Strategy Sophistication and Accuracy:
Adult Performance on an Oddball Number Line Task

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Introduction

- Individual differences on number line task performance are correlated with mathematics achievement.
- Strategies used by adults to complete this task have yet to be investigated.
- The current study aimed to identify predictors of accuracy on an oddball number line task. Spatial skill, mathematical performance, and strategy type were examined.
- **Hypothesis**: Participants who employ more sophisticated strategies (i.e. using multiple landmarks) will have a higher degree of accuracy on this task.

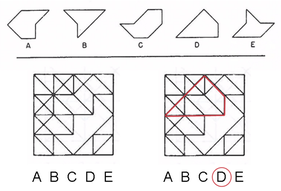
Method

Participants: N=121 adults

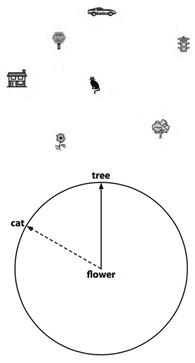
Procedure:

Spatial Measures

Hidden Figure Test:



Spatial Orientation Task:



Math Measures

Ordering Task:

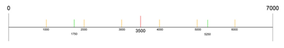
Keymath™:
Diagnostic assessment of mathematical concepts and skills.

Strategy

Upon completion of all number line trials participants were asked to report any strategies used to identify the location of the target number.

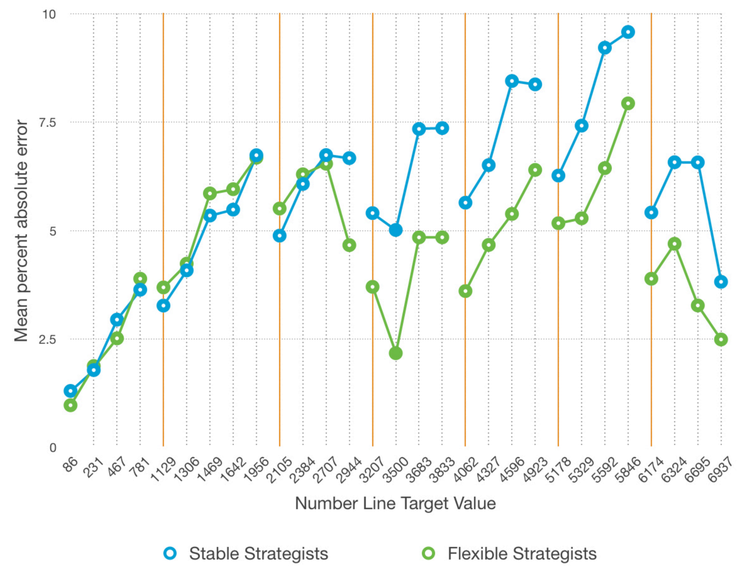
Stable: Reported using a single landmark (e.g. midpoint)

Flexible: Reported using multiple landmarks (e.g. midpoint and thousand points).



Results

Figure 1. The relationship between strategy and accuracy in an oddball number line task.



A hierarchical multiple regression was run to identify skills that predict performance on the number line task. The full model of gender, spatial skills, numeracy knowledge, and strategy sophistication level was statistically significant, R^2=.21, $F(6,114)=4.89$, $p<.0005$; adjusted R^2=.163.

Table 1. *Hierarchical Multiple Regression Prediction VO_2max from Gender, Spatial Skills, Numeracy Knowledge, and Strategy Sophistication.*

VO_2max

	Model 1		Model 2		Model 3		Model 4		Model 5	
Variable	B	β	B	β	B	β	B	β	B	β
Constant	4.38**		4.57**		6.55**		8.91**		10.06**	
Gender	.51	.11	.31	.07	.34	.07	.22	.05	.15	.03
Sp. Or.			.02*	.20	.01	.15	.01	.10	.01	.08
HFT			-.11	-.14	-.12	-.15	-.08	-.10	-.09	-.11
Ordering					-2.66*	-.24	-1.67	-.15	-1.48	.13
Keymath							-.24*	-.23	-.22*	-.22
Strategy									-.82*	-.18
R^2	.011		.083		.138		.175		.205	
F	1.37		3.53*		4.66*		4.87**		4.89**	
ΔR^2	.011		.072		.055		.036		.030	
ΔF	1.37		4.57*		7.46*		5.05*		4.32*	

Note: N=121. * $p<.05$, ** $p<.001$.

Discussion

- The striking pattern of increasing error within each thousand range (e.g, 2000 – 3000; Fig. 1), along with better performance at the midpoint and endpoints, suggests that adults are using proportional reasoning strategies based on landmarks.
- Flexible strategists made less error on targets greater than 3500 (the midpoint), compared to stable strategists.
- Both stable and flexible strategy groups underestimated the value of the midpoint, but the stable strategists do so to a larger degree.
- Overall, performance on the number line task was related to strategy group and to mathematical problem solving skill.

Table 2. *Simple correlations between measures and dependent variable.*

Predictors	Gender	Spatial Orientation[a]	Hidden Figure Test	Ordering Task	*KeyMath*™	Strategy Level
Mean % of absolute error for all NL trials	.106	.248**	-.185*	-.276**	-.371✚	-.234**

Note: [a]Mean deviation; *$p<.05$; **$p\leq.005$; ✚$p<.0005$.

Participants who incorporate multiple reference points into their strategy perform more accurately on the number line task than those who use a single reference point. The relationship between strategy and accuracy is especially evident for targets in the upper range.

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