

Teccce J J. Contingent negative variation (CNV) and psychological processes in man.

Psychol. Bull. 77:73-108, 1972.

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Contingent negative variation (CNV) is an event-related brain potential that appears as a baseline shift in the electroencephalogram. It is an accurate and objective neurophysiological indicator of psychological functioning. Magnitude of CNV bears a positive monotonic relationship to attentiveness and a curvilinear (inverted-U) relationship to arousal level. [The *Science Citation Index*® (SCI®) and the *Social Sciences Citation Index*® (SSCI®) indicate that this paper has been cited in over 200 publications since 1972.]

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In the early 1960s, I began the study of attention while a postdoctoral fellow at the National Institute of Mental Health. Then, in the late 1960s, while working on the electroencephalogram (EEG) and attention with Allan Mirsky at Boston University Medical Center, I read that Grey Walter had discovered a new event-related brain potential called contingent negative variation (CNV).¹ This EEG wave promised to be the neurophysiological window needed to access higher mental functions and immediately caught on with neuroscientists, particularly psychologists. I myself became intrigued with its promise as a sensitive and accurate indicator of attention functions.

There was a flurry of CNV research in the five years or so following Walter's discovery. Published findings seemed to fit an attention model extraordinarily well, and I began to draft a theoretical paper. However, reviewing the literature proved difficult. Some papers never went beyond an abstract; others were ambiguous or lacking in significant details of methodology and treatment of results. At times, I thought of giving up, but was spurred on by the likelihood of de-

veloping a simple attention model to explain the entire body of published CNV data. I also thought other investigators would benefit, as I did, from a summary and critical commentary. With more enthusiasm than reflection, I submitted a first version for publication. It was rejected for being too superficial, and rightly so. However, the comments of one referee were so clearly prejudiced that adrenaline began flowing freely, and I was off to a fresh start.

The journal's evaluation consumed four months and, in the interim, the literature had swelled. From 1969 to 1970, I worked extensively on a new draft while a visiting scientist in Keith Conners's laboratory at Massachusetts General Hospital. Upon finishing a "final" version, I felt uneasy with the simple proposition that the magnitude of CNV was associated with attentiveness. It struck me that Donald Hebb's inverted-U hypothesis of the relationship between arousal and behavior² was necessary to complement the attention-arousal theory of CNV development emerged.

One reason for the frequent citation of this review was the *Zeitgeist*. There was a compelling need for critical evaluation of conceptual and methodological issues. In addition, the attention-arousal model seemed to provide a heuristic function and generated new, testable hypotheses. With its clarity, accuracy, and comprehensiveness, the paper became a primer on CNV. I understand that young investigators have found the review helpful in initiating research. This didactic function is the one most satisfying to me, a teacher, and I delight in hearing about graduate students with a tattered reprint as their constant companion.

My own work benefited from summarizing the extensive CNV literature. The article literally opened a number of laboratory doors, and through exchange visits, both national and international, many lasting collegial and personal relationships have evolved. I recently published a sequel to this paper with Lynn Cattanaach, a graduate student in psychology at Yale.³

1. Walter W G, Cooper R, Aldridge V J, McCallum W C & Winter A L. Contingent negative variation: an electric sign of sensorimotor association and expectancy in the human brain. *Nature* 203:380-4, 1964. (Cited 365 times.)
2. Hebb D O. Drives and the C.N.S. (conceptual nervous system). *Psychol. Rev.* 62:243-54, 1955. [See also: Hebb D O. Citation Classic. *Current Contents/Social & Behavioral Sciences* 11(14):10, 2 April 1979.]
3. Teccce J J & Cattanaach L. Contingent negative variation. (Niedermeyer E & Lopes da Silva F, eds.) *Electroencephalography: basic principles, clinical applications and related fields*. Baltimore, MD: Urban and Schwarzenberg, 1982. p. 543-62.