

Implicit Learning of an Embedded Regularity in Older Adults using a Serial Response Time (SRT) Task in a Virtual Reality Medium

Rose Martini¹, PhD, OT(C)

Lisa Aquilino¹, Simone Buissé¹, Anabelle Dumais¹,
Valérie Pion¹, Ebony St. Rose²,

Heidi Sveistrup^{1,2}, PhD, and Diane Ste-Marie², PhD

¹ University of Ottawa, School of Rehabilitation Sciences

² University of Ottawa, School of Human Kinetics

Introduction

- Learning any task involves at least two forms of learning: explicit and implicit.

Explicit learning

- learning within conscious awareness and under intentional or voluntary control of the performer (Gentile, 2001).

Implicit learning

- operating outside one's conscious awareness and under automatic control of the performer (Gentile, 2001).

Studying implicit learning

- Serial response time (SRT) tasks
 - employed to study implicit learning of embedded regularities (i.e., regularly occurring predictive pattern).
 - traditional SRT tasks use simple movement responses, such as a finger key press in response to a visual stimulus
 - not reflective of the kind of complex processing required for most daily activities.
- More complex task
 - present task involves whole body movements in a virtual reality environment
 - more ecologically valid than any of the previously used SRT tasks.

Purpose

- Determine whether older adults learn an embedded regularity in a gross motor reaching SRT task in a virtual reality environment
- Determine whether learning occurred implicitly or explicitly

Method

Participants

- 17 adults
- 63-80 years (mean = 68.8 years)
- 6 participants dropped

Method



Task

- Balls appeared from the four quadrants of the screen
- Tripod used as a home position
- Participants were asked to reach with their preferred hand to contact the virtual balls as quickly as possible
- Inter-trial delay interval between balls was 0 ms
- Time it took for participants to move hand from tripod to each of the balls (reponse time) was recorded by the system

Procedure

Acquisition phase

- A second order conditional (SOC) sequence, used five blocks of 84 acquisition trials
- Within each block, the embedded SOC sequence (the repeated sequence) appeared four times intermixed with random trials.
- At the end of each block
 - participants were queried as to whether they noticed anything in particular
 - encouraged to obtain a faster time on next block

Retention phase

- Followed after a 30 min. delay interval
- Series of 16 trials
 - 6 balls random
 - 10 balls repeated

Recognition phase

3 tasks

1. Interview

2. Process Dissociation Procedure (PDP)

- Inclusion condition
- Exclusion condition



Recognition phase

3. Recognition task

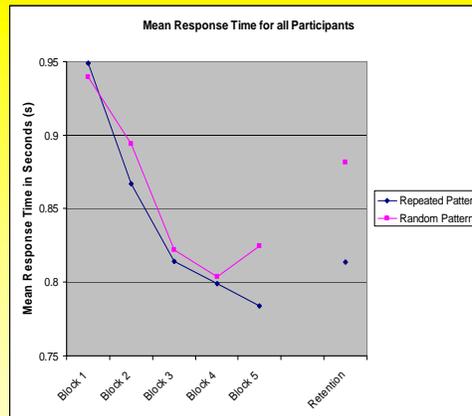
- 16 sequences of 4 balls
- Determine if the sequence shown is part of the pattern



RESULTS

Acquisition phase and retention phase response times

Adults performed significantly faster across blocks for both repeated and random patterns
 $F(4, 40)=20.233, p<.000$
Responses times were significantly faster for the repeated sequence
 $F(1, 10)=9.981, p <.01$
Few errors (mean=2.3)



RESULTS

Recognition Phase

- **Interview**
 - Level of awareness of the pattern
- **PDP**
 - Inclusion
 - 8/11 able to produce patterns beyond chance level
 - Serial list position effect
 - Exclusion
 - Artificial production of pattern
 - 1/3 produced patterns beyond chance level
- **Sequence recognition task**
 - Unable to discrimination between old and new sequences

Discussion:

Acquisition and Retention

- Results replicated those of similar SRT studies using simple motor tasks (Cherry & Stadler, 1995; Howard & Howard, 1989; 1992)
- Cautiousness noted in elderly participants
- Learning maintained after a 30-minute interval

Discussion:

Recognition

- Explicit learning demonstrated
 - Interview results
 - PDP tasks
 - Sequence Recognition Task
- Increased awareness of the presence of a pattern
 - Greater movement time

Conclusion

- Older adults can learn a repeated pattern during a GM SRT task
 - How does learning during a GM SRT task in older adults compare to young adults and children?
 - Participants generally not cognisant of the presence of a repeated pattern, but did demonstrate greater awareness.
 - Does a greater movement time influence implicit/explicit learning?