SHORT-TERM RETENTION OF POPULAR MUSIC IN OLDER ADULTS: SUPPORT FOR A PLASTICITY THEORY OF IMPLICIT MUSIC KNOWLEDGE ACQUISITION

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1 Introduction

Studies of music preference have shown that older adults prefer music popular during their adolescence or early adulthood [1]. The reason for this may go beyond the fact that adolescents spend more time listening to popular music than at other times in their lives. We propose that just as the brain may have a sensitive period for acquiring language [2], there may be a sensitive period during adolescence dedicated to the acquisition of musical information. During adolescence, music has special social significance [3]. In a review article, Blakemore and Mills [4] proposed that adolescence is a sensitive period for the acquisition of social information. Also the meso-cortical dopamine system underlying the reward system is rapidly developing at this time along with other systems [5] potentially making the reward of music stronger than at other times of life.

Previous work in our lab has piloted a method to test the hypothesis of a critical period for music acquisition in an age cross-sectional design [6, 7]. This paradigm gathers data on knowledge of pop music across the decades and adds a subsequent surprise retention task of excerpts of pop music. Building on this earlier work, we propose that a musical grammar is developed implicitly during a sensitive period of adolescence. The model is referred to as PTIMKA - the Plasticity Theory of Implicit Music Knowledge Acquisition.

In the present study, older adults were presented with excerpts from 36 top hits of the last 6 decades. They rated their familiarity with the excerpts and named the artist, title, and year of popularity. Then, they carried out a surprise test of memory for the previously heard excerpts. Consistent with PTIMKA, retention should be best for songs popular during adolescence as these styles are congruent with the music grammar established during the adolescent sensitive period for music knowledge acquisition (see Fig. 1).

2 Method

Participants - There were 27 adults over the age of 50 years recruited either from local organizations or via word-of - mouth. All participants were Canadian-born residents, except one born in Great Britain, moving to Canada as a young child. One person who had a hearing impairment performed more than 5 SD's below the mean of remaining participants on the music memory test, and was excluded from the sample, leaving 26 participants (14 males, 12 females, mean age 65.5 years, SD 6.7).

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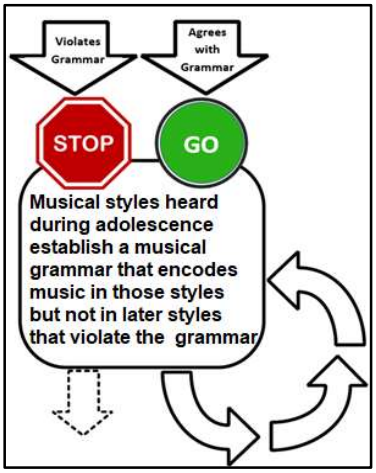

Figure 1: PTIMKA **P**lasticity **T**heory of **I**mplicit **M**usic **K**nowledge **A**cquisition

Procedure - Using their own computers, participants carried out 2 successive online tasks presented via Qualtrics®: a pop music knowledge task, a retention task, and a demographic questionnaire. The consent form led to a link to the questionnaire. Testing took approximately 45 min. The study protocol was approved by the UPEI Research Board.

Materials - Clips (~ 6 sec duration) were drawn from 36 top hits listed in *Billboard* year-end charts for the US and Canada or *RPM* (a Canadian trade magazine). The next most popular song was chosen if the top song could not be used (e.g., if it were revived in a subsequent decade). Two clips were created for each song. Three songs were chosen from each half decade between 1962 and 2021. For each of 36 retention trials a comparison foil was drawn from previously unselected top hits in the same half decade of the target song

Pop Music Knowledge Task - For each trial, participants were presented with both clips of a song and were asked to rate the familiarity of the song, name its artist and title and provide (or guess) the year the song was popular. Following 2 practice trials, 36 trials were presented in a random order.

Retention Task - Participants were again presented with 2 clips, but this time, in a 2-alternative forced-choice task, in which one of the clips had been presented in the music knowledge task while the other was a clip of a pop song from the same era but had not been previously presented. Participants were asked to identify the "old" previously presented clip and rate their level of confidence in their choice. Two practice trials preceded the randomly presented 36 test trials.

3 Results and Discussion

Familiarity, Title, Artist, and Year Popular - The mean familiarity of the 6 songs in a decade was highest for the decade 1972-1981 and consistently declined. Participants were 15 (SD 6.7) in 1972. A similar pattern showed for mean correct title and name of the artist of the pop songs (see Fig. 2). The mean error in guessed year of popularity was poorest for the most recent decade. Main effects for all 4 variables were highly significant in 1-way ANOVAs (1 factor of Decade; 6 levels) (Table 1).

Table 1. Results of Analysis of Variance

Factor	*df (GG)*	*F*	*p*	η_p^2
Familiarity	2.5, 63.17	37.27	<.001	.60
Artist	3.1, 76.70	12.71	<.001	.34
Title	2.9, 71.85	43.88	<.001	.64
Year error	2.9, 71.53	42.18	<.001	.63
Retention	3.4, 85.70	4.66	.003	.16
Confidence	2.9, 73.02	20.67	<.001	.45

Retention and Confidence - Participants correctly discriminated the 36 "old" from "new" clips with .88 (SE .02) mean proportion correct. Performance linearly decreased with increasing decade (Fig. 3). Mean confidence in judgment, on a 0.0 to 2.0 scale was 1.54 (SE .07) and showed a similar decreasing trend (Fig. 3). These effects were significant in ANOVA (Table 1, last two rows).

Comparison with Younger Adults - The same paradigm was conducted with 19 Canadian-born university students (mean age 20.3 years, SD 2.3). While the main effect of Decade was statistically significant for the 6 dependent measures, in contrast to older adults, the younger adult mean Familiarity, Artist, Title, Retention and Confidence scores *increased* with increasing decade, and judged year of popularity was highest for the most recent decade. Most important is the performance for Retention, shown in Figure 4 for group *d'*, an unbiased measure of discrimination. While mean *d'* for Retention was lower for older adults, their scores decreased for every decade after 1972-1982 while for younger participants Retention improved with increasing decade.

4 Conclusion

Each trial of the retention task contained a song excerpt presented in the previous pop music knowledge task. Each excerpt was subject to the same immediate memory decay, yet memory was better and confidence higher for those songs popular during the participant's adolescence. The relative difficulty of older adults to retain the memory of recently popular music excerpts heard 15 minutes prior is consistent with the view that exposure to music during adolescence establishes a music grammar that has lifelong service for encoding music in those styles but not styles that violate the grammar. Data from younger adults showing trajectories opposite to those for older adults are consistent with this inter pretation, but in this case their adolescent music grammar

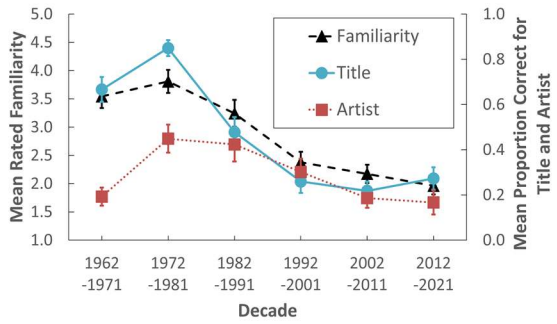

Figure 2. Mean rated familiarity (left *y*-axis) and mean proportion correct Title and Artist judgements (right *y*-axis)

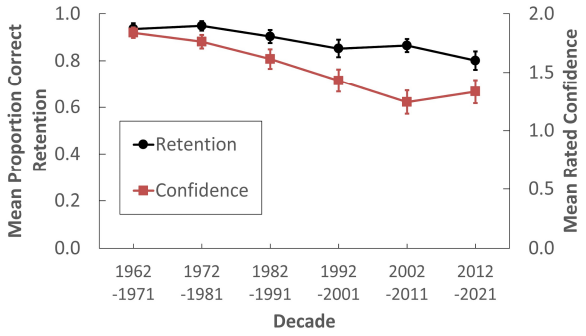

Figure 3 Mean Retention and Confidence over 6 Decades.

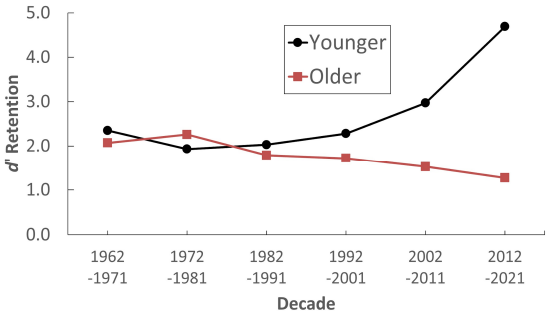

Figure 4. Group *d'* for retention scores for younger and older adults as a function of decade of music popularity

fails to encode music grammar from earlier styles. In conclusion, consistent with the Plasticity Theory of Implicit Musical Knowledge Acquisition (PTIMKA), popular music styles congruent with an adolescence-established music grammar are more accurately encoded and associated with higher confidence than were styles violating this grammar, as would songs popular before or after adolescence.

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