Fractionating the Visuo-Spatial Sketchpad: Active Processes Required!

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Introduction

What is the relation between visual and spatial components of working memory?

Logie (1995) has described the theoretical relation between the visual cache and inner scribe components of the "visuo-spatial sketchpad" as passive and active, respectively.

Visual cache: Passive storage component that is subject to decay and interference by new visual information.

Inner scribe: Active rehearsal component that stores spatial codes and prevents both

visual and spatial codes from decaying.

Purpose

In the present research our aim was to further explore Logie's (1995) proposed relation between the passive visual store and the active inner scribe. Specifically, we examined whether the visual cache played a passive or active role in retaining visual information.

Experiment 1

Hypothesis 1: If the inner scribe prevents information from decay, then disrupting the inner scribe with spatial interference should have more of an effect on spatial memory retention than visual interference.

Hypothesis 2: If the visual cache is sensitive to decay (i.e., lack of spatial rehearsal) and input from new visual material, then disrupting the visual cache with either visual interference or spatial interference should produce equivalent effects on visual memory retention.

Methods

Participants (n = 18) performed six tasks (2-control & 4 dual-task), in a repeated measures design.

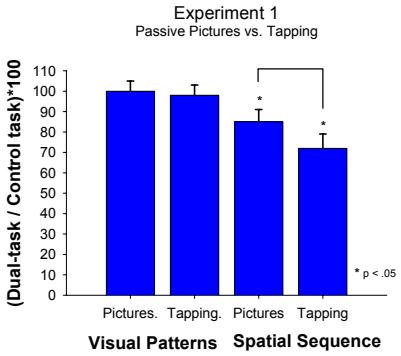
Primary memory tasks:
- Visual Pattern span & Spatial Span

One of three interference tasks performed during 10 s retention interval:
- Control (blank screen; No interference)
- Looking at abstract pictures (visual interference)
- Tapping on a pegboard (spatial interference)

Procedure

1) Shown a primary memory task to retain
2) 10-second retention interval
3) Reproduce primary memory task
4) Visual pattern span task terminated after 3 consecutive errors & Spatial span task after 2 consecutive errors.

Result



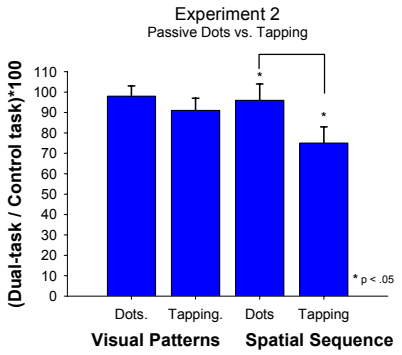
(✔) Retaining a spatial sequence was more difficult when tapping than when looking at abstract pictures.

(x) Neither abstract pictures nor tapping had an effect on retaining a visual pattern. Lack of tapping interference suggests visual retention does not rely on spatial rehearsal. Lack of visual interference may be due to manipulation of visual interference not being strong enough.

Experiment 2

Same hypothesis, methods and procedures. Changed from looking at irrelevant pictures to looking at coloured dot patterns.

Result



Results were similar to previous experiment. Together these results suggest that retention of visual information does not rely on rehearsal by the inner scribe.

Why was there no effect of visual interference on visual retention?

Alternative Suggestion

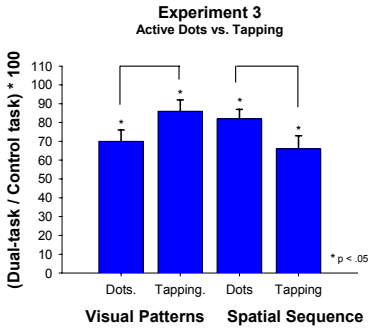
Active processing of the spatial interference task disrupts spatial memory retention more than visual interference. However, passive processing of the visual interference task does not disrupt visual or spatial memory retention.

Perhaps active processing of the visual interference task would disrupt visual memory retention more then spatial interference.

Experiment 3

Same hypothesis, methods and procedures. Changed from looking at coloured dots to actively scanning the dots for two letters (x and o) placed amongst the dots.

Result



(✔) Retaining a spatial sequence was more difficult when tapping than when actively scanning dots

(✔) Retention of visual pattern was more difficult when actively scanning dots than when tapping.

This result suggests that visual information is retained by an active visual rehearsal mechanism.

Conclusion

Contrary to Logie (1995), the visual cache appears to use a visual rehearsal mechanism to retain visual information.

Different interference effects were found when retaining visual and spatial information, thus indicating that these components are independent, rather than interdependent, components of working memory.