

RECOGNIZING FAMILIAR AND FOREIGN WORDS AND MUSIC BY CHILDREN AND ADULTS: AN EXAMINATION OF THE CRITICAL PERIOD HYPOTHESIS

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1. INTRODUCTION

Acquisition of language is usually an easier task in childhood than in later life (Birdsong & Molis, 2001; Johnson & Newport, 1989; Trehub, 1976; but see Bialystok, 1997). The general finding is consistent with Lenneberg's (1967) proposal of a critical period for language acquisition: typical language development requires extensive exposure to language during childhood.

Comparisons between language and music have revealed many similarities. Both language and music are based on generative rules capable of producing an unlimited number of new sequences (Sloboda, 1985). As they both rely on auditory functions, language and music may share certain neural mechanisms (Zatorre et al., 2002). Finally, both language and music acquisition proceed in systematic stages (Besson & Schön, 2001).

Given the similarities between language and music in terms of generativity, auditory modality and developmental stages, it is of interest to determine whether the linguistic notion of critical period applies to the acquisition of music. Our laboratory has been conducting research on this issue by studying memory and preference in different age groups for music representing popular styles of the last 10 decades. For example, children, pre-adolescents, and young adults were asked to rate popular music from the 10 decades of the 20th century on preference and familiarity (Bailey, 1999; Bailey & Cohen, 2002). Participants later received a surprise recognition task using a test tape containing examples only some of which were previously presented. In support of an early critical period for music acquisition, young children, in contrast to older participants, were uninfluenced by style in immediate recognition of music though performing at beyond chance levels. To account for these results it was proposed that exposure to music of a certain style or grammar early in life establishes a representation of the grammar of that style (Cohen, 2000). Due to declining brain plasticity, this grammar serves the individual throughout life. Consequently music styles that violate the grammar will not be well encoded whereas music styles that reflect the grammar will be well encoded.

Whereas the past work examined music in American (Western) styles, the theory applies also to music of non-Western styles. The non-Western grammar would violate the grammar acquired by Canadian children early in life. The present study investigates the possibility of a critical period for the acquisition of music grammar by comparing recog-

nition of non-Western and Western music.

The argument proposed for examination of the critical period for music also applies to language. It would be expected that if an early critical period for language exists, then recognition of acoustically presented words in a foreign language would be relatively more easily retained by children who are acquiring the rules of language than by adults who had already acquired them. Hence, the present study also investigated the relative ease with which children versus adults carried out a recognition task for words in their own versus an unfamiliar language. According to the critical period hypothesis it was predicted that the difference in the foreign and native recognition scores for music and language would be less than the respective difference within these two acoustical domains for adults.

2. METHOD

2.1 Stimuli

English words, Hindi words, Western classical music excerpts and non-Western music excerpts were recorded on compact disk. For each of the 4 stimulus categories, there was one presentation track and two test tracks, each with 12 items. The test tracks contained 6 of the original words or excerpts and 6 new but similar examples. The language lists consisted of equal numbers of 2, 3, and 4 syllable words (4 of each). The musical excerpts were instrumental to avoid cues from lyrics and were from either Western culture or a variety of non-Western cultures.

2.2 Participants

Adults. There were 19 adults (mean age 28.3 years, SD = 9.5, range 19-46) from the university population approximately half of whom had private music lessons, and 12 children (mean age 10.5 years, SD 1.7, range 8-13) attending a summer camp or friends / acquaintances of the experimenter (E.D.M.). Of the children, 4 had some private music training.

2.3 Procedure

All participants were asked to listen to a list of English words after which they were presented with one of two test lists and asked to indicate, for each test-list word, whether or not they had heard it on the original list. The same procedure was carried out with Hindi words, Western musical excerpts, and non-Western musical excerpts.

3. RESULTS

As a check on the internal validity of the Western/non-Western music distinction, 12 university students rated the music excerpts on a 5-point scale where 1 represented Non-Western music and 5 Western Music. Because several selections received mean ratings in the mid-range, only those excerpts that received extreme ratings were included, leaving 10 rather than 12 items in the music recognition test.

For each participant, the mean percent correct recognition was calculated as shown in Figure 1. The relative ease of recognizing the Hindi words by children as compared to adults is dramatic. The difference does not appear for the music examples.

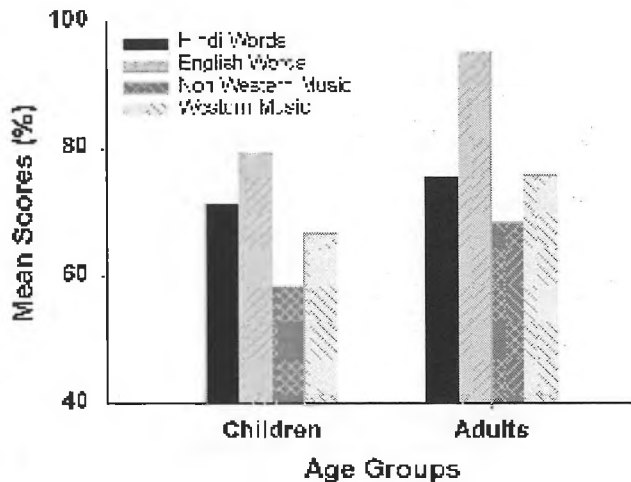


Figure 1. Mean percent recognition for Western and non-Western words and music for children and adults.

Mean per cent correct for words and music, for the 2 age groups was entered into an ANOVA with 2 within-subject variables of foreign vs native (Culture), and words vs music (Stimulus Domain), and 1 between groups factor of Age. Separate analyses were also carried out for words, music, and each age group. In the overall analysis, there were main effects of Culture, $F(1,29) = 20.60$; $p < .0001$, Domain, $F(1,29) = 17.43$; $p < .001$, and age, $F(1,29) = 11.36$; $p < .005$. In the analysis of words, the Culture x Age interaction was significant, $F(1,11) = 4.96$; $p < .05$ as were main effects of Culture, $F(1,11) = 25.94$; $p < .0001$, and Age, $F(1,11) = 5.94$; $p < .05$. In the analysis of music, Culture x Age was not significant, the main effect of Culture only approached significance, $p < .064$, but Age was significant, $F(1,11) = 4.75$; $p < .05$. For children, words were more easily recognized than music, $F(1,11) = 5.78$; $p < .05$ and Culture approached significance, $p < .09$. For adults words were more easily recognized than music, $F(1,18) = 13.18$; $p < .005$. English words and music were more easily recognized than Non-Western counterparts, $F(1,18) = 27.10$; $p < .0001$ and Culture x Domain was significant, $F(1,18) = 4.77$; $p < .05$.

4. DISCUSSION

The pattern of results for words is consistent with the early critical period hypothesis. Children suffered significantly less from linguistic unfamiliarity than did adults. It would be expected that even younger children than those tested here would be less sensitive to the cultural distinctions. In contrast to the age-related performance differences for words, both children and adults suffered relatively equally from unfamiliar music. However, recognition of the familiar music was relatively poor for adults in contrast to that for English words. Future work could examine music that more clearly distinguishes Western and non-Western culture for adults, using popular as opposed to classical genres for the Western music. We have previously proposed the possibility of an additional, later critical period for music due to the social significance of music in adolescence and early adulthood (Bailey & Cohen, 2002). The present data showing less detriment due to cultural variables for music than words in late adolescence are to some extent consistent with the notion of a second critical period for music.

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- Acknowledgement: The work is supported by a grant from the Natural Sciences and Engineering Research Council (NSERC) to A. J. Cohen.