

Introduction

Nitrous oxide/oxygen inhalation sedation is widely used to alleviate anxiety and improve cooperation during dental procedures in children, but its effects on memory formation remain incompletely understood.¹ While previous studies have documented the anxiolytic and sedative properties of nitrous oxide, few have systematically examined its influence on anterograde memory in a clinical pediatric population.² The amnesic property of nitrous oxide/oxygen inhalation sedation is one that allows some patients not to recall the severity of their pain or duration length of an appointment.³ This study aimed to prospectively study whether nitrous oxide inhalation during dental procedures affects children's ability to recall a simple image presented prior to treatment, compared with a control group receiving no sedation.

Hypothesis

Nitrous oxide inhalation sedation does not cause anterograde amnesia in children.

Purpose

The purpose of the study is to determine whether nitrous oxide inhalation sedation used for restorative dental procedures causes anterograde amnesia in children, specifically impairing their ability to form new memories during dental procedures.

Results

A total of 80 children participated, with 40 receiving nitrous oxide/oxygen inhalation sedation and 40 receiving routine care. Image recall after treatment was similar between groups (nitrous: 87.5%, control: 92.5%), with no statistically significant difference ($\chi^2 = 0.139$, $p = 0.709$). Logistic regression analysis also showed that nitrous oxide concentration ($B = -0.024$, $p = 0.766$) and duration of exposure ($B = -0.004$, $p = 0.949$) were not significant predictors of recall, and the overall model was not significant ($\chi^2(2) = 0.131$, $p = 0.937$; Nagelkerke $R^2 = 0.006$).

Material & Methods

This experimental study included 80 children ages 3–14 receiving dental treatment at the University of Toledo College of Medicine and Life Sciences Department of Dentistry at ProMedica Toledo Hospital. Children received either nitrous oxide sedation during restorative treatment or routine dental care without sedation, based on their scheduled procedure. Before treatment, each child was shown a simple picture card for five seconds and asked to name it. After the procedure, once the child returned to baseline, they were asked if they remembered the picture to determine whether amnesia occurred.

Demographics

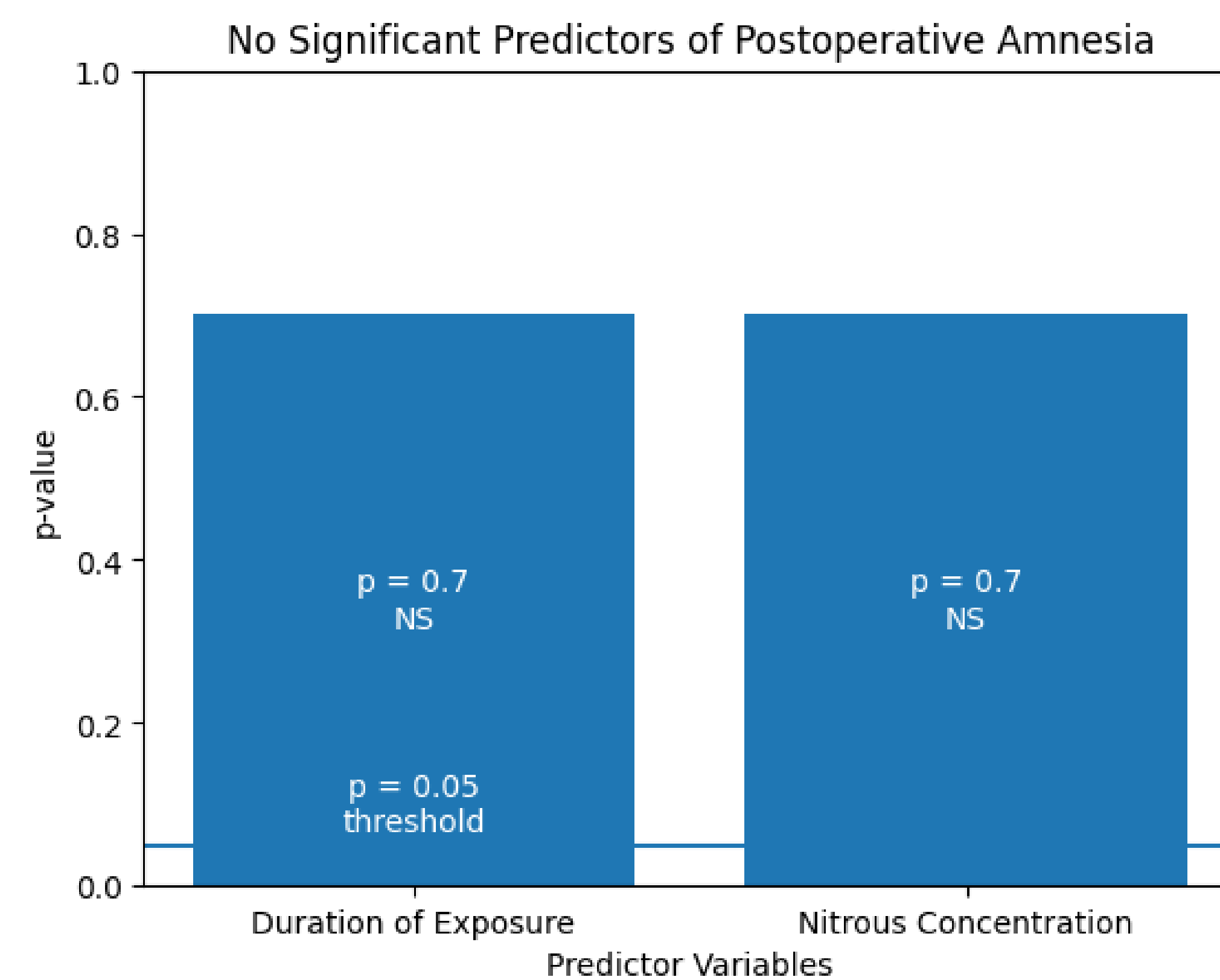
Variable	Value
Total Subjects	80
Mean Age (years)	8.85+2.98
Female	38
Male	42

Contingency Table

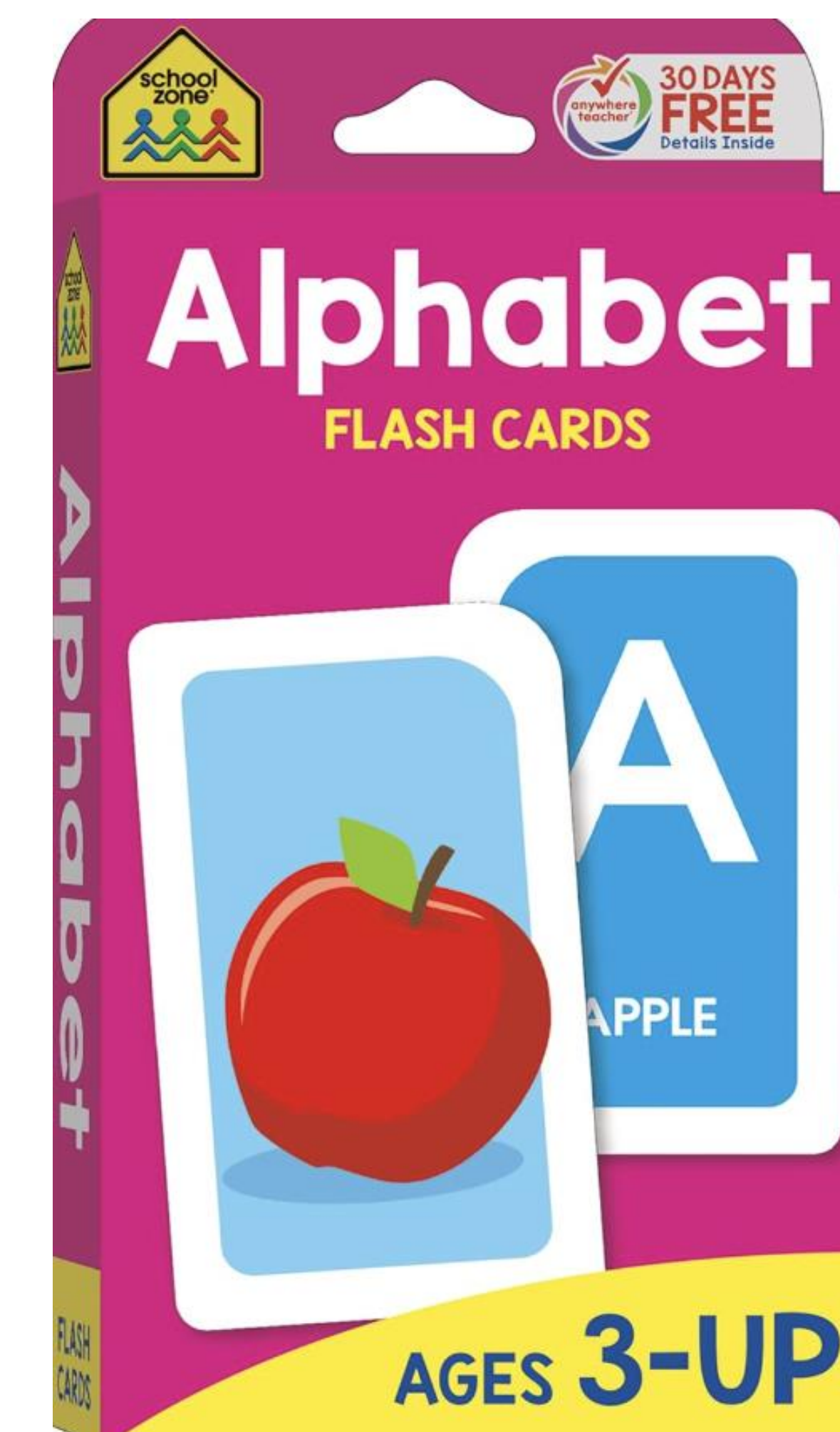
Group	Amnesia (0)	Recall (1)	Total
Nitrous	5	35	40
Recare	3	37	40
Total	8	72	80

Chi-square Analysis

Statistic	Value
Chi-square	0.139
Degrees of Freedom	1
P-value	0.709



Neither nitrous oxide concentration nor duration significantly predicted postoperative amnesia ($p > 0.05$).



Statistical Analysis

Using a Pearson chi-square test no statistically significant difference was found between sedation group and postoperative amnesia ($\chi^2(1) = 0.139$, $p = 0.709$; significance set at $p < 0.05$). A binary logistic regression was also performed to determine whether nitrous oxide concentration or exposure duration predicted recall. The model was not statistically significant ($\chi^2(2) = 0.131$, $p = 0.937$), and neither concentration ($p = 0.766$) nor duration ($p = 0.949$) significantly predicted recall, indicating that nitrous oxide dose did not meaningfully influence memory outcomes in this sample.

Discussion

This study found no significant difference in recall between children who received nitrous oxide sedation and those who received routine care, suggesting that nitrous oxide at typical dental concentrations does not reliably cause postoperative amnesia. Nitrous oxide mainly reduces anxiety and provides mild sedation, so most children still remember the experience. Clinically, this supports its use to improve comfort and cooperation, though it may not be effective when memory suppression is desired. Limitations include the non-randomized design, use of a single recall task, and the study being conducted at one clinical site.

Conclusion

- Nitrous oxide sedation did not cause postoperative amnesia in children during routine dental procedures.
- Nitrous oxide concentration and exposure time were not related to recall.
- These findings suggest nitrous oxide is a safe and effective method to reduce anxiety while maintaining awareness and memory.
- Future directions: compare nitrous oxide with oral sedatives (e.g., meperidine) to better understand how different sedation methods affect memory in pediatric dental patients.

References:

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