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Musical Soundtracks as a Schematic Influence on the Cognitive Processing of Filmed Events

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Previous research has demonstrated that the accompanying music of a film can influence both the affective impact of a scene as well as its subsequent remembering. The intent here was to investigate whether the affect of music can also contribute to a story’s comprehension by guiding the course of selective attending and providing a more elaborative encoding of characters’ actions, motivations, and inherent temperament. These ideas were examined by presenting participants with three ambiguous film clips accompanied by positive, negative, and no music. Immediately after viewing each clip, some participants were asked to extrapolate the film’s ending, evaluate the personality and motivations of the main character(s), and complete a series of bipolar adjective ratings about the film’s actions. In addition, other participants returned a week later for a surprise recognition test that assessed their memory for certain objects within each film. Results revealed that relative to the control group of no music, positive and negative music significantly biased viewers’ interpretation and subsequent remembering of a film in a mood-congruent fashion. These findings are discussed in terms of the schematic influences of music upon the cognitive processing of visual scenes. Received January 19, 2000; accepted January 24, 2001.

Films and movies provide a major source of entertainment within our society, and in the background of the ongoing action, there is typically an accompanying musical soundtrack. Although the primary focus of filmmaking is upon the visual depiction of a story, the music selected for a film is an integral aspect of the art form itself and is intentionally used to exert different effects upon a viewing audience (Bordwell & Thompson, 1979; Gianetti, 1982; Johnson, 1969). For example, the choice of a particular genre of music, such as classical, jazz, or rap, often helps to establish the context and setting of a story and in what particular era it occurs. Perhaps
even more frequently, music is selected for the affect it conveys. Playing music in parallel with a particular episode of a film can not only highlight the scene’s significance but accentuate the emotional meaning of the depicted activities as well. For example, the tragedy of a death scene and its effects upon loved ones is much more poignant when accompanied by music that conveys a sense of anguish and despair. In other cases, music can be used to induce suspense by relying upon a strategy known as foreshadowing. Here, music is played immediately before a climactic scene which thereby invites viewers to generate expectancies about what will happen next. The films of Alfred Hitchcock provide many such examples of this technique in which ominous music may be played at the onset of a seemingly innocent scene of birds flying about a town square.

Effects of Music on the Movie-Viewing Experience

From a cognitive perspective, the use of music within film provides an interesting context in which to investigate effects of the auditory modality upon the cognitive processing of visual information. The primary question of interest is How does the presence of music influence the interpretation of the unfolding story and those aspects of the film that are selectively attended to and subsequently remembered?

To date, much of the past literature has primarily focused upon music’s ability to enhance the emotional impact of a film’s narrative. In one such demonstration of this effect, Thayer and Levenson (1983) monitored the physiological responses of participants while they viewed a film on industrial accidents. The music accompanying the film’s scenes was manipulated such that it consisted of relaxing documentary music, ominous horror music, or no music at all. Relative to the control condition, the results revealed that while the documentary music significantly decreased electrodermal responses, the stressful horror music led to significant increases in physiological activity—thereby suggesting that music altered the level of internal arousal within viewers.

Others have investigated the effects of music upon affective judgments. Through its structural arrangement of pitch, timing, and loudness characteristics (Hevner, 1936; Levi, 1982; Rigg, 1964; Scherer, 1979), music is not only able to induce different levels of arousal but express different types of moods such as joy, anger, or melancholy. By pairing such melodies with scenes varying in their overall affect, one can assess the combined effects of these two stimuli together relative to the presence of one modality alone. Relying on this sort of strategy, Marshall and Cohen (1988) presented participants with a short animation film prepared by Heider and Simmel (1944) that depicted three geometrical figures (a large triangle, a small triangle,
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and a small circle) moving about a rectangular enclosure. These figures had previously been found to vary along the semantic differential dimensions of activity, potency, and evaluation, and in the presence of “strong” versus “weak” music, the magnitude of these judgments additively increased. For example, the large triangle was perceived as the most aggressive and agitated of the three “characters” and even more so when accompanied by louder and more active music, but less so in the presence of “weak” music. Several subsequent studies have revealed similar effects (Bolivar, Cohen, & Fentress, 1994; Lipscomb & Kendall, 1994, Expt. 2; Sirius & Clarke, 1994) and as a set, demonstrate that the mood (in)congruity of music can enhance or attenuate the affective impact of a visual scene.

In addition to effects upon perceptual judgments, there is also evidence that music can influence the remembering of filmed events. Boltz, Schulkind, and Kantra (1991) addressed this issue by manipulating both the relative placement as well as the mood of music relative to that of a visual scene. In this study, melodies that had been prerated as positive or negative in their overall affect were factorially paired with 16 different film clips that resolved to either a positive or negative ending. In one group, participants viewed these clips in the absence of any musical soundtrack but in two other groups, music either coincided (accompanying condition) or immediately preceded (foreshadowing condition) the film’s outcome. Afterwards, all participants performed a series of memory tasks, one of which required them to recall as many of the 16 film clips as possible. The primary finding was a significant interaction between mood congruity and musical placement. Relative to the control group, participants in the foreshadowing condition better remembered those films in which the music was incongruent with that of the scene. However, in the accompanying condition, the opposite effect occurred—here, films displaying mood-consistent information were the most memorable.

In interpreting this overall pattern of results, Boltz et al. (1991) appealed to certain principles of schema theory. Foreshadowing music encourages an audience to extrapolate a future scenario of events that is consistent with the implied mood of the music. However, if this expectancy is subsequently violated by a mood-incongruent scene, then this creates a “surprise” that becomes more salient in memory than does a mood-consistent scene. The enhanced memorability of expectancy violations has been repeatedly demonstrated in the past literature (Belmore & Hubbard, 1987; Bower, Black, & Turner, 1979; Graesser, Woll, Kowalski, & Smith, 1980; Hastie, 1980; Maki, 1990; Nakamura, Graesser, Zimmerman, & Riha, 1985) and is typically attributed to attentional mechanisms in which people presumably devote more processing effort toward unexpected information in order to make sense of the anomaly (Bobrow & Norman, 1975; Friedman, 1979).
The effects of accompanying music, on the other hand, were suggested by Boltz et al. (1991) to involve a somewhat different set of underlying mechanisms. Here, musical affect is assumed to direct a viewer's attending toward those aspects of a film that display a similar connotative meaning. This not only ensures that attending is focused on that information most relevant to the story's plot and overarching theme but, in addition, may enable a viewer to elaborate and generate certain inferences so that the characters' motivations and behaviors become more clear. The resulting memory code is therefore a more integrated one than would be the case in either the absence of music or the presence of mood incongruent music. In the latter instance, memory is impaired because attending is misguided toward irrelevant information that has no meaning relative to the plot conflict. In sum, then, music is suggested to perform functions beyond that of mood accentuation by contributing to the story's comprehension.

Music as a Schema?

Although schema theory provides a useful means in which to explain the effects of mood congruity and musical placement on the overall memorability of a film, the comprehension function of music has never been directly assessed. The recall data within the study by Boltz et al. (1991) offered one such opportunity but unfortunately, given the relatively large number of film clips to recall, participants provided only very brief summaries of each clip with minimal descriptive details. Hence, additional research is needed to evaluate systematically the idea that music may perform an elaborative function in film comprehension and remembering. This in turn demands a closer examination of the schema literature in order to determine the specific ways in which music may influence the semantic processing of a film and how these processes might be assessed in an empirical setting.

Although many different accounts of schema theory have been offered (e.g., Bartlett, 1932; Brewer & Nakamura, 1984; Hastie, 1981; Neisser, 1976; Taylor & Crocker, 1981), most theorists agree that one of the primary functions of a schema is to provide an interpretative framework. That is, at any given point in time, people are inundated with information arising from the multitude of events surrounding them. And yet, one rarely feels overwhelmed by this information due to the existence of certain cognitive frameworks, termed schemas, that contain knowledge on how to perform different types of activities and how people in different social and vocational roles typically behave. Schemas therefore allow one to make sense of what is going on, why people are behaving in the ways in which they are, and what is likely to occur next. This in turn serves to reduce the amount of
attentional effort that is needed for perception and comprehension, and to organize one's perceptual experience into a coherent and intelligible whole. In addition, this interpretative function of schemas also exerts an influence upon memory. When experiencing a given event, the invoked schema serves to guide selective attending toward those actions and objects consistent with the adopted interpretation so that these items are subsequently much better remembered than schema-irrelevant information. Particularly after a time delay, it is also very common to erroneously remember new information that never occurred but nonetheless is consistent with the activated schema. This not only includes particular objects from the relevant event but also inferences about people's motives, actions, and behaviors.

These various theoretical functions of schemas have been validated in a number of empirical studies, many of which have relied upon ambiguous situations that can be interpreted from multiple perspectives. By systematically activating different schematic frameworks in different groups of individuals, one can examine how the same event can lead to differences in selective attending and remembering as well as the types of inferences generated to explain the characters' actions and behaviors. One such example of this methodological strategy is found in a study by Zadny and Gerard (1974), who presented subjects with a videotape of a man and a woman walking around the living room of an apartment and handling various objects. The key manipulation was the intention ascribed to these individuals. One group was told that the characters were looking for drugs in a friend's apartment; a second group was informed that the characters were burglars, searching for objects to steal; and the third group was told the characters were waiting for their friend to return to his apartment. Immediately after viewing the film, subjects were asked to recall all objects from the room. The results showed that even though all subjects saw the exact same scene, their memory was biased by the initial interpretation that was provided. For example, subjects in the “theft” condition remembered items such as a diamond ring and credit cards better than drug-related items such as a water pipe and roach clip. Overall, then, this study illustrates how different schemas can be activated for the same scenario and lead to differences in selective attending and subsequent remembering. These findings have been corroborated by others (Anderson, 1977; Bransford & Johnson, 1972; Pichert & Anderson, 1977) who have also relied on biasing instructions as a means of manipulating subjects' perspectives during story comprehension.

Within the realm of film-making, screenwriters and directors often rely on the basic functions of schemas, either intentionally or unintentionally, to enhance the overall enjoyment level of the viewing audience. Brewer (1980) and his colleagues (Brewer & Lichenstein, 1981) have noted that the elements of suspense and surprise are key ingredients to a “good” story
whereby people's level of internal arousal is heightened and then subsequently resolved. Although many different techniques are used to induce suspense during the viewing experience, one common strategy is to introduce ambiguity to the underlying plotline of a story. As in the case of the Zadny and Gerard (1974) study, a screenwriter may create an ambiguous situation that can be interpreted from multiple perspectives, bias viewers toward a given interpretation, and then surprise the audience by resolving to an alternative outcome. Within this overall strategy, the techniques used to bias viewers toward one interpretative framework versus another may involve the use of particular camera angles, suggestive dialogue or, as argued here, the use of music during the ambiguous portion of the story's plot. For example, suppose at the onset of a film, we see a man who is unobtrusively following a woman throughout the streets of a large city. On the surface, we have absolutely no idea who this man is or why he is following this woman. However, if soft romantic music is playing in the background, we might infer he is an old lover who has returned to the city after an absence to renew his romance with the woman. After adopting this perspective, our selective attention may then be guided toward some objects and actions within the scene and away from others; lead us to adopt certain inferences about the man's personality; and generate expectancies about what actions and events will appear next. On the other hand, if the initial scene is accompanied by eerie, ominous music, then the interpretative framework that is adopted is apt to be a much more negative one that leads one to attend to and subsequently remember a very different set of objects and actions.

In sum, it is argued that those structural characteristics of music that give rise to certain moods (Hevner, 1936; Levi, 1982; Rigg, 1964; Scherer, 1979) can influence the viewing experience beyond simply enhancing or attenuating the affective impact of a visual scene (Bolivar et al., 1994; Lipscomb & Kendall, 1994, Expt. 2; Marshall & Cohen, 1988; Sirius & Clarke, 1994). Musical soundtracks may also play a role in comprehension by activating a given schematic framework that gives rise to certain biases during selective attending and subsequent remembering, as well as elaborative inferences that clarify the characters' temperament and behavior.

The Present Study

The purpose of the present experiment was to evaluate this idea by presenting participants with three short ambiguous film clips that could be interpreted from either a positive or negative perspective. One film was paired with positive music, another with negative music, and a third with no music at all. Immediately after viewing a given film, participants were
divided into two groups and asked to perform tasks in which different schematic functions could be independently assessed from one another. In order to evaluate whether music can bias the overall interpretation of a film, one group of participants was asked to extrapolate the film's future course and to complete a series of essay questions concerning the characters' personality and overall intentions. This was then followed by a series of questions concerning particular scenes within the film that asked participants to evaluate, on an 11-point Likert scale of polarized adjectives, what the characters were feeling. One week later, a second group of participants was asked to return to the laboratory for a surprise recognition test that assessed their memory for particular objects within each film. The intent here was to examine whether music can selectively bias attending such that some objects not only become more memorable than others but also lead to false recognitions such that new schema-consistent information is incorrectly identified as having occurred in the film.

METHOD

Design and Participants

The design was a $3 \times 3$ mixed factorial. All participants were presented with three film clips in which the accompanying music varied in its overall affect (positive, negative, or no music). The between-subjects variable was the particular type of music paired with a given film, and this varied across three different sets.

One hundred and eight participants from an introductory psychology course at Haverford College were tested in the experiment for course credit.

Stimulus Materials

Presentation Phase

The filmed material used in this experiment was based on several feature-length films and 30-min programs recorded from network television1: *The Hitchhiker, Alfred Hitchcock Presents,* and *Shortstories.* Eight different clips, each approximately 5 min in duration, were then selected according to several criteria. First, each film clip necessarily had to be an ambiguous one in which the actions and intentions of the main characters were unclear and could be interpreted in either a positive or negative fashion. In addition, each had to be relatively unfamiliar to most college students; display a clear beginning and end so that it could be considered a distinct episode within the context of a story (Thorndyke, 1977); and lack any preexisting music within the background of a character's dialogue. Last, each clip had to contain several different objects that could later be tested for in a recognition memory task.

These eight film clips were then presented to an independent group of six participants who were asked to rate each, on a 7-point scale, for its degree of familiarity (1 = very familiar) and ambiguity (1 = very ambiguous). Those three film clips deemed the most ambiguous were then used as stimuli for the actual experiment.

The first scene was from the movie *Cat People* (Fries & Schrader, 1982) and depicts a sister who has just arrived at her brother's home after a long separation. They become

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1. The use of all filmed material in this experiment conformed to the specifications of the House Report on piracy and counterfeiting amendments (House Report 97-495, pp. 8-9).
reacquainted and examine various memorabilia from their childhood. Without having seen the rest of the movie, the intentions of the brother toward his sister are very unclear. The second scene was taken from the movie *Vertigo* (Hitchcock, 1958) in which a man follows a woman through the streets of San Francisco, stopping at various locales along the way. From this episode alone, the relationship between the two characters is unclear. The third and final scene was from an episode of the television show, “The Hitchhiker,” entitled *Split Decisions* (Chesler, 1984). A real-estate agent meets identical female twins at their home, which contains various props they have inherited from their magician father. Both sisters are very eccentric and it is unclear whether they intend to harm or seduce the visiting real-estate agent. These three film clips were given new titles to distinguish them in the participants’ memory. In addition, even though all participants in the pretest were not familiar with any of the films, it is possible they may have heard of their original titles, which could have had a biasing effect upon the experimental results. Hence, *Cat People* was renamed *The Reunion*, *Vertigo* was relabeled *The Drive*, and *Split Decisions* was renamed *The Sale*. A more detailed description of each film clip is presented in Appendix A.

For each of the three films, eight musical compositions were selected as potential stimuli: four tunes expressing a positive mood and the remaining four a negative, suspenseful mood. Because of their potential familiarity, none of these melodies constituted the original musical score of a given film. Instead, each was considered relatively obscure to most college students and selected on the basis of those structural parameters identified in the past literature (Hevner, 1936; Levy, 1982; Rigg, 1964; Scherer, 1979) as conveying positive vs. negative music. In general, the negative music displayed a minor mode, atonality, and an irregular rhythm. Conversely, the positive music displayed a major mode, a consistent tonality scheme, and a very predictable rhythm. All melodies were instrumental with no lyrics.

A pretest was then conducted to validate the affect and familiarity of all tunes as well as the appropriateness of a given melody relative to a given film clip. Ten independent judges were first asked to rate each melody, on a 7-point scale, for its overall familiarity (1 = very familiar) and affect (1 = very positive) and to provide two or three adjectives that seemed most descriptive of the tune. Results confirmed that those melodies selected as positive and negative were in fact perceived as such, and that all melodies were completely unfamiliar to all participants. Following this initial set of ratings, participants then watched a given film clip while listening to its respective set of four positive melodies and were asked to select the one melody that seemed most appropriate to that clip. This procedure was then repeated for the set of negative melodies as well as the set of tunes for the two remaining film clips. On the basis of these judgments, the following positive tunes were paired with each of the three film clips: *Blossom Meadow* (Winston, 1982) for the film *Cat People - The Reunion*; *Adagio for Strings* (Barber, 1938) for the film *Vertigo - The Drive*; and *Schutzlievel* (Scholz, 1993) for the film *Split Decisions - The Sale*. For the negative pairings, all three film clips were paired with different selections from the *Rubycon* album by Tangerine Dream (1975). Each piece of music was approximately 5 min in duration and was edited such that it played throughout a given film clip. A structural description of these six melodies is presented in Appendix B.

A final pretest was then conducted not only to ensure that the selected pairings were relatively valid ones but to aid in the selection of items for a subsequent recognition memory test. An independent group of 12 participants was asked to view the three film clips, paired with accompanying music and after each, to provide an interpretation of the film and a description of what they thought would happen next. They were also asked to recall any objects that came to mind and to list a set of objects they had expected to see but did not. These results confirmed that the accompanying music did indeed seem to bias participants’ responses.

Last, the three different film clips were arranged into 9 presentation orders for counterbalancing purposes. Within a given order, one clip was paired with positive music, a second with negative music, and the third with no music at all. Across the different orders, the temporal sequence of the three individual film clips was varied such that each clip appeared in each of the three serial positions. These three arrangements were then factorially crossed...
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with three other arrangements in which the affect of the accompanying music also appeared in each of the three serial positions.

**Testing Phase**

In the testing phase of the experiment, a questionnaire was constructed for each film clip that was designed to evaluate participants’ interpretations of each scene. They were first asked to extrapolate a film’s ending and describe what they thought was going to happen next. The participants were then asked to indicate whether they believed (yes or no) that one of the main characters in the scene was planning on harming the other (brother hurting his sister in *The Reunion*; man hurting woman in *The Drive*; and the twins harming the real-estate agent in *The Sale*) and to justify the reasons for their response. In addition, they were asked to describe the personality and motivations of the main character.

In the second part of the questionnaire, the participants were asked to complete a series of four questions for each film by rating a character’s feelings or intentions on an 11-point bipolar adjective scale, ranging from −5 to 0 to +5. The sets of adjective pairs for each film were constructed from the responses obtained within the final pretest and are shown in Appendix A.

For the memory phase of the experiment, a set of objects was selected for each film that fell into four categories: old positive and negative objects that had actually been present in the film, and new positive and negative objects that had never been present but were consistent with the affective interpretation of the film. These items were obtained from the earlier pretest in which a group of participants was asked to interpret each film and produce both old and new objects. To ensure greater validity, these items were presented to an independent group of 12 participants, who after viewing a given music version of each of the three film clips, were asked to judge the overall valence of an object on a 7-point scale (1 = very positive). This resulted in a total of 20 word items for each film clip: 5 old positive, 5 old negative, 5 new positive, and 5 new negative. Appendix A contains a complete list of items for each film.

**Apparatus**

A Panasonic AG-1950 video-editing system, connected to two Panasonic VCR’s and two NEC PM-1971A television monitors, was used to copy and edit the videotapes. Accompanying music was imposed by playing prerecorded music from a Kenwood KR-V5570 stereo receiver through a Sima SSM-3 sound mixing board, which allowed any existing dialogue within a film to be preserved. The volume of the music relative to that of the scene was adjusted such that the perceived ratio was equivalent across all music/film pairs and approximately 3/4 the amplitude of the scene’s dialogue.

During the actual experiment, the participants viewed the set of filmed episodes on a 19-in. Panasonic CT-20R12T television monitor interfaced with a Panasonic PV-2501 videocassette player. For the recognition memory task, the list of words for each film was presented via the PsyScope software program (Cohen, MacWhinney, Flatt, & Provost, 1993) on four Power Mac 6115 CD computers.

**Procedure**

All participants were randomly assigned to one of the nine counterbalancing conditions. In order to independently assess the effects of music on the interpretation and remembering of films, respectively, participants were randomly assigned to one of two task groups. In each, they were informed that they would be watching a set of film clips and later asked some questions. Participants in the first group were tested on the same day that the films were presented. Immediately after viewing a given clip, they were administered a questionnaire that asked them to extrapolate the film’s ending, interpret the characters’ motivations
and actions, and complete the set of adjective ratings. After all three film clips had been presented, participants were also asked to indicate whether they had previously seen any of the films or heard any of the melodies. This session lasted approximately 45 min.

The second group merely viewed the films during their presentation and afterwards, they too were asked if any of the films or melodies were familiar. One week later, they returned to the laboratory and were given a surprise recognition memory test. For each of the three film clips, participants were presented with a randomized list of 20 words that were flashed onto the computer screen in front of them. The word remained on the screen until the individual pressed either the “old” or “new” key on the computer console, at which point the next word appeared. Before each task began, the participants were given the title of the respective film as well as a brief, one-sentence description of the clip to refresh their memory. The ordering of the three sets of memory tasks was identical to that of the presentation phase of the experiment. This phase of the experiment was approximately 15 min in duration.

RESULTS

Separate analyses were conducted on the three dependent measures of interest, namely, the interpretative responses, adjective ratings, and the recognition memory data. In each, the data were collapsed over the variable of film order so that the resulting statistical design was a 3 × 3 mixed factorial in which musical affect was the repeated-measures variable and film instance/musical affect pairing was the between-subjects variable. When significant effects emerged, they were further analyzed through a set of Tukey post-hoc comparisons whose error term was adjusted for repeated-measures variables. Given that two participants had previously seen Vertigo, their entire data set for this particular film was omitted.

Interpretative Responses

In order to obtain a single quantitative value for the set of interpretative responses to each film, four naive judges evaluated participants' responses to the extrapolation task and the set of short-answer questions. They assigned a value that ranged from −3 to 0 to +3 that was based not only on what participants thought would happen next, but also on whether they believed one character was going to harm another and what kind of person they thought the main character was. A score of −3 corresponded to a strongly negative interpretation involving death or extreme violence. A score of 0 reflected a very neutral interpretation that was neither positive nor negative. Finally, a score of +3 suggested a very positive interpretation involving some form of a very happy outcome. Overall, the four judges displayed a relatively high degree of agreement ($r^2 = .95$), and their scores were averaged to obtain a single value for the statistical analysis.

An overall analysis of variance (ANOVA) revealed a significant main effect of music, $F_{2,28} = 21.47, p < .0001$, which is depicted in Figure 1. Notice that in the no-music condition, all scores cluster around a value of 0.
corresponding to a neutral valence, thereby providing some validity to the ambiguity of films used in this experiment. Relative to this control group, positive accompanying music led to more positive interpretations \((p < .01)\) whereas negative accompanying music led to more negative interpretations \((p < .01)\).

Figure 1 also shows that the effect of music generalized to all three film clips. Nonetheless, a significant interaction between musical affect and film instance, \(F_{4,56} = 3.21, p < .05\), revealed that the affect of music differentially influenced the individual films. In the positive music condition, the film *Vertigo* produced a significantly higher rating \((p < .05)\) than the two remaining films, and in the negative music condition, it produced the lowest rating. Conversely, the film *Split Decisions* was perceived to be the most negative film in the negative music condition \((p < .05)\) and the least positive in the positive music condition.

**Content Analysis**

In order to obtain insight into the nature of the interpretative responses, a content analysis was next conducted on both the extrapolation and short-answer questions. The same four judges who provided the set of interpretative scores were asked to code the responses into various categories that emerged from the overall data set. Although individual participants used different language to express their interpretation of a given film, a rela-
tively small set of themes consistently emerged. The judges were therefore able to unanimously agree on the verbal identification of those motivations associated with a character's behavior as well as the set of adjectives (and their synonyms) that described the character's personality. The results are shown in Table 1, where for each experimental condition, three columns of responses are provided: the percentage of participants who claimed that one character would harm the other; the various intentions or motivations ascribed to the main character(s); and the personality traits used to describe the main character(s).

For responses to the harm question, two of the three films (*Cat People, Split Decisions*) produced the predicted pattern of results. Although the frequency of yes/no responses was evenly distributed in the no-music condition, responses in the positive-music condition were biased toward “NO, one character will not harm the other” but toward “YES, one will harm the other” in the negative-music condition. The one exception was the film *Vertigo*. Here, almost all participants in both the positive and no music conditions did not think the man would harm the woman—in other words,

<table>
<thead>
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<th>TABLE 1</th>
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<tbody>
<tr>
<td>Content Analysis of the Interpretative Responses</td>
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<table>
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<tr>
<th>Harm?</th>
<th>Interpretation</th>
<th>Brother's Personality</th>
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<tr>
<td><strong>A. Positive Music</strong></td>
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<tr>
<td>Yes .17</td>
<td>Happy life together .44</td>
<td>Kind/caring .33</td>
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<tr>
<td>No .83</td>
<td>Will fall in love .22</td>
<td>Loving .22</td>
</tr>
<tr>
<td></td>
<td>Sister will move in with brother .22</td>
<td>Protective .17</td>
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<tr>
<td></td>
<td>Brother will harm sister .11</td>
<td>Possessive .06</td>
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<tr>
<td><strong>B. Negative Music</strong></td>
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<tr>
<td>Yes .94</td>
<td>Brother will harm sister .39</td>
<td>Crazy/deranged .22</td>
</tr>
<tr>
<td>No .06</td>
<td>Brother will kill sister .33</td>
<td>Evil .17</td>
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<tr>
<td></td>
<td>Brother will do supernatural harm to sister .17</td>
<td>Manipulative .17</td>
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<td></td>
<td>Sister will discover something evil about brother .11</td>
<td>Controlling/possessive .17</td>
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<td>Brother will initiate a sinister event .17</td>
<td>Mysterious .17</td>
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<td>Violent .06</td>
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<td>Self-centered .06</td>
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<tr>
<td><strong>C. No Music</strong></td>
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<tr>
<td>Yes .44</td>
<td>Will have a sexual relation .28</td>
<td>Caring .28</td>
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<tr>
<td>No .56</td>
<td>Brother will share family secret with sister .22</td>
<td>Manipulative .28</td>
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<td>Will have a happy life .17</td>
<td>Strange .17</td>
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<td>Brother will try to win sister's inheritance .17</td>
<td>Secretive .17</td>
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<tr>
<td></td>
<td>Brother will initiate a sinister event .17</td>
<td>Troubled .06</td>
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<td>Driven .06</td>
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**TABLE 1 (CONTINUED)**

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<tr>
<th>Harm?</th>
<th>Interpretation</th>
<th>Brother’s Personality</th>
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<tbody>
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<td><strong>II. Vertigo — The Drive</strong></td>
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<td></td>
</tr>
<tr>
<td>A. Positive Music</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.00</td>
<td>Man is long-lost lover</td>
</tr>
<tr>
<td>No</td>
<td>1.00</td>
<td>and/or is romantically infatuated with woman</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Man is a private investigator</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Negative Music</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>.82</td>
<td>Man is a hit man who will murder woman</td>
</tr>
<tr>
<td>No</td>
<td>.18</td>
<td>Man will harm woman</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Man is supposed to kill woman but is morally incapable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. No Music</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>.06</td>
<td>Man is a private investigator</td>
</tr>
<tr>
<td>No</td>
<td>.94</td>
<td>Will become romantically involved</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>III. Split Decisions — The Sale</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Positive Music</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>.12</td>
<td>Twins will seduce the real-estate agent</td>
</tr>
<tr>
<td>No</td>
<td>.88</td>
<td>Twins want to do magic tricks on agent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Negative Music</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>.94</td>
<td>Twins will kill agent</td>
</tr>
<tr>
<td>No</td>
<td>.06</td>
<td>Twins will hurt agent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. No Music</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>.50</td>
<td>Twins will force agent to do magic tricks</td>
</tr>
<tr>
<td>No</td>
<td>.50</td>
<td>Twins will hurt agent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

Numerical values represent the proportion of participants responding to a given category.

Positive music exerted no influence upon behavior. However, the negative music did bias responses in that the majority of participants claimed the man would harm the woman.

The two remaining analyses are more interesting because they reveal the perceived intentions and temperament of the main characters as a function
of the accompanying soundtrack. In the film *Cat People*, participants in the no-music condition produced a wide range of scenarios surrounding the brother's actions toward his sister. Some thought the two might eventually engage in a sexual relationship (.28) or achieve a happy life together (.17) while others thought the brother might reveal a family secret to his sister (.22), try to win her inheritance (.17), or initiate some sort of sinister event (.17). The personality assessment of the brother was also mixed and produced descriptive adjectives that ranged from manipulative, strange, and secretive to troubled and caring. However, in the presence of positive-music, participants' responses displayed much less variability: most predicted that the brother and sister would either live together (.22), develop a happy relationship (.44), or fall in love with one another (.22). In addition, the personality of the brother was consistently described as kind/caring, loving, and playful. On the other hand, the presence of negative music cast the brother in a very different light. Here, the interpretative responses were all negative in that participants believed the brother would either hurt (.39), kill (.33), induce some sort of supernatural harm to his sister (.17) or at best, the sister would discover something evil about her brother (.11). Consistent with these ascribed intentions, the brother's personality was described as evil, crazy/deranged, mysterious, manipulative, dominating, violent, and self-centered.

Table 1 reveals a similar pattern of results for the two remaining films. In the no-music condition of *Vertigo*, the man was most often perceived as a private investigator who was intelligent, curious, and analytical. However, the same man was described as a sensitive, caring long-lost lover romantically infatuated with the woman when the accompanying soundtrack was positive in affect, but a cold, lonely hit man when the accompanying music was negative in affect. Last, the film *Split Decisions* also produced a wide range of both positive and negative responses in the no-music condition. The presence of positive music, however, led participants to believe that the twin sisters were strange, playful women who merely intended to seduce or perform magic tricks on the real-estate agent but in the presence of negative music, insane psychotic sisters who meant to kill or harm the agent. In sum then, the affect of music exerted a very strong influence on participants' interpretations such that responses were biased toward the particular mood of the music.

**Adjective Ratings**

For the adjective ratings, participants were asked to rate the actions and feelings of the characters in each film on four 11-point bipolar adjective scales. After converting all of the negative adjectives to negative numbers and the positive adjectives to positive numbers, the set of ratings for a
given film were averaged together to obtain a single score. These are shown in Figure 2 as a function of film instance and the affect of the accompanying music.

The overall ANOVA revealed a main effect of music, $F_{2,28} = 19.52$, $p < .0001$, in which relative to the control group of no music, the presence of positive music led to significantly more positive ratings ($p < .05$) while the presence of negative music led to significantly more negative ratings ($p < .05$).

As seen in Figure 2, this effect applied to all three films. There was, however, a significant interaction between musical affect and film instance, $F_{4,56} = 3.83$, $p < .03$. Although the three film clips did not significantly differ from one other in the positive and no music conditions, the film *Vertigo* produced significantly lower ratings than the two remaining films in the negative-music condition ($p < .05$).

**Recognition Memory Performance**

The recognition memory data were assessed through three types of analyses. First, overall hit rate (i.e., the percentage of old objects correctly identified as such) was examined as well as the incidence of false alarms (i.e., the percentage of new objects incorrectly identified as old). Last, a signal detection analysis was conducted to assess hit rate relative to false alarms. Each is discussed in turn.

![Fig. 2](image-url)

*Fig. 2.* Mean adjective ratings as a function of the affect of accompanying music and film instance. Error bars denote standard deviations.
**Hit Rate**

An overall $2 \times 3 \times 3$ ANOVA was conducted that evaluated the repeated measures variables of object affect (positive, negative) and musical affect (positive, negative, no music) for the three participant groups who varied in the particular film clip that was paired with a given type of musical affect. The most important finding was a significant two-way interaction between the affect of remembered objects and the affect of the accompanying music, $F_{2,46} = 25.87, p < .001$, which is shown in Figure 3. In the no-music condition, positive items were better remembered than negative items ($p < .05$). However, the more interesting finding is that relative to the positive items in the control condition, the hit rate of these remembered objects significantly increased in the presence of positive music ($p < .05$) but significantly decreased in the presence of negative music ($p < .05$). The opposite effect was observed with negative items: relative to the control group, these objects became easier to remember with negative soundtracks ($p < .05$) but significantly more difficult to remember with positive soundtracks ($p < .05$). Overall, then, the hit rate of recognition memory was characterized by a pattern of mood congruency. This effect was a robust one that generalized to each of the three film clips. Unlike the interpretative or adjective rating data, film instance did not produce any significant effects.

Last, the overall ANOVA revealed a significant main effect for affect of the remembered objects, $F_{1,23} = 52.67, p < .001$. When collapsing over the various music conditions, positive items were better remembered than negative items.

![Fig. 3. Mean hit rate (“old”/old) as a function of the affect of accompanying music and the affect of remembered old objects. Error bars denote standard deviations.](image-url)
False-Alarm Rate

The mean percent false alarms of positive and negative items as a function of musical affect are shown in Figure 4. Once again, there was a significant interaction of these two variables, $F_{2,46} = 15.50, p < .001$. Although there was a tendency for participants in the no-music condition to falsely remember positive items more so than negative ones, this difference in fact was nonsignificant. However, relative to this control group, positive objects were more likely to be falsely recognized in the presence of positive music ($p < .05$) but less likely in the presence of negative music ($p < .05$). Conversely, negative objects produced a significantly higher false-alarm rate in the presence of negative music ($p < .05$) but a lower rate in the presence of positive music ($p < .05$). As in the case of hit rate, this interaction generalized to all three film instances: this latter variable produced no significant effects.

Signal Detection Analysis

In order to obtain a measure of memory discriminability independent of response bias effects, a $d'$ analysis was conducted from a procedure reported by Hochhaus (1972). In this analysis, the hit rates of old positive and negative items were evaluated relative to the false recognitions of new positive and negative items, and then transformed into $d'$ and bias values with the use of the abscissa and ordinate values of the standardized normal distribution. For this purpose, the number of targets and non-targets were combined according to the method of Neisser (1967) and the standard deviation was used to calculate the critical ratio for the mean values. The results showed that the $d'$ values were higher for positive music than for negative music and no-music conditions. The bias values indicated a slight bias towards rejection of targets in the no-music condition, but no significant difference was found between the music conditions.

**Fig. 4.** Mean false-alarm rate (“old”/new) as a function of the affect of accompanying music and the affect of misremembered new items. Error bars denote standard deviations.
distribution. Any $d'$ values of 0 represent random guessing, whereas values of 4.65 reflect perfect discrimination accuracy. Bias scores ($B$) independently estimate whether participants are differentially inclined toward old or new responses. $B$ values of 1.00 reflect no bias effects, whereas values greater than 1.00 reveal a bias toward “new” responses, and values less than 1.00 reveal a bias toward “old” responses. The results are shown in Table 2.

Consistent with the recognition accuracy data, musical affect and the affect of remembered objects exerted an interactive influence on memory discriminability, $F_{2,46} = 15.42, p < .001$. A set of Tukey post-hoc comparisons ($p < .05$) confirmed the presence of a mood congruency effect. Relative to the control group of no music, $d'$ increased when the affect of the remembered objects was consistent with the affect of the accompanying music, but decreased when the affect of the two variables differed from one another. The main effect of each factor alone was nonsignificant.

Response bias effects emerged in some conditions of the experiment as revealed by a significant interaction between music and the remembered objects, $F_{2,46} = 12.01, p < .01$. The no-music condition yielded $B$ values that were not significantly different from 1.00, indicating the lack of bias. Although bias was also absent in the mood-congruent conditions, responses in the two incongruent conditions were significantly more likely to be “new.”

**General Discussion**

The main finding of this experiment is that music influenced the comprehension and memory of filmed material. This conclusion is supported by data from the interpretative, adjective rating, and recognition memory

<table>
<thead>
<tr>
<th>Table 2</th>
<th>$d'$ and $B$ Values for the Recognition Memory Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Music</td>
<td>$d'$</td>
</tr>
<tr>
<td>Positive Music</td>
<td></td>
</tr>
<tr>
<td>Positive Items</td>
<td>1.68</td>
</tr>
<tr>
<td>Negative Items</td>
<td>1.17</td>
</tr>
<tr>
<td>No Music</td>
<td></td>
</tr>
<tr>
<td>Positive Items</td>
<td>1.48</td>
</tr>
<tr>
<td>Negative Items</td>
<td>1.28</td>
</tr>
<tr>
<td>Negative Music</td>
<td></td>
</tr>
<tr>
<td>Positive Items</td>
<td>0.92</td>
</tr>
<tr>
<td>Negative Items</td>
<td>1.68</td>
</tr>
</tbody>
</table>
tasks, which together provide very consistent evidence for schema-mediated behavior.

The use of ambiguous film clips, which could be interpreted in either a positive or negative fashion, offered an ideal means to methodological rigor in that the exact same sequence of action remained invariant across all experimental conditions. And as the results indicate, the manipulation of musical affect alone was sufficient to bias the cognitive processing of each scene in a very systematic fashion. One manifestation of this phenomenon was in the overall interpretative framework adopted in participants' extrapolation and short-answer responses. For example, in the movie *Vertigo*, recall that the man following the woman was assumed to be a private detective in the absence of music but a murderous hit man in the presence of negative music and a long-lost lover in the presence of positive music. Music then served to clarify the role of each character, the nature of their relationship to one another, and once this perspective was assumed, allowed subjects to make inferences of coherence and elaboration (Black, Galambos, & Read, 1984; Kintsch, 1974; McKoon & Ratcliff, 1986) about what the characters were feeling at certain points within the film, their inherent temperament, and the nature of their future actions. In short, the affect of accompanying music provided a means in which to make sense of what was going on and in doing so served to integrate the scene's action and dialogue into an affectively consistent framework.

Although the interpretation of a given scene was altered by music, one could argue this is neither surprising nor particularly compelling evidence for schematic influences of music on the cognitive processing of film. After all, it is possible that an individual could imagine similar sets of scenarios and interpretations in the presence of music alone. The recognition memory data, on the other hand, provide more persuasive support for the interactive influence of music and film because here it was found that different musical soundtracks led to marked differences in which particular objects from a film were selectively remembered. The individuals who participated in this task merely viewed the set of films at the time of encoding and did not engage in any sort of interpretative task that could later bias their behavior. And yet, 1 week later, they displayed a better remembering of those items whose associated mood was congruent with that of the accompanying music. For example, in the positive-music condition of *Vertigo*, participants were more apt to remember the bright, sunny day and bouquet of flowers than the dark sedan and deserted alley, whereas in the presence of negative music, the opposite pattern of results occurred. In addition to effects of selective memory enhancement, music also led to the confabulation of new schema-consistent information in memory. As in the case of recognition accuracy, these false alarms displayed an affect similar to that of the accompanying soundtrack. In the negative-music condition of *Vertigo*, for
example, participants misremembered the presence of an ice pick and open grave whereas in the positive-music condition, an engagement ring, old letters, and a worn photo were more likely to be misremembered. Although response bias effects failed to emerge in these mood congruent conditions, participants were more inclined to identify objects as “new” when their associated mood conflicted with that of the accompanying music. Given that the affect of these items was inconsistent with one's schematic framework, participants were biased toward believing they had never been presented.

In sum, these overall results from the recognition memory task illustrate that music does not simply convey different moods that can bias the interpretative framework or visual imagery of an individual, even in the absence of an accompanying film. Instead, music appears to exert a direct influence on the cognitive processing of a film by guiding selective attending toward mood-consistent information and away from other information that is inconsistent with its affective valence. In the present study, this not only resulted in a selective remembering of both old and new items but the overall pattern of memory responses also suggests these participants formed a scenario that was very similar to that adopted by the second group of participants who independently engaged in the set of interpretative tasks. Hence, these findings suggest that music and film resulted in a cross-modal integration of audiovisual information that collectively gave rise to a schematic framework that influenced behavior.

The results observed in this experiment are consistent with those of others who have observed schema-mediated behavior in other contexts. Zadny and Gerard (1974), for example, also relied on an ambiguous film clip (depicting people wandering around an apartment) and, by manipulating the nature of instructions administered to participants, found that the types of inferences made as well as those objects best remembered were systematically biased by the imposed interpretative framework. This effect has been observed by others who have relied on a similar methodological strategy (Pichert & Anderson, 1977) or one in which ambiguous scenarios are presented to individuals who vary in their personal background and self-schemata (Anderson, 1977). In each case, the activation of different interpretative frameworks at the time of encoding led to the extraction of different story themes and hence a different mental representation of the story's grammar. The present experiment demonstrated that a very similar phenomenon can occur with the presence of accompanying music within the context of a visual story. In this case, however, it was the implied mood of the music at the encoding phase that activated a given schematic framework that then influenced the comprehension, selective attending, and subsequent remembering of a story.
The role of affect in cognitive behavior has long been acknowledged in the past literature. Several theorists, such as Isen (1982, 1984, 1987) and Bower (1981), argue that affective states can function like category names to prime related material in the cognitive system. The basic idea is that any event stored in memory is also linked to its associated mood and that events with similar affect are linked together into a higher order category. Hence, the particular affective state of an individual or surrounding context may serve to prime this material via spreading activation such that it becomes more accessible within the cognitive system and thereby influences the course of selective attending and comprehension. On a behavioral level, this underlying process is assumed to manifest itself in terms of “mood congruency effects.” Mood congruency is a very reliable phenomenon that has been repeatedly observed in many different contexts. The most typical strategy is to induce a given mood within individuals (as for example through the Velten technique, manipulating the success or failure of subjects’ actions, or hypnosis) and then asking them to perform some sort of cognitive task on material that varies in its affective valence. Overall, it has been found that the affect of recalled words (Teasdale & Russell, 1983), autobiographical events (Teasdale & Fogarty, 1979), the interpretation of TAT stimuli (Bower, 1981; MacFarland, 1984), and the production of word associations (Bower, 1981; Fisher & Marrow, 1934) all tend to be consistent with the particular mood state of the individual.

The results of the present experiment are entirely consistent with this past literature. Through its structural arrangement, music is able to express different moods (Hevner, 1936; Levi, 1982; Rigg, 1964; Scherer, 1979) which, within the context of a film, can either enhance or attenuate the emotional impact of a visual scene (Bolivar, Cohen & Fentress, 1994; Lipscomb & Kendall, 1994, Expt. 2; Marshall & Cohen, 1988; Sirius & Clarke, 1994). Here, it was found that musical affect can also activate a cognitive framework that serves to guide the interpretation and subsequent remembering of a film in a mood-congruent fashion.

These results in turn have implications for a variety of contexts. In the realm of film-making, music can be argued to contribute to the art form itself. Given that musical affect influences the interpretative framework of viewers, this means that a screenwriter can leave many aspects of the story line unsaid. Especially in the case of ambiguous scenes, the use of music can encourage viewers to generate inferences about the characters' motivations, personality, and emotional reactions to different events in lieu of explicitly stating this information in the story's dialogue and ongoing action. This not only provides a degree of suspense and a set of expectancies that may be subsequently confirmed or violated, but also a means for actively engaging the viewer into the story's plot line. According to the work
of Brewer and Lichenstein (1981), this may enhance the overall enjoyment level of the film or at the very least, make it much more interesting.

One issue that remains to be investigated is the influence of music in scenes that are clearly unambiguous within a film’s plot. Some research by Magliano, Dijkstra, and Zwaan (1996) suggests that in these contexts, other cinematic devices such as mise en scène or montage are much more effective than music in generating predictive inferences about future story events. Nonetheless, there are other ways in which music may influence the cognitive processing of unambiguous scenes. Boltz, Schulkind, and Kantra (1991), for example, found that relative to a no-music condition, accompanying music whose mood was consistent with that of a film served to enhance the subsequent recall of the scene, whereas mood-inconsistent music impaired remembering. One explanation of this finding is that the mood congruency of audiovisual information ensures that attending remains focussed on relevant information so that viewers can readily integrate the sequence of characters’ actions, dialogue, and behavior into one coherent scheme that can later be easily retrieved from memory. Mood incongruent pairs, on the other hand, are more likely to result in misguided attending toward irrelevant information such that the resulting representation is much more fragmented in memory. Additional research is needed to directly assess this hypothesis and those ways in which music may interact with the cinematic techniques discussed by Magliano et al. (1996).

At a more general level, the use of music within film provides a very useful medium in which to explore various issues within the field of cognitive psychology. It not only has the potential to render insight into the nature of story comprehension and social perception but also the processing of both mood and cross-modality information. Within the more specific domain of psychomusicology, this type of research may also reveal some additional levels of meaning within music that have implications for certain theoretical models of music cognition.2

References

2. This research was supported by a Faculty Research Grant from Haverford College and presented at the meeting of the Society for Music Perception and Cognition hosted at Northwestern University in August 1999. The author wishes to thank Karen Larrimer for conducting a pilot study for the experiment in partial fulfillment of her senior thesis requirement, as well Erika Fulton and Lawren Young for data collection. In addition, a special thanks to Roger Kendall, Lola Cuddy, and Joe Magliano for their comments on an earlier version of this manuscript, and to Donna Fournier for her assistance in the musical analysis.


**Appendix A**

**I. CAT PEOPLE — THE REUNION**

**A. Story Summary**

At the beginning of this film, which is set in New Orleans, a brother has just returned home from picking up his long-lost sister at the train station. The brother introduces his sister, Irena, to his housekeeper, Female. In the next scene, the brother, sister, and housekeeper are eating dinner together and during the meal, both siblings refer to their deceased parents and express how much they have missed one another during their long separation. The brother then takes Irena upstairs for a “surprise” whereupon he opens a large cupboard full of old circus memorabilia they had played with as children. The two siblings look through some old family photographs and then begin to juggle some balls while chanting an old nursery rhyme. In the final scene, Irena is shown sleeping in her room while her brother and Female are downstairs.

**B. Emotional Ratings**

1. How did Irena feel when she entered her brother’s home?
   - extremely comfortable
   - very comfortable
   - comfortable
   - neutral
   - uncomfortable
   - extremely uncomfortable

2. How did the housekeeper, Female, act during the conversation at dinner?
   - extremely suspicious
   - very suspicious
   - suspicious
   - neutral
   - not suspicious
   - extremely nonchalant

3. Which adjective best describes the atmosphere between the brother and sister during the juggling scene?
   - extremely relaxed
   - very relaxed
   - relaxed
   - neutral
   - not relaxed
   - extremely tense

4. What adjective best describes the brother’s actions during this entire film?
   - extremely manipulative
   - very manipulative
   - manipulative
   - neutral
   - not manipulative
   - extremely loving

**C. Recognition Memory Items**

<table>
<thead>
<tr>
<th>Positive Old</th>
<th>Positive New</th>
<th>Negative Old</th>
<th>Negative New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costume masks</td>
<td>Family bible</td>
<td>Tribal spear</td>
<td>Voodoo doll</td>
</tr>
<tr>
<td>Feathered boa</td>
<td>Clown dolls</td>
<td>Human skull</td>
<td>Hunting knife</td>
</tr>
<tr>
<td>Juggling balls</td>
<td>Old locket</td>
<td>Full moon</td>
<td>Blindfold</td>
</tr>
<tr>
<td>Old photo</td>
<td>Wrapped gifts</td>
<td>Storm clouds</td>
<td>Bottle of poison</td>
</tr>
<tr>
<td>Airplane frame</td>
<td>Music box</td>
<td>Statues of demons</td>
<td>Witchcraft book</td>
</tr>
</tbody>
</table>
II. VERTIGO—THE DRIVE

A. Story Summary

This film opens with a man following a woman in his car into a back alley. The woman then gets out of her car and goes into a building where the man soon follows. The man watches the woman as she buys a small bouquet of flowers and then quickly returns to his car when he sees she is about to leave. Next, the man follows the woman’s car to a church and once again, he unobtrusively pursues her from afar. The woman walks through the church and into the adjacent cemetery, where she stops at a grave. The man enters the cemetery but remains out of her line of vision. He watches the woman until she leaves the cemetery.

B. Emotional Ratings

1. What adjective best describes the man’s intentions for following the woman?
   extremely benevolent –5 –4 –3 –2 –1 0 +1 +2 +3 +4 +5 extremely malevolent

2. How would you describe the man’s feelings toward the woman?
   extremely uncaring –5 –4 –3 –2 –1 0 +1 +2 +3 +4 +5 extremely caring

3. What adjective best describes the woman’s actions during the scene?
   extremely innocent –5 –4 –3 –2 –1 0 +1 +2 +3 +4 +5 extremely suspicious

4. How would you describe the man’s inherent character and temperament?
   extremely cold –5 –4 –3 –2 –1 0 +1 +2 +3 +4 +5 extremely warm

C. Recognition Memory Items

<table>
<thead>
<tr>
<th>Positive Old</th>
<th>Positive New</th>
<th>Negative Old</th>
<th>Negative New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flower bouquet</td>
<td>Engagement ring</td>
<td>Tombstones</td>
<td>Ice pick</td>
</tr>
<tr>
<td>Sunny day</td>
<td>Worn photo</td>
<td>Dark sedan</td>
<td>Gun and holster</td>
</tr>
<tr>
<td>Church altar</td>
<td>Old letters</td>
<td>Barred windows</td>
<td>Short rope</td>
</tr>
<tr>
<td>Burning candles</td>
<td>Stone cupids</td>
<td>Deserted alley</td>
<td>Envelope of money</td>
</tr>
<tr>
<td>Rose bushes</td>
<td>Box of candy</td>
<td>Black clothing</td>
<td>Open grave</td>
</tr>
</tbody>
</table>

III. SPLIT DECISIONS—THE SALE

A. Story Summary

The film begins with a man walking into the yard of an old house. There, he encounters a young blond woman who is using a chainsaw to cut some wood. He introduces himself as the real estate agent she had contacted and asks if it is a good time to look at the house. The woman invites the man into the house through the front door, which is broken. Once inside, the woman goes upstairs to change and another blond, the first woman’s twin sister, enters the room and greets the man. The man becomes confused and thinks this is still the first woman he met in the front yard. The woman offers him some tea and the agent happily accepts. The first twin then returns and offers the man a beer. The man, still confused, says yes to the beer as well. The sisters return, both dressed in provocative attire, and the agent finally realizes there are two women in the house. When the man comments on the unusual contents of the house (e.g., guillotine, coffin table with a protruding saw), the women explain how their father was a great magician and describe their part in his magical act. The agent then asks to see the rest of the house.
B. Emotional Ratings

1. How would you describe the first sister’s attitude toward the real estate agent when they first meet in the front yard?
   - extremely friendly –5 –4 –3 –2 –1 0 +1 +2 +3 +4 +5 extremely hostile
2. Which adjective best describes the twins’ attitude toward the man throughout the duration of the film?
   - extremely threatening –5 –4 –3 –2 –1 0 +1 +2 +3 +4 +5 extremely seductive
3. What adjective best describes the man’s response to the attention he receives from the women?
   - extremely excited –5 –4 –3 –2 –1 0 +1 +2 +3 +4 +5 extremely nervous
4. How would you describe the women’s intentions toward the real estate agent?
   - extremely violent –5 –4 –3 –2 –1 0 +1 +2 +3 +4 +5 extremely fun-loving

C. Recognition Memory Items

<table>
<thead>
<tr>
<th>Positive Old</th>
<th>Positive New</th>
<th>Negative Old</th>
<th>Negative New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nude sculptures</td>
<td>Garter straps</td>
<td>Chain saw</td>
<td>Bottle of pills</td>
</tr>
<tr>
<td>Antique loveseat</td>
<td>Tarot cards</td>
<td>Coffin table</td>
<td>Mummies</td>
</tr>
<tr>
<td>Vases of flowers</td>
<td>Massage oils</td>
<td>Guillotine</td>
<td>Noose</td>
</tr>
<tr>
<td>China tea set</td>
<td>Sex toys</td>
<td>Hand saw</td>
<td>Rusty axe</td>
</tr>
<tr>
<td>Playboy bunny</td>
<td>Water pipe</td>
<td>Skulls</td>
<td>Dead animals</td>
</tr>
<tr>
<td>outfits</td>
<td></td>
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</tr>
</tbody>
</table>

Appendix B

I. CAT PEOPLE—THE REUNION

A. Positive Music—Blossom Meadow (Winston, 1982)

Genre: New Age
Instrumentation: Piano
Structural Characterization: major mode; very tonal and a highly predictable melodic line; moderate tempo; very regular rhythm in a duple meter; arpeggiated accompaniment in the left-hand; moderate pitch range near middle of the keyboard
Descriptive Adjectives Used by Pretest Listeners: Calm, Light, Airy, Cheerful, Pleasant

B. Negative Music - Excerpt from Rubycon Album (Tangerine Dream, 1975)

Genre: Electronic
Instrumentation: electronic synthesizer, percussions, woodwinds, moaning voices
Structural Characterization: Tune begins with a very slow tempo and irregular rhythm and displays many prolonged notes that rise to atonal and dissonant pitches. However, during the last 30 s, a fast, driving, and very regular rhythm appears in which notes are confined to a low narrow pitch range.
Descriptive Adjectives Used by Pretest Listeners: Eerie, Mysterious, Unsettling
II. VERTIGO — THE DRIVE

A. Positive Music—Adagio for Strings (Barber, 1938)
Genre: Classical
Instrumentation: string orchestra
Structural Characterization: major mode; slow regular tempo; rhythm in a triple meter; wide pitch range with long melodic phrases
Descriptive Adjectives Used by Pretest Listeners: Sad, Tender, Yearning, Wistful, Solemn, Peaceful

B. Negative Music—Excerpt from Rubycon Album (Tangerine Dream, 1975)
Genre: Electronic
Instrumentation: Electronic Synthesizer
Structural Characterization: very dissonant with no clear key; begins with a slow, irregular rhythm and gradually becomes faster and more rhythmic over time; narrow pitch range with unpredictable appearances of high atonal notes
Descriptive Adjectives Used by Pretest Listeners: Eerie, Unsettling, Edgy, Suspenseful

III. SPLIT DECISIONS — THE SALE

A. Positive Music—Schutzliesel (Scholz, 1993)
Genre: German Drinking Song
Instrumentation: Woodwinds and brass band with percussives
Structural Characterization: major mode; moderate tempo; marching rhythm with a steady, duple meter; wide pitch range
Descriptive Adjectives Used by Pretest Listeners: Fun, Boisterous, Folksy

B. Negative Music—Excerpt from Rubycon Album (Tangerine Dream, 1975)
Genre: Electronic
Instrumentation: Electronic Synthesizer
Structural Characterization: minor mode but much atonality and dissonance; moderate tempo with an irregular rhythm; narrow low pitch range
Descriptive Adjectives Used by Pretest Listeners: Anxious, Mysterious, Evil