Cross-modal Integration: Visuomotor Activity, Auditory Recall, and Its Implications for Art Therapy

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Introduction

There is very little past research focused on what occurs in the brain and body when art is created. Anecdotally, artists have reported feeling as though the environment they made a piece of art in gets "stored" in the artwork. When they look at the art, specific memories about their artmaking environment are unintentionally recalled. It has been found that when unrelated visual and auditory stimuli are integrated, the visual stimulus activates the auditory cortex (Meyer et al., 2007). The present study was conducted to examine the integration of visuomotor and auditory input in the context of creating art.

Cross-modal Integration (or Association)

- The process in which pieces of information received by different sensory modalities, or senses, come to influence each other.
- The basis of all development and learning (Gilman, 2009; Meyer et al., 2007).
- Example: Learning the danger of a stove after touching a hot stove. The sight of a stove is integrated with the pain of the heat. Future experiences with a stove are now impacted by this integration, subconsciously or consciously.

Auditory Input

- Stimulus received by a sensory modality at the time of encoding, or learning.

Auditory Recall

- "To transfer prior learning or past experience to current consciousness: that is, to retrieve and reproduce information; to remember" (American Psychological Association, 2015).

Goal of Study

- Subconsciously integrate visual and auditory stimuli
- Spontaneously trigger recall of cross-modal memories with unimodal, semantically unrelated integrated stimuli
    - Specifically, use art from an artmaking session as a retrieval cue to recall the auditory input that occurred during the artmaking session
- Avoid testing memory skill

Method

Participants

- 99 participants
- 65 women, 33 men, and 1 unreported gender
- 67 under experimental conditions & 32 under control conditions
- 18 to 22-years-old (*M* = 19.74, *SD* = 1.20)

Procedure

1) IRB Approval and Informed Consent
2) Experiment
    - 3 five-minute segments of podcasts
    - Experimental condition: coloring
    - Control condition: eyes closed
3) 1-week recall delay
4) Recall survey
    - Experimental condition: coloring sheets as a recall cue
    - Control condition: no recall cue

Materials

Podcasts

- "Short Stuff: Artificial Banana Flavor" (0:40-5:40) from *Stuff You Should Know*
- "A History of Migraine" (3:15-8:15) from *Stuff You Missed in History Class*
- "The Twenty-Fifth One: Cancel the greeting card industry" (1:20-6:20) from *Take It To Heart*

Coloring Sheets



Auditory Recall Survey

- Multiple choice, short answer, and essay answer
- No indication of the content of the podcasts
- Explicitly asked the experimental group to examine their coloring sheets as they completed the survey
- Asked about each podcast's:
    - Main topic
    - Assumed gender of voices
    - Personal trains of thought that occurred while listening
    - One specific fact, statement, or story from the podcast

Hypotheses

#1: Auditory recall scores will be significantly higher for the experimental group with the visuomotor activity at encoding and associated visual cue at recall than the control group with no visuomotor activity or visual cue.

#2: Within the experimental condition, the representational coloring pages will serve as a stronger visual cue and produce higher recall scores than the abstract page.

Results

Hypothesis #1, Independent Samples T-test:
There was no significant difference in the recall scores for the visuomotor activity (*M* = 7.82, *SD* = 5.24) and control (*M* = 8.81, *SD* = 6.47) groups; t(97) = .815, p = .417, 95% CI [-3.41, 1.42].

Hypothesis #2, Paired Samples T-test:
Recall scores associated with the representational sheets (*M* = 2.87; *SD* = 1.79) were significantly higher than those associated with the abstract sheet (*M* = 1.88; *SD* = 2.30); t(66) = 4.22, p < .001, 95% CI [-1.46, -.52].

Supportive Quotes
Although cross-modal integration was not significantly found across all participants, several participants reported cross-modal experiences:
"I remember thinking about how condescending the guy who didn't like gift cards talked about the subject while I was coloring the red dinosaur."
"I remember worrying about my FYS journal."
"While I was coloring the bird, the podcast was discussing the origin of the word migraine..."
"I remembered thinking about the name of the died-out species [of banana]... they spelled it out while I was coloring the pink towards the top of the lighthouse."

References

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Discussion

The results of the present study indicate a lack of cross-modal integration significant enough to create spontaneous auditory recall using an associated visual recall cue. Participants who colored while listening to the podcasts and had their artwork to view during auditory recall scored similarly to those who listened to the podcasts with their eyes closed. However, results did indicate that cross-modal integration is strengthened more by representational stimuli than abstract stimuli. Podcasts heard while coloring the lighthouse and dinosaur sheets were recalled better than that of the abstract sheet.

Limitations

- Faulty survey, no interrater reliability
- Lack of effort of participants
- Complex coloring sheets caused stress
- Partially tested memory skill rather than integration
- Primacy effect

Implications for Art Therapy
Given that art therapy by definition is a cross-modal experience, the field of art therapy would tremendously benefit from taking the nature of cross-modal integration into consideration.
Considering the significant results of Hypothesis #2, art therapy may be more effective on a neuropsychological level when the client produces representational art rather than abstract art.
Memories with visualizable details appear to be encoded more accurately and retrieved with less distortion than those with mainly auditory or non-perceptual details (Scheurich et al., 2021). This implies the possibility to recondition triggering auditory stimuli, by presenting positive visual information (i.e. creating a piece of art) while processing the auditory trigger. Associating a positive visual association and calm nervous system state with the auditory trigger in an art therapy session may partially override the negative aspect of the auditory stimulus.
Cross-modal integration implies that a client's auditory input, physical sensations such as a calm nervous system, and emotions from the art therapy session would be engrained into the piece of art. They could later revisit the artwork and feel a sense of safety.

Acknowledgements

Dr. Laird Edman, Dr. Jennifer Feenstra, Dr. Reed Mueller, the Northwestern Honors Program, & Greta Grond