



# AOTA Evidence Briefs

## Brain Injury

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

### BI #15

## The coma-arousal procedure may reduce the duration of coma and increase patients' responsiveness.

Mitchell, S., Bradley, V. A., Welch, J. L., & Britton, P. G. (1990). Coma arousal procedures: A therapeutic intervention in the treatment of head injury. *Brain Injury, 4*, 273–279.

#### Level: IIB3c

Nonrandomized controlled trial, 2 groups, less than 20 participants per condition, low internal validity, low external validity

### Why research this topic?

Evidence suggests that sensory stimulation plays a **significant** (*see Glossary*) role in maintaining arousal of the **cortex** (*see Glossary*). The researchers hypothesized that sensory stimulation of patients in a coma following a severe head injury would expedite their recovery.

### What did the researchers do?

The researchers, variously of the University of Newcastle upon Tyne and Newcastle General Hospital (United Kingdom), tested their hypothesis with two groups of 12 participants (10 men and 2 women in each group). All 24 participants were being treated in the Neurological Unit of Newcastle General Hospital. They ranged in age from 17 to 42 years, with an average of 22.3 years in group 1 and 22.8 years in group 2. The researchers matched the groups closely in terms of age, gender, type and location of head injury, surgical intervention, and score on the Glasgow Coma Scale on admission.

After participants were stable (2 to 12 days following their injury), relatives of participants in the experimental group initiated the Coma Arousal Procedure. The procedure, pioneered at the Institute for the Achievement of Human Potential in Philadelphia, involved stimulating all five senses using simple devices or items contained in a kit (e.g., wooden blocks to strike together, a stiff-bristled brush, and brightly colored objects). The stimulation occurred in a sequence involving each of the five senses. Each successive sequence involved a change in the stimulus and, if possible, the location of its application. Five sequences constituted a cycle. Relatives administered one or two cycles a day. Across 4 days, the pattern of the sequence varied among cycles: pattern 1 on day 1, pattern 2 on day 2, and so forth. Then the variation repeated: pattern 1 on day 5, pattern 2 on day 6, and so on.

As part of patient-care routines, nurses and physiotherapists (the British term for physical therapists) provided **kinesthetic** (*see Glossary*), **proprioceptive** (*see Glossary*), and **vestibular** (*see Glossary*) stimulation beyond the usual **passive range of motion** (*see Glossary*) activities.

The control group received no intervention.

The researchers were interested in *average duration of coma* (measured in days) and *patients' responsiveness* (as measured by the Glasgow Coma Scale, administered weekly).

## What did the researchers find?

The average duration of coma was 22 days for the experimental group and 26.9 days for the control group. This difference was significant.

The experimental group also showed slightly greater improvement in responsiveness. Their weekly averages on the Glasgow Coma Scale were 5.16, 7.6, 11.4, and 14, compared with the control group's weekly averages of 5.08, 6.4, 9, and 13.08. The researchers did not test the significance of these differences.

## What do the findings mean?

- For *therapists and other providers*, the findings suggest that the Coma Arousal Procedure can reduce the duration of a coma and increase patients' responsiveness. The procedure's reliance on sensory stimulation implies a prominent role for occupational therapists in training patients' relatives to administer the procedure and to monitor the patients' activity.
- Informal observations during the study suggest that the procedure benefits patients' relatives, reducing their distress by giving them an active role in treatment.
- Readers should, however, compare the findings of this study with those of a study by Pierce et al. reported in the preceding issue of *Brain Injury* (Pierce, J. P., Lyle, D. M., Quine, S., Evans, N. J., Morris, J., & Fearnside, M. R. [1990]. The effectiveness of coma arousal intervention. *Brain Injury*, 4, 191–197). Pierce et al. found no advantage of a coma arousal program over conventional treatment.
- The findings suggest a direction for research: replication of the study with a larger sample, investigation of the long-term effects of the Coma Arousal Procedure, and exploration of whether there are critical periods of a coma when the Coma Arousal Procedure may be most effective.
- Research has not established the cost-effectiveness of professional, staff, or family and caregiver involvement in Coma Arousal Procedures. This lack of information suggests another direction for research: more rigorous investigation of the effects of Coma Arousal Programs and comparison of outcomes when health care professionals are involved versus when family members and caregivers are involved.

## What are the study's limitations?

The researchers' method of selecting their study participants was not systematic; that is, they matched the participants in each group according to various factors. This flaw in the study's design lowers confidence that the results can be attributed to the intervention.

The study provides useful information. However, it has limited generalizability for the persons with traumatic brain injury population across settings. Although the treatment represents current practice, the participants did not represent all age ranges and all types of head injuries.

## Glossary

**coma arousal**—attempting to arouse patients from a coma using sensory stimulation

**contracture**—“permanent shortening (as of muscle, tendon, or scar tissue) producing deformity or distortion” (*Merriam-Webster's Medical Dictionary*)

**kinesthetic**—relating to muscles and tendons

**passive range of motion**—arc of motion through which the joint passes when moved by an outside force

**proprioceptive**—capable of receiving stimuli originating in the muscle, tendons, and other internal tissues

**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.

**vestibular**—relating to balance

■ 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).

This work is based on the evidence-based literature review completed by Beatriz C. Abreu, PhD, OTR, FAOTA, and colleagues.

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.



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