

# USE OF A DIGITAL PEN TO ADMINISTER A PSYCHOMOTOR TEST.

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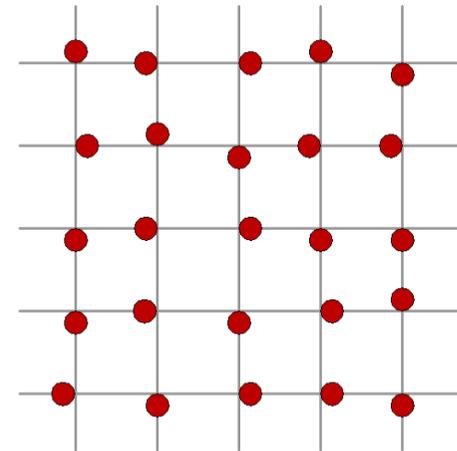
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## Introduction

Psychomotor and cognitive tasks are increasingly administered by computer, and the use of a computer with pen input has many advantages. The interface is straightforward and easy to use (Tseng et al., 1998). A wider range of tests can be automated than with a conventional computer (see e.g. Cameron et al., 2001; Fryer et al., 2000). The devices are very portable, and can easily be used in a hospital ward or in a club setting (Parrott and Lasky, 1998). However the screens on such computers are too small for some types of test, and the feel of the pen on the screen is not the same as that of paper, raising questions of equivalence with speeded tests.

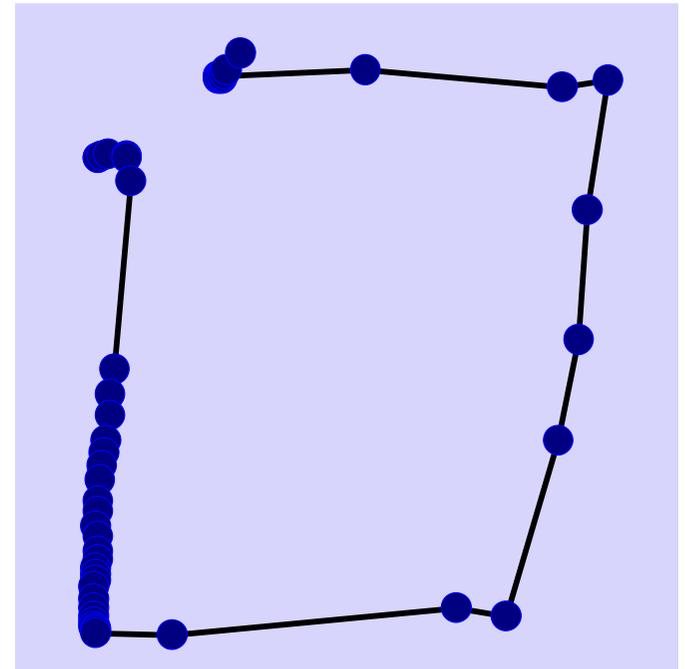
Recently a new digital pen and paper system (Anoto®) has been introduced which records pen strokes as they are made by scanning an irregular pattern of small dots on the paper (right). The dots are not visible in normal use, the paper simply appearing slightly off-white. This system can obtain speed and accuracy of a pen based task in a similar way to a pen tablet, but has the advantages that the pen writes with a conventional ball-point, giving a normal feel, and test material can be prepared on paper sizes of A4 or larger if needed. The present study uses a very simple psychomotor task to assess the suitability of the digital pen for this purpose.



## Methods

We studied seven volunteers, 3 male, 4 female, aged 20-22 who were taking part in a larger study on ethanol and motor control. They were asked to draw ten 1cm squares as quickly as possible on a sheet of paper without being able to see what they were drawing. They did this before and 45 minutes after consuming a dose of ethanol producing blood alcohol concentrations of 60-85 mg/100 ml (mean 73).

The pen used was the Logitech io, which provided xy coordinates of the position of the pen as well as pressure information at a fixed sampling rate of 100 Hz. Data were transferred to an XML file on a PC. An example of a digitised square is shown on the right. The data were then analysed using SAS.



## Results and Discussion

The sizes of the sides of the squares drawn were increased by 6.8% in the ethanol condition ( $p < 0.05$ , Wilcoxon signed ranks test), showing an increase in size similar to the findings from other measures in the study. The mean time to write the squares decreased by 5.2%, but this difference was not significant. These results show that the digital pen is a practicable method of administering a psychomotor test. It allows automation of data collection but also obtains information on stroke speed that cannot be obtained using a normal pen.

The square drawing task used a blank sheet of Anoto® paper, but test material can be printed on the digital paper, allowing automation of tests such as Mazes, Digit-Symbol Substitution, and Trail-Making

# References

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