Complementary Therapies in Medicine 41 (2018) 161–168

Contents lists available at ScienceDirect

Complementary Therapies in Medicine

journal homepage: www.elsevier.com/locate/ctim

Exploratory study on the natural ground electric current that flows through human body as a possible pathway for the therapeutic effects of beach going

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ARTICLE INFO

Keywords:
Beach
Grounding
Body resistance
Ground electric current
Ground electric potential

ABSTRACT

This paper explores the electrical nature of sandy beach and proposes a pathway for the therapeutic effects of beach going. The electric potential and current generated on the ground across the human body and resistors were measured. The ground was found to have a non-homogenous electric potential which generated a potential difference between any two points on the ground. A power curve, similar to a battery, in the nanowatt range was obtained. This power appeared to be stable across time but varies across ground location. Standing on the beach with dry feet did not allow any current in the micro-ampere range to conduct. But upon moistening the feet, the body electrical resistance was reduced by 94% and the ground potential difference across the two feet was sufficient to drive a micro-ampere range current through the body. This may be one reason for the therapeutic effects of being on the beach.

1. Introduction

Being in nature is known to have therapeutic effects on human health.[1–5] Of the natural environments, the beach is one that has a high appeal to a lot of people.[6] The therapeutic effects are usually attributed to psychological or physical activities.[7]

There is a lack of studies that attribute the benefits to physical pathways. Physical pathways are those that involve the transfer of matter or energy between the human body and the natural environment. For example, the waves are known to produce electrically charged spray droplets,[8,9] and the inhalation of these negative ions are thought to provide beneficial health effects.[10,11]

This study proposes a physical pathway, namely the flow of electric currents through a grounded human body, specifically when standing barefooted on the beach. It is frequently assumed that the ground is an equipotential surface and therefore any conducting body (e.g. human body) in contact with it becomes part of that equipotential surface[12,58]. Because they are thought to be equal in electric potential, it is thought that there is no potential difference between them. With such assumption, it is not expected that current will flow through that conducting body.

However, the natural ground is made up of a mixture of many materials including sand, stones, minerals, organic matter etc. Different materials have different electrical properties (e.g. conductivity, capacitance). Even in a seemingly homogeneous sandy beach, the distribution of these materials are not uniform.[13,14] The non-uniform distribution of these materials will cause a difference in electric potential between two points on the ground, also known as self-potential.[15,16] This difference may be sufficient to draw a measurable current through the human body.

It is known that organisms generate or rely on electric currents and fields at the cellular level. This knowledge may be one reason for the recent revival of the idea of grounding the human body,[17,18] which involves putting the human body at the same equipotential surface as the ground. Electrostatic build-up and its subsequent discharging disrupts the natural electric field of the human body and this process has been suggested to have an effect on health.[19,20] Grounding prevents the build-up of excessive electric field in the body due to these factors.[21,22] It has also been suggested that the free electrons present on the ground will travel up through the human body as electric current whenever an electrical pathway is established between the human body and ground[23,24] and it has been suggested that this current has a beneficial health effect.[25,26]

Some of the above studies have successfully demonstrated the alteration of human body voltage due to grounding but have failed to detect this current. This study attempts to determine if this current exists by examining the electric potential difference between the normal foot stance distance on the ground, and whether this electric potential difference is sufficient to drive an electric current continuously through a human that is standing barefooted on it.

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https://doi.org/10.1016/j.ctim.2018.09.017
Received 18 July 2018; Received in revised form 17 September 2018; Accepted 17 September 2018
Available online 22 September 2018

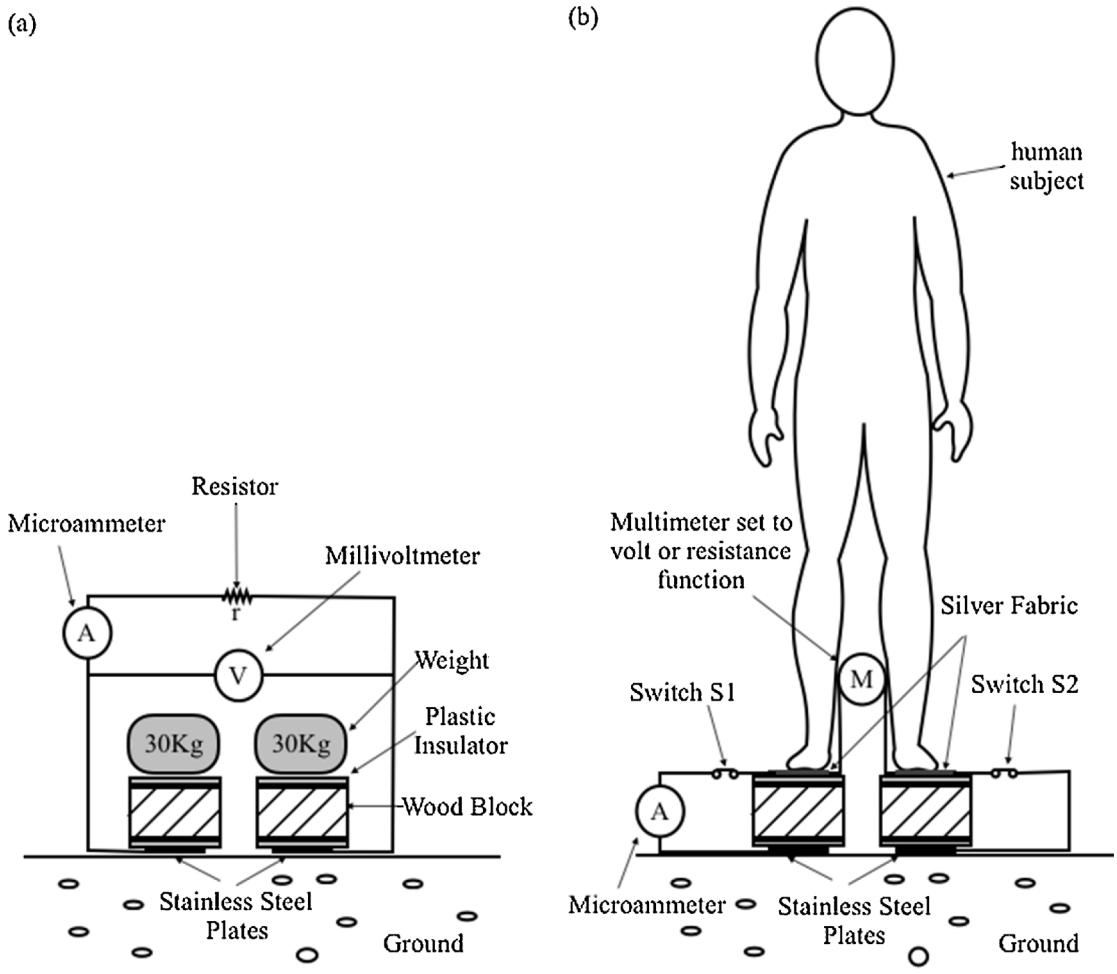

Fig. 1. a). Experiment set-up for the measurement of ground current and voltage. 1(b). Experiment set-up for the measurement of ground current through a human body and the voltage across it.

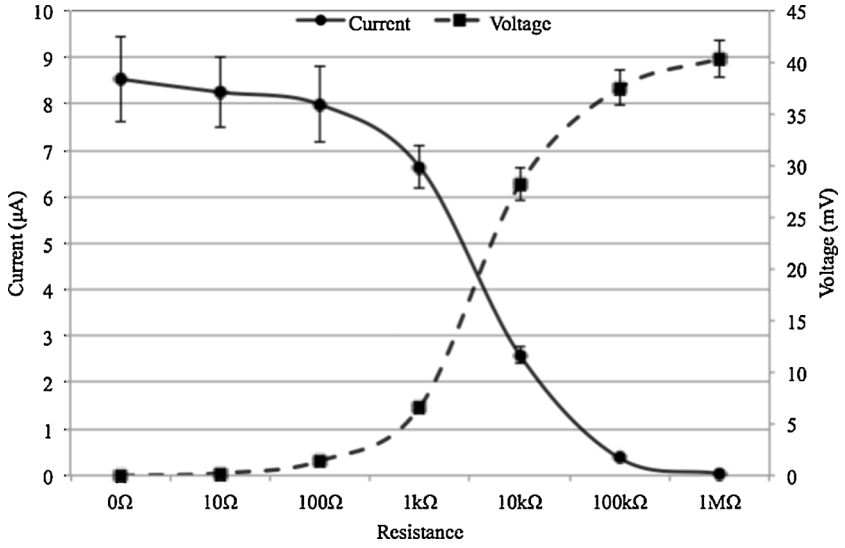

Fig. 2. Dependance of ground voltage and current on resistance (mean ± 1 SE, n = 3).

2. Methods

2.1. Experiment set-up

The measurements of electric current and electric potential of the ground was performed using the set-up in Fig. 1(a). Two identical stainless steel metal plates were used as the electrode. The metal plates had a dimension of 5.5 cm (W) × 16.0 cm (L), with a thickness of 1.0 mm. One side of the plate had an insulated copper wire (∅ = 2.0 mm) soldered on to it. The soldered part was then covered