

Zig-zag tracking: Evaluation of a test of psychomotor speed and accuracy designed for repeated administration.

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Background

Performance in psychomotor tasks involves both speed and accuracy. These can be traded off against each other, with fast performance being associated with low accuracy (or high error rates), while slower performance allows high accuracy. The speed-accuracy trade-off adopted in a particular situation depends on a number of factors, including individual style, the instructions given, and rewards or feedback based on test performance (Wickelgren, 1977).

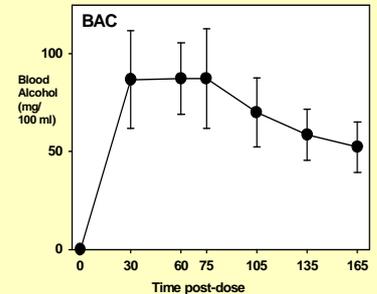
Drugs that affect performance may differentially affect speed and accuracy. Benzodiazepines slow performance on a number of psychomotor tasks with little effect on accuracy. Ethanol has a quite different profile, increasing errors, but with less effect on speed (Tiplady et al., 2003). It is therefore important to measure both speed and accuracy of psychomotor performance

Paper and pencil tracking tasks such as the Spiral Maze (Gibson, 1978) have proved particularly useful. The Spiral Maze, however, exists in only a single version, and it is desirable to have multiple equivalent versions for use in human behavioural pharmacology. The recently developed Zig-zag Tracking Test (ZZTR) has been designed to facilitate version generation by using a repetitive shape.

Methods.

The total time to complete the ZZTR was recorded, and an error score was calculated by adding one point each time the pen touched the side of the track or an obstacle, two points if it crossed or penetrated the boundary.

The test was evaluated in a study in which 7 female and 4 male volunteers aged 18-25 received ethanol and placebo as part of a larger study. Performance on ZZTR and other tests including the Gibson Spiral Maze (GSM) was assessed before ethanol and at 30, 75 and 135 minutes post dose. Tests were practiced twice before baseline assessment. Blood alcohol concentrations were measured using a breathalyser.



Results

Maximum blood alcohol concentrations (BAC) were obtained at 30 minutes post-drink (mean 86.8 mg/100ml, S.D. 25.0).

Both ZZTR and GSM showed increased error scores with ethanol at all time points, with no significant effect on speed.

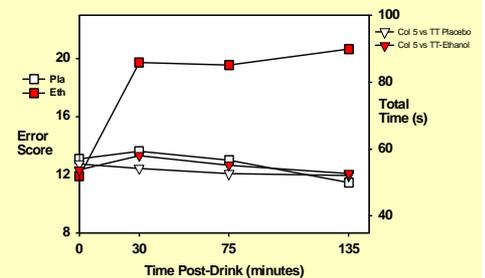
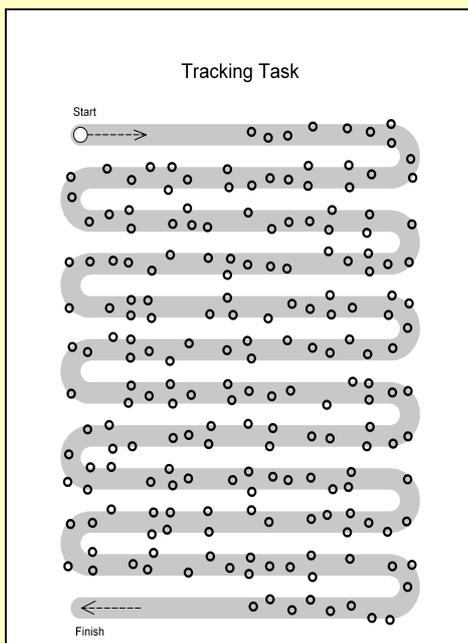


Table 1. Effects of ethanol on speed and accuracy.

Task, Measure	30 minute Time-Point		
	Placebo	Ethanol	t, sig
Spiral Maze			
Time (s)	31.6 (4.92)	32.5 (5.68)	0.67 n.s.
Error Score	4.73 (4.08)	8.27 (6.45)	2.62*
Zig-Zag Tracking			
Time (s)	54.2 (9.8)	58.1 (13.6)	1.68 n.s.
Error Score	13.6 (13.1)	19.7 (12.3)	2.45*

Means are shown, (standard deviation in brackets). Statistical analysis used ANOVA. * p<0.05; n.s. not significant



Discussion and Conclusions

These data confirm results from previous studies showing that ethanol impairs accuracy but not speed of performance in this type of tracking task. Error scores on both tracking tasks showed similar sensitivity to the effects of ethanol.

The regular structure of the ZZTR allows the standardized generation of multiple versions of equivalent difficulty, particularly important in psychopharmacology, where a test may be performed many times by a particular volunteer.

Further development of the test will involve the use of a digital pen/paper system. This will allow automation of scoring of both speed and accuracy in the task, and will also make it possible to obtain more detailed information about performance on the task.

References.

- Gibson, H. B. 1978, Manual to the Gibson Spiral Maze, 2 edn, Hodder and Stoughton Educational, Sevenoaks, Kent.
- Tiplady, B., Hiroz, J., Holmes, L., & Drummond, G. (2003) Errors in performance testing: a comparison of ethanol and temazepam. *J.Psychopharmacol.*, 17:41-49.
- Wickelgren, W. A. (1977) Speed-accuracy tradeoff and information processing dynamics. *Acta psychologica*, 41:67-85.

Copies of the Zig-zag Tracking Test may be obtained from Brian Tiplady , email: brian@penscreen.com web: www.penscreen.com