Title
A MAZE TEST AS A MEASURE OF RECOVERY FROM ANESTHESIA

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Introduction
It is important to establish the reliability of any test used to measure post operative recovery since improving test scores after anaesthesia can be either an effect of practice and learning or represent true recovery from anaesthesia. This study was undertaken to establish the reliability and validity of a maze test used for this purpose.

Method
Four different mazes of an oblong box 'brick wall' pattern were chosen. Each maze measured 16 cm by 21 cm with a path width of 3 cm within the maze, and the patient started at the bottom and worked towards the top of the page. Only one path was possible through the maze; 1 minute was allowed for each maze, and the path length traced in this time was measured as the test score. The total path lengths of the 4 mazes ranged from 64 to 68 cm. Each maze was constructed of increasing difficulty - in the first third, a wrong turning entered a closed cell; in the second third, a wrong turning traversed one cell before entering a closed cell; and in the last third, a wrong turning traversed 2 cells before entering a closed cell.

In the first part of the study, 50 control subjects were given the 4 mazes in random order to perform consecutively at 1 minute intervals. To detect evidence of learning, results were expressed as a percentage of the first test score. In the second part of the study, designed to determine the sensitivity of the test, 24 day surgery patients, ages 18 to 36 yrs were studied. Anaesthesia was induced with either alfentanil-propofol (Group A) or fentanyl + pentothal (Group B), followed by enflurane, and of total duration less than 15 mins. The patients were given 2 consecutive mazes to perform pre-operatively, and then 1 maze at 30 min and 60 mins after the end of anaesthesia. Post operative scores were expressed as a percentage of the 2nd pre operative test score. Before performing each post operative test, patients were given a 10cm visual analogue scale (VAS) to measure subjective assessment of sedation. The ends were labelled either 'asleep' or 'mentally fully alert'. Analyses were by ANOVA and the t-test with a statistical significance level of 5%.

Results
Controls
Inspection of the results for each of the 4 different mazes revealed a normal distribution, (skewness co-efficient ranged -0.4 to 0.5, kurtosis co-efficient ranged -0.4 to 0.6), and 4-factor ANOVA showed no statistical difference in difficulty between any of the 4 mazes. During the data collection, it was clear there were 2 groups; 23 subjects (46%) showed clear evidence of improvement with practice, while 27 subjects (54%) showed no improvement with practice - see Fig 1.

Discussion
Another common paper and pencil test is the letter cancellation test, which has a marked learning/practice effect. The results of this study show that mazes also have a learning/practice effect, but only for 46% of the subjects, and that this can be compensated for by a single practice attempt before taking the baseline score. Performance at 30 mins after brief anaesthesia was depressed to 56 - 86% of baseline (0.37< t <1.37); this is similar to the sensitivity of the letter cancellation test where there was a depression to 86-90% of baseline (0.56< t <1.37)2. There is a correlation between maze performance and patient's assessment of their own sedation, but maze performance returns to baseline before patients feel fully recovered. This suggests the maze test may not be sensitive enough to detect low levels of psychomotor impairment, and patients are able to raise their performance for the short period of the test while still suffering residual sedation.

Conclusions
A maze test had a learning effect in 46% of subjects which could be compensated for by a single practice attempt before taking the baseline test. It was found to be a valid test of recovery from anaesthesia, could distinguish between 2 anaesthetic techniques, and there was a correlation between maze score and a VAS sedation score. Maze score returned to baseline before the patients assessed themselves fully recovered from anaesthesia.

References