

Introduction

Biological motion perception is often assessed using a single task. However, it was shown that there are at least two distinct processes at work, one based on local motion information and one based on integrating information about the structure across the display (Troje and Westhoff, 2006). Along with other recent results, this suggests that biological motion is analyzed via a hierarchy of perceptual abilities, including:

- The ability to perceive (any) motion.
- Figure-ground segregation.
- Local motion processing – “life detection”
- Perceptual organization (structure-from-motion).
- Assigning meaning: action, style, identity.

We have developed a battery of tests, **BMLtest**, that measures these abilities independently, producing a profile for each individual. Test scores can be used to examine individual differences (and therefore the relations between abilities), or population differences.

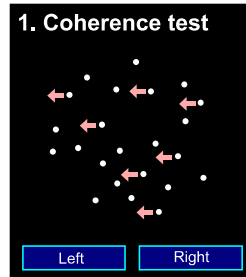
Applications

- Neuropsychology
- Autism spectrum disorders
- Functional imaging
- Developmental psychology
- Aging
- Peripheral vision
- Prosopagnosia

General Principles

- All stimuli derived from motion-capture data, rather than Cutting's (1978) animation (see Saunders, Suchan, and Troje, 2009)
- Use QUEST when applicable, to efficiently measure a wide range of performance levels.
- Each test brief, 2-6 minutes

The Tests



Basic motion integration

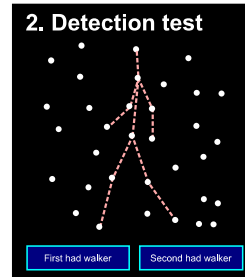
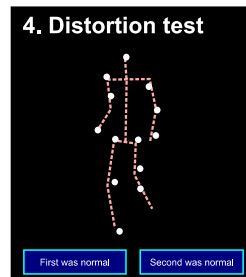


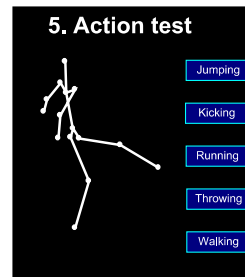
Figure-ground segregation



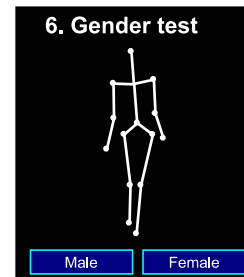
Local motion invariant processing



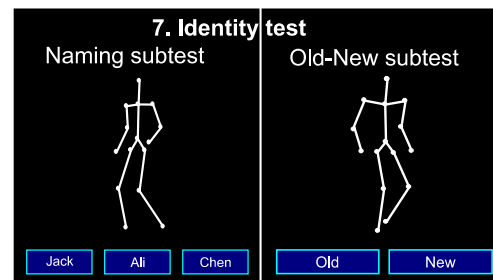
Structure-from-motion



Action categorization



Style recognition



Person recognition

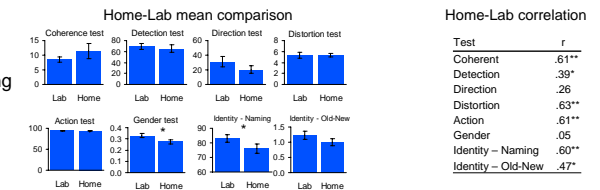
Conclusions

- **BMLtest** efficiently assesses the major components of biological motion processing.
- It is effective in a home testing environment.
- The measured abilities are relatively independent.

Evaluation

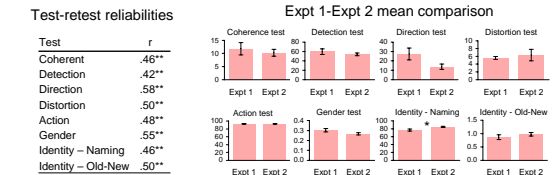
Experiment 1 – Robustness to setting

- $N = 30$ undergraduates
- All completed battery in the lab and on their home computer via the internet, order randomized
- < 30 minutes on average
- Similar test means between lab and home
- Most tests correlated highly between lab and home



Experiment 2 – Normative data and test-retest reliabilities

- $N = 65$ undergraduates
- Took all tests at home twice, separated by one week
- All test-retest reliabilities significant, and similar test means to Experiment 1



- Evidence for independence of underlying constructs from lack of correlation between tests

	Coherent	Detection	Direction	Distortion	Action	Gender	Identity – Naming	Identity – Old-New
Coherent	—							
Detection	0.07	—						
Direction	0.05	0.08	—					
Distortion	0.06	-0.28	-0.11	—				
Action	0.13	0.30	-0.07	-0.26	—			
Gender	-0.04	0.00	-0.10	0.24	-0.07	—		
Identity – Naming	0.13	0.33	0.17	-0.20	0.23	-0.03	—	
Identity – Old-New	0.24	0.32	-0.17	-0.25	0.24	0.15	0.51*	—

* Indicates significance at .05 after sequential Bonferroni correction.

References

- Cutting, J. E. (1978) Program to generate synthetic walkers as dynamic point-light displays. *Behavior Research Methods & Instrumentation*, 10, 91-94.
- Saunders, D. R., Suchan, J. & Troje, N. F. (2009) Off on the wrong foot: Local features in biological motion. *Perception*, 38, 522-532.
- Troje, N. F. & Westhoff, C. (2006) The inversion effect in biological motion perception: Evidence for a “life detector”? *Current Biology*, 16, 821-824.