

Yiren Ren, Thackery Brown
yiren@gatech.edu, thackery.brown@psych.gatech.edu

Sophia Kaltsouni Mehdizadeh, Grace Leslie
smehdizadeh7@gatech.edu, grace.leslie@gatech.edu

INTRODUCTION

Musical preferences tend to develop during adolescence and young adult life. Furthermore, **nostalgia** and attempting to remember past events are common reactions to, and functions of, music.

Episodic memory is one psychological mechanism of musically induced emotion, where music induces emotion in the listener by cueing some memory that the listener has^[2].

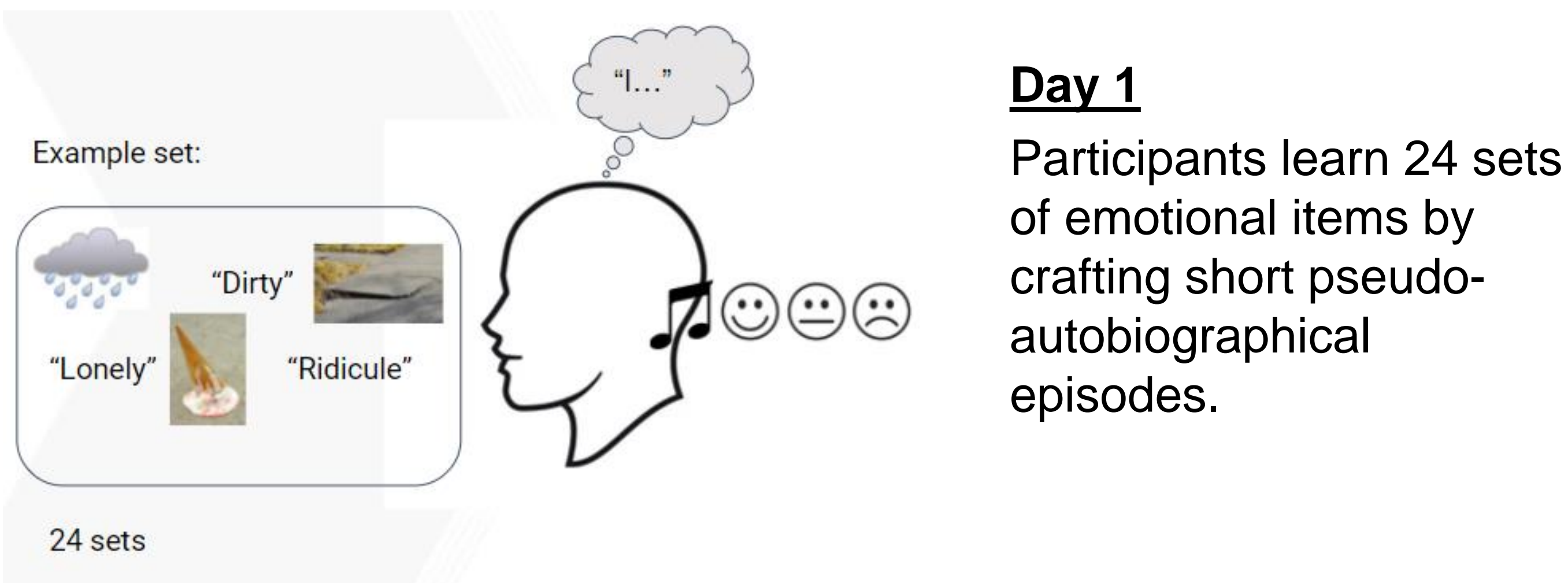
Reconsolidation is a memory mechanism by which a specific cue (ex. Spatial context) drives partial reactivation of an old memory, while new memories/information is still being acquired. This can have the effect of distorting or updating the old memory, which will affect how it is recalled in the future.

Is it possible to modulate one's emotional memories through memory reconsolidation, using music as the cue?

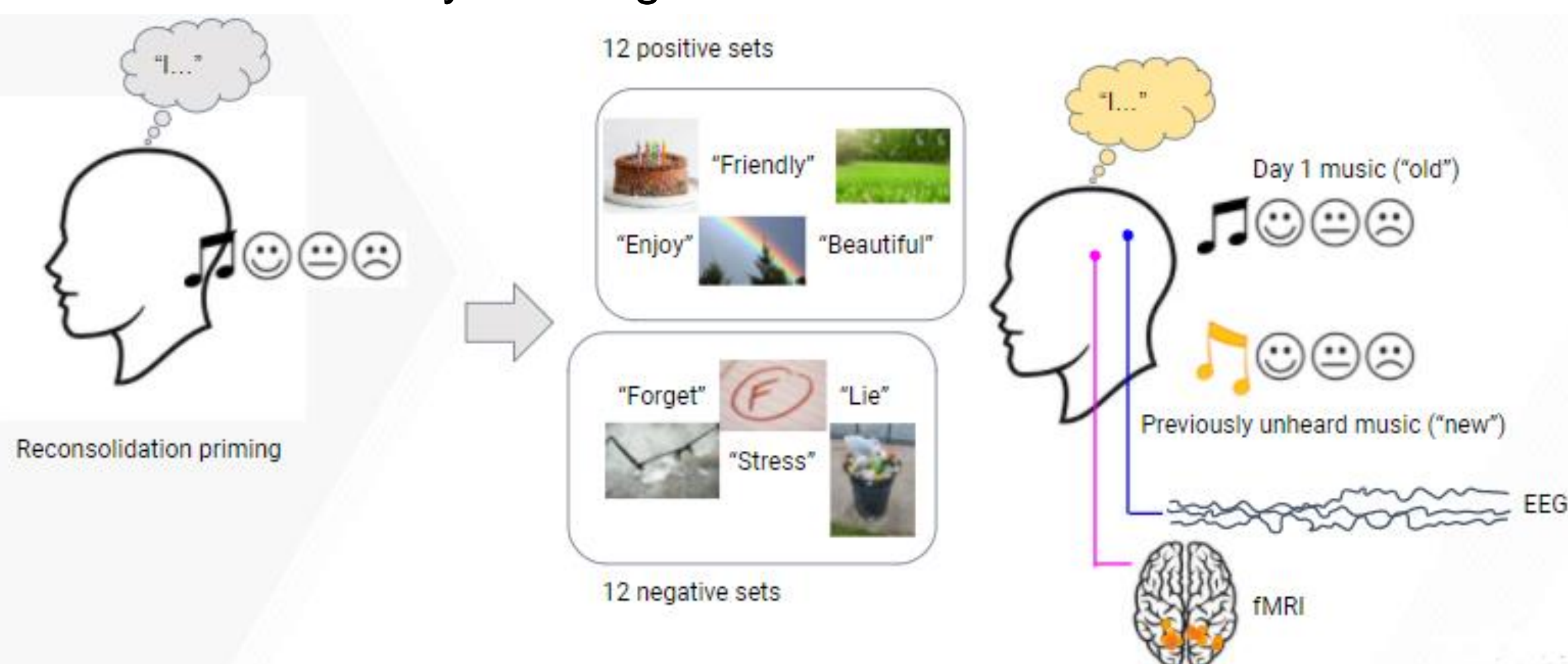
METHODS

We have adapted the **3-day object learning paradigm** from Hubbach, et al.'s (2007) landmark behavioral reconsolidation study^[1] to be:

- Within subjects
- Simultaneous EEG/fMRI
- Emotional instead of neutral imagery
- Music as the powerful contextual cue



Day 2 Participants receive reminder cues of Day 1 episodes, followed by learning 24 sets of new items in the same manner.



Day 3 We test participant's recall of Day 1 items only and analyze for **"intrusions"** (mistakenly including any Day 2 items).

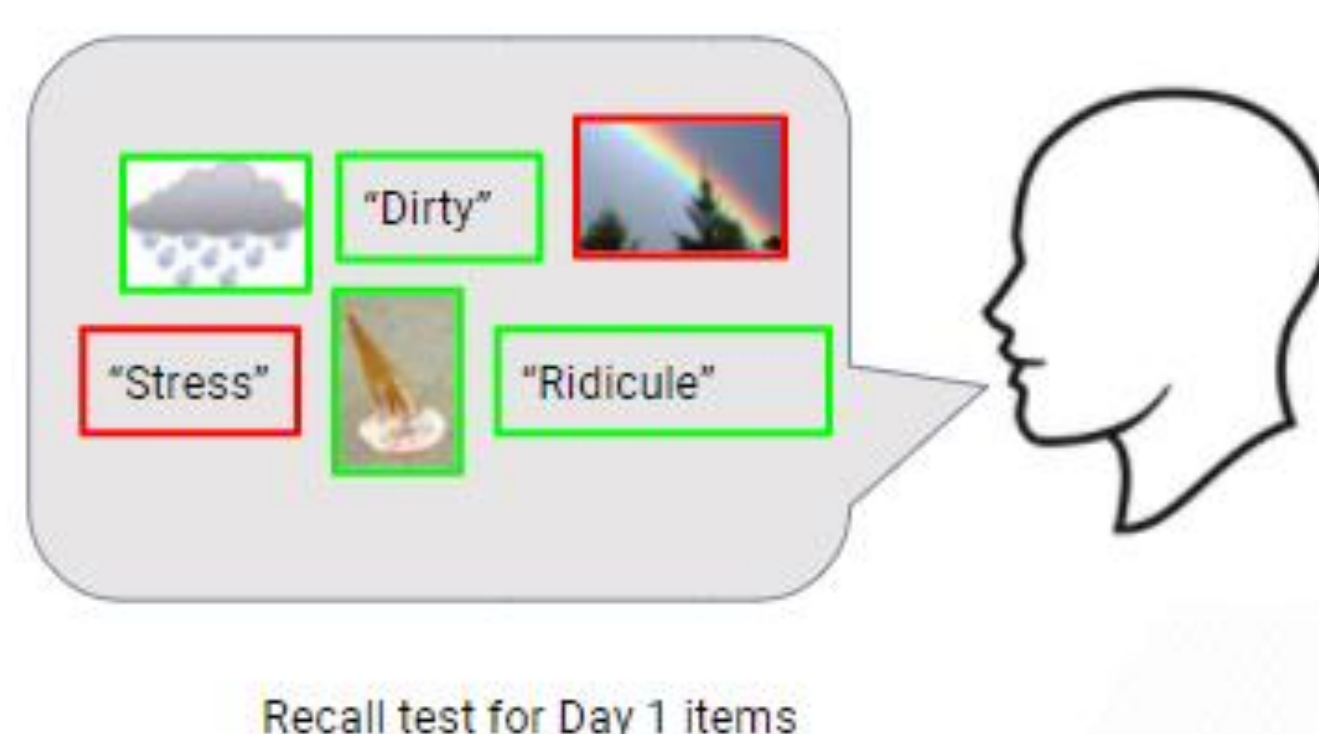


Fig. 1: Visual representation of study tasks and procedure across 3 days

AIMS

Provide behavioral and neural evidence that music can serve as a contextual trace, triggering reconsolidation, and encouraging integration of new memories with old ones.

Test if this process can transform feelings associated with prior emotional memories.

MOTIVATION

Encoding new memories through old contexts and modulating one's emotional memories is a **proposed treatment for dysfunctional mood disorders**^[3]. Greater understanding of these underlying mechanisms could facilitate development of **behavioral or EEG neurofeedback interventions**^[4].

Findings could also be applied more generally to **techniques for mood regulation**.

Limited existing data.

BEHAVIORAL AND EEG HYPOTHESES

"Intrusions" are the behavioral observation commonly used to track the extent to which reconsolidation has occurred.

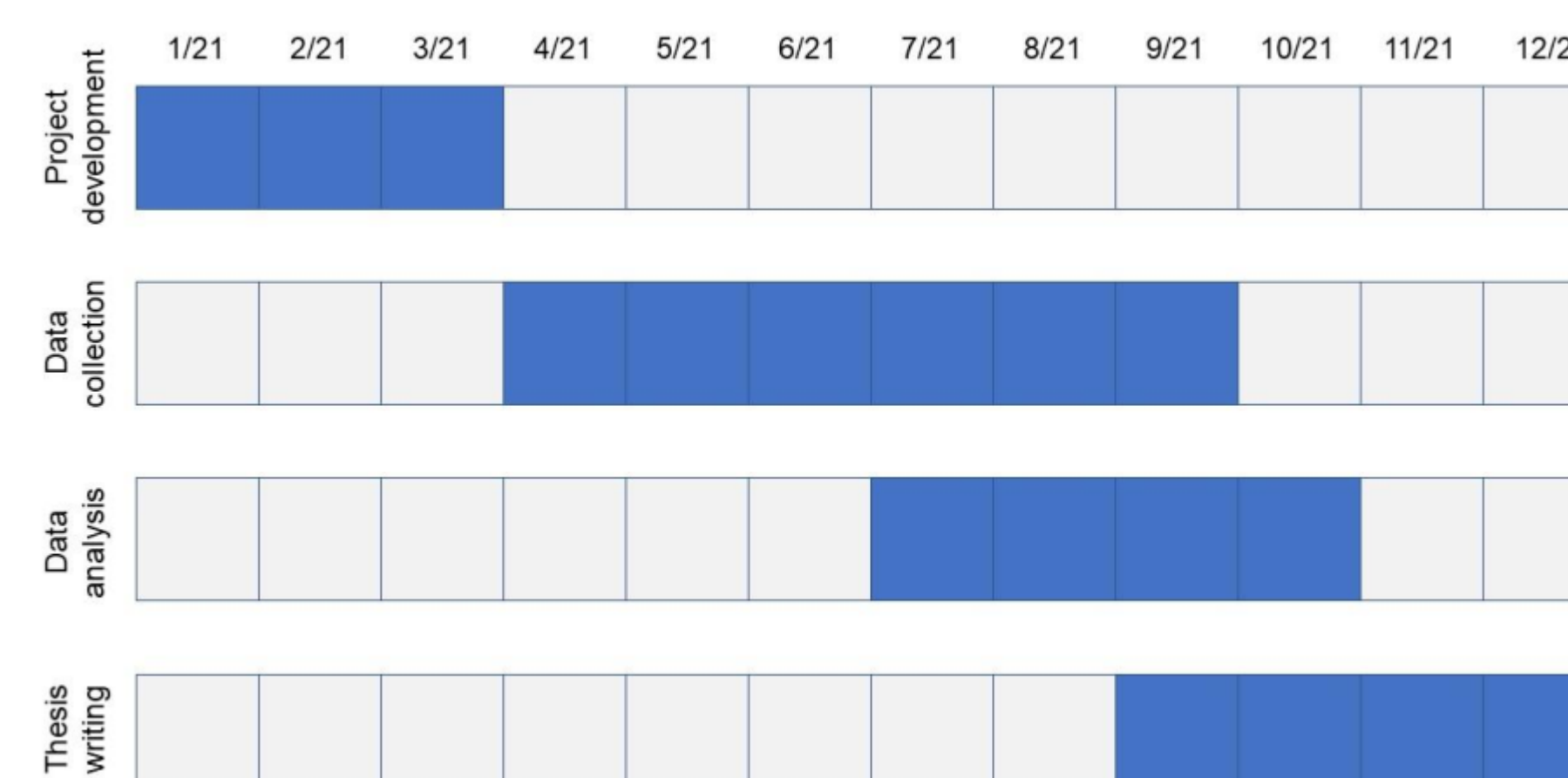
	More intrusions	Fewer intrusions
H1	"Old" (Day 1) music	"New" (Day 2) music
H2	Incongruent → congruent	Congruent → incongruent
H3	Preferred-valence music	Unpreferred-valence music
H4 / EEG	Higher frontal midline theta band power	---

By simultaneously recording **EEG and fMRI** we hope to achieve a greater **neural understanding of the reconsolidation mechanism**, and how it may be influenced by emotion, preference, type of contextual cue, etc.

NEXT STEPS



With the announcement that we were **awarded the CABI MRI seed grant**, we are proceeding with our planned dual fMRI/EEG study.



REFERENCES

1. Hubbach, A., Gomez, R., Hardt, O., & Nadel, L. (2007). Reconsolidation of episodic memories: a subtle reminder triggers integration of new information. *Learning & memory* (Cold Spring Harbor, N.Y.), 14(1-2), 47-53. <https://doi.org/10.1101/lm.365707>
2. Juslin, P. N. (2013). From everyday emotions to aesthetic emotions: Towards a unified theory of musical emotions. *Physics of Life Reviews*, 10(3), 235-266.
3. Lane, R. D., Ryan, L., Nadel, L., & Greenberg, L. (2015). Memory reconsolidation, emotional arousal, and the process of change in psychotherapy: New insights from brain science. *The Behavioral and brain sciences*, 38, e1. <https://doi.org/10.1017/S0140525X14000041>
4. Rozengurt, R., Shtoots, L., Sheriff, A., Sadka, O., & Levy, D. A. (2017). Enhancing early consolidation of human episodic memory by theta EEG neurofeedback. *Neurobiology of learning and memory*, 145, 165-171. <https://doi.org/10.1016/j.nlm.2017.10.005>