Is Commercially Available Point Finder Accurate and Reliable in Detecting Active Auricular Acupuncture Points?

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Abstract

Objectives: This study was done to determine the specificity and sensitivity of a commercial Pointer Plus (Point finder) in detecting a region of low skin resistance on the ear.

Design: This was a prospective blinded study.

Setting/location: The study was done at the Yale New Haven Hospital, New Haven, CT.

Subjects: The subjects were men and women who work at Yale New Haven Hospital.

Interventions: There were no interventions.

Outcome measures: Correlations were made between self-reported musculoskeletal pain and the detection of low skin resistance on the ear.

Results: The positive predictive value for Pointer Plus detecting low skin resistance correlating to the neck region of French auricular map is 0.76 (76%). The positive predictive value for Pointer Plus to detect low skin resistance area correlating to the low back region of French auricular map is 0.25. The positive predictive value for Pointer Plus in detecting any low in skin resistance on the external auricles in patients who complained of more than two musculoskeletal pains is 0.29.

Conclusions: The specificity and sensitivity of a commercial Pointer Plus (point finder) in detecting a region of low skin resistance on the ear being unreliable, depending on the correlating area based on a published auricular map. Additional assessments are needed to support the clinical practice.

Introduction

AURICULOTHERAPY IS A FORM of alternative treatment based on the idea that the external auricles represent the entire body.¹ Ailments of the entire body are assumed to be treatable through stimulation of the surface of the ear. Although auricular somatotopic mappings may not be based on or supported by any medical or scientific evidence, auriculotherapy is commonly used to treat patients with substance abuse and musculoskeletal pain.^{2–6} The stimulation techniques applied to the external auricle are similar to those used for acupuncture treatment. As a result, auriculotherapy is commonly considered a microsystem acupuncture therapy.

Traditional acupuncture textbooks often make the claim that auricular acupuncture is Chinese in its origin.⁷ However, auriculotherapy and the somatotopic organization of

the ear map was created by a French neurologist, Dr. Paul Nogier, in 1957 using a phrenological method of projection of a fetal homunculus on the ear to be used as reference for complaints and points for treatment.^{8,9} Based on the concept of auriculotherapy, when there is pain and/or pathology in the body, its correlated auricular reflex point becomes “active,” exhibiting low skin resistance and pressure allodynia.^{10,11} A recent study was able to elicit very tender auricular points in a population with chronic musculoskeletal pain.¹⁰ Low skin resistance is often described in the classic acupuncture textbooks as one of the characteristics of traditional body acupuncture points.^{1,8,9} As a result, many instruments have been developed and became commercially available to guide the acupuncturists, researchers, and educators in facilitating the localization of acupuncture points and active reflex auricular points.

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Pointer Plus (Hong Kong, China) is a small, pocket-size handheld unit, which has a spring detection probe allowing a constant pressure during the search of an acupuncture point and applying stimulation. Because of its light weight and portability, it is one of the instruments commonly used by acupuncturists. While it is popular with acupuncturists, there are growing data indicating that not every acupuncture point exhibits low skin resistance.¹² Thus, the instrument developed to detect the change in skin resistance might not be an effective tool in identifying the body acupuncture points or active reflex auricular points. The following double-blind study was designed to determine the specificity and sensitivity of Pointer Plus in detecting the active reflex auricular point that correlates with the discomfort and pain of the body reported by the volunteers, and to determine the corresponding auricular points.

Materials and Methods

After the Yale University Human Investigation Committee approved the research protocol, volunteers were recruited for this double-blinded study. In order to maintain consistency with studies published in the literature, the study protocol was based on two previous studies.^{10,11} All of the participants were asked to fill out an anonymous self-report inventory, which allowed them to report whether they experienced any musculoskeletal pain and to specify its location and duration. Once a participant filled out the inventory sheet, he/she was escorted to an isolated room with a comfortable recliner. The participants were sitting in the recliner with his/her body covered with a blanket, so the examiner (SMW) could only see the participant's face, but not the rest of the body.

The participants were instructed not to talk to the acupuncturist except for the general greeting. The examiner did not know the participant and had no prior knowledge of the information listed in the participant's self-report inventory. The examiner used a Pointer Plus to conduct the auricular diagnosis. The acupuncturist first cleaned the participant's external auricles with a cotton swab and then handed the participant a metal probe (i.e., grounding electrode) connected to one of the outputs of the Pointer Plus. Then she held the Pointer Plus in her right hand and applied the spring detection probe of Pointer Plus to the participant's external ears and placed her left hand posterior to the external auricle examined so the auricle would not move back as the probe was tracing along the auricle. She then applied the probe with constant pressure while tracing along the right and then the left external auricle. If there was a detection of low skin resistance area, the Pointer Plus released an alert alarm. The examiner then marked the location of the low skin resistance point on a pair of unlabeled ear figures.

The second and third authors (IM, ECL) compared the locations of low skin resistance areas on the external auricle marked by the examiner and the participants' intake sheets using an auricular map. French somatotopic map, published in a previous study,^{10,11} was used as a guide of corresponding body regions in this study. For example, if the respondent self-reported neck pain in the intake sheet, based on auricular theory the "neck" region of the external auricle should have low skin resistance and it was detected by Pointer Plus, they classified it as "true positive." If the Pointer Plus

detected low skin resistance at "neck region" but the participant did not report any neck pain, they then classify it as "false positive." Accordingly, if a participant reported having neck pain, but the Pointer Plus did not detect any low skin resistance of the corresponding "neck" region of the ear, then it was classified as "false negative" and if the participant reported no neck pain and the Pointer Plus did not detect any low skin resistance at the external auricle corresponding to neck region, it was classified as "true negative."

Results

A total of 208 volunteers (83 men and 125 women) participated in this study. The ages ranged from 21 to 59 years old (mean $\pm$ standard deviation = 32.5 ± 6 years). Among 208 participants, 70 (34%) complained of pain in one area, and 84 (18%) complained of two or more painful areas of the body. The duration of pain ranged from a few days to months to years.

Twenty-three (23) participants reported having neck pain and 185 reported no neck pain. Pointer Plus identified 21 participants having low skin resistance at the "neck" area of either external auricle; however, only 16 (true positive) of these participants self-reported neck pain and 5 (false positive) participants did not have neck pain. Pointer Plus was not able to detect any low skin resistance areas at either external auricle at the somatomapping of the "neck" region in 187 participants. Among these 187 "Pointer Plus negative" participants, 7 participants self-reported having neck pain (false negative) and 180 reported no neck pain (true negative). Therefore, the specificity and sensitivity for Pointer Plus in detecting low skin resistance at the "neck" area of the external auricles is 0.97 and 0.69, respectively. The positive predictive value for Pointer Plus detecting low skin resistance correlating to the neck region of the French auricular map is 0.76 (76%).

Fifty-three (53) participants reported having low back pain. Pointer Plus was able to detect 28 participants with low skin resistance at the "low back" region of the auricle. However, only 7 participants had low back pain (true positive) and 21 participants had no low back pain (false positive). Pointer Plus did not detect low skin resistance at the low back area in 180 participants (Pointer Plus negative). Among 180 Pointer Plus negative participants, 46 participants reported low back pain (false negative) and 134 participants had no low back pain (true negative). The specificity and sensitivity for Pointer Plus in detecting low skin resistance at the "low back" area of the external auricles is 0.86 and 0.13 respectively. The positive predictive value for Pointer Plus to detect low skin resistance area correlating to the low back of the French auricular map is 0.25.

Eighty-four (84) participants had self-reported more than one location of musculoskeletal pain and 124 had no complaint of any pain. Pointer Plus identified 147 participants who had at least one area of low skin resistance; among them, 44 participants self-reported musculoskeletal pain (true positive) and 103 participants did not have any musculoskeletal pain (false positive). Pointer Plus did not detect any low skin resistance area on the external auricles in 61 participants; among them, 21 participants had self-reported no pain (true negative) and 40 participants had nonspecific pain (false negative). The specificity and sensitivity of Pointer

Plus detecting any pain of the body is 0.15 and 0.52, respectively. The positive predictive value for Pointer Plus in detecting any low in skin resistance on the external auricles in patients who complained of more than two musculoskeletal pains is 0.29.

Discussion

Based on the condition of this study, it was found that the specificity and sensitivity of a commercial Pointer Plus (point finder) in detecting a region of low skin resistance on the ear unreliably varies, depending on the correlating area based on a published auricular map.

Multiple factors can affect the results of this study. We classified these confounding variables into the following: (1) Instrument, operator and patients' characteristics: The sensitivity of Pointer Plus to identify the active auricular points may be limited by the fact that skin resistance can be easily affected by factors such as the diameter of the spring-load probe, skill of the operator, the number of sweat glands of the skin, electrode pressure, thickness of stratum corneum, and electrode polarization.¹²⁻¹⁴ (2) The etiology of pain: Although the manifestation/location of pain may be similar between two different patients, the diagnosis based on traditional Chinese medical theory can be different. For example, back pain can be caused by kidney *yin* or *yang* deficiency or stagnation of *qi* and blood.^{15,16} Thus, the low skin resistance sensed by the Pointer Plus on the ear should be at the reflect point of kidney not at reflect point of lower back. (3) Duration of pain: Based on French auriculotherapy, the chronicity of an illness can affect the location of representative auricular points. There are three phases (phase I, II, and III) of French Auricular Maps that are described in the literature. Phase I map is frequently used as a guide for acute conditions, phase II map is commonly used for degenerative conditions, and phase III map should be applied for chronic conditions.⁹ Although we understand the different phases described in the literature, the reference of auricular map used in this study was used in previous publications for either persistent or chronic musculoskeletal pain.^{10,11} (4) The somatotopic organization of external auricles: Although auricular acupuncture maps have been used for several decades as guides for diagnosis and treatment, scientists have not yet been able to demonstrate or validate such a highly specific functional map of the external auricles.^{10,14} A clinical study¹⁰ indicated the lack of agreement between the region of patients' reported musculoskeletal pain and location of the tender zones of the external ears as assessed by a pressure stylus with an auricular acupuncture map used in the landmark auricular acupuncture research article. A recent animal study also failed to demonstrate the highly specific functional map of the ear.¹⁷ In addition, there are discrepancies between different auricular maps in regard to the corresponding body organs.^{7,15} Therefore, additional studies are needed to validate the existence of somatotopic organization of the external auricles.

Conclusions

This study found, similarly to previous studies, that the sensitivity and positive predictive value of Pointer Plus are relatively low. Therefore, acupuncturists and researchers

should not solely rely on these instruments to locate the acupuncture points. Pointer Plus and similar instruments can only be used as an adjunct to clinical assessment and palpation in identifying the acupuncture points. Future studies should not only focus on validating the correlation of the location of pain to the changes in skin resistance of the external auricle(s) but also on validating the "active" auricular point to the corresponding location of complaint and its correlated underlying diagnosis.

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Disclosure Statement

There is no commercial sponsor for this study and the sponsor of this study had no role in study design, data collection, data analysis and data interpretation or writing of the reports. The authors have full access to all the data in the study and the corresponding author is responsible for the decision of to submit for publication.

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