J Acupunct Meridian Stud 2011;4(1):5–13

ELSEVIER

REVIEW ARTICLE

Electrodermal Activity at Acupoints: Literature Review and Recommendations for Reporting Clinical Trials

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Received: Nov 19, 2010
Accepted: Nov 26, 2010

KEY WORDS:
acupuncture;
capacitance;
electric potentials;
skin conduction;
skin resistance

Abstract
Electrodermal activity (EDA) at acupuncture points (acupoints) has been investigated for its utility as a diagnostic aid, a therapeutic monitoring tool, and a physiological outcome measure. The research methodologies reported in published trials, however, vary considerably and publications often lack sufficient details about electrical instrumentation, technical procedures, laboratory conditions, recorded measures, and control comparisons to permit a critical appraisal of the studies or to replicate promising findings. We developed a 10-category (54 subitems) Quality of Reporting scale based on technical issues associated with EDA measurements, publication requirements for reporting EDA in the psychophysiological literature, and recommendations from the CONSORT Statement for reporting clinical trials. Using our Quality of Reporting scale, we extracted data from 29 studies that evaluated EDA at acupoints in patients and generated weighted scores for each of the 10 categories of essential information. Only 9 of the 29 studies reviewed scored a mean of greater than 50% for reporting details of essential information. To rigorously build a program of research on EDA at acupoints we need to standardize research methodology and reporting protocols. We propose a checklist of recommended informational items to report in future clinical trials that record EDA at acupoints.

1. Introduction

Electrodermal activity (EDA) at acupuncture points (acupoints) has been used by clinicians as a diagnostic aid and therapeutic monitoring tool for more than 50 years [1–4]. Recently, researchers have begun to explore EDA at acupoints as a potential physiological outcome measure for use in clinical trials of acupuncture [5,6]. No clear guidelines, however, exist for conducting or reporting this type

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of research. The instruments, techniques, and measurement protocols that are used vary widely, and to date, neither the diagnostic validity of EDA recordings at acupoints nor their utility as outcome measures has been definitely established.

This lack of standards or guidelines for conducting and reporting EDA at acupoints research became obvious when we recently attempted to conduct a systematic review aimed at answering the question, "Is there evidence to support the use of EDA at acupoints as an aid to diagnosis and/or therapeutic monitoring?" Our review of 29 relevant studies [5,7–34] revealed not only that the quality of available studies is heterogeneous, but that what is being evaluated under the rubric of electrodermal testing is very diverse. The existing literature reveals marked dissimilarities in EDA at acupoints testing procedures, electrical parameters measured, measurement techniques, instruments, clinical approaches, medical conditions studied, outcomes, and statistical analyses. To move this program of research forward, the careful conduct and detailed reporting of clinical trials involving measurements of EDA at acupoints is essential. It is only when the technical and procedural details of a study are fully reported that we can critically appraise, accurately interpret, and attempt to replicate outcomes.

Our specific objectives for this review are to summarize the EDA at acupoints literature, evaluate the quality of reporting essential information in 29 clinical trials, and begin to define reporting guidelines for future studies. We will elaborate on 10 domains of essential information and propose a checklist of 54 items that need to be addressed in EDA at acupoints research. We will also refer readers to examples of good reporting from the reviewed literature. Our review does not include recommendations for designing, conducting, or analyzing trials, but solely addresses adequacy of reporting.

2. Materials and Methods

2.1. Literature review

One author (K.S.) searched four electronic databases (PubMed, AltHealthWatch, Scientific Citation, and AMED) from the time of inception through August 10, 2010, to identify clinical studies that involved the evaluation of EDA at acupoints in humans. Various search strategies were employed depending on the size and scope of the database. In some cases, a simple keyword search using the terms "electrodermal" and "acupuncture" were sufficient to retrieve relevant articles. In other cases, a more sophisticated strategy involving multiple terms such as "electrical skin resistance," "impedance," "conductance," "admittance," and/or "electric potential," subject headings, truncation, and excluded terms was required. K.S. examined the results of the searches to identify articles for analysis, screening by title, abstract (when available), and full text where necessary. The bibliographies from relevant original research, reviews, and a key textbook [35] in the EDA field were searched to identify additional references.

2.2. Inclusion/exclusion criteria

Studies were selected for inclusion using the following criteria. Publication type: Only English language articles were included due to limited funding for accurate translation. Abstracts, posters, and editorials were excluded because they were unlikely to provide sufficient details about EDA parameters. Study design: Clinical trials, case series, case reports, and observational studies were all included because our goal was to summarize and evaluate all available EDA at acupoints protocols. Electrical measurements: Only studies that measured the electrical characteristics of acupoints were included. Studies that reported conductance measurements in meridians or at trigger points were excluded. Clinical indication: We included studies involving any clinical diagnosis or medical condition in patients but excluded studies that evaluated physiological changes in healthy volunteers.

2.3. Items for data extraction

Our list of essential data to be extracted was based on electrical parameters outlined in a review by Ahn and Martinsen [36] covering technical issues in electrodermal measurements at acupoints, psychophysiological research publication requirements for reporting EDA [37,38] and on the extended CONSORT statement for clinical trial reporting [39,40]. We defined 10 broad categories of information with 54 subitems. Four evaluators used an iterative process to clarify and refine specific items in each information category. Table 1 lists the final data items that were extracted from each study.

2.4. Data extraction and scoring process

When the data extraction sheet was finalized, the 29 identified articles were randomly distributed to four reviewers. Two reviewers evaluated each article, extracting and scoring data on a total of 54 items. A quality assurance (QA) score was developed to quantify how completely each item in the 10 categories was reported. Two points were given if an item was reported in enough detail to characterize the clinical aspects and electrical parameters,

Table 1 Ten domains of essential information to be reported in trials involving measurements of electrodermal activity at acupuncture points

Essential information	Subitem information extracted from each study
1. General	• Electrodermal Activity (EDA) approach • Medical diagnosis • Acupuncture diagnosis • Method of diagnosis • Objectives • Hypothesis
2. Subjects and settings	• No. of participants • Method of recruitment • Inclusion/exclusion criteria • Randomization procedures • Patient demographics • Settings where data collected
3. Skin site selection	• Bioactive point names and body locations • Justification of bioactive point • Point location by acupuncturist or operator • Training of acupuncturist or operator
4. Controls	• Participants, skin sites or substances • Rationale for control chosen • Timing of evaluation of controls • Controls tested under same conditions • Randomized order for testing controls
5. Electrode system	• Rationale for choice of electrode system • No. of electrodes • Material of electrodes • Size, geometry of electrodes • Electrodes pretested
6. Confounding variables	• Probe/skin interface • How probe/skin contact maintained • Skin preparation technique • Location of reference electrode • Justification for location of reference electrode • Material of reference electrode • Skin surface described • Pressure on probe electrode • Skin moisture factors • Contact impedance polarization • Physical movement • Confounders with repeat measurements
7. Instrument/ electrical parameters	• Name of instrument, manufacturer contact information • How instrument works, manipulates signal • Calibration/validation of instrument • Type of current and rationale • Amplitude of current • Frequency of current • Grounding for electric potential measurements • Input impedance for electric potential measurements
8. Measurements	• Primary and secondary outcome measures • Clear what was being measured • No., frequency, and duration of measurements • Mathematical manipulation of data when applicable • Account for temporal variability, emotion, time of day • Test-retest reliability of system • Interuser reliability
9. Blinding	• Blinding of participants, operators, assessors • Success of blinding
10. Results/ statistical analysis	• Summary presentation of primary and secondary outcomes • Statistical methods

permitting replication by other investigators. One point was given if the item was only partially described but enough detail was given to make reasonable inferences about that item. For example, if the electroacupuncture according to Voll (EAV) method [3,41] was named we assumed, although not clearly stated, that a direct current (DC) was applied to obtain electrical conductance measurements. In this case one point was given for the item that requested "Type of current and Rationale." One point was also given if, for example, the authors did not specifically state that control skin sites were assessed under the same conditions as active sites but described testing several sites that included both active and control points in one measurement session. Zero points were assigned if an essential informational item was not mentioned in the report. Not all categories of information were applicable to all studies. For example, information about grounding and input impedance needed to be reported if electrical potentials were measured [42], but this

information was not applicable when DC resistance or conductance measurements were made. By contrast, when DC measurements were recorded a description of a DC return reference had to be included. A perfect QA score was 100% for the 10 categories.

3. Results

In this section we will summarize the quality of reporting each of the 10 information domains, (Figure 1), make recommendations for adequate reporting of essential information, and refer the reader to examples of appropriate reporting.

3.1. General aspects of the study

3.1.1. Approaches used to evaluate EDA at acupuncture points

Four main electrodermal testing approaches were used in the 29 studies: EAV (n=10) [13,17,18,20, 23,26,27,29,30,33], Auricular (n=9) [9,10,21,22, 24,25,28,31,34], Ryodoraku (n=6) [8,14–16,19,32], and Jing-well (n=2) [5,12]. Additionally, in one study [7], disease specific meridian-relevant acupoints were measured and in another, 24 unnamed acupoints on the hands and feet were assessed [11]. Each of these EDA testing approaches has its own historical development, theoretical underpinnings, instrumentation, acupoint selection, and clinical testing procedures. A brief description of each of the four main approaches follows.

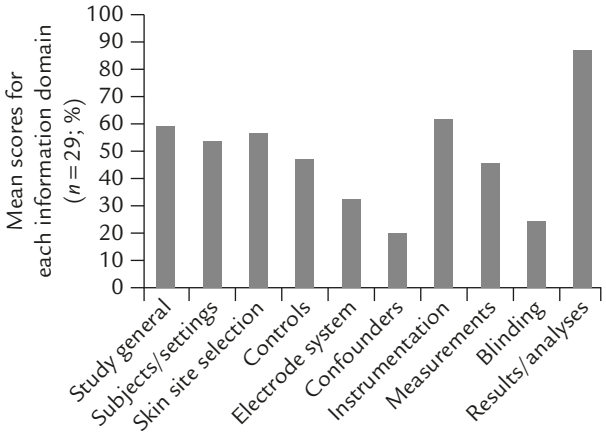

Figure 1 Each of the 10 domains of information was scored between 0–10% in 29 studies for a total possible score of 100% for the 10 domains. The information domains, depicted on the horizontal axis of this graph, are comprised of the 54 subitems listed in Table 1. The majority of studies received poor scores (<35%) for reporting three categories (details of the electrode systems, technical confounders, and blinding procedures).

EAV was developed by Reinhold Voll in the 1950s [2,3] and is summarized for modern acupuncturists in a publication by Tsuei [43]. EAV involves testing skin resistance at specific points, generally on the hands and feet. The electrodermal screening devices (EDSD) used, consist of a direct current voltage source that delivers approximately 10–12 μA of DC current at 1–1.25 V, a reference electrode contacting the patient some distance from the measurement site, and a voltmeter to measure the voltage drop from the source to the reference electrode [43]. Electrical resistance is measured in kohms, converted to conductance (the reciprocal of resistance) and reported in normalized units on a scale of 0–100. Readings are usually described with two values, the initial reading and the indicator drop. According to Voll's theory, initial readings from 45 to 55, followed by no indicator drop, are normal ("balanced"); conductance readings above 60 indicate inflammation in the system associated with the point being tested; and readings below 45 suggest organ stagnation and/or degeneration [43]. An indicator drop is considered the most important part of the EAV measurement and when found, the focus of EAV testing consists of evaluating the EDA response to the introduction of various substances (usually placed on a metal plate connected in the electrical circuit). Similarly, remedies for the presumed dysfunctions are tested to see if normal readings are restored by the introduction of a nutritional, homeopathic, or other remedy. A typical examination may also include a four quadrant measurement (hand to hand, foot to foot, right hand to right foot, and left hand to left foot) to assess whole body energy.

Of the 29 studies, 10 explicitly stated use of the EAV approach [13,17,18,20,23,26,27,29,30]. One study recorded measurements between the hands and feet [33]; a method we assumed to be the four quadrant method. Seven of the EAV studies reported testing for allergies by including ampoules of various allergens and control substances in the electrical circuit with the patient [13,17,18,20,26,29,30].

Auricular electrodermal testing is based on the work of Paul Nogier who in the 1950s developed an acupuncture microsystem on the external ear for diagnosing and treating organ pathology in the body [44,45]. Several other microsystems exist, including the hands and feet, which are studied in the EAV system. Nogier originated the concept of a homunculus (an inverted fetus) on each ear with auricular sites that correspond to organs and tissues on the entire body. Pathology of a site on the body is believed to be diagnosable by means of inspection, palpation, and electrical skin conductance of relevant zones on the ear. More than 200 acupoints have been identified on the ear [46]. In the presence of

pathology, specific auricular acupoints are said to have comparatively higher or lower resistance than nearby reference or control sites (anatomically unrelated sites on the homunculus). In the simplest form, electrical conductance is measured using an ohm meter that applies a small voltage and measures the current flow or resistance to current flow. The reference electrode is held in the patient's hand while the probe/stylus is applied by an examiner to specific acupoints on the ear. Nine of the 29 studies evaluated more than 75 different auricular acupoints for confirmation of conditions such as musculoskeletal disorders, heart disease, cancers, and other internal organ pathologies [9,10,21,22,24,25,28,31,34].

Ryodoraku was developed in the 1950s by Yoshio Nakatani [1]. The technique consists of measuring electrical conductance at representative points for each meridian, generally the Yuan (Source) points on the wrists and ankles. Because of the high variability in skin conductance measurements, readings are never taken as absolute but rather as relative to all other measurements on the same patient and reported on a normalized scale [1]. Increased conductance (decreased resistance) is believed to represent an excess in the meridian being measured, and decreased conductance (increased resistance) represents a deficiency [47]. Six of the 29 studies reported using the Ryodoraku system [8,14–16,19,32].

Jing-well (Tsing) measurements are based on the work of Kobei Akabane, who counted the number of strokes of a burning moxa punk across the Jing-well point that were required to produce a sensation of heat [48]. The number of strokes required was believed to be inversely correlated with the energy level in the meridian, i.e., meridians with deficient energy require more strokes before the sensation of heat is felt. Since then, Dr. Akabane's methods have been adapted to electronic measurement. Electrical resistance measured at the Jing-well (Tsing) points is believed to reflect the general energetic balance of the meridians. The parameters that are evaluated in this system are: left-right asymmetry, *yang* and *yin* meridian balance, upper and lower body balance, and maximum deviation from the mean value of all meridians [48]. Two of the 28 studies measured the Jing-well acupoints, one of these measured electrical resistance [5] and the other measured electrical potentials at these 24 acupoints [12].

3.1.2. Diagnoses

Medical diagnoses in the 29 studies varied substantially and included respiratory allergy or sensitivity ($n=5$), cancer ($n=5$), cocaine abuse ($n=2$), diabetes ($n=2$), and one for each of endometriosis, dysmenorrhea, autoimmune disease, internal organ disease, tuberculosis, liver disease, food allergy, postorthopedic surgery, rheumatoid arthritis, musculoskeletal pain, obesity, coronary artery disease, chronic obstructive pulmonary disease, and renal colic. Several studies lumped together multiple types of cancer [9,14,15,34] or numerous other pathologies [17,28,31]. In only one study was an acupuncture diagnosis (*qi* vacuity) made [33].

Recommendations are as follows: Because EDA at acupoints was developed to identify energetic imbalances rather than western diagnoses defined by medical ICD-9 codes, we highly recommend that future EDA at acupoints studies report a patient's acupuncture/energetic diagnoses in addition to their medical diagnoses. We also recommend stricter inclusion/exclusion criteria so that there is greater homogeneity in the patients in any given study. Exemplary descriptions of medical or acupuncture diagnoses and inclusion/exclusion criteria are provided in Semizzi et al [26], Saku et al [24], and Yu et al [33].

3.1.3. Study objectives and hypotheses

Stated objectives and hypotheses for the 29 studies include correlating EDA with medical diagnosis [14,16–18,20,22,24–30,49], assessing the association between EDA at acupoints and clinical outcomes [5,13,19], comparing disease-relevant acupoints with adjacent skin sites [8,10,21], correlating EDA with disease severity [9,12], confirming acupuncture energetic diagnosis [33], correlating EDA with histology of auricular points [34], investigating EDA at acupoints during weight reduction [32].

Recommendations are as follows: Each of these objectives comprises a research question worthy of investigation. Researchers studying EDA at acupoints, however, need to be reminded that large questions must be reduced to testable hypotheses to derive meaningful information. Researchers' should clearly state their objectives and define their hypothesis in the Introduction section of the manuscript. There also needs to be a statement of how the hypothesis will be statistically tested. Examples of clearly stated objectives and hypotheses are found in Falk et al [10], Lewith et al [20], Semizzi et al [26], and Yu et al [33].

3.2. Participants/settings

The number of participants ranged from 14 to 351 with a mean of 107 (SD±81.2). Recruitment methods, patient demographics, and inclusion/exclusion criteria in the majority of studies were inadequately reported. Nine studies were performed in hospitals,

including surgical suites and emergency departments, four in clinician's offices, four in outpatient clinics, and three in university departments. In 7 of the 29 studies, the setting where the research was conducted was not described. Randomization procedures were also poorly described in general and patient demographics insufficiently explained.

Recommendations are as follows: The recent CONSORT statement [50] suggests that a comprehensive description of the eligibility criteria that were used to select trial participants is needed to help readers interpret the study, judge to whom the results of a trial apply, and ascertain its relevance to clinical or public health practice. A description of the method of recruitment, such as by referral or self selection (for example, through advertisements), is also important in this context. The nature and stage of the disease being studied should be specified. Information on the settings and locations is crucial to judge the applicability and generalizability of a trial. For example, were participants recruited from primary, secondary, or tertiary health care or from the community?

Studies conducted by Ahn et al [5], Gerosa et al [11], Lewith et al [20], Yu et al [33], and Margolin et al [21] provide appropriate descriptions of how participants were recruited, the demographics of the patient populations, inclusion/exclusion criteria, and the settings where the studies were conducted.

3.3. Skin site selection for bioactive points (acupuncture points)

Bioactive points or acupoints were adequately described either in the text or with illustrations in most studies. Between 4 and 23 acupoints on the ears were tested in studies that used the auricular approach, whereas practitioners who used the EAV approach typically tested between one and 10 skin sites on the hands and/or feet. Ryodoraku assessments involved assessing 24 acupoints on the wrists and ankles and JingWell studies recorded electrical measurements at 24 acupoints on the corners of the finger and toe nail beds. One study [7] evaluated just two disease-specific acupoints (LU 9 and LR 8) in patients with tuberculosis and liver dysfunction, respectively.

Recommendations are as follows: Because countless acupoints may be tested, a rationale or justification needs to be provided for why specific bioactive points are chosen. Furthermore, for replication purposes a description of the exact anatomical locations where skin measurements are obtained is vital. Margolin et al [21], Tsuei et al [29], and Oleson et al [22] each give thorough descriptions and rationales for the acupoints they selected.

3.4. Controls

Of the 29 studies, 26 described having a control intervention or population, but the controls varied widely and included healthy human volunteers, other patient populations, alternate skin sites, substances in ampoules, or combinations of humans, skin sites, and substances. In 10 studies, healthy volunteers, hospital employees, or persons who did not have the disease under investigation but had other diseases served as controls. Five studies used skin sites consisting of non-acupoints or acupoints that supposedly were not related to the disease being studied. In several of the EAV studies either inert substances, such as normal saline, or medications in ampoules were used as controls. In some reports, two types of control, healthy volunteers plus nonacupoints, or control substances plus control skin sites, were employed. Other EAV studies used a control substance, or a control population plus control substances, or a control substance and control skin sites.

Recommendations are as follows: A variety of controls are appropriate for testing EDA at acupoints. However, a clear rationale for the particular control that is selected needs to be included along with a description of the comparisons that are to be made in the planned statistical analyses. Semizzi et al [26] and Falk et al [10] provide detailed discussions of their choices of a control (healthy volunteers and physiological saline in the former and inactive skin sites in the latter) when using the EAV system and the Auricular system, respectively.

3.5. Electrodes

The electrode systems used in the studies were poorly described in general. In only 5 of the 29 research protocols were the electrode systems described in enough detail to build or purchase a similar system [10,21,23,26,28]. However, even in those higher quality studies, a description of whether the measurement system had been validated and how electrodes were calibrated prior to use in the study was reported in only two [10,23].

Recommendations are as follows: Standards for measuring skin conductance were first recommended in 1971 [38] and then adopted by the official journal of the Society for Psychophysiological Research in 1981 [37]. No such standards have been developed for EDA at acupoints research. It will be a challenge to develop standards in this area of research because of the many approaches in current use. Consequently it is vital that researchers provide an exact description of the electrode system and the number and type of electrodes used, including size, shape, materials, and conductive interfaces so that

study replication is possible and methodological standards can evolve for each of the EDA at acupoints approaches. Prokhorov et al [23] present an exemplary description of the electrode system they used.

3.6. Confounding variables

Electrical skin measurements at acupoints are generally believed to be unreliable because they are confounded by artifacts created by lesions or moisture on the skin surface, inadequate skin preparation, type and placement of the reference electrode, problems at the probe-skin interface, skin probe pressure variability, contact impedance and polarization at the probe tip, as well as the influences of repeating measurements [36]. These factors substantially affect the accuracy and repeatability of EDA measurements and yet, only three of the 29 studies reported on how these issues were addressed [10,21,23]. The average reporting score for this category of essential information was 20% suggesting that this domain of information needs particular attention in future studies.

Recommendations are as follows: Ahn et al [36] elaborated on the technical challenges associated with recording electrical characteristics at acupoints. Because the confounders in EDA research are so pervasive and significantly affect the accuracy and reliability of electrodermal measurements, it is essential that the equipment, methodology, and procedures be tested for precision and reliability prior to conducting an actual clinical trial. Furthermore, to allow replication, how each potential problem is to be addressed in the study design also needs to be itemized. Margolin et al [21] provide an enlightening discussion of how they handled confounding variables in their study.

3.7. Instrumentation and electrical parameters

Four distinct electrical parameters were measured in these 29 studies. Skin conductance (or admittance), skin resistance (or impedance), skin capacitance, and skin potentials. Almost 2/3 EDA at acupoint researchers ($n=18$) measured resistance or conductance using a simple DC system. Three studies used an alternating current system (AC) to measure impedance (or admittance) [10,21,24]. One study measured skin capacitance [23] and one measured electrical skin potentials [12]. Reporting in many studies, however, was often ambiguous or confusing, making it difficult to interpret results. With no clear explanation that such a process had occurred, some researchers measured electrical resistance, then transformed the resistance values (kohms) to conductance (mhos or Siemens), then further converted the conductance values to normalized units which were reported on scales of 0–40, 0–100, or 0–200. These disparate ways of reporting make it difficult to compare one study's findings to another. Direct skin conductance recording using a constant voltage system is recommended for psychophysiological research when evaluating autonomic responsiveness [37,38]. Direct skin conductance measurements alone, however, may not be appropriate for evaluating EDA at acupoints. It has been suggested that although electrical capacitance measurements at acupoints are infrequently evaluated, this parameter may offer insights into the character of acupoints and meridians and its measurement should be considered in future studies [42,51,52].

Recommendations are as follows: At this nascent stage of EDA at acupoints research, we cannot recommend definitive standards for instrumentation and electrical measurements. We do, however, encourage authors to report the details of their instrumentation, explaining exactly how the instrument makes its measurements, what electrical parameters are measured, why those parameters are chosen, and what units are finally reported. An example of excellent reporting of instrumentation and electrical parameters is found in Prokhorov et al [23].

3.8. Measurements

The Measurement information domain refers to electrical outcomes, the number and duration of electrical measurements, laboratory conditions under which testing was performed, accounts of temporal variability, emotion, time of day, noise, movement and hydration, and whether the equipment was evaluated for interuser reliability. This information was poorly reported in general with only seven of the 29 studies receiving a grade of 60% or greater in reporting these parameters.

Recommendations are as follows: The accuracy and reliability of the instrument in taking its measurements, laboratory conditions, and the variability among different operators using the same instrument substantially impacts the scientific validity of the experiment. Careful attention should be paid to these technical and procedural issues when conducting and reporting a clinical trial. An example of excellent reporting in which measurement conditions were well defined and the overall quality of the measuring techniques attended to is found in Falk et al [10].

3.9. Blinding

The mean score for how researchers reported their blinding procedures for EDA testing or whether

those blinding procedures were successful was 30% with none of the 29 studies scoring greater than 50%.

Recommendations are as follows: We highlight the recommendations of Day and Altman who stress the special need for blinding in studies of diagnostic accuracy [53]. They state that blinding to diagnosis of persons who perform a diagnostic test and of those assessing the results is particularly important in view of the potential for subconscious bias when the tester knows the diagnosis. It is also important when evaluating the reproducibility of a measurement technique that observers be unaware of their previous measurement(s) on the same individual. On average, diagnostic test performance is overestimated when the reference test is interpreted with knowledge of the test result.

3.10. Results/statistical analysis

In this review we did not judge the validity of the statistical methods or results, nor did we assess whether the statistical analyses were appropriate for the study design or for the parameters being evaluated. We merely determined whether the results and statistical analysis were reported in enough detail to permit verification. Twenty out of 29 studies provided sufficient details of the statistical analysis for verification of the study's results.

Recommendations are as follows: The updated CONSORT statement acknowledges that data can be analyzed in many ways, some of which may not be strictly appropriate in a particular situation [50]. It is essential to specify which statistical procedure was used for each analysis. They suggest the principle to follow is, "Describe statistical methods with enough detail to enable a knowledgeable reader with access to the original data to verify the reported results" [50]. Four studies, Ahn et al [5], Falk et al [10], Margolin et al [21], and Semizzi et al [26], provide summary data and descriptive and interferential statistics in sufficient detail to permit alternative analyses and replication [40].

4. Discussion

Evaluation of the quality of reporting in 29 studies that tested the clinical utility of EDA at acupoint measurements revealed a marked inadequacy in reporting essential methodological details. Notably deficient were descriptions of how confounding variables that influence the accurate recording of EDA measurements were addressed, which blinding procedures were implemented, and the details of the types of electrode systems that were used. Only 9 of the 29 papers [5,10,17,20–23,26,33] provided enough information on the protocol and methodologies used to qualify for inclusion in a future systematic review that will answer the question, "Is there evidence to support the use of EDA at acupoints as an aid to diagnosis and/or therapeutic monitoring?"

To rigorously build a program of research on EDA at acupoints there is a need to standardize research methods and reporting protocols. An important goal in future publications should be to provide sufficient detail to conform to the quality expected by scientific journals. Such publications will in turn attract the attention of a broader range of scientists. We recommend that the 10 broad categories of information and the 54 subitems listed in Table 1 be evaluated and reported in future EDA at acupoints studies.

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