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VARIABILITY AND SPECIFICITY OF THE SINGLE SQUARE VOLTAGE PULSE METHOD FOR MEASURING CONDUCTANCE AT ACUPUNCTURE POINTS FOR MIND/BODY RESEARCH. Shin Lin, Gaetan Chevalier, Tim Ross, Manhvu Nguyen, and Howe Lin. International Alliance for Mind/Body Signaling and Energy Research, Department of Developmental & Cell Biology, Department of Biomedical Engineering, and Susan Samuelli Center for Integrative Medicine, University of California, Irvine, CA 92697-2300.

The "Single Square Voltage Pulse" (SSVP) method was developed by Motoyama to measure conductance before polarization (BP) and after polarization (AP) at jing-well acupoints (Motoyama et al., Psychophysiology 21:541-550, 1984; Kiddo, J. Intl. Soc. Life Info. Sci. 15: 60-71, 1997). It has been proposed that BP is an indication of the "energy/strength" of the corresponding meridians and their associated organs while AP is related to "stress" commonly measured as galvanic skin response. Besides measuring the conductance values with a 1 millisecond pulse of 3 volts rather than with a constant current, the method incorporates the use of a hand-held electrode probe with a flexible shank to make electrical contact with an adhesive sponge electrode pad pre-placed on the acupoint to minimize variation in pressure and physical stimulation by the probe. In Part I of this study, we examined the variability of the SSVP instrumentation (AMI Care System from AMICA Co., Japan) and methodology under different conditions. First, by using a micromanipulator (Model M from Leitz Corp., Germany) to place the electrode probe onto an electrode pad adhered to the jing-well acupoint of the Pericardium Meridian on the hand, we showed that the average variability values of the BP and AP measurements were 0.61% and 2.02%, respectively, based on 165 sets of 27 continuous measurements on 6 subjects made without lifting the probe off the pad. These values represent the minimum achievable reproducibility of the SSVP method under idealized conditions. Furthermore, we found that increasing the pressure of the probe on the pad by adjusting the setting on the micromanipulator resulted in an increase of the BP value by 3-5%, with occasionally a slight increase in variability. Under normal experimental conditions when the probe was placed by hand on electrode pads on all 28 jing-well acupoints on the hands and feet of 5 subjects, the variability was 8.1 % for BP and 15.4% for AP, based on 10 rounds of measurements with the same set of pads. In Part II of the study, we tested the specificity of the location of the electrode pad in relation to the BP and AP values. First, we placed a grid of 3x21 electrode pads along the Pericardium (PC) Meridian, with some of the pads in the middle row covering acupoints PC4, PC5, PC6, and PC7 on the ventral side of the forearm of 8 subjects. We then made 28 continuous measurements with a hand-held probe, and calculated the average BP and AP values at each pad. We found that in 14 out of 32 cases (i.e., 4 acupoints in each of the 8 subjects), the location of an acupoint (determined according to standard acupuncture textbooks) coincided with a pad on the center row with the highest average BP and AP values relative to its immediate distal and proximal neighbors. If we allow for a slight misalignment of pads with acupoints and look for the one or two pads with the highest BP and AP relative to their neighbors, the coincidence would increase to 23 out of 32 cases for both BP and AP. These results demonstrate that the area of the skin at or near acupoints are far more likely to have higher BP and AP values than predicted by random chance. In Part III of this study, we examined how the mind/body exercise of Tai Chi might affect BP and AP values. Nine advanced subjects (3 of them measured twice) with an average of 23 years of experience were measured before and after 15-20 minutes of Tai Chi practice. We found that in all cases, there was an increase of overall BP (average of BP measured at the 28 jing-well acupoints) ranging from 8-26 % (average of 17%). By comparison, we did not find a definite pattern of change with respect to overall AP values (6

cases increased, 4 cases decreased and 2 cases showed no change). In conclusion, this study shows that the SSVP method has a low level of variability particularly when the difference in pressure exerted by the electrode probe on the conducting electrode pad is minimized. The pilot study on Tai Chi practitioners indicates that BP values can be used as a useful marker for studying the beneficial effects of mind/body practices. (Supported by a grant from the Rockefeller-Samueli Center for Research in Mind-Body Energy, and the Joseph and Sou-Lin Lee Endowment for Traditional Chinese Medicine Research).