



AOTA Evidence Briefs

Stroke

**A product of the American Occupational Therapy Association's Evidence-Based Literature Review Project*

S #22

The speed at which patients sand a board has greater influence on heart, lung, and metabolic function than the incline of the board

Muraki, T., Kujime, K., Su, M., Kaneko, T., & Ueba, Y. (1990). Effect of one-hand sanding on cardiometabolic and ventilatory functions in the hemiplegic elderly: A preliminary investigation. *Physical and Occupational Therapy in Geriatrics*, 9, 37–48.

Level IIC2c

Nonrandomized comparison of two or more groups or treatments in a quasi-experiment without randomization to group, condition, or sequence; less than 20 participants per condition or group; moderate internal validity; low external validity

Why research this topic?

Occupational therapists often have stroke clients perform sanding exercises with their impaired arm. Typically, to increase the challenge, therapists alter the speed of the sanding or the incline of the board being sanded. The exercises have the potential to improve cardiometabolic and pulmonary responses (heart, lung, and metabolic functions). Muraki and colleagues (1990) of Kobe University (Suma-ku Kobe, Japan), wondered which factor—the speed of sanding or the incline of the board—would have a greater effect on the outcomes.

What did the researchers do?

The researchers designed a study in which all the participants performed a sanding task under each of five conditions. In the first condition, called grade 1, the participants rested for 3 minutes in a chair with their sound arm resting on the table. In the second and third conditions, called grades 2 and 3, the participants sanded on a horizontal level (0 degrees) for 3 minutes with their sound arm, in grade 2 keeping pace with a metronome set to a speed of 15 cycles per minute and in grade 3 keeping pace with a metronome set to a speed of 30 cycles per minute. In the fourth and fifth conditions, participants sanded at an angle of 15 degrees for 3 minutes keeping pace with a metronome set to a speed of 15 cycles per minute (grade 4) and then 30 cycles per minute (grade 5). They took a 3-minute rest in the chair between exercises. An occupational therapist delivered the interventions in a hospital.

The outcome area of interest was *cardiopulmonary function* as measured by metabolic equivalent (MET) level (oxygen consumption); *pressure rate product* (arterial blood pressure times heart rate); and *volume of expired air*.

What did the researchers find?

On all three measures, there was a **significant** (see *Glossary*) difference between grade 1 and all the other grades, the latter producing larger values (indicating more exertion).

On the measures of MET level and pressure rate product, there also was a significant difference between grades 2 and 3 (which involved the same angle at different speeds).

On the measure of volume of expired air, there was a significant difference between grades 2 and 3 and between grades 4 and 5 (which also involved the same angle at different speeds).

What do the findings mean?

For therapists and other providers, the findings suggest that sanding exercises improve cardiometabolic and pulmonary functions. They also suggest that increasing the speed of sanding has a greater effect than increasing the angle of the board being sanded. The peak MET level achieved under the most intense condition (grade 5) was less than 2, which is comparable to MET levels of self-care activities and within the capabilities of stroke clients who do not also have heart disease.

What are the study's limitations?

First, maturation may have occurred because the researchers did not randomly assign the participants to various sequences. "Maturation is a threat when an observed effect might be due to the respondent's growing older, wiser, stronger, more experienced, and the like between pretest and posttest and when this maturation is not the treatment of research interest" (Cook & Campbell, 1979, p. 52). In this study all the participants did the conditions in the same sequence (instead of doing them in a random sequence). Therefore, fatigue, boredom, strength, and the like might have set in by the time the participants got to the later conditions, and such factors, rather than the speed or the incline, could have affected the outcome.

Second, the therapist who delivered the intervention may have known the study's hypothesis and unintentionally influenced the results.

Reference

Cook, T. D., & Campbell, D. T. (1979). *Quasi-experimentation: Design and analysis issues for field settings*. Boston: Houghton Mifflin.

Glossary

significance (or significant)—A statistical term, this refers to the probability that the results obtained in the study are not due to chance, but to some other factor (such as the treatment of interest). A significant result is one that is likely to be generalizable to populations outside the study.

Significance should not be confused with clinical effect. A study can be statistically significant without having a very large clinical effect on the sample. For example, a study that examines the effect of a treatment on a client's ability to walk, may report that the participants in the treatment group were able to walk significantly longer distances than the control. However, if you read the study you may find that the treatment group was able to walk, on average, six feet, while the control group was able to walk, on average, five feet. While the outcome may be statistically significant, a clinician may not feel that a one foot increase will make his or her client functional.

■ Terminology used in this document is based on two systems of classification current at the time the evidence-based literature reviews were completed: *Uniform Terminology for Occupational Therapy Practice—Third Edition* (AOTA, 1994) and *International Classification of Functioning, Disability and Health (ICIDH-2)* (World Health Organization [WHO], 1999). More recently, the *Uniform Terminology* document was replaced by *Occupational Therapy Practice Framework: Domain and Process* (AOTA, 2002), and modifications to *ICIDH-2* were finalized in the *International Classification of Functioning, Disability and Health* (WHO, 2001).

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For more information about the Evidence-Based Literature Review Project, contact the Practice Department at the American Occupational Therapy Association, 301-652-6611, x 2040.

