

Executive control, skill acquisition and training

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My evolving study of processing and response limitations on coping with task demands

- **On the Economy of the Human Processing system:** Performance as a combined product of resource availability and attention policy. (*Navon and Gopher, 1979 Psych Review, Gopher Brickner and Navon 1980 JEP:HPP*)



- **Strategies of attention and management policy** (*Gopher et al 1989, Acta Psychologica, Donchin and Gopher, 1986 Handbook Human Perception and Human Performance*)



- **The Skill of Attention Control.** (*Gopher 1993, Attention and Performance XIV; Gopher et al. 1994, Human Factors*).

Functional View of Skills

- Skill is a well organized knowledge base in long term memory acquired with experience for the performance of a targeted task.
- These memory bases serve to facilitate and improve the ability to respond to recurrent events as well as cope with and adjust to related events.
- Performance of any given task is a joint product and a meeting point between environmental requirements (bottom up) and performer existing knowledge bases (top down).
- Task formation and the development of skill knowledge bases are guided and supervised by intents, objectives and goal directed behavior.

A task can be described across many aspects

Display

2,6,3,7,1,8,9,4



Responses

A Key, B Key



Presentation mode

Visual, auditory

Time and trial

sequence structure

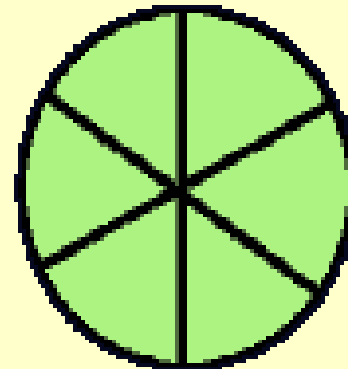


Possible Assignments

- $A < 5, B > 5$
- A odd, B even
- Sum of pairs, larger smaller than 10
- A a digit with a close circle, B no close circle



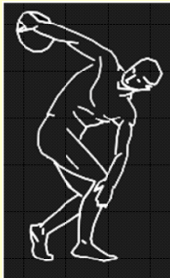
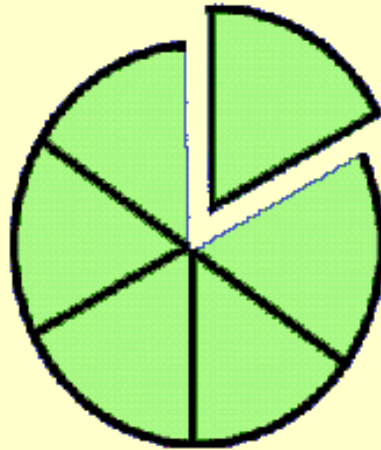
Performance Instructions Reward Structure



????

Task shell – the binding representation

All “separate elements” are combined together to create a “**task shell**”, in the service of intentions and goal directed behavior (Gopher 2004).



Control Processes Formulate Task Shells

- Control processes are the class of processes that initiate, coordinate, synchronize, and regulate the conduct of goal directed behavior (Norman, Shallice, Baddely, Hitch, Allport, Umilta, Meyer, Logan, Monsell, Cohen, Carlson, Gopher).
- Control processes are also those that bind together all task elements to establish a coherent task shell in the service of intentions.
- The formation of a task shell is the building block of the conduct of purposive behavior
- **The three constituents of a skill:**
Elementary capabilities, control strategies, metacognitive knowledge.

The emphasis change training protocol

Emphasis change is a training protocol under which subjects are required, during training, to systematically change their emphasis (effort, attention allocation policy) on major sub-components of the performed tasks.

Emphasis levels are varied between few minute practice trials or pre-specified short durations of task performance.

The value of emphasis change training

- Introduces variability as a major component of the training.
- Force trainees to explore alternatives and discover best match.
- Create a more flexible and adjustable Task Shell
- Train executive control skills

Why does variability in training help?

- Introduces trainees and leads them to explore a larger performance alternatives and attention strategies space. Teach them the merit of alternatives and the ability to cope with them (Erev & Gopher, 1999).
- Leads to the formation of a more general and adaptive “**task shell**” which incorporates variability and the need to cope with variability as basic features (Gopher, 2004).

Current and forthcoming directions of research

- 1. The contribution of control processes and executive control training of high demand skills
- 2. Can control and executive control be trained in separate settings and be transferred?

(High demand tasks; cognitive training in sport, aging)

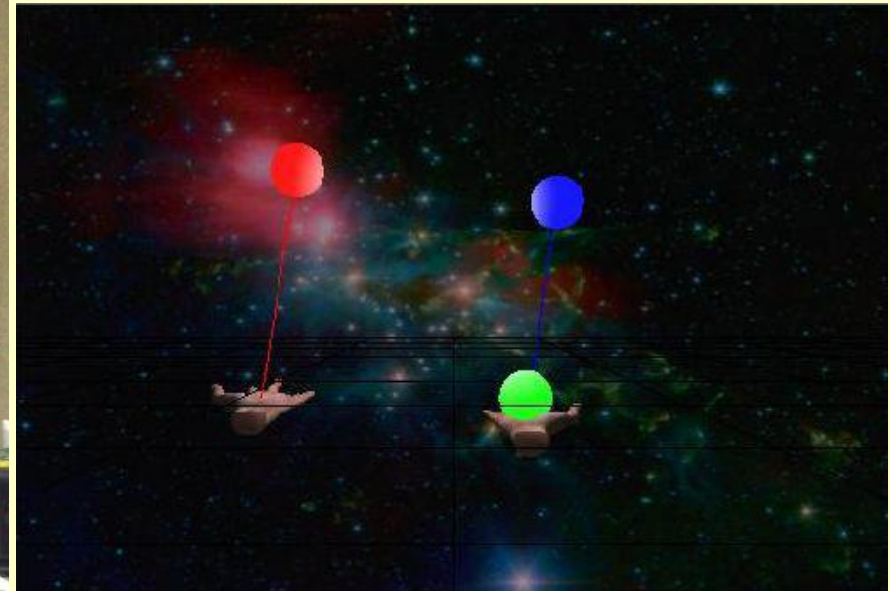
<http://www.intelligym.com/>

- 3. The confluence of top down and bottom up training protocols on the acquisition and transfer of skills.

(Skill based Training in multimodal virtual environments; AI mentoring; Rehabilitation)

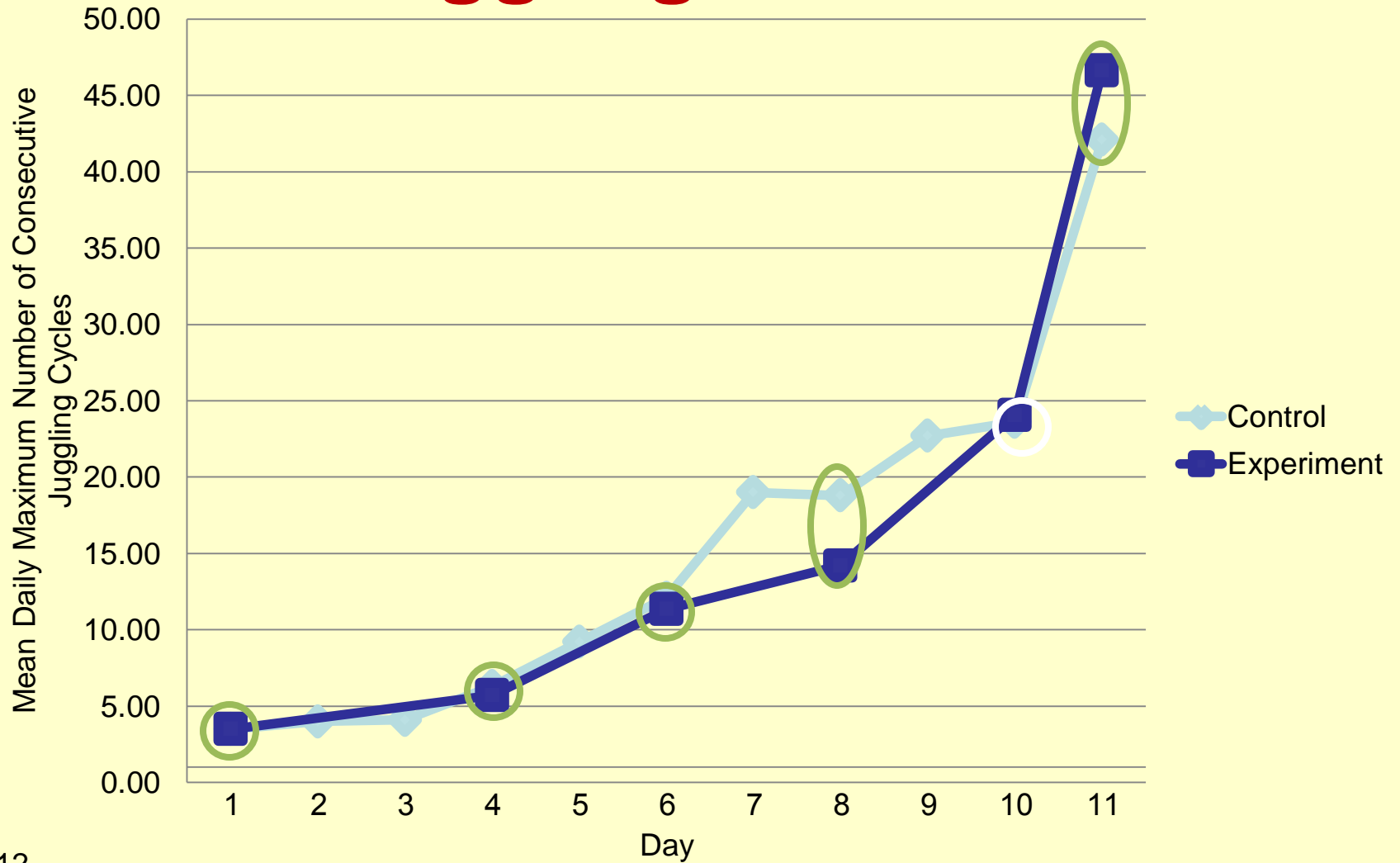
Bergamasco Bardy Gopher(2012) **Skill Training in Multimodal Virtual Environments** Taylor and Francis

Training to Juggle with the Light Weight Juggler(LWJ)



Results

Real Juggling Performance





**Thank you for your
none divided
attention**