Everyday Spatial Experience, Video Games, and Their Influence on Spatial Abilities

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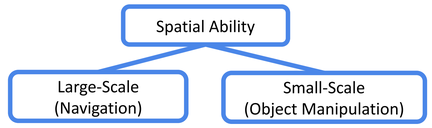
Introduction

- Spatial ability is **malleable** (Uttal et al., 2013) and **multi-faceted** (Hegarty & Waller, 2005)



- Does everyday experience with hobbies and activities affect large and small-scaled spatial abilities?
- Video game experience is related to small-scale spatial abilities (Bediou et al., 2018)
- Many navigation measures involve a video game style interface. Does experience playing video games affect task performance?

Hypotheses:

- **H1:** Navigation will correlate with large-scale measures (more than small-scale)
- **H2:** Gaming and Creative will correlate with small-scale measures (more than large-scale)
- **H3:** Video Game Experience will correlate with Desktop tasks more than Immersive tasks

Method

Participants – 178 (110 female, age 18-34) Part of large Immersive VR study (10 hrs, 40 tasks)

- **SoCal Spatial Activities Questionnaire**
  5 Components (Sub-scales)
  - **Navigation** - *camping, hiking, fishing, sailing*
  - **Gaming** - *video games, football, baseball, chess*
  - **Creative** - *drawing, painting, gymnastics, ballet*
  - **Fitness** - *racquetball, tennis, bowling, jogging/walking*
  - **Technical** - *programming, web/game design, drawing maps*
- **Video Game Experience Questionnaire (VGE)**

Example item from SoCalSAQ

Daily

For the following activities, rate each one on a scale from 1 to 6 with 1 indicating that you have never participated in the activity and 6 indicating that you have participated **everyday**. Answer about the time in your life when you were most engaged in this activity, e.g. if you used to play a sport everyday but no longer play it, answer 6 indicating everyday.

Jogging/walking

1 (Never) | 2 | 3 | 4 | 5 | 6 (Everyday or more)

Example item from VGE

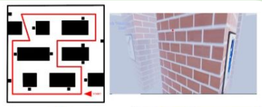
How much video game experience do you have?

A great deal
A lot
A moderate amount
A little
None at all

Measures of Spatial Ability

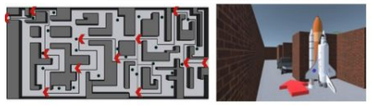
Large-scale

Dual-Solutions Paradigm (Immersive VR)

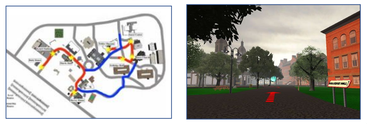


Maze (Immersive VR)

Route Learning (Desktop)

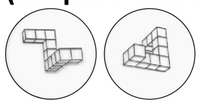


Virtual SILCton (Desktop)

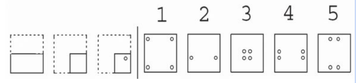


Small-scale

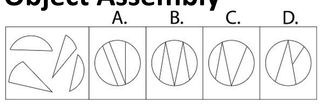
Mental Rotation (Shepard & Metzler, 1978)



Paper Folding



Object Assembly



Combined Measure of Large-Scale and Small-Scale (each task equally weighted)

Results

Experience and Large-Scale Measures

Task	Outcome Measure	Navigation	Gaming	Creative	Fitness	Technical	VGE
DSP	Pointing	.15*	.16*	.19*	.10	.12	.12
	Efficiency	.10	.19*	.00	.03	.06	.10
	Shortcuts	.13	.26*	.06	.05	.08	.28*
Maze	Pointing	.13	.41*	.04	.05	.20*	.34*
	Efficiency	.16*	.20*	.08	.09	.07	.21*
	Accuracy	.17*	.34*	.08	.06	.09	.31*
Route	Error	.12	.37*	.09	.20*	.21*	.39*
SILCton	Pointing (Within)	.15	.33*	.05	-.01	.07	.29*
	Pointing (Between)	.12	.24*	.03	.09	.25*	.19*
	Map Reconstruction	.13	.23*	.14	.06	.18*	.23*
SBSOD	Score	.26*	.25*	-.02	.14	.14	.21*

Experience and Small-Scale Measures

Task	Outcome Measure	Navigation	Gaming	Creative	Fitness	Technical	VGE
Mental Rotation	Avg of Score and Time	.16*	.32*	.07	.08	.20*	.25*
Object Assembly	Score	.02	.23*	.00	.02	.15*	.16*
Paper Folding	Score	-.04	.12	.12	-.03	.30*	.08

Comparison of Correlations

Combined Measure	Navigation	Gaming	Creative	Fitness	Technical	VGE
Large-Scale Measures	.21*	.43*	.09	.15	.20*	.35*
Small-Scale Measures	.04	.29*	.09	.02	.30*	.20*

$p = .11$

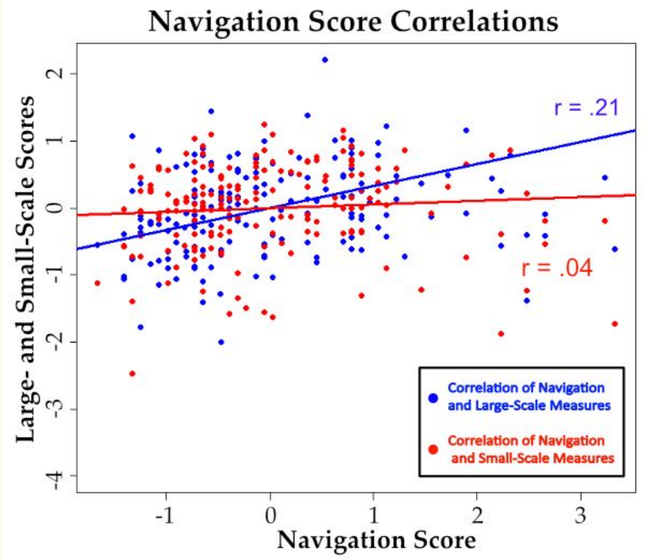
Combined Measure	VGE
Desktop	.33*
Immersive VR	.26*

n.s.

*$p < .05$

- **H1** - Navigation activities correlated more with large-scale measures than small-scale, (trending, $p = .11$)
- **H2** - Not supported, Gaming activities are correlated with both small-scale and large-scale measures
- **H3** - Not supported, Video game experience correlated with both desktop and immersive VR tasks (difference n.s.)

Results (continued)



Discussion

- More everyday navigation experience predicts higher navigation ability; does not predict object manipulation ability
- Gaming experience (video games and certain sports) predicts both navigation and object manipulation ability
- Video game experience predicts object manipulation ability and navigation in both desktop and Immersive VR tasks
- Future directions - re-analyze with full n=250 sample, mediation, sex differences, causality

References

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