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Short Report

The effects of relaxation and postural training on external perception: Improvement of visual acuity, visual field, and hearing acuity

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Abstract: This study examined the effects of muscular relaxation and postural training on external perception using a visual acuity test, a visual field test, and a hearing acuity test. Eighteen undergraduate students were randomly assigned to experimental and control groups. The experimental group underwent muscular relaxation and postural training. Each subject in this group was administered the tests before and after the training. Each subject in the control group carried out the tests before and after participating in a 30-min conversation with the experimenter. On all three tests, the experimental group improved significantly more than the control group.

Key words: muscular relaxation, postural training, visual acuity, visual field, hearing acuity.

Konno (1989, 1990, 1993a, 1993b) and Konno, Ohno, and Hoshino (1990) found that perception of self and others improved through muscular relaxation and postural training. These studies suggested that such training makes one's inner state stable, and in turn the sense of inner stability affects perception. Hatakeyama, Etoh, and Konno (1994) indicated that as the sense of muscular relaxation and the sense of stability in standing posture increased, positive changes in external perception occurred. For example, visual field widened, the vividness of objects increased, and the contour of objects became more distinctive.

Similar effects have been found in children with severe developmental disturbance. Konno (1986) reported that a child with cerebral palsy and severe mental retardation came to be able to respond to his environment and could sit by himself through muscular relaxation and postural training.

This study examined the effects of muscular relaxation and postural training on visual and auditory perception using visual acuity, visual field, and hearing acuity tests.

Method

Subjects

Eighteen undergraduate students participated in this study. None had hearing loss or weakness in corrected sight. They were randomly assigned to experimental and control groups.

Muscular relaxation and postural training

The experimental group underwent muscular relaxation and postural training using the *Dohsa* method originally developed by Naruse (1973). First, muscular relaxation was carried out on both shoulders, and then postural training was given. The muscular relaxation used in this study was *tokeau-taiken* ("experience of melting sense"). For example, in the case of relaxing the shoulders, a trainer (in this study the experimenter served as a trainer) softly placed his hands on the subject's shoulders and gently pressed them, then he released that pressure as slowly as possible, keeping his hands on the shoulders. While releasing that pressure, both the subject and the trainer feel a sense of warmth, stretching, and the sense of moving in the shoulders, and can share these experiences with each other "in one body." The criteria for muscular relaxation were: feel the sense of warmth at the shoulders, come to be light at the shoulders, feel the sense of stretching at the shoulders. Whether the subjects met these criteria or not was judged according to their introspective reports.

Postural training was carried out on the waist and ankles, in the sitting position with the legs crossed. Subjects moved their waist and back upward without tension or movement at the neck and the shoulders. The criteria for relaxation of the ankle were as follows: feel the sense of stretching at the ankle and the thigh, feel the ankle moving of itself. The criteria for the waist were as follows: feel the sense of warmth at the waist, move the waist without muscular tension in the other part of the body, feel the sense of firmly standing on the ground.

Each subject underwent training until these criteria were achieved, which took about 30 min.

The subjects in the control group, instead of receiving the training, had a conversation with the experimenter, with the purpose of establishing communication.

Tests for visual acuity, visual field, and hearing acuity

Each subject in the experimental group was administered a visual acuity test, a visual field test, and a hearing test before and after the training. Each subject in the control group participated in these tests before and after the 30-min conversation with the experimenter.

The visual acuity test was Dr. Landolt's International Ring Test-Type Chart. Each subject was tested first with the right eye, and then with the left, in ascending and descending series. Static visual field was tested for horizontal field. In this study, instead of using a perimeter, a special piece of apparatus was used. This was a straight measure, on which movable white fixation marks (1 cm in diameter) were attached at both sides. The subject stood at the center of this apparatus, 35 cm away, with his/her chin on a stand. The test was carried out first for the right visual field (i.e., right eye) then for the left, in ascending and descending series. The hearing acuity test was carried out using 250 Hz, 500 Hz, and 1,000 Hz pure tones, in that order of presentation. These tones were presented first to the right ear then to the left, in ascending series and descending series.

Questionnaires

After finishing the post-test, the subjects in the experimental group answered a 12-item questionnaire concerning the changes of body perception, and an eight-item questionnaire measuring changes of external perception. For each item the subjects compared the feeling before and after the training. Each item was rated on a seven-point scale.

Results

Visual acuity test

Figure 1 compares mean difference values for visual acuity (post-test–pre-test) between groups, and between right and left eyes. In the control group, the difference score was 0.1 for the right eye and 0.04 for the left, whereas the experimental group obtained 0.19 for the right eye and 0.25 for the left. The result of a two-way analysis of variance yielded a significant main effect for group factor, $F(1, 32) = 4.269$, $p < .05$.

Visual field test

The mean difference values (post-test–pre-test) between the groups and right and left sides for visual field are shown in Figure 2. The control group obtained 0.80° for the right visual field and 0.65° for the left. The experimental group gained 2.16° for the right visual field and 1.41° for the left. As a result of a two-way analysis of variance, a significant main effect for group factor was found $F(1, 32) = 7.786$, $p < .01$.

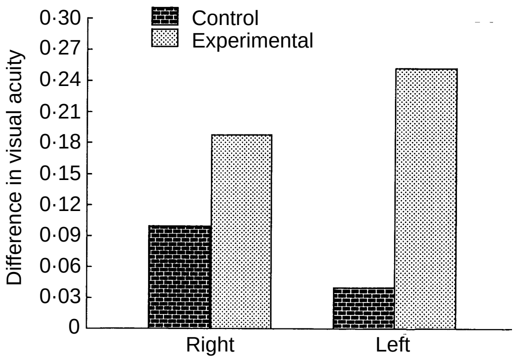

Figure 1. Comparison of mean difference scores on visual acuity between the control and experimental groups, right and left eyes.

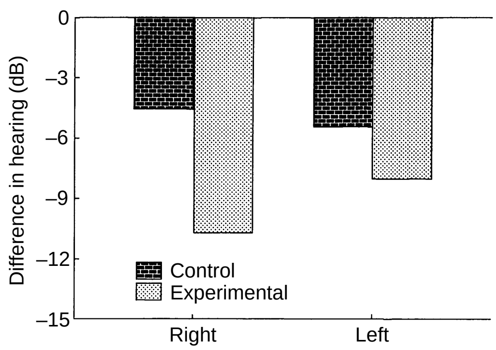

Figure 3. Comparison of mean difference scores on hearing for 250 Hz between the control and experimental groups, right and left ears.

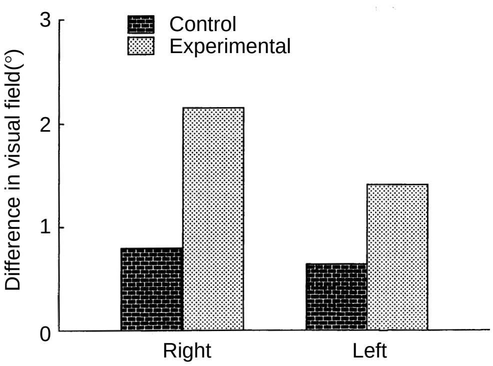

Figure 2. Comparison of mean difference scores on visual field between the control and experimental groups, right and left eyes.

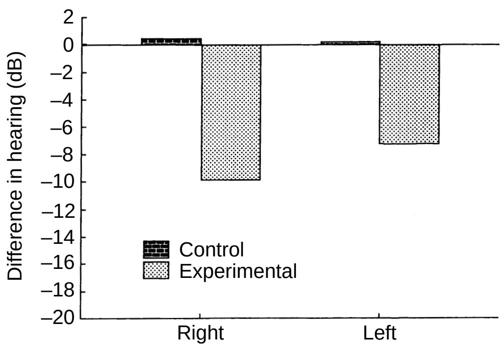

Figure 4. Comparison of mean difference scores on hearing for 500 Hz between the control and experimental groups, right and left ears.

Hearing acuity test

Figure 3 compares the mean difference values on the 250 Hz pure tone between the groups, and between the right and left ears. The mean difference value in the control group was –4.5 dB for the right ear and –5.47 dB for the left ear. The experimental group gained –10.75 dB for the right ear and –7.33 dB for the left ear. A two-way analysis of variance revealed a significant main effect for group factor, $F(1, 32) = 4.554, p < .05$.

Similar results were found with the 500 Hz hearing test (Figure 4) and the 1,000 Hz hearing test (Figure 5). In the 500 Hz test, the control group gained 0.52 dB for the right ear and 0.27 for the left. However, the experimental group gained –9.92 dB and –7.22 dB, respectively. There was a significant main effect for group factor, $F(1, 32) = 14.149, p < .01$. In the 1,000 Hz hearing test, the control group gained –0.8 dB for the right ear and 2.25 dB for the left ear. The respective values for the experimental group were –5.77 dB and –10.14 dB. A significant

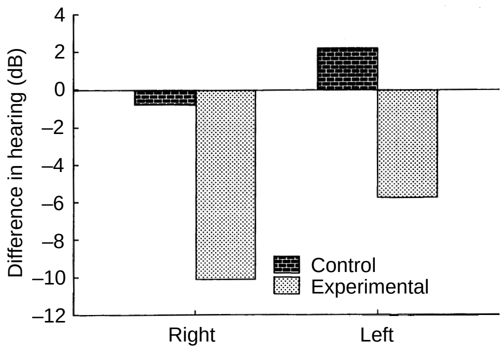

Figure 5. Comparison of mean difference scores on hearing for 1,000 Hz between the control and experimental groups, right and left ears.

main effect for group factor was again evident, $F(1, 32) = 17.416, p < .01$.

Changes of body perception

A factor analytic study of 12 items using difference scores (post-test–pre-test) was carried out, and as a result of varimax rotation four factors were extracted. The name, eigenvalue and cumulative percentage of contribution in each factor were as follows: factor 1, "sense of firm standing on the ground" (3.14, 26.17%); factor 2, "sense of activity in body" (3.04, 51.58%); factor 3, "sense of muscular relaxation" (2.86, 75.48%); factor 4, "sense of fullness in abdomen" (1.96, 91.82%).

The mean rated score for factor 1 was 3.36 before the training and 5.44 after the training, and those of factor 2, factor 3 and factor 4 were, respectively: 3.33 and 5.41; 2.67 and 5.93; 2.94 and 5.22. A two-way analysis of variance revealed a significant main effect for before and after the training, $F(1, 64) = 132.636, p < .01$.

Changes of external perception

As a result of a factor analysis using the method mentioned above, three factors were obtained. The name, eigenvalue and cumulative percentages for each factor were as follows: factor 1, "vividness of external world" (2.83, 35.40%); factor 2, "broadness of visual field" (2.62, 68.42%); and factor 3, "active impression of external world" (1.67, 89.30%). The respective mean rated scores before and after the training were as follows: 3.53 and 4.86 for factor 1; 3.61 and 4.44 for factor 2; 3.61 and 4.61 for factor 3. A two-way analysis of variance revealed a significant main effect for before and after the training, $F(1, 48) = 41.49, p < .01$.

Discussion

Previous studies have indicated that a positive body experience achieved through muscular relaxation and postural control brings about positive changes in external perception. However, the evidence was obtained from introspective reports, verbal reports or responses to questionnaires. In this study, visual acuity, visual field and hearing acuity were used as objective indices. After the training, the experimental group showed remarkable improvements in body perception and external perception. They also had a good body sensation, and external impression was more vivid, broader, and more active. Differences between the control and experimental groups in the degree of improvement achieved on the visual acuity, visual field, and hearing acuity tests were significant.

According to previous studies on the *Dohsa*-method, muscular relaxation and postural training cause a positive change of body image, and in turn this may enhance self-image. The positive perception of both body and mind may bring about positive attitudes to relating to one's environment, resulting in the improvement in visual and auditory perception. Furthermore, as indicated in the studies on the visual world of infants (Bower, 1971) and on the affordance theory (Gibson, 1979), the establishment of three-dimensional posture may enhance the ability of human beings to relate actively to their own external world.

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