Encoding & Retrieval in Memory for Melodies

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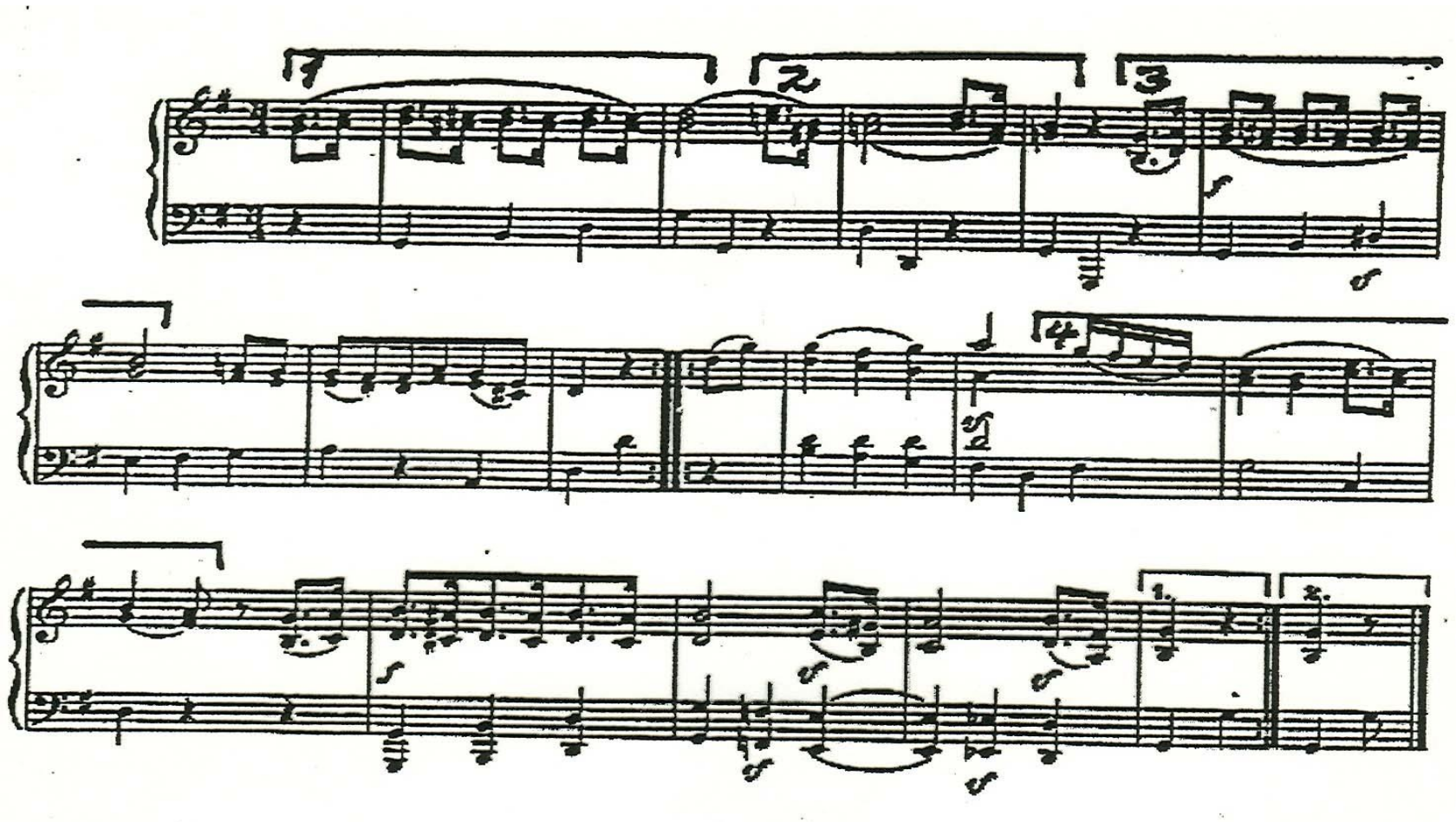
Thanks to Rachna Raman & Barbara Tillmann

CONTOUR

- Melodic/Rhythmic contour is a strong cue for retrieval of a melody



CONTOUR

- The contour is specific to a particular melody
- Composers can use contour to allude to another melody – for example, the chorus of Schubert's *Sei mir gegrűsst* refers to the song *Bist du bei mir* from Bach's *Anna Magdalena Notebook*
- It is part of what Bharucha (1994) called "veridical" information that pertains to an individual familiar melody

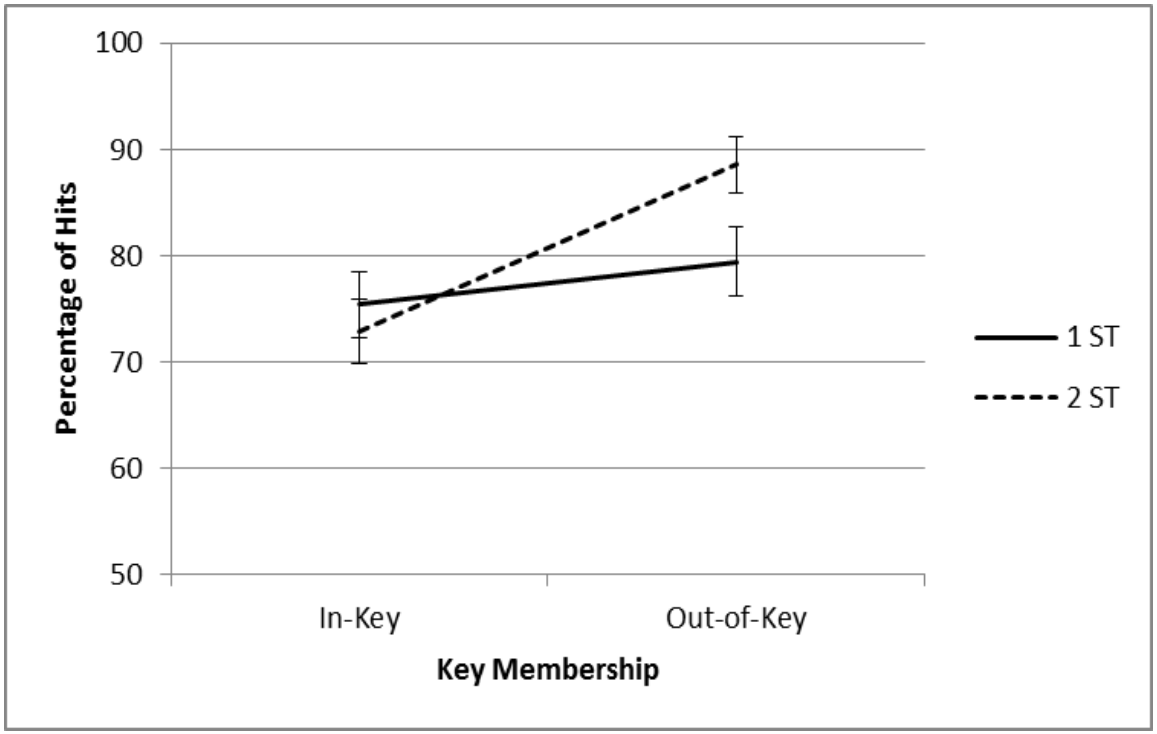
VERIDICAL & SCHEMATIC INFORMATION

- Song-specific veridical information is complemented by general schematic information, such the tonal scale embedded in the tonal hierarchy
- The tonal scale (in a particular mode such as major or minor) provides the pitch pattern for a family of melodies
- Dowling (1978) proposed that melodies are remembered as combinations of veridical (contour) and schematic (scale) information.

MELODY RETRIEVAL

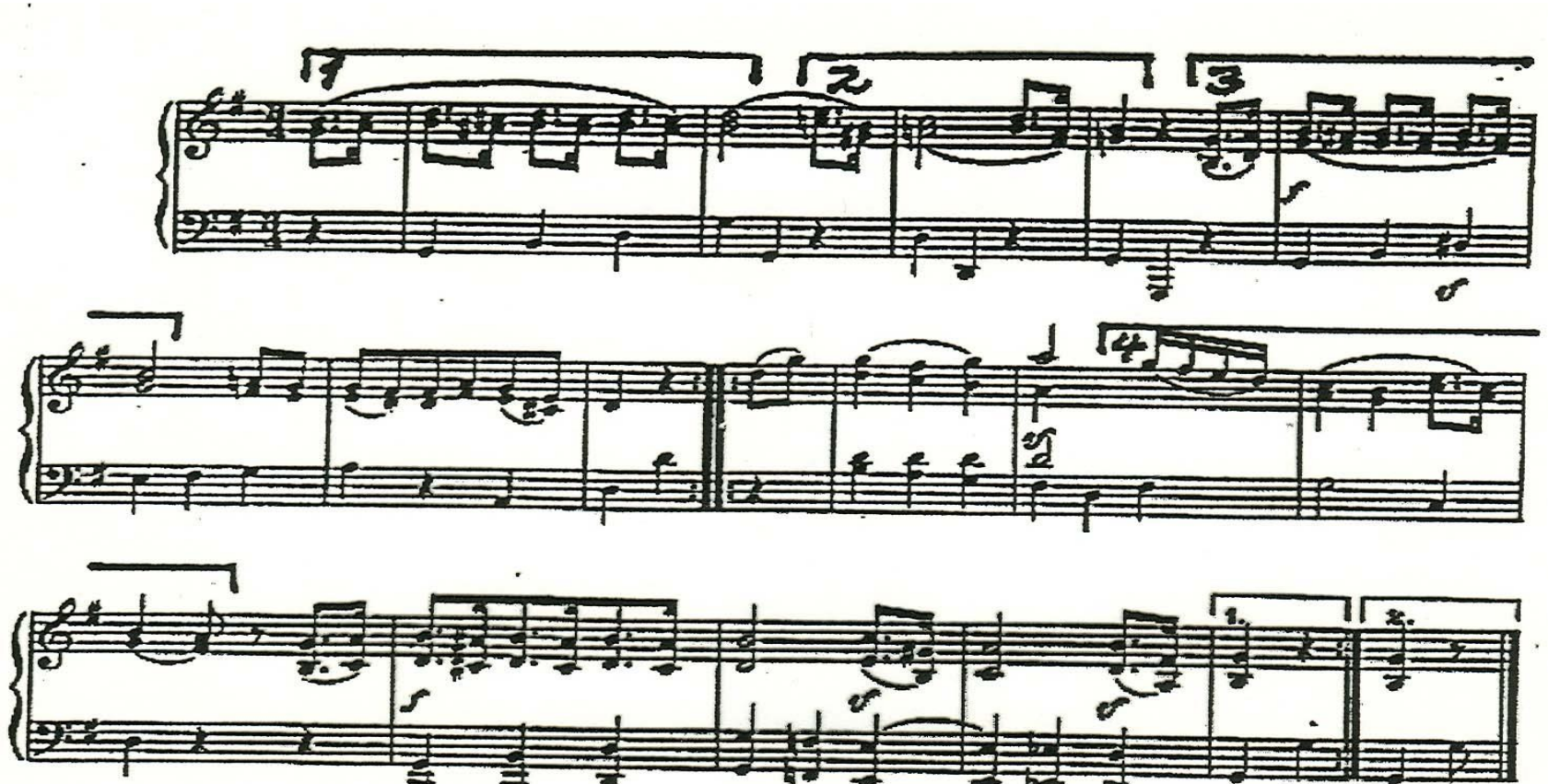
- The influence of scale in retrieval can be seen in the task of detecting wrong notes in a familiar melody.
- The melody is retrieved to check against the heard melody for wrong notes.
- Out-of-key wrong notes are detected rapidly and accurately
- Wrong notes 2 ST from their targets are detected better than those 1 ST away, but the gain from violations of expected interval size is not as great as for violations of the scale

MELODY RETRIEVAL



MELODY ENCODING

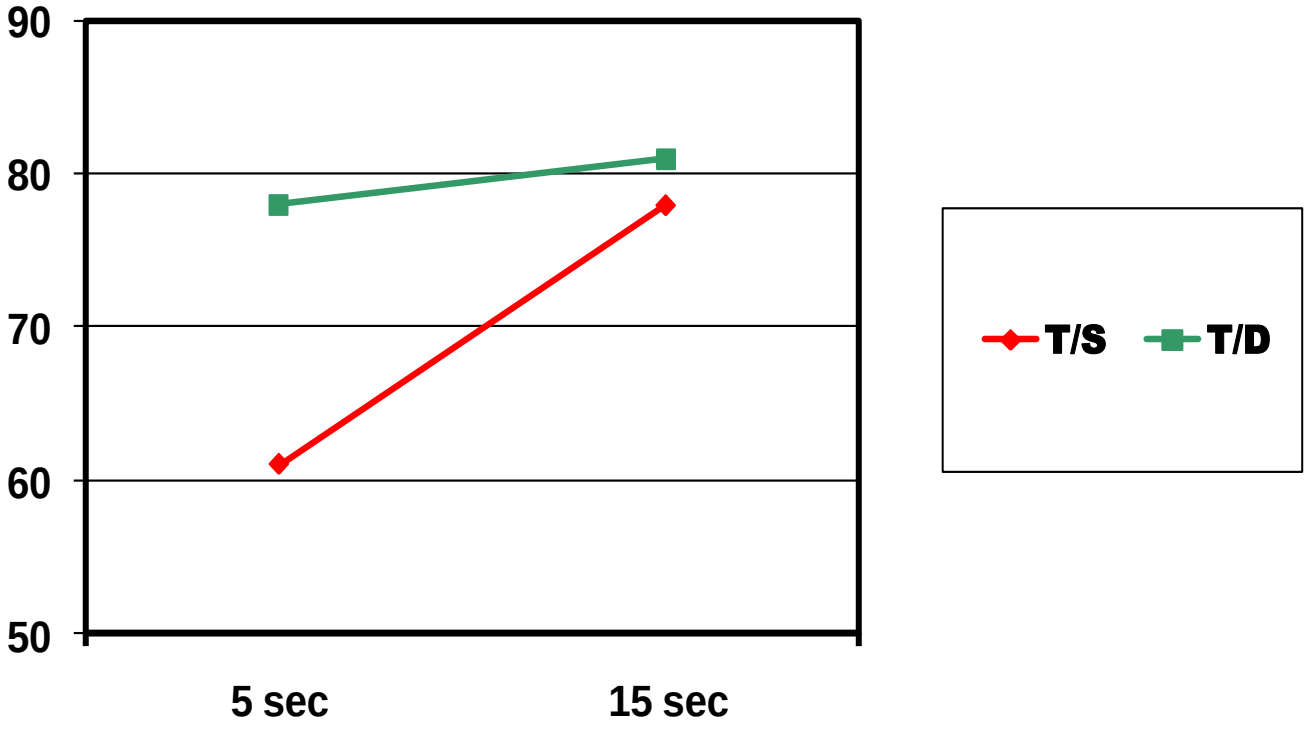
- New melodies are encoded as combinations of contour and scale, but the encoding takes time – of the order of 10-15 sec
- Take Beethoven's *Minuet in G:*



MELODY ENCODING

- Dowling & Tillmann (2001, 2014) presented minuets like this, in which one of the first couple of phrases would be tested later
- Here, if the first phrase is a target, it could be tested with a same-contour lure at the third phrase, 4-5 sec later
- In that case, the third phrase would be confused with the first, and would produce a false alarm response.
- BUT, if we wait for 6 intervening measures (12-15 sec) the confusion disappears, and Ss accept a target and reject the imitation

MELODY ENCODING

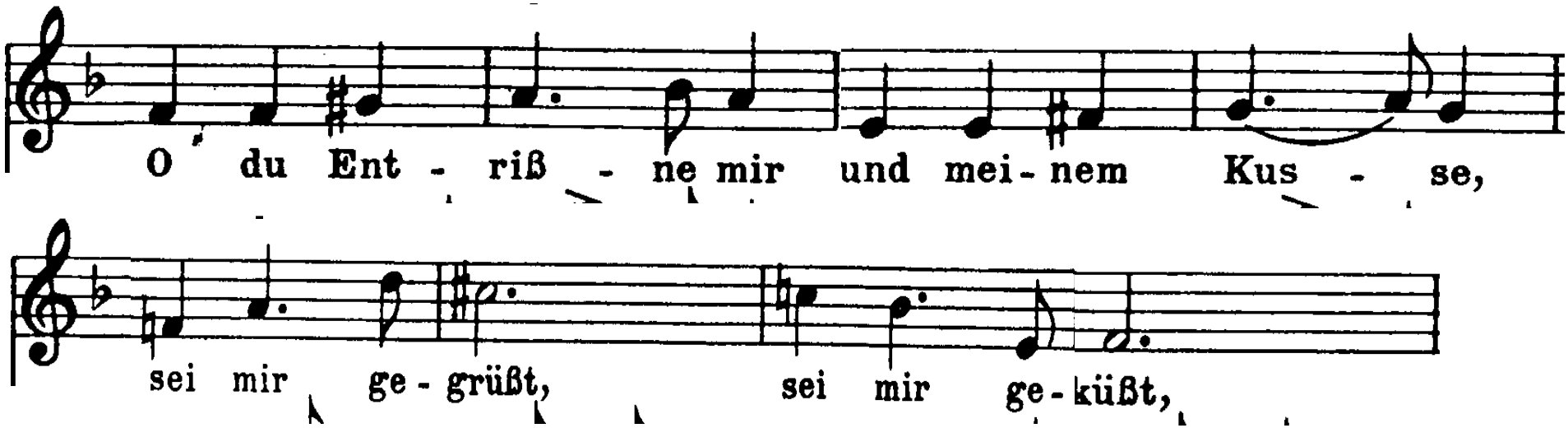


MELODY ENCODING

- Thus it takes considerable time in the encoding process to bind the contour to the scale
- When tested too soon (4 sec) S answers in terms of individual features such as contour (including rhythm) and scales
- When tested later, the contour is bound to the scale at the right level, and S can reject the lure
- Encoding the melody results in an "object file" in Treisman's terms

MELODIES WITH OUT-OF-KEY PITCHES

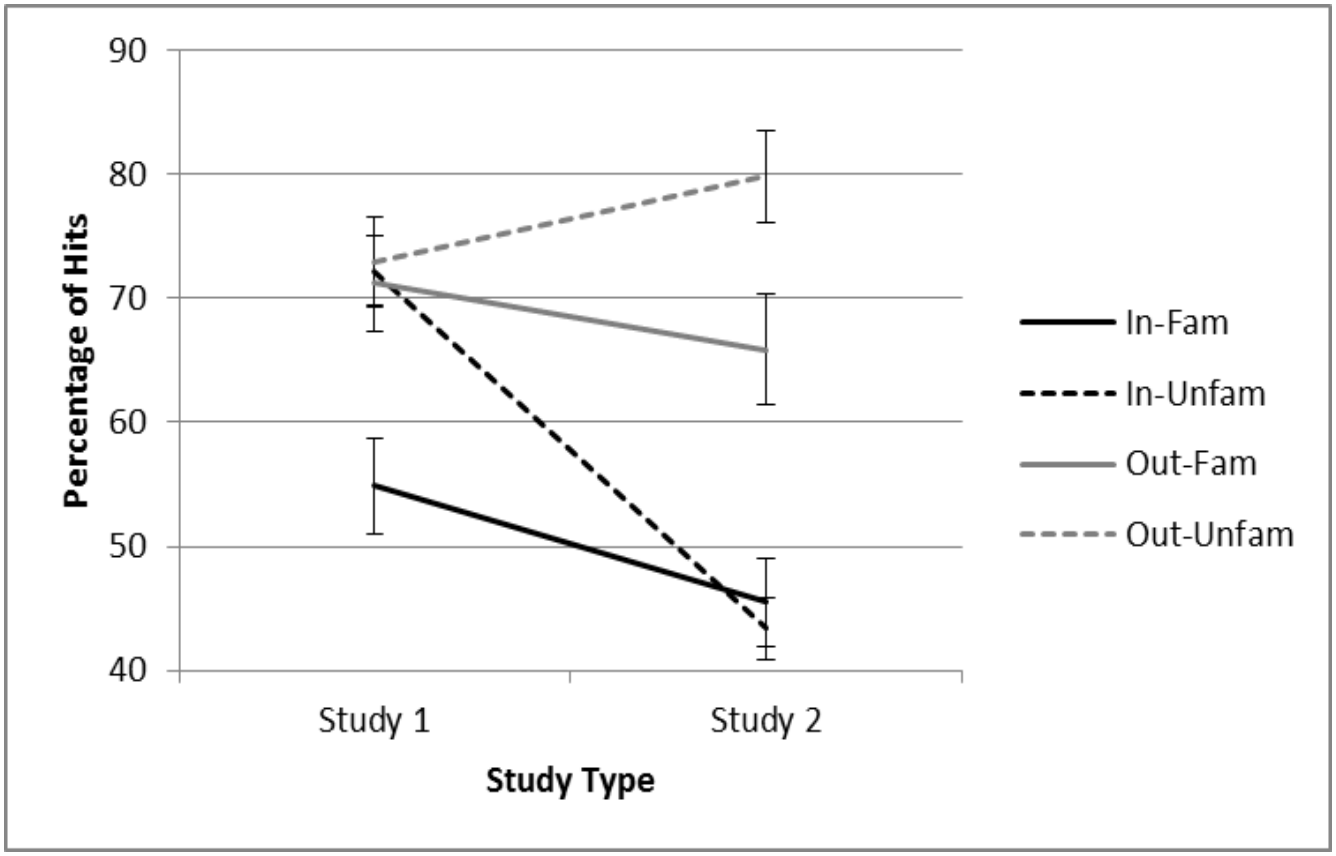
- Many melodies, especially from the 19th century on, contain out-of-key pitches in their familiar form – for example, Schubert's Ave Maria, or even more extreme, his *Sei mir gegrűsst:*



MELODIES WITH OUT-OF-KEY PITCHES

- We familiarized Ss with melodies containing out-of-key notes
- We wanted to see what would happen when those notes were altered to be wrong notes
- Would they be more noticeable if they remained out-of-key, or if they came back into the key?
- We did the experiment twice, with different melodies but the same design
- Out-of-key wrong notes were more noticeable

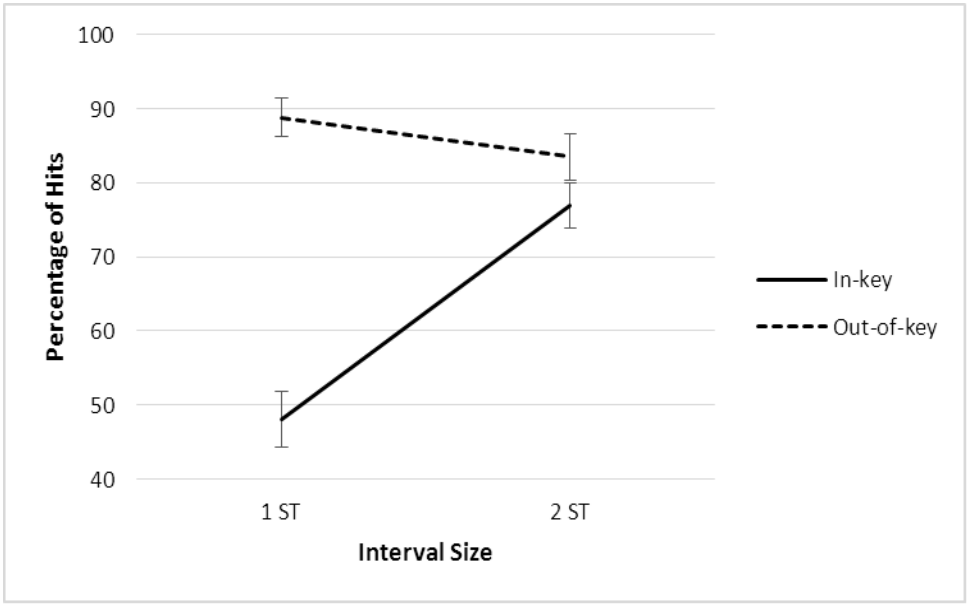
MELODIES WITH OUT-OF-KEY PITCHES

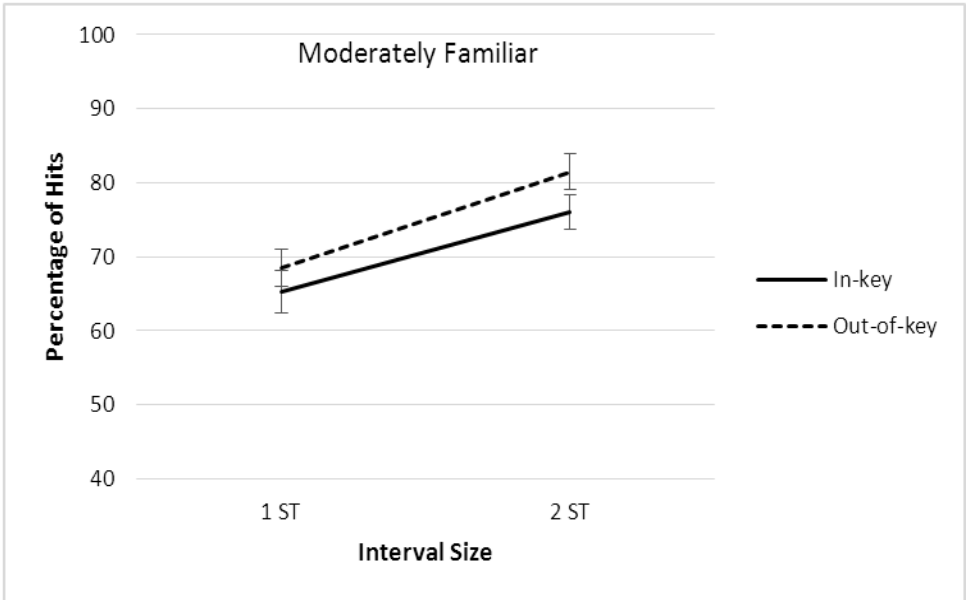


HIGHLY FAMILIAR MELODIES

- Post-hoc analyses of previous experiments led us to think that responses to wrong notes in highly familiar melodies differed from those with merely moderately familiar melodies
- From recent familiarity ratings we selected 8 highly familiar tunes and 24 that were moderately familiar
- We presented these with wrong notes that were in-key vs out-of-key, 1 or 2 ST up or down from their original targets,

HIGHLY FAMILIAR MELODIES





HIGHLY FAMILIAR MELODIES

- Expected interval size is much more important with highly familiar than with moderately familiar melodies
- This points to the importance of veridical information in the memory representations of these melodies
- Which suggests that these melodies serve as a foundation for the pitch pattern of the tonal scale, rather than vice versa

HIGHLY FAMILIAR MELODIES

- Practicing scales is characteristic of highly theorized musical cultures such as in Western Europe, India, China, and Japan. In hunter-gatherer cultures people often just learn the songs, but their underlying tonal systems are just as important to the musical structure, and are consistent and highly durable

CONCLUSIONS

- Melodies are stored in memory as melodic/rhythmic contours, which are attached to the appropriate tonal scale at the right pitch level in retrieval
- The contour and a certain amount of note-to-note pitch interval information constitute veridical information of that melody in memory, whereas the tonal scale is part of the schematic, general information

CONCLUSIONS

- During encoding of a new melody it takes time (ca. 10 sec) to bind the contour to the scale at the right pitch level
- When a familiar melody has out-of-key pitches, if those pitches are altered to make wrong notes, they are more noticeable when they're out-of-key than in-key
- Alterations in the pitch intervals of highly familiar melodies (veridical information) are very noticeable, unlike with moderately familiar melodies

CONCLUSIONS

- This suggests that those melodies form part of the foundation for the schematic information of the tonal scale system

Thank You!

Brandon Carter

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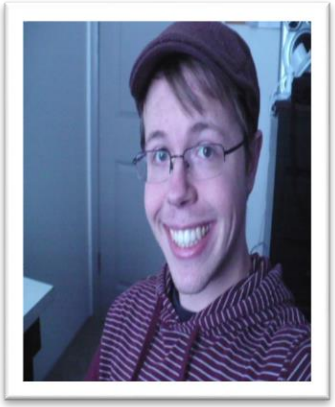

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