnes & Martinsen, 2007).

What do we know about the skin?

The entire body is covered in multiple layers of skin, called *keratinocytes,* that function as part of a large organ called the integumentary system. The integumentary system, like other organs, can be thought of metaphorically as a large stuff-sack intended to perform certain functions. Skin can be hairy or *glabrous* (hairless). The functions of the skin include protection from infection, resistance to abrasion, tactile sensation, traction, storage of lipids, synthesis of vitamin D, reduction of dehydration, and thermoregulation through both sweating and blood flow to areas near the skin surface. Thermoregulatory sweating is less likely at the hands and feet, and the skin at these high-contact points is much thicker than in other areas. (Refer to Boucsein, 2012; Fowles, 1986; Handler et al, 2013; and Venables & Christie, 1973 for more information.)

The outermost layer of the skin is the epidermis, consisting of the corneum (outer horny cell layer), which contains multiple layers of dead squamous cells that are linked together to form a continuous layer for protection from the external environment. The epidermis also consists of basal cells and melanocytes that give the skin color. Underneath the outermost layer of skin is the dermis, sometimes referred to as the "true skin" because these cells are supplied with blood and nutrients and contain hair follicles, erector pili muscles attached to each hair, glands for the secretion of oils and other chemicals, and nerve endings that provide sensory information to the brain.

Underneath the dermis layer of skin is the hypodermis, which attaches the skin to other connective tissue over the skeletal muscles. Sweat glands are described as located in this layer, along with blood vessels and neurons

associated with the other layers of the skin (Boucsein, 2012).

Everything you ever wanted to know about sweating, but were afraid to ask

Two kinds of sweat glands have been found in human skin: *apocrine* and *eccrine*. Sweat glands are a type of exocrine gland, which are tiny organs that secrete a substance onto the surface of the skin by way of a duct. In contrast to endocrine glands, which secrete directly into the circulatory system, exocrine glands secrete their products externally. The glands themselves have been described as a kind of valve called a *poral valve* that can open to release fluid when internal pressure increases sufficiently.

Alternatively, apocrine sweat glands are located in axillary and perianal areas in humans (in contrast, they are located over most of the skin surface of most non-primate animals). Apocrine sweat glands discharge into hair follicles, and become active during puberty. These sweat glands can develop a pungent odor from decomposition of the bacteria that enjoy apocrine secretions more than other types of sweat secretions. Polygraph examiners are normally unconcerned about the examinee's apocrine sweat gland activity.

Eccrine sweat glands are located over most of the surface of the human body and are more densely located in the palmar areas of the hands and feet. People have an average of two to five million eccrine sweat glands (Fowles, 1986). Activity in the eccrine sweat glands is thermoregulatory. Maximum sweat rates for adults can be up to 2–4 liters per hour or 10–14 liters per day, and will vary with climate and physical condition. Sweating helps to keep the skin moist, and may contribute to plasticity. Sweat is mostly water, derived from blood plasma, and contains trace amounts of lactic acid, minerals, and urea. Sweat typically has neutral to moderately acidic pH levels, between 4.5 and 7.0. Other functions of sweating can include gustatory sweating, such as when eating spicy food. It is also suggested that sweating may play a role in sexual selection. Eccrine sweat gland activity is enervated by acetylcholine, and is a useful indicator changes in activity in the autonomic nervous system.

Hydration of the skin may be affected by ambient temperature. In a cold environment the skin may begin to dehydrate in an attempt to insulate the body from excessive heat loss. This can lead to smaller EDR amplitudes along with greater latencies and longer rise times. Under warm circumstances the sweat glands may fully saturate the skin, allowing sweat moisture to be secreted to the surface the skin where evaporation can assist in cooling. The exact underlying mechanism of sweating and EDA have been studied

for many years, and – like our knowledge of the basic structure and function of cells themselves – although much is known, there remain as many questions as answers. Sweat ducts are involved in both hydration of the skin and sweating at the skin surface, and both have been shown to affect recorded changes in EDA (Edelberg, 1983).

Conductivity of the skin can increase as the skin becomes hydrated, and of course when the skin is wet with sweat. This is because sweat contains sodium and chloride electrolytes (Na+ and Cl-). A simple resistance or conductance model describes changes in electrodermal activity as changes in skin hydration that occur as a function of changes in activity in the autonomic nervous system that occur as a result of a combination of cognitive, affective and learning processes related to the test stimuli (Fowles, 1980; Handler et al., 2013).

Sweating disorders such as hyperhidrosis (i.e., excessive sweat glad activity resulting excessive sweating and abnormally wet skin) are a disorder of the autonomic nervous system. Although not a dangerous problem, persons with these conditions may require medical treatment. Of course, there are additional uncertainties associated with polygraph test results when testing persons known to have functional disorders involving the autonomic nervous system, especially when the effects of these problems can be observed in the polygraph data. Most, if not all, polygraph development and validation studies have not involved persons with autonomic nervous system disorders.

Recent research into sweat-diagnostics and wearable technology has led to increases in our knowledge about sweat, and may lead to more convenient and rapid analytics at the individual and group level. At the present time it is unclear how this new knowledge and technology may apply to polygraph testing.

How much electricity is involved in the polygraph EDA sensor?

The recommended maximum current density for psychophysiological recording of EDA with human subjects is 10 micro-amperes (Boucsein, 2012, Edelberg in Brown eds., 1967) per square centimeter (10uA/cm2) of skin. Despite the fact that psychophysiologists have published a preference for constant voltage recording, Boucsein (2012) noted that resistance recording systems remain in use for which a constant current source is used, and wherein it is easy to limit the current source to below 10uA while also using an electrode area of at least one square centimeter. Constant voltage circuit designs will select a fixed voltage that will enable the acquisition of data at current densities that vary in a range below the 10uA maximum. To create

a sensation of shock it would be necessary to subject an examinee to voltages and current densities that are not within the capabilities or the design of typical polygraph field instruments. To create a static charge that can dissipate across an air gap (for example: when walking on a carpet floor and then touching a light switch) will require voltage that exceeds that of the EDA circuit by orders of magnitude.

What if a person has an artificial pacemaker or defibrillator?

Considering the voltages and current densities involved in a typical polygraph EDA circuit, it is highly unlikely the available current could travel beyond the skin region local to the sensors because the EDA circuit will offer the path of least resistance for the current to return to its source. Of course, it will be wise to consult with a healthcare provider for more information before proceeding to conduct a polygraph test on a person who uses one of these devices.

What is the unit of measurement for EDRs in the displayed or printed polygraph chart data and extracted scores?

Graphically displayed changes in activity and resulting numerical values for EDRs do not represent the actual level of resistance or conductance. Instead, EDRs are displayed and quantified in dimensionless units that are monotonically related to the level of change in phasic activity.

Dimensionless means that the numerical units are not associated with a physical unit of measurement. This means that they neither represent inches nor millimeters – which can be expected to change with different graphic display or printing sizes. Dimensionless values are commonly used in many areas of science and testing because they allow the comparison and combination of different types of data and data from different sources.

Monotonic means that there is a relationship between the direction and magnitude of observed data and changes in physiology. A monotonic relationship requires no assumption of linearity and no assumption of location for a zero value (e.g., the location for 0 resistance or 0 conductance). This avoids problems associated with assumptions of linearity and the use of either resistance or conductance units. Monotonically, greater changes in the data signify greater changes in physiological activity, regardless of the unit of measurement, regardless of whether it is acquired in resistance or conductance units, and regardless of whether the circuit relies on a constant-current or constant-voltage design. Although EDRs and EDL could be measured in actual conductance or resistance values, field polygraph practitioners have traditionally not attempt-

ed all of the mathematical transformations necessary to make this possible. What is important in the evaluation of polygraph data is the relative magnitude of changes in physiological activity that are evoked by the different test stimuli.

Should we use metal plates or wet electrodes?

Many field polygraph systems have traditionally used metal plate electrodes with good results. However, psychophysiologists prefer and recommend wet electrodes – with approximately the same concentration of electrolytes as human sweat or interstitial fluid – because these are thought to achieve a more stable connection compared to metal plate electrodes in the event of problematic contact between the skin and electrode, or in the case of incidental physical movement during testing. Electro-conductive gel or paste has also been used successfully with plate and block type electrodes. Regardless of the type of electrode, there are no known differences in the interpretable value or meaning of EDA data that is of normal quality – for which EDRs can be distinguished from EDL, for which the EDRs are timely with the test stimuli, and for which the EDA data is within the normal range.

Should we clean the skin with soap and water or alcohol?

It is reasonable to make an unobtrusive visual inspection of the skin surface while attaching the electrodes, looking for obvious indications of potential poor conductivity between the skin and EDA electrode. Although well-intentioned, cleaning the skin with alcohol-based cleaners, is contra-indicated. Cleaning the skin immediately prior to polygraph testing can potentially strip away the normal oils, fluids and electrolytes that support conductivity, thereby interfering with the ability to obtain useable EDA data. Once cleaned it will take time for the skin to re-hydrate and re-establish the normal balance of electrolytes associated with normal skin resistance and skin conductance.

Can we conduct a polygraph with examinee with problematic EDA data?

Field polygraph examiners can expect to observe a lot of variation among different examinees, including some examinees who have difficult EDA data or un-interpretable EDA data. When the EDA data are interpretable such that EDRs can be differentiated from EDL, when the EDA data is within the normal range, and when EDRs are associated temporally with the test stimuli, there are no known problems or concerns associated with the interpretation of recorded polygraph data. When EDRs cannot be differentiated from EDL, when EDRs are not associated temporally with the test stimuli, or when the data are not within the

normal range, then caution is in warranted in the interpretation of recorded EDA data.

Whether it is valid to attempt to interpret recorded polygraph data when the EDA data are not usable or interpretable is partially a practical matter. For example: it is possible to execute the scoring and feature extraction methods and achieve no scored information (i.e., scores of 0 can be thought of as scores that provide no information towards a conclusion of deception or truth-telling, similar to having no data).

Attempts to interpret recorded polygraph data when the EDA data are not usable or interpretable is also partially a matter of test development and validation. Analytic models that make naïve assumptions about the independence and contribution of test data (e.g., naïve Bayes models and 3-position numerical scoring systems) may be completed without the EDA data without violating the assumptions or requirements of the analytic model. However, attempts to analyze polygraph test data without EDA may violate the basic assumptions and requirements of analytic models that rely on normed statistical or structural equations that attempt to make use of the synergistic contribution of the different types of recorded data. Regardless of the analytic methods, our knowledge of polygraph accuracy and validity relies on information that includes the use of EDA data. For this reason, field practitioners may want to use caution whenever attempting to interpret and classify test results with test data for which the EDA is unusable or un-interpretable.

Is it possible to fix or rectify problematic EDA data?

Problems with unstable tonic EDA can be effectively managed with an automatic EDA filter. An effective filter design will not interfere with EDA data in the frequency ranges involved in electrodermal responses of interest to polygraph examiners. This is typically in the range of .03hz to .2hz (Lafayette Instrument Company, 2013). Sudden downward movement of the EDA data may be caused by movement of the palmar or digital extremities to which the EDA sensor is attached, and may also be the result of poor contact when using a damaged EDA sensor. EDA data that is outside the normal range can sometimes be corrected by relocating the EDA sensors or through the use of wet electrode gel to improve the stability of the EDA sensor contact and EDA circuit.

Should we use the automatic or manual EDA mode?

Automatic EDA modes were introduced decades ago in response to observations that tonic EDL is unstable for some persons, making it difficult to use and interpret the EDA data. Pro-

fessionals who are interested in both EDRs and EDL will want to use the manual EDA data. Field polygraph professionals who do not interpret EDL data may want to use the Automatic EDA mode that removes low frequency tonic instability, making it easier to manage and extract EDRs from the recorded test data.

Do medications affect the EDA?

There is little published research on medication effects and EDA. Some medications may have anti-cholinergic effects that slow the EDA response data. This does not preclude individuals from testing when they take these medications, and field polygraph examiners should be careful to never make recommendations or impose requirements that are contrary to or interfere with medical or psychiatric care. There is no known medication and no published theoretical premise suggesting that any medication will differentially affect responses to different test stimuli. In practical terms this means that although there may be some increased risk for inconclusive results as a result of some medications, there is no known increase in risk for testing error associated with medication use.

Medication effects may vary with the type of medication, dosage, individual physiology, length of time while taking a medication, the combination of different medications and other factors. Persons who function optimally while taking medications may produce polygraph test data of optimal interpretable quality. However, polygraph examiners should remain aware that published studies on polygraph test development and validation, and published statistical reference data and published structural models may not be representative of persons who require the administration of multiple prescription medications to remediate the potentially overwhelming effect of their medical or psychiatric issue on their day to day functioning.

What can we tell the examinee about the EDA data and EDA sensor?

Examiners are ethically obligated to explain the testing procedure to the examinee in order to obtain the examinee's informed consent for testing. In brief, informed consent requires that the examinee is informed about both what will be done during the testing procedure and how the testing procedure and test result may affect them both during testing and after testing. Examinees should be advised of the name of the sensor, where it is located, and its general function in terms of recording changes in activity in the autonomic nervous system that are observed through electrodermal activity.

Why should field practitioners be concerned with all of these technical details?

Polygraph examiners are not required to work with technical details in their day-to-day operations, and so some field practitioners may be less interested in these technical details. They may prefer instead to refer important questions to other professionals with more expertise. Those who desire to develop and market themselves as experts in the science of polygraph may have more obligation and opportunity to respond to reasonable questions about the scientific and technical details of the polygraph test and recording instrumentation. It is our hope that this FAQ will be a useful reference that will advance both professional and public awareness of the science and practice of polygraph testing.

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