The Role of Familiarity in Episodic Memory and Metamemory for Music

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Participants heard music snippets of varying melodic and instrumental familiarity paired with animal-name titles. They then recalled the target when given either the melody or the title as a cue, or they gave feeling-of-knowing (FOK) ratings. In general, recall for titles was better than it was for melodies, and recall was enhanced with increasing melodic familiarity of both the cues and the targets. Accuracy of FOK ratings, but not magnitude, also increased with increasing familiarity. Although similar ratings were given after melody and title cues, accuracy was better with title cues. Finally, knowledge of the real titles of the familiar music enhanced recall but had, by and large, no effect on the FOK ratings.

Researchers have explored the role of familiarity on memory performance using a variety of different types of materials such as words (e.g., Hall, 1954), nonsense syllables (e.g., Simon & Feigenbaum, 1964), text (e.g., Mills & Nicolas-Fanourakis, 1966), faces (e.g., Klatzky & Forrest, 1984), and objects (e.g., Beiderman, 1987). For instance, using musical materials, Bartlett, Halpern, and Dowling (1995) showed that episodic memory for traditional tunes was better than that for novel tunes. In general, it has been widely accepted that the more familiar the materials, the better they are recalled, a finding that is also echoed in the literature on expertise in which experts remember materials from their domain of expertise better than nonexperts (e.g., Chase & Simon, 1973; Peynircioğlu & Mungan, 1993).

The role of familiarity in the domain of metamemory is less well known. To be sure, many studies have shown that when recall fails in response to cues, ratings of feeling of knowing (FOK) are nevertheless influenced considerably by the familiarity of those cues or by the familiarity of the general topic in question, although the predictive accuracy of these ratings often remains unrelated to familiarity with the cue or the topic (e.g., Reder, 1987). Fewer studies have dealt directly with the effect of familiarity of the to-be-recalled items themselves. Schwartz and Metcalfe (1992) found that FOK ratings were not influenced when they manipulated the familiarity of the to-be-recalled words by priming those targets or making them more salient. In a similar vein, Metcalfe, Schwartz, and Joaquim (1993) varied the familiarity of both the cue words and the target words in an episodic paired-associate task by using repetition and found that whereas the familiarity of the cues strongly influenced the magnitude of the FOK ratings, the familiarity of the targets did not (see also Reder & Ritter, 1992). One exception to such findings was found when the familiarity of the targets was increased through overlearning, which in turn did increase the magnitude of the FOK ratings (e.g., T. O. Nelson, Leonesio, Shimamura, Landwehr, & Narens, 1982).

In all of these studies, familiarity was manipulated during the study phase. In studies in which items with differing levels of a priori, or semantic familiarity, are used, however, a different picture seems to emerge. For instance, Otani and Hodge (1991) showed that FOK ratings for words from high-frequency word lists were lower than those from low-frequency word lists. Similarly, in a semantic-memory task, Peynircioğlu and Tekcan (2000) showed that familiarity with the language of the target words led to lower FOK ratings, although the familiarity with the language of the cue words did enhance the FOK ratings, as in episodic studies (e.g., Schwartz & Metcalfe, 1992). In neither study was the accuracy of the ratings affected by familiarity (cf., Reder, 1987). Thus far, then, it appears that greater familiarity with the cue words, regardless of whether such familiarity exists semantically or is created episodically, tends to increase FOK ratings. Greater familiarity with the target words themselves, however, appears to have no effect on FOK ratings when created episodically and leads to lower FOK ratings when it exists semantically. The accuracy of FOK ratings, on the other hand, either changes in the same direction as FOK magnitudes or remains unaffected.

In a study using musical materials, Peynircioğlu, Tekcan, Wagner, Baxter, and Shaffer (1998) showed that participants' FOK ratings for melodies and their titles varied depending on whether the music had lyrics, but in both cases, these ratings predicted melody recognition more accurately than they predicted title recognition. However, because the authors were interested in performance in semantic memory, the titles were necessarily the original titles for the music, thus forming a gestalt, and because only very familiar music was used, the effect of familiarity itself could not be explored.

In this study, we used an episodic-memory procedure and paired snippets of instrumental music with random animal names as titles to lessen the influence of previous title–melody associations. This procedure also enabled us to vary the familiarity of the music while keeping the verbal labels or the titles the same. Leibert and Nelson (1998) had found that, at least with verbal materials and when familiarity was increased episodically through repetition, FOK ratings depended on whether both the target and the cue were repeated or only one component was repeated. The magnitude of the ratings increased when a target–cue pair was repeated as a gestalt but not when only the target word or only the cue word was repeated while paired with a new word. In our study, the familiarity of only the nonverbal components was varied, both when we presented them as cues (without varying the familiarity of the

verbal targets) and when we presented them as targets (without varying the familiarity of the verbal cues).

In addition, we varied familiarity on both a conceptual level (well-known melody vs. novel melody) and a more sensory or contextual level (MIDI version—that is, a computer generating the programmed musical line—vs. original recording of the well-known melodies). Finally, we looked at how verbal mediation from semantic memory (i.e., knowing the original titles of the melodies) might influence memory and FOK ratings for the familiar melodies as well as their new titles.

Method

Participants

A total of 96 American University students participated in the experiment for extra credit in psychology courses.

Materials

For the presentation phase, the materials comprised 48 snippets of highly familiar and 36 snippets of novel music.[1] Familiarity was operationalized on the basis of a priori knowledge of the melodies. Most of the 48 familiar snippets, such as those from the first movement of Mozart's "A Little Night Music" or the main theme of Gershwin's "Rhapsody in Blue," were from the instrumental selections used by Peynircioğlu et al. (1998). The remainder comprised similar, newly selected snippets that did not have lyrics, such as the theme music from the film *Star Wars*. The snippets were an average of 8.4 s long (ranging from 3.4 s to 17.3 s) and were randomly assigned to titles selected from the Battig and Montague (1969) norms for four-footed animals. Thus, for instance, the "A Little Night Music" snippet was paired with *cow*, and the *Star Wars* snippet was paired with *zebra*. The 36 novel snippets were either taken from collections of international folk songs or composed for this experiment, were an average of 8.6 s long (ranging from 5.3 s to 14.7 s), and had been piloted to be truly unfamiliar, with all of them receiving ratings of 2 or less on an 11-point familiarity scale where 0 denoted *not at all familiar* and 10 denoted *very familiar*. They were assigned a random subset of the animal-name titles used for the familiar snippets.

The 48 familiar snippets, along with their spoken animal-name titles, were recorded onto TDK tapes and played on an Aiwa NSX-V20 stereo system. The animal name always preceded the melody. For Condition 1, these familiar melodies were from original recordings. For Condition 2, MIDI versions of the same melodies were created and recorded as single-line melodies, obtained from their original scores, using a Power Macintosh computer, Finale (1997) software, and the piano setting on a Korg X5D synthesizer. For Condition 3, MIDI versions of the 36 novel snippets were recorded as they were in Condition 2.

For the forced-choice recognition phase, each melody or title was presented among two others that were musically similar in terms of genre and instrumentation. For example, the snippet from Mozart's "A Little Night Music" was grouped with those from Chopin's "Minute Waltz" and the "Alla Turca" from Mozart's Piano Sonata No. 12; and the theme from *Star Wars* was grouped with those from *Star Trek* and *2001: A Space Odyssey*. These groupings were the same regardless of whether melodies were cuing the titles or the titles cuing the melodies because the titles were all animal names and hence were necessarily similar to one another without any special groupings. No new items were used in this phase; thus all titles and all melodies that had been heard during the presentation phase acted both as targets and as lures.

During the recall–judgment phase, participants were given a sheet with blank spaces for their answers and FOK ratings. A portable tape recorder was used to record the participants' recall of the melodies to be judged later for correctness. During the recognition phase, when titles were given as cues, participants were given a sheet with the words "Melody 1, Melody 2, and Melody 3" printed on it, and they circled the correct answer after hearing the title and the three melodies. When melodies were given as cues, participants were given a sheet with three alternative titles printed on it, and they circled the correct answer after hearing the melody.

In Conditions 1 and 2, following the recognition test, participants listened to the 48 snippets again and were asked to give the real titles of each of the pieces or any information they had, such as the name of a movie or TV show in which the melody might have been heard. In all conditions, at the end of the session, participants were given questionnaires asking about their musical background and listening habits.

Design and Procedure

There were three between-participants conditions, each of which included 32 participants. All participants were tested individually. In Conditions 1 and 2, the 48 familiar melody snippets (the original versions in Condition 1 and single-line versions in Condition 2) were each assigned an animal-name title. These 48 items were randomly divided into two lists of 24 items each (Lists A and B). One list served as the *melodies as cues* list, in which the melody was used to trigger the memory for the title, and the other served as the *titles as cues* list, in which the title was used to trigger the memory for the melody.

During the presentation phase, all participants were presented with all of the 48 title–melody pairs. They were instructed to listen to each pair in preparation for a memory test and, to help them remember, to perhaps create an association between the animal names and the melody.

During the recall–judgment phase, for half of the participants in each condition, melody cues were given for List A items and title cues were given for List B items, and vice versa for the other half of the participants. These two types of recall–judgment tests were given one after the other immediately following the presentation phase. In addition, the order in which the cues were presented was counterbalanced across two subgroups of participants so that half received melodies as cues first and half received titles as cues first. During this phase, if participants were able to remember a title, they were asked to write it on the answer sheet, and if they were able to remember a melody, they were asked to sing or hum it into the portable tape recorder. They were asked not to make any wild guesses and were given 20 s to produce an answer. If they could not, they were asked to give an FOK rating between 1 (*there is only a 20% chance that I will recognize it later*) and 5 (*there is more than 80% chance that I will recognize it later*) on the basis of whether they would be able to pick out the correct target from three possible choices if given this cue again. Note that FOK ratings were given only to items that could not be recalled; thus, we did not obtain FOK ratings for errors of commission, which might have happened more frequently for the more familiar melodies (cf. Krinsky & Nelson, 1985).

The recall–judgment phase was immediately followed by the recognition phase, in which participants were given a cue and three alternatives from which to choose for each item. Titles cued by melodies and melodies cued by titles were blocked in the same manner in which they were blocked during the recall–judgment phase, although the order in which the items were presented within each block was different. During this recognition phase, each item served as both a target and a lure across all test items. No additional melodies or titles were employed as lures, and each title or melody appeared exactly three times within the recognition test, once as a target and twice as a lure. In this way, participants needed to use the cues as intended and base their decisions on memory for the composite rather than using the strategy of remembering whether the melody by itself or the title by itself had or had not been presented. Indeed, in pilot testing, when new titles and melodies had been used as lures, the recognition task had

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become trivial because participants had been able to use a simple process of elimination. For instance, even if they did not remember a melody, they could nevertheless remember that only one of the animal names had been presented during the entire study phase. Thus, in this test, participants were told that all of the items would be repeated a number of times throughout the test and that their task was to choose the correct target for each cue. Each participant went through this phase at his or her own pace.

After completing the recognition tests for both titles and melodies, participants were given another recall test, the *real title/information* test. During this semantic-memory test, they were presented with each of the 48 melodies again, without their animal-name titles, and asked to give the real title of the piece or some other piece of information about the melody, such as the composer or the name of a TV show in which it might have been heard. The purpose was to check for any effects of verbal mediation and to see whether knowledge of the real title affected performance by providing additional cues or an opportunity to create a different type of association (e.g., title–title association) rather than the intended music–verbal label association. Finally, participants were given a questionnaire asking about their musical background and listening habits.

The design and procedure for Condition 3 were very similar to those used in Conditions 1 and 2, except for the following differences. To avoid floor effects in recognition, only 36 items were used, rather than 48. These items were randomly divided into two sets of 18 (Sets 1 and 2). First, Set 1 was presented, followed by the recall–judgment phase for this set, in which the 18 items were further divided into two lists of 9 items each (Lists A and B), one list to serve as the melodies as cues list and the other as the title as cues list. The recognition test for Set 1 followed immediately. Then the entire procedure was repeated for Set 2. The same counterbalancing measures were used as in Conditions 1 and 2. In addition, there was no second recall test on the real titles–information of these pieces.

Results and Discussion

Of main interest was the effect of familiarity of the melodies on episodic recall as well as on FOK ratings and their accuracy. Overall familiarity varied across the three conditions such that the greatest familiarity was in Condition 1, with the original recordings of the melodies, the next greatest familiarity was in Condition 2, with familiar melodies pared down to their single-line MIDI versions, and the lowest familiarity was in Condition 3, with unfamiliar single-line melodies. We should note again that the same titles were used in all conditions so that the familiarity of the verbal components was kept constant across the three conditions.

The main results are summarized in Table 1, and 3 (familiarity) $\times$ 2 (cue type) analyses of variance (ANOVAs) were done on each of the variables of interest: recall, magnitude of FOK ratings, and accuracy of FOK ratings. As can be seen in Table 1, overall

recall decreased as a function of decreasing familiarity, $F(2, 186) = 43.04$, $MSE = 36.80$, $p < .01$. This was the case for both when titles were given as cues to elicit melody recall, $F(2, 93) = 10.26$, $MSE = 17.47$, $p < .01$, and when melodies were given as cues to elicit title recall, $F(2, 93) = 7.49$, $MSE = 56.13$, $p < .01$. Thus, familiarity of the cues themselves, as well as the familiarity of the to-be-recalled material, enhanced recall performance. There was no Cue Type $\times$ Familiarity interaction, $F(2, 186) = 0.69$, $MSE = 36.80$, $p > .05$.

We also looked at the effect of contextual or instrumental familiarity (keeping the melodies the same) by comparing Conditions 1 and 2 and the effect of melodic familiarity (keeping the instrumentation the same) by comparing Conditions 2 and 3. Post hoc tests revealed that recall was affected by melodic familiarity but not by instrumental familiarity. Indeed, recall of both titles and melodies were affected by melodic familiarity, $ts(93) = 2.76$ and 3.24, $ps < .01$, respectively, but not by instrumental familiarity, $ts(93) = 0.97$ and 1.12, $ps > .05$, respectively.

Of perhaps greater interest was the effect of familiarity on the magnitude and accuracy of FOK ratings. We calculated Goodman–Kruskal gamma correlations between FOK ratings and recognition performance to gauge accuracy (T. O. Nelson, 1984). As can be seen in Table 1, the magnitude of overall FOK ratings did not appear to be affected by familiarity, $F(2, 186) = 1.71$, $MSE = 0.56$, $p > .05$. When looked at separately, the effect did not reach significance with either the titles given as cues alone or melodies given as cues alone, $Fs(2, 93) = 0.86$ and 1.49, $MSEs = 0.51$ and 0.60, $ps > .05$, respectively, and there was no Cue Type $\times$ Familiarity interaction, $F(2, 186) = 0.68$, $MSE = 0.56$, $p > .05$. In addition, post hoc contrasts showed that there were no significant differences in FOK magnitudes as a function of either melodic familiarity alone or instrumental familiarity alone, $ts(93) = 1.53$ and 0.08, $ps > .05$, respectively, when titles were given as cues, and $ts(93) = 0.00$ and 1.14, $ps > .05$, respectively, when melodies were given as cues. Thus, FOK magnitudes did not appear to be affected by familiarity of either the cues or the targets. All of these findings, as well as all FOK magnitude findings that follow, were replicated when mean FOKs were used instead of median FOKs.

We should also note that, as mentioned above, these FOK ratings were given only to errors of omission. The percentages of errors of commission in Conditions 1, 2, and 3 were 4.69, 5.21, and 7.47, respectively, when melody cues were given, and 1.56, 1.43, and 0.00, respectively, when title cues were given. Thus, similar to the correct recall results, in all cases, there were more incorrect

Table 1

Recall Percentages, Median FOK Ratings, Recognition Percentages of Unrecalled Items, and Gamma Coefficients for Melodies as Cues and Titles as Cues Lists

| Measure | Familiar original | | | Familiar single line | | | Unfamiliar single line | | |
	Melody cue	Title cue	Overall	Melody cue	Title cue	Overall	Melody cue	Title cue	Overall
Recall	11.3 (1.7)	4.6 (1.0)	7.9	9.5 (1.2)	3.4 (0.8)	6.5	4.3 (0.9)	0.0 (0.0)	2.2
FOK	2.78 (0.15)	2.63 (0.13)	2.70	2.58 (0.13)	2.64 (0.16)	2.61	2.58 (0.10)	2.34 (0.12)	2.46
Recognition	62.4 (1.7)	59.5 (2.2)	61.0	55.2 (2.4)	57.2 (2.6)	56.2	53.2 (2.4)	59.7 (2.6)	56.5
Gamma	0.51 (0.06)	0.54 (0.04)	0.53	0.40 (0.04)	0.51 (0.05)	0.46	−0.05 (0.08)	0.25 (0.07)	0.10

Note. Standard errors of the mean are in parentheses. FOK = feeling of knowing.

recalls with melody cues than with title cues, $F(2, 186) = 8.86$, $MSE = 27.97$, $p < .01$, presumably because it was easier to guess verbal animal-name titles than it was to guess the melodies. There was also a significant Cue Type × Familiarity interaction, $F(1, 186) = 6.21$, $MSE = 27.97$, $p < .01$. Perhaps not surprisingly, errors of commission remained about the same regardless of the familiarity of the cues, $F(1, 93) = 1.48$, $MSE = 47.23$, $p > .05$, whereas they seemed to decrease when the targets were less familiar—though only approaching statistical significance, $F(1, 93) = 2.76$, $MSE = 8.72$, $p = .07$. Thus, possibly, at least in guessing, participants were relying more on a target-retrievability or accessibility strategy than on a cue-familiarity strategy (cf. Koriat & Levy-Sadot, 2001).

Unlike the magnitude of FOK ratings, the accuracy of FOK ratings was affected by decreasing familiarity, $F(2, 186) = 32.81$, $MSE = 0.10$, $p < .01$. Indeed, the differences in FOK accuracy reached significance when the cue-type conditions were considered separately, as well; that is, the effects were significant both when titles were given as cues (i.e., affected by target familiarity) and when melodies were given as cues (i.e., affected by cue familiarity), $Fs(2, 93) = 9.69$ and 23.81, $MSEs = 0.09$ and 0.12, $ps < .01$, respectively. In addition, the Cue Type × Familiarity interaction approached significance, $F(2, 124) = 2.92$, $MSE = 0.10$, $p = .057$, suggesting that the familiarity of the cues tended to be more important than the familiarity of the targets.

Post hoc contrasts showed that FOK accuracy also decreased from Condition 2 to Condition 3, that is, as a function of melodic familiarity, $t(93) = 5.98$, $p < .01$, when melodies were given as cues, and $t(31) = 3.06$, $p < .01$, when titles were given as cues. There were no differences in accuracy between Conditions 1 and 2, however, $t(93) = 1.28$ for melody cues and $t(93) = 0.45$ for title cues (both $ps > .05$). That is, even though melodic familiarity did influence prediction accuracy, regardless of whether the melodies were used as the cues or the targets, instrumental familiarity did not have any influence in either case.

Again, because the participants gave FOK ratings only to unrecalled items, those items that were incorrectly recalled were not considered when calculating the accuracy of the FOK ratings. We might speculate that had we asked for FOK ratings to all items and included the errors of commission in the analyses as well, it is likely that incorrect recalls would have received relatively high FOKs during the rating phase and then, possibly, led to lower gamma scores, because the participants would not have been as successful on these items during the recognition test. And given the pattern of commission errors, the increase in such errors with increasing unfamiliarity in melodic cues would have made the observed decreases in accuracy with increasing unfamiliarity even more striking.

We should note that one shortcoming of this study was that there were some musical variables for which we did not control between the three conditions which might have influenced the findings. For instance, whereas most of the highly familiar snippets in Conditions 1 and 2 were from classical music and film and TV themes, the unfamiliar snippets in Condition 3, although still within the Western style, were taken from international folk songs or were composed just for this experiment, thus possibly confounding the genre of the music between the conditions. Also, there was no condition in which the original versions, rather than just the MIDI versions, of the novel materials were presented, because familiar-

ity with instrumentation or contextual familiarity would not be an issue; however, perhaps the complexity of the snippets might have interacted with the melodic familiarity dimension in contributing to the establishment of the animal-name title–melody associations. A better choice would have been the use of the same genre of music across all conditions, with a conscious effort to equate complexity and other musical variables to rule them out as confounding variables.

Another question of interest in the present study was how the use of verbal materials (titles) to cue melodies might be different from the use of melodies to cue verbal materials. With similar instrumental music, Peynircioğlu et. al. (1998) found that melodies were better memory cues for titles than vice versa, and that melody cues led to higher FOK ratings than title cues, although title cues led to better accuracy than did melody cues. In this study, combined across familiarity conditions, melodies were again better memory cues for titles than vice versa, $F(1, 186) = 43.04$, $MSE = 36.80$, $p < .01$. Also, title cues again led to better accuracy than did melody cues, $F(1, 186) = 9.75$, $MSE = 0.10$, $p < .01$. There was, however, no difference between melody cues and title cues in terms of the magnitudes of FOKs that were elicited, $F(1, 186) = 1.03$, $MSE = 0.56$, $p > .05$. One possible reason for this particular difference between the two studies might be that in the Peynircioğlu et. al. study, the original titles had been used, whereas in the present study, arbitrarily assigned animal-name titles were used. That is, in the present case, the titles' connections to their respective melodies were semantically unpredictable and through episodic memory only.

Finally, we looked at the results as a function of expertise. Interestingly, no differences emerged in any of the memory or metamemory measures when musical expertise was defined by years of training or amount of listening (all $ps > .05$). There were, however, differences when we looked at expertise in terms of whether the real name of the piece was known to the participants. Thus, in Conditions 1 and 2, where this was applicable, we separated the participants into two groups depending on their demonstration of such semantic knowledge. Those who recalled more than the mean number (10.63 in Condition 1 and 7.22 in Condition 2) of real names recalled by all participants were classified as experts, and those who recalled fewer were classified as nonexperts. This resulted in 14 and 13 participants being classified as experts and 18 and 19 being classified as nonexperts in Conditions 1 and 2, respectively. Table 2 shows the differences between these two groups. As can be seen, experts recalled more targets overall, $F(1, 60) = 15.68$, $MSE = 6.00$, $p < .01$, and this was true with both original familiar melodies, $t(30) = 3.13$, $p < .01$, and single-line familiar melodies, $t(30) = 2.44$, $p < .05$, and there was no interaction as a function of Condition, $F(1, 60) = 1.17$, $MSE = 6.00$, $p > .05$. It should be noted that recall, here, again refers to recalling the arbitrarily assigned animal-name titles from the melody cues or recalling the melodies from the animal-name cues.

There were no differences between the two groups with respect to overall FOK magnitudes or accuracy. There were also no interactions as a function of Condition (all $ps > .05$), except in the case of gamma measure, where the Condition × Expertise interaction approached significance ($p = .058$), mainly because experts appeared to be less accurate than nonexperts in their predictions with the original versions of the familiar melodies, $t(30) = 2.33$, $p < .05$. Perhaps in this condition, because experts recalled more

Table 2
Recall Percentages, Median FOK Ratings, Recognition Percentages of Unrecalled Items, and Gamma Coefficients as a Function of Expertise in Knowledge of Real Titles and Combined Across Cue Type

Measure	Familiar original		Familiar single line		Overall	
	Experts	Nonexperts	Experts	Nonexperts	Experts	Nonexperts
Recall	11.6 (1.4)	5.1 (1.2)	8.7 (1.4)	4.9 (1.2)	10.2	5.0
FOK	2.63 (0.19)	2.76 (0.17)	2.79 (0.20)	2.49 (0.17)	2.70	2.62
Recognition	56.3 (2.6)	56.4 (2.3)	59.8 (2.7)	53.8 (2.3)	58.1	55.1
Gamma	0.42 (0.05)	0.56 (0.05)	0.48 (0.05)	0.43 (0.04)	0.45	0.50

Note. Standard errors of the mean are in parentheses. FOK = feeling of knowing.

items than nonexperts, their FOK ratings were necessarily given to the remaining more difficult items in comparison (e.g., Bradley, 1981). Such an item-selection effect, coupled with the greater knowledge of the real titles, which may have created unwanted demand characteristics, might have caused this observed accuracy difference. Overall, then, whereas verbal mediation between the melody and the animal-name title via the real title of the melody seems to play a substantial role in recall, with the possible exception of prediction accuracy with original recordings of familiar music, verbal mediation does not seem to play a role in most FOK judgments, in terms of either magnitude or accuracy.

Conclusion

Previous familiarity with music affected episodic recall in that familiar snippets were remembered better in response to random verbal title cues and acted as more effective cues to elicit those random verbal titles. This is a finding consistent with research using verbal materials in which familiarity of both the cues and the to-be-remembered words has usually benefited memory performance (e.g., Garner & Whitman, 1965; Ihalainen, 1967; D. L. Nelson, Garland, & Crank, 1970; Saltz & Felton, 1968; Whitman, 1966). The current findings applied mainly to melodic familiarity, however, a more conceptual phenomenon having to do with the essential identity of the material, and not with the more contextual familiarity created by keeping the full harmony and instrumentation associated with those familiar melodies. Also, these findings appeared to be, at least to some extent, due to mediation between the known title or other verbal information about the melody and its new arbitrarily assigned title (cf. Booth & Cutietta, 1991; Serafine, Davidson, Crowder, & Repp, 1986).

Previous familiarity with the music, either at the melodic or the instrumental level, seemed to have no effect on the magnitudes of FOK ratings, however. Even though participants recalled more familiar melodies better and used them as cues more effectively, when initial recall failed, they did not use this familiarity dimension with either the cues or the targets while making predictions about future recognition. This finding was somewhat surprising. Greater familiarity with the cues, whether preexisting semantically or created episodically, has usually tended to increase FOK ratings (e.g., Otani & Hodge, 1991; Metcalfe et. al., 1993). And greater familiarity with the targets has usually tended to decrease FOK ratings, at least when it exists semantically (e.g., Peynircioğlu & Tekcan, 2000). In our study, the FOK ratings were influenced by

neither the familiarity of the cues nor that of the targets. Perhaps this lack of influence of familiarity, especially on the cues, was because of the arbitrary and cross-modal nature of the cue–target links, which did not allow for the familiarity of the melody itself to have any effects on the feelings of knowing (cf. Leibert & Nelson, 1998).

More interestingly, unlike that in most FOK research, in which accuracy either varies in the same way as FOK magnitudes or remains unaffected, the accuracy of the present FOK judgments was indeed affected by melodic familiarity, though not by instrumental familiarity, in that participants were more accurate with the more familiar melodies. In addition, this was true both when these melodies were the to-be-remembered targets themselves and when they were being used as cues to elicit the verbal titles. Thus, previously, familiarity with the cues had been shown to affect FOK magnitudes (e.g., Reder, 1987) but not accuracy. In this study, we showed that familiarity with the targets is important, as well, although such familiarity affects the accuracy of FOK ratings rather than their magnitudes. Finally, given that there were no differences with respect to either FOK magnitude or overall accuracy between those participants who knew more of the real verbal titles and those who did not, and that the only accuracy difference in the original-versions condition was in favor of those who knew fewer real titles, unlike recall performance, these FOK judgments did not appear to be enhanced by verbal mediation.

References

Bartlett, J. C., Halpern, A. R., & Dowling, W. J. (1995). Recognition of familiar and unfamiliar melodies in normal aging and Alzheimer's disease. *Memory & Cognition, 23,* 531–546.

Battig, W. F., & Montague, W. E. (1969). Category norms for verbal items in 56 categories: A replication and extension of the Connecticut Category Norms. *Journal of Experimental Psychology Monographs, 80(3, Pt. 2).*

Beiderman, I. (1987). Recognition-by-components: A theory of human image understanding. *Psychological Review, 94,* 115–217.

Booth, G. D., & Cutietta, R. A. (1991). The applicability of verbal processing strategies to recall of familiar songs. *Journal of Research in Music Education, 39,* 121–131.

Bradley, J. V. (1981). Overconfidence in ignorant experts. *Bulletin of the Psychonomic Society, 17,* 82–84.

Chase, W. G., & Simon, H. A. (1973). Perception in chess. *Cognitive Psychology, 5,* 55–81.

Finale for Macintosh. (1997). [Computer software]. Eden Prairie, MN: Coda Music Technology.

Garner, W. R., & Whitman, J. R. (1965). Form and amount of internal structure as factors in free-recall learning of nonsense words. *Journal of Verbal Learning and Verbal Behavior, 4,* 257–266.

Hall, J. F. (1954). Learning as a function of word frequency. *American Journal of Psychology, 67,* 138–140.

Ihalainen, V. J. (1967). Learning and the association values of nonsense syllables. *The Journal of Psychology, 67,* 3–15.

Klatzky, R. L., & Forrest, F. H. (1984). Recognizing familiar and unfamiliar faces. *Memory & Cognition, 12,* 60–70.

Koriat, A., & Levy-Sadot, R. (2001). The combined contributions of the cue-familiarity and accessibility heuristics to feelings of knowing. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 27,* 34–53.

Krinsky, R., & Nelson, T. O. (1985). The feeling of knowing for different types of retrieval failure. *Acta Psychologica, 58,* 141–158.

Leibert, T. W., & Nelson, D. L. (1998). The roles of cue and target familiarity in making feeling of knowing judgments. *American Journal of Psychology, 111,* 63–75.

Metcalfe, J., Schwartz, B. L., & Joaquim, S. G. (1993). The cue-familiarity heuristic in metacognition. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 19,* 851–864.

Mills, J. A., & Nicolas-Fanourakis, A. (1966). Relationship between scaled familiarity, rate of learning, and extent of recall in connected discourse. *Psychological Reports, 19,* 1195–1202.

Nelson, D. L., Garland, R. M., & Crank, D. (1970). Free recall as a function of meaningfulness, formal similarity, form and amount of internal structure, and locus of contingency. *Journal of Verbal Learning and Verbal Behavior, 9,* 417–424.

Nelson, T. O. (1984). A comparison of current measures of feeling-of-knowing accuracy. *Psychological Bulletin, 95,* 109–133.

Nelson, T. O., Leonesio, R. J., Shimamura, A. P., Landwehr, R. S., & Narens, L. (1982). Overlearning and the feeling of knowing. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 8,* 279–288.

Otani, H., & Hodge, M. H. (1991). Mechanisms of feeling of knowing: The role of elaboration and familiarity. *The Psychological Record, 41,* 523–535.

Peynircioğlu, Z. F., & Mungan, E. (1993). Familiarity, relative distinctiveness, and the generation effect. *Memory & Cognition, 21,* 367–374.

Peynircioğlu, Z. F., & Tekcan, A. İ. (2000). Feeling of knowing for translations of words. *Journal of Memory and Language, 43,* 135–148.

Peynircioğlu, Z. F., Tekcan, A. İ., Wagner, J. L., Baxter, T. L., & Shaffer, S. D. (1998). Name or hum that tune: Feeling of knowing for music. *Memory & Cognition, 26,* 1131–1137.

Reder, L. M. (1987). Strategy selection in question and answering. *Cognitive Psychology, 19,* 90–138.

Reder, L. M., & Ritter, F. E. (1992). What determines initial feeling of knowing? Familiarity with question terms, not with the answer. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 18,* 435–451.

Saltz, E., & Felton, M. (1968). Encoding of nonsense syllables for meaning. *Psychological Reports, 23,* 1087–1093.

Schwartz, B. L., & Metcalfe, J. (1992). Cue familiarity but not target retrievability enhances feeling-of-knowing judgments. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 18,* 1074–1083.

Serafine, M. L., Davidson, J., Crowder, R. G., & Repp, B. H. (1986). On the nature of melody-text integration in memory for songs. *Journal of Memory and Language, 25,* 123–135.

Simon, H. A., & Feigenbaum, E. A. (1964). An information-processing theory of some effects of similarity, familiarity, and meaningfulness in verbal learning. *Journal of Verbal Learning and Verbal Behavior, 3,* 385–396.

Whitman, J. R. (1966). Form of internal and external structure as factors in free-recall and ordered recall of nonsense and meaningful words. *Journal of Verbal Learning and Verbal Behavior, 5,* 68–74.