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Kinesthetic Training And Industrial Skills

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Could there be a shortcut to learning some industrial skills? The authors of this article experimented on university students to discover whether kinesthetic training could significantly improve the performance of an occupational task.

Performing industrial skills requires internal motor responses, i.e., involves kinesthetic and muscle senses (Gagne and Fleishman 1959, p. 225). Training could be more efficient if the fundamental motions of the skills could be broken down into their internal kinesthetic stimuli and responses, and if then through the administration of a kinesthetic training program these responses could be transferred in the acquisition of industrial tasks (Edwards 1972). Such a program would mean that many specific skills which normally take years of training to acquire could be programmed into basic kinesthetic dimensions and learned directly.

In 1969 a study was undertaken to provide professional educators with the dimensions of sensory activity. The measurement of tactile sensitivity of arms and hands was investigated (Lutz 1969). A torque discriminator with a variety of attachments enabled the researchers to measure several general arm and hand motions. Using a test retest procedure, Lutz attempted to assess the reliability of these motions over a period of time. The five measures included finger twisting (clockwise and counterclockwise), open hand twisting (clockwise and counterclockwise), and downward arm pulling. Except for the downward arm pulling, all dimensions had high reliability coefficients (.604 to .722). Lutz concluded that measurement of kinesthetic sensitivity was stable over time.

Edwards (1972) used similar procedures. He administered Lutz's testing program in which his subjects' existing finger-twisting sensitivity levels were established using the method of limits. He then developed a training program using knowledge of results as reinforcement for learning. Edwards' program was successful in significantly increasing his subjects' kinesthetic acuity in finger twisting.

The purpose of the present study was to attempt to replicate Edwards' results and then determine whether kinesthetic training was transferrable to a skilled occupational task involving similar kinesthetic elements. The task of hole-tapping was chosen for the occupational transfer task. It has been determined that there are a number of kinesthetic elements in common between performance of the chosen occupational task and use of the torque discriminator (Ade 1976).

METHOD

Subjects. The population of this study consisted of all students enrolled in the Introduction to Technology course at Bowling Green State University during the spring quarter of 1977. There were 58 subjects.

An occupational task inventory was administered to the population. This identified subjects already experienced with the chosen occupational task. Twenty-nine subjects had used a hole-tap wrench two times or more and were eliminated from the experiment to prevent contamination of the data. The 31 remaining subjects were randomly assigned to the experimental and control groups. The data from two subjects were eliminated from the experiment due to attrition. This left 15 control subjects and 14 experimental subjects.

Apparatus. The subjects were pretested, posttested, and trained on the torque discriminator. The torque discriminator has a subject's console and a control console. The control console switch has eight different settings, A through H. This enables the researcher to increase or decrease the torque resistance applied to an aluminum shaft on the subject's console.

The kinesthetic pretest and posttest instructions were recorded on a cassette tape to deliver the oral portion of the tests. The researchers synchronized the torque discriminator to the recorded instructions during the testing. The discriminator was adapted to training purposes by changing its position and adding a simulated tool handle to the rotating shaft.

PROCEDURES

Pretesting. The subjects were randomly assigned to the experimental or control group. All were pretested to determine their kinesthetic discrimination ability. The pretest consisted of 72 pairs of torque settings administered on the torque discriminator. Subjects felt each pair of settings and determined whether the second setting was easier, the same, or harder than the first setting.

Kinesthetic Training. Experimental subjects were given the kinesthetic training to increase their kinesthetic sensitivity. The training program used 107 pairs of torque resistances. Subjects identified the second setting as easier, the same, or harder than the first. When subjects incorrectly identified the relationship of the second setting to the first, the researcher informed the subjects of their incorrect response. The pair was then readministered. If the response was correct, the researcher immediately told the subject. This continued until the training program was completed.

Posttesting. A posttest identical to the pretest was administered to all subjects. Posttest scores were compared with the pretest scores to determine the effectiveness of the training program.

RESULTS

The scores of the experimental subjects increased significantly by the posttest. Their mean pretest score was 94.14, but the mean posttest score was 105.85. The standard deviation for each was 10.91 and 9.21 respectively. The "t" value was 2.69, which was significant at the .05 level, with 13 degrees of freedom. On the other hand, the control group did not do as well. Their mean pretest score was 97.20 and their mean posttest score 99.47. The respective standard deviations were 11.78 and 9.87. The "t" value was .55, which did not represent a significant difference, with 14 degrees of freedom. These results replicated those obtained by Edwards (1972). He hypothesized that the administration of the kinesthetic training program (which was the same as the one used in this study) would result in increased posttest kinesthetic sensitivity scores among university students. His results, as did those in this study, indicated that the training significantly increases discrimination.

The mean posttest scores of the experimental and control groups were compared, but the "t" value of 1.73 was not significant at the .05 level, even though there was a difference of 6.38 points in mean scores. Finally, the "t" test of means was performed on the occupational task performance results. The mean score of the experimental group was 357.50 and that of the control group 484.67. The respective standard deviations were 85.38 and 148.02. The "t" value was found to be 2.75, which was significant at the .05 level, with 27 degrees of freedom.

CONCLUSIONS

The subjects' pretest and posttest experiences with the torque discriminator were responsible for some of the gain in the subjects' posttest scores. Mere orientation to the equipment probably resulted in the increase. It appears that taking the torque discrimination test on one occasion may cause some kinesthetic learning. It also appears that the learning was not enough to transfer to the occupational task performance of hole-tapping.

NOTE

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