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RECOVERY FROM NITROUS OXIDE-OXYGEN PSYCHOSEDATION AS DETERMINED--ETC(U).  
JAN 78 C H HAWKINS, E A RUSSELL, W A AYER

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RECOVERY FROM NITROUS OXIDE-OXYGEN PSYCHOSEDATION AS DETERMINED BY THE FUSION FREQUENCY OF FLICKER

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Major Christopher H. Hawkins  
Colonel Emery A. Russell, Jr \*\*  
Lieutenant Colonel William A. Ayer\*\*\*

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U.S. Army Institute of Dental Research  
Walter Reed Army Medical Center  
Washington, D.C. 20012

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- \* Resident, Periodontics, U.S. Army Institute of Dental Research, Washington, D.C. 20012
- \*\* Chief, Department of Surgery, U.S. Army Institute of Dental Research, Washington, D.C. 20012
- \*\*\* Chief, Advanced Theory and Science of Dental Practice Course, U.S. Army Institute of Dental Research, Washington, D.C. 20012

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RECOVERY FROM NITROUS OXIDE-OXYGEN PSYCHOSSEDATION  
AS DETERMINED BY THE FUSION FREQUENCY OF FLICKER

Psychosedation with nitrous oxide and oxygen has shown increasing use as an adjunct in reducing anxiety for dental patients<sup>1,2</sup>. Current techniques employ machines which deliver a mixture that can be varied up to a maximum of 50% nitrous oxide and a minimum of 50% oxygen<sup>3</sup>. One purported advantage of this psychosedation technique is the rapid recovery by the patient from its effects following its termination. Because nitrous oxide-oxygen psychosedation is used with ambulatory nonaccompanied dental patients it is important that the extent and duration of any residual effects from the clinical application of this technique be assessed.

Several investigators have studied the psychomotor effects of nitrous oxide-oxygen combinations when used as an anesthetic agent either alone<sup>4</sup> or in conjunction with other anesthetic agents<sup>5</sup>. Some investigations have evaluated the psychomotor effects of nitrous oxide when used in the nitrous oxide-oxygen psychosedation technique. Trieger, et al<sup>6</sup> demonstrated rapid recovery from various concentrations of nitrous oxide and oxygen in experimental situations by means of the modified Bender Motor Gestalt test. Ayer and Getter<sup>7</sup> investigated psychomotor effects of nitrous oxide-oxygen psychosedation on dental patients by means of the Reusch color and peg board tests and their findings indicated a return to normal function within three minutes after termination of the nitrous oxide. Machen, et al<sup>8</sup> obtained similar results with the peg board test when they investigated the effects of nitrous oxide-oxygen psychosedation on children receiving dental treatment. Goldstein and Goldstein<sup>9</sup> found a return to normal of vital signs (pulse, blood pressure and respiration) within five minutes of termination of nitrous oxide with patients receiving dental treatment.

The fusion frequency of flicker (FFF) is a perceptual phenomenon based on the rate of successive flashes of light from a stationary light source, at which the appearance of flickering disappears and the light appears to be steady and continuous. It has been shown that the FFF is a function of the CNS rather than the retina and is a sensitive method for determining, in a quantitative way, CNS involvement<sup>10</sup>. Berg, et al<sup>11</sup> have indicated that FFF is a more sensitive index of cerebral involvement than the EEG. It also has the advantage of testing simplicity, short duration of test determinations, and it is remarkably free of practice effects<sup>9</sup>.

Numerous studies using the FFF principle have been made of various disease states and strong correlations have been demonstrated with impairments induced by psychoses, cardiovascular disease and hypertension and various drugs.<sup>12,13,14</sup> Smith<sup>5</sup> and Vickers<sup>15</sup> used the FFF to determine recovery from several general anesthetic agents. Allen<sup>16</sup> utilized FFF to assess CNS effects of hyperventilation during general anesthesia.

The present study was undertaken to examine further the possible residual effects of nitrous oxide on cerebral function following its use as a psychosedative agent used in conjunction with dental treatment by utilizing fusion frequency of flicker determinations.

#### Materials and Methods

Twenty (20) male patients who were receiving nitrous oxide-oxygen psychosedation in conjunction with routine dental treatment volunteered to participate in this study. Testing was done at three periods: prior to and five and fifteen minutes after termination of the nitrous oxide administration.

The apparatus used was a #58017 Visual Perception Control\* designed to demonstrate flicker-fusion over a continuously variable range from 5 to 60 flickers per second. In accordance with FFF determination procedures suggested by Simonson and Brozek<sup>10</sup>, the light source was exposed under constant conditions at a constant distance utilizing discontinuous exposures of ascending frequency of flicker. The exposures were of one second duration repeated every four seconds. Two determinations were made at each test period. Prior to the first test the flicker-fusion phenomenon was demonstrated to the subject to ensure his understanding.

### Results

The subjects participating in the present study had a mean age of 26.2 years. Routine dental procedures were carried out on the subjects during the course of the nitrous oxide-oxygen administration.

The data were tabulated and are illustrated in Figure 1. The data were subjected to statistical analysis using paired t-tests. The results of the analyses of all comparisons (time 1 vs. time 2; time 1 vs. time 3; and time 2 vs. 3) were not statistically significant at the .05 level, thus indicating that the FFF did not differ over testing periods. It thus may be inferred that visual perceptual impairment did not occur in the present study.

### Discussion and Summary

There do not appear to be any residual cortical effects, as determined by FFF measurements, resulting from nitrous oxide-oxygen psycho-sedation used as an adjunct to dental treatment.

The results support the findings of previous studies<sup>6,7,8,9</sup> which

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\* Lafayette Instrument Co.,  
Sagamore Parkway & 9th St. Rd.  
Lafayette, Indiana 47092

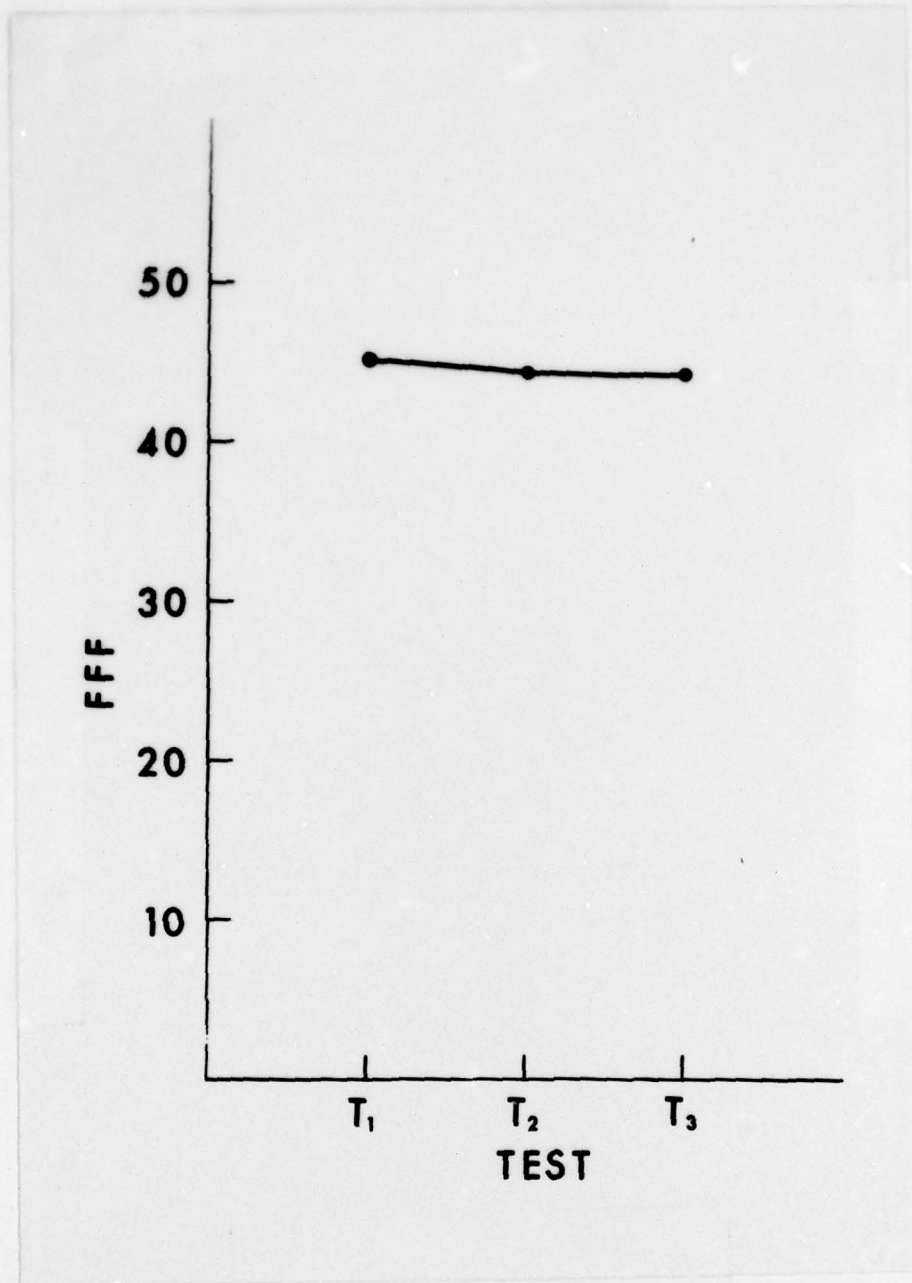


Figure 1. Mean FFF scores of subjects over testing Time 1, Time 2 and Time 3.

indicated that the effects of nitrous oxide-oxygen sedation on dental patients were reversible within a period of three to five minutes of its termination. In this study, as in previous studies, the patients were oxygenated for approximately three minutes after the nitrous oxide had been discontinued. The expectation that there would be a return to normal at the first post treatment determination (five minutes post operative) was confirmed.

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Requests for reprints should be addressed to:

Major Christopher H. Hawkins  
SGRD-UDE  
US Army Institute of Dental Research  
Washington, D.C. 20012