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·心理学·

The Whole Body's Skin Conductance Response to Short-term Integrative Body-Mind Training*

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ABSTRACT Objective: To study the effects of short-term integrative body-mind training (IBMT) on trainees' whole body's skin conductance response as an indicator of meditation state. **Methods:** Sixty-eight healthy undergraduates were randomly assigned to an experimental (IBMT) group or a control (relaxation training) group. Skin conductance response was tested before and after 10 days training. **Results:** Before training, the body's entire skin conductance response was performed equally in two groups. Moreover, upper body's skin conductance response scores were higher than other parts. After training, the whole body's skin conductance response was found to be regulated to the same level by five hours IBMT (0.5 h/day) but not relaxation training. **Conclusions:** The present study suggests that IBMT as body mind training is associated with lower upper body's skin conductance response to a balance state comparing with the relaxation group.

Key words: Integrative body-mind training; Relaxation training; Skin conductance response

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Introduction

Integrative Body-Mind Training (IBMT) originates from ancient Eastern tradition and involves body relaxation, mental imagery, and mindfulness training [1]. The method stresses no effort to control thoughts, but instead a state of restful alertness that allows a high degree of awareness of body, breathing, and external instructions from a compact disc. It stresses a balanced state of relaxation while focusing attention. Thought control is achieved gradually through posture and relaxation, body mind harmony, and balance with the help of the coach rather than by making the trainee attempt an internal struggle to control thoughts in accordance with instructions [2].

In previous studies [2,3], IBMT has been shown to have broad positive effects on attention and emotions by altering central and autonomic nervous system interaction when compared with relaxation training (RT). Because of these significant effects of emotion regulation processes such as short-term IBMT to psychological and physical health, there has been a recent push to better understand the brain and body correlated with this ability. Cooperation between body and mind is emphasized in IBMT to achieve the balanced state of relaxation. It is of vital importance to find a convenient method for studying the differences of the balanced state of relaxation between IBMT and RT. In present study we measured mood states and the whole body's skin conductance response (SCR) to explore the body mind harmony rules of short-term IBMT.

Electrodermal testing was developed as an aid in prescribing homoeopathic remedies [4]. The impedance can be measured by the volume conductor under the current stimulus threshold and the skin conductance can be measured by a constant voltage in the epidermis. The conductance across the skin is called the absolute value of the skin conductance level or the base skin conductance because it is generally considered in the underlying value of physical activity in a calm state. The change of skin electrical power is a human biological phenomenon, which is clearly related with the sweat gland activity and these electrical changes are regulated by cholinergic sympathetic nerve fibers [5]. The sweat glands are mainly affected by the activities of the temperature inside or outside the body and the human's sweat secretion of physiological and psychological reactions is caused by the central sympathetic activities. Therefore, the skin electrical activity can be used as an indirect indicator of the sympathetic nerve activities [6] or an indicators evaluating emotionality [7]. When external stimuli causes physical or psychological irritation, the skin conductance level will present a transient and rapid fluctuation. This potential fluctuation on the skin is called skin conductance response.

1 Materials and Methods

1.1 Participants

Sixty-eight healthy undergraduates at Dalian University of Technology without any training experiences were recruited. They were randomly assigned to IBMT or RT group (34:34). Thirty-two experimental subjects of IBMT group (17 males, mean age = 21.47 years, standard deviation [SD] = 0.28) completed the whole IBMT session for 10 days with 30 mins of training per day. Thirty-four subjects of RT group (18 males, mean age = 21.32 years, SD = 0.25) were given the same number and length of group ses

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sions but participated in a form of relaxation training. The study was approved by the local Ethical Committee. All participants gave their informed consent after the study procedure had been explained in detail.

1.2 Profile of Mood States

The Profile of Mood States (POMS) [8] is a psychological rating scale used to assess transient, distinct mood states. The respondent rates each item on a 5 point scale ranging from "Not at all" to "Extremely". Its age range is 18 years and older and its administration time is 5 to 10 Minutes. Its alpha coefficient is ranged from 0.81 to 0.94. The POMS have been found the standard to exhibit a highly satisfactory level of internal consistency, while product moment correlations indicate a reasonable level of test-retest reliability. Factor analytic replications provide evidence of the factorial validity of the 6 mood factors: tension-anxiety, depression-dejection, anger-hostility, vigor-activity, fatigue-inertia and confusion-bewilderment, and an examination of the individual items defining each mood state supporting the content validity of the factor scores [9].

1.3 VEGATEST

The SCR was recorded via the VEGATEST which could quickly and simply gain an overview of body's entire physiological situation [10]. Seven measuring sections consisted of six measurement points located at the skin of the feet, the head and the hands (Fig. 1).

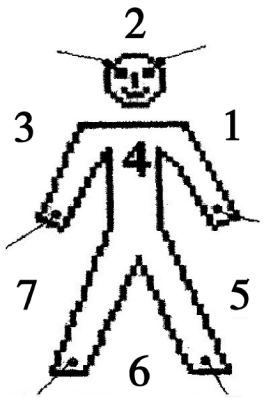

Fig. 1 Seven measuring section and the corresponding organ or organ group

Seven measuring sections consisted of six measurement points located at the feet, the head and the hands. The corresponding organ or organ group: 1 left hand / head on the left: the left ear, left eye, tonsil, cervical, and arterial; 2 left / right head: eyes, ears, upper, central nervous system; 3 on the right / right: right ear, right eye, tonsil, cervical, intravenous; 4 right / left hand: lung, heart, breast, thyroid, upper abdominal; 5, left hand / left foot: the spleen, pancreas, stomach, descending colon, left kidney, left lung, duodenum; 6 left foot / right foot: lumbar spine, urethra, rectum, bladder, pelvic organs; 7 right foot / right hand: the liver, gallbladder, bile ducts, appendix, right kidney, right stomach, ileum.

The apparatus consists of a box which contains a galvanometer (Wheatstone bridge circuit) [11]. Every measuring section was investigated in two consecutive runs by negative and by positive 13 Hertz pulse trains and a consecutive return current. After the application of the electrodes, the automatic measurement process was started. The number and amplitude of SCRs were recorded by the device during the measurement running (within 60 seconds). The difference between skin conductance's fluctuation amplitude values was an indication for regulatory characteristics to pulse stimulus. A dial with 100 scale divisions shows 100 when the connected resistance is 0 while a dial with 100 scale divisions shows 0 when the connected resistance is infinity.

The SCR is the difference between the data before and after stimulation[12], which can predict to the body's irritability caused by physiological and mental state. The greater the response caused by pulse trains is, the greater the amplitude of SCR is [7].

1.4 Measures

The first experimental phase was the baseline observation period. Before training, the volunteers received POMS questionnaire and were measured the whole body's skin conductance response (SCR) changes at rest via the VEGATEST. In order to avoid the impact of neuromuscular activity, the volunteer sat in a chair keeping his eyes closed and feelings of a relaxed state. In order to avoid the impact of sweat gland activity on skin conductance tests, the measurement time was arranged in 13:30 to 16:30, and the room temperature was controlled at 17 ℃ to 25 ℃ [7].

The second experimental phase was the training period. The volunteers were randomly assigned to IBMT or RT group. The experimental subjects of IBMT group completed the whole IBMT session for 10 days with 30 mins of training per day. The subjects of RT group participated in the same number and length of relaxation training [13] which was very popular in the West. Everyday training was presented in a standardized way by playing a compact disc and guided by a skillful training coach. The coach answered any questions after each training session.

The third experimental phase was the remove training period. We measured the whole body's skin conductance response (SCR) changes at rest after 5 h of IBMT and RT. The measurement time and sequence were corresponding to the baseline observation period.

1.5 Statistical analysis

The independent samples t-test was used to analyze the differences between the two groups and the paired sample t-test was used to analyze the differences between pre-test and post-test in a group. Pearson's correlation coefficient was used to analyze the relationship between two variables, and p-values less than 0.05 were considered statistically significant.

2 Results

2.1 Pearson;s correlation coefficient was used to analyze the rela tionship between SCR levels of seven measuring sections and the scores of POMS

In the baseline observation period, the test including 68 subjects demonstrated a positive correlation between the SCR levels of the first section and the depression dejection scores (r=0. 273, P=0.026) of the POMS. Similarly, there was a positive

correlation between SCR levels of the second section and the anger hostility scores (r=0.242, P=0.050) or depression dejection scores (r=0.252, P=0.041) of the POMS. The SCR levels of the third section also manifested a significant positive correlation with the depression dejection scores (r= 0 .274, P=0.026). However, SCR levels of the other four sections exhibit no correlation with scores of anger hostility or depressiondejection.

2.2 The Student′s t −test was used to analyze the differences of seven measuring sections′ SCR levels between the two groups and group differences

The independent samples t-test was used to analyze the differences of seven measuring sections' SCR levels between IBMT group and RT group. In the baseline observation period, the body's entire SCR was performed equally in two groups. Moreover, the levels of SCR were higher in 1, 2 and 3 section than 4, 5, 6 and 7 section in both groups (Fig. 2).

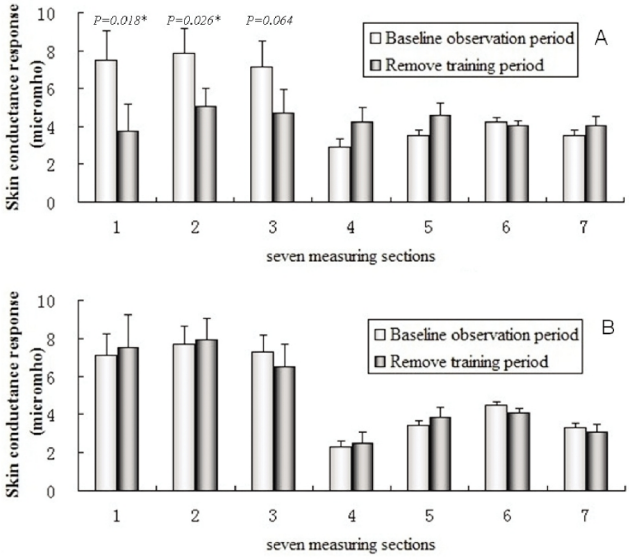

Fig. 2 Comparison of seven measuring sections of skin conductance response before and after training for integrative body-mind training group (A) and relaxation training group (B). *P < 0.05. Error bars indicate 1 SD.

The paired sample t-test was used to analyze the differences between pre-test and post-test in IBMT group. In the remove training period, the IBMT group obtained significantly lower SCR scores on the first section (P=0.018) and the second section (P=0. 026), and a decreasing tendency on the third section (P=0.064). After 10 days of training, the IBMT group scored slightly higher on the 4th section's SCR (P=0.087) with 5, 6 and 7 section's SCR scores rose and fell, but these differences did not reach statistical significance. In addition, the whole body's SCR showed a balanced state in IBMT group, while statistical differences and this harmonious state were not observed in the RT group compared to the baseline.

3 Discussion

This study found that university students' SCR were higher in 1, 2 and 3 section than 4, 5, 6 and 7 section in the baseline observation period. Previous studies showed that SCR is regulated by the cholinergic sympathetic nerve, so the skin conductance can be used as indicators of sympathetic nerve activities and emotional levels [5]. These results reflect that university students are in an unbalanced state after the stress. Why does this phenomenon arise? It may be brought about by combined factors, but the main one is that contemporary college students are in the face of intense learning, interpersonal relationships, graduate employment or other issues, which may lead to greater pressure. Furthermore, the higher pressure and longer duration of stress could cause the stronger negative emotions and the larger physiological responses [14]. Therefore, appropriate psychological interventions are greatly important and should be pushed and promoted to improve the sub-health state.

After 10 days of training, the IBMT group has been found to be significantly lower SCR scores on the first section (P=0.018) and the second section (P=0.026), and a decreasing tendency on the third section (P=0.064) comparing with RT group. The SCR scores greatly changed was seen in the former three sections, prob ably because the former three sections corresponding anatomical location includes an important part of the central nervous system - the brain. In addition, the subjects of IBMT group showed higher SCR levels of the first, second and the third sections, which were positively correlated with lower anxiety and depression scores of the POMS. These results were consistent with previous findings that short-term IBMT altered central and autonomic nervous sys tem interaction [15] and improved functioning of the executive at tention network, which has been linked to greater reduction in anxiety and more positive mood states than relaxation [3]. There fore, the lower stress levels of the former three sections are likely to reflect the psychological and physiological improvement of the IBMT practitioners. Moreover, the whole body's SCR showed a balanced state in IBMT group after training. However, the imbalance sate in pre-test may reflect a negative stimulate leading to dysregulation of body. Why does IBMT come into entire balancing state while RT not? The possible reasons are that IBMT is not based solely on brain structure and function, but on the continuous interaction of the brain with the body and the external world. IBMT incorporates key components of body and mind techniques including breathing adjustment, mental imagery and meditation to practice awareness of our habitual affective, cognitive and behavioral response patterns and stress a balanced state of relaxation through posture and relaxation and body mind harmony [2,3]. These combinations may amplify the training effect of harmonizing mind body relationship over the use of only one component to improve overall stamina and withstand discomfort caused by micro-current stimulation[16].

This study showed a pattern of positive association between electrodermal activity (amplitude of SCR uctuation) and the mo

tion state. After only 5 hours of training, the whole body's SCR showed a harmonious state in IBMT group, but not in RT group. The current outcomes indicate that IBMT improves functioning of harmonizing mind body interactions and open a door for simple and effective investigation of meditation effects.

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短期整体身心调节法的全身皮肤电导反应规律*

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摘要 目的：探讨短期整体身心调节法练习者的全身皮肤电导反应特点。**方法**：采用单因素完全随机实验设计，将68名在校大学生分为整体身心调节组和放松组，分别进行为期10天的整体身心调节训练和经典的肌肉放松训练，并于训练前和训练结束后，测试两组学生身体7个分支的皮肤电导反应。**结果**：训练前，大学生前3支皮肤电导反应大于后4支；训练10天后，与训练前相比，整体身心调节训练组第1、2支皮肤电导反应显著减小，7个分支的皮肤电导反应出现均衡的规律；放松训练组学生身体7个分支皮肤电导反应变化不显著。**结论**：短期整体身心调节法形成了全身皮肤电导反应的均衡，可能反映短期整体身心调节法的整体身心相互作用原理。

关键词：整体身心调节训练；放松训练；皮肤电导反应

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