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Associationism and musical soundtrack phenomena

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It is often assumed that musical soundtracks influence the interpretation of film. Film music theorists further assume that such musical influences depend on the combination of meanings derived from musical and film material. The present article suggests that these assumptions about film music fall within an associationist tradition and translate into testable hypotheses about mental function. This view is supported first by a discussion of the reliance of musical meaning on experience and then by a review of three recent experiments which investigate the influence of music on film meaning. Experiment 1 uses simple musical and visual materials and measures one affective meaning at a time. Experiment 2 uses slightly more complex materials and measures multiple scales of affective meaning employing the semantic differential technique. Experiment 3 uses realistic complex materials and measures both affective and denotative meaning. In all studies, the direct influence of musical meaning on film meaning was often observed. To accommodate the data, it is proposed that musical and film information independently activate associations of both affect and denotation and that meaning at any point in time is the resultant of the total associations generated. This foundation provides a basis for examining further assumptions and hypotheses about the functions of film music, thus revealing facts about film music necessary for future cognitive modelling.

KEY WORDS: Associationism, music, film, soundtrack, meaning, cognition

"Change the score on the soundtrack, and the image-track can be transformed." So says film-music theorist Claudia Gorbman (1987, p. 30) and she is not alone. The notion that film music[1] influences the interpretation of film is basic common sense, a part of folk psychology. Experts schooled in the disciplines of film and/or music agree as well: composers of film music such as Aaron Copland, Bernard Herrmann, and Miklos Rozsa take as granted that film music provides meanings, emphasis, tension, and connection in the drama that cannot be conveyed in other ways (cf., Carroll, 1988; Palmer, 1980). These assumptions are based primarily on introspection and may differ in detail from individual to individual. Nevertheless, the general agreement among experts suggests that it would be valuable to regard their assumptions as hypotheses about complex, cognitive processes underlying film music perception. I suggest here, that these hypotheses about the conjunction of effects from music and film align themselves with an experimental psychological approach which seeks to account for complex mental phenomena in terms of interconnected component elements. This approach, called associationism, embraces empirical study and controlled experimentation and would help to translate expert opinion into specific facts and theory. The application of the associationist viewpoint to understanding film music was first suggested by the author in an

overview of psychological perspectives on film music (Cohen, 1990). The present article develops the approach by mapping first the features of associationism onto examples from film music, then by discussing experimental origins of musical meanings, and finally, by describing three experiments on the effect of musical meaning on the meaning of film.

Associationism

Associationism has a long history in experimental psychology (cf., Anderson & Bower, 1973; Earhard, 1974). It is rooted in the philosophy of Aristotle and the British empiricists, Hobbes, Locke, Hume and Hartley, and its influence has been noted in classical conditioning, stimulus-response theory, theories of memory and contemporary connectionism.[2]

Anderson and Bower (1973, pp. 9–12) describe four features of associationism. As will be shown, each feature is well exemplified by typical assumptions made about film-music phenomena. First, associationism is sensationalistic; it identifies the basic components of mental experience with sensory experience. Anderson and Bower (1973) include emotions within the category of sensory experience (see also, Bower, 1981). Simple ideas are identified with elementary, unstructured sensations. The many statements about film music which acknowledge the sensory (auditory or emotional) origin are clearly sensationalistic. For example, "Music . . . can set up emotional vibrations in the mind of the audience that may complement, supplement or even contradict the visual image. It supplies an all-important third dimension" (Palmer, 1990, p. 11). Or consider the words of Jean-Paul Sartre during the silent film era which describe the emotional experience produced by the musical accompaniment:

> Above all, I liked the incurable muteness of my heroes. But no, they weren't mute, since they knew how to make themselves understood. We communicated by means of music; it was the sound of their inner life. Persecuted innocence did better than merely show or speak of suffering: it permeated me with its pain by means of the melody that issued from it. I would read the conversation, but heard the hope and bitterness; I would perceive by ear the proud grief that remains silent. (In Anderson, 1988, p. xv).

In addition, there is a notion that music is more closely aligned to these sensory origins than are other kinds of both auditory and non-auditory information. Ruben (1985, p. 284) for example refers to film music and silence as two of the purest of the soundtrack's four voices (the other two being speech and sound effects) and Carroll (1988) speaks of music as having a privileged or direct route to the emotions. This concurs with the psychoanalytic literature and with clinical psychological literature which shows that mood can be induced more effectively by music than by standard verbal techniques (Albersnagel, 1988). Hence, sensationalism is an appropriate premise for current thought about film music.

Second, associationism is mechanistic. Simple algebraic rules predict the properties of complex configurations from the properties of the underlying simple ideas. Thus, the effects of complex configurations from the properties of the underlying simple ideas. Thus, the effects of combining dimensions of music (e.g., rhythms and harmonies) or of combining music and film can be predicted (following Anderson & Bower, 1973). This is consistent with the view that music independently adds meaning. For example, Eisenstein (1928/1949, p. 259) believed that sound was a

separate element in the montage[3] which provided new means for expression that were otherwise limited by using visual images alone. Carroll (1988) more recently writes "music modifies". He specifically claims that music may attribute to the visuals an otherwise unavailable quality and that ". . . the associated musical elements are modifiers which attribute expressive properties to the referent . . ." (p. 222).

Hand in hand with its mechanistic nature, associationism has as a third feature, reductionism; the events to be explained decompose into the basic stock of simpler units. This is compatible with attempts to understand film music phenomena in terms of the component visual and musical elements. For example, Eisenstein described a sequence from *Alexander Nevsky* in stills juxtaposed to the musical score to demonstrate the exact audiovisual correspondence that he and Prokofiev supposedly achieved (Eisenstein, 1942; Gorbman, 1987).

Finally, associationism is connectionist.[2] This means that ideas, sense data, memory nodes, or mental elements are associated together in the mind through simultaneous or contiguous experience. To translate this notion into the realm of film music, we have only to consider the principle of leitmotiv, which has been regarded as the structural premise of most film scores (Palmer, 1980, p. 550). The term is borrowed from its use in opera where it denotes a musical theme which typically accompanies a particular character or activity in the drama and takes on the meaning of that character or activity, such that the music alone evokes its memory (Grout, 1973, p. 417; Lipscomb, 1990, p. 6). Countless examples are found in discussions and critiques of film music (e.g., Carroll, 1988, pp. 217–218; Rozsa, 1982, p. 133). Gorbman (1987) describes Steiner's score for *Mildred Pierce* in terms of themes which become associated with the main characters, e.g., "One comes gradually to associate Mildred with this music" (p. 93), and later, "The association between this motif (B) and its character is established rapidly" (p. 94) and "A fourth theme (D) is a jaunty melody associated with Mildred's restaurant business . . ." (p. 95). The concept of connectionism is clearly at the heart of such statements.

The examples given above show that much discourse about film music fits within an associationist framework and is replete with associationist hypotheses. The discussions of film music, however, rarely acknowledge the hypothetical status of these statements[4] and, to the best of the author's knowledge, have not considered the statements within a broader associationist view. With its emphasis on the role of experience, associationism is also compatible with the scientific method which tests hypotheses through empirical research. Testing associationist hypotheses about film music would contribute to a more precise understanding of how the mind can process the audiovisual complexities of film music.

In summary, within the associationist framework, it can be hypothesized that both musical soundtracks and film activate basic percepts and emotions, that the effects of combining music and film depend on the summation of these activated elementary percepts and emotions and that further multimodal phenomena of film music can be understood in terms of connections formed between these elements. Within the associationist framework, the scientific method can be applied to test the hypotheses through controlled experiments leading to reproducible results. If the hypotheses are not supported, then the hypotheses can be rejected or other theoretical viewpoints can be sought. The initial problem, however, is to begin to collect data that can be examined in terms of the hypotheses.

Having now suggested that associationism provides a useful starting framework

for investigations of musical soundtrack phenomena, an example will be given of testing an associationist assumption about film music. The hypothesis or assumption in question is that music alters film meaning. It will be addressed in three experiments. The successive experiments use materials of increasing complexity to suggest that the principles appropriate to simple stimuli are equally appropriate to complex stimuli. It will be concluded that associationist concepts help us to isolate the role of musical meaning in film and this approach could be applied to a variety of questions about film music. However, before embarking on this plan, we first examine the position that musical meaning *itself* is derived through associationist principles. The overall hypothesis is that music acquires its meaning through prior associations and that music transfers these meanings to portions of films which it accompanies.

Musical meanings and associationist origins

It is often claimed by music theorists such as Hopkins (1979) and Meyer (1956) that meanings of music are broad and tend to lack specific denotation. Film-music theorists agree on this point (Gorbman, 1987; Carroll, 1988) and, analogous to the 18th Century music theorists who argued that music required text to make it intelligible (Schroeder, 1990), film-music theorists claim that music finds specific meaning through conjunction with film. Nevertheless, some music has quite specific meanings on its own (e.g., Kracauer, 1960, p. 141). These specific meanings will be referred to as denotative meanings. To give a simple example, the tune *Auld Lang Syne* will bring to the minds of many people the image of a New Year's Eve party. The occurrence is no mystery, since the song is sung primarily in this situation. Such denotative meaning clearly depends upon experiencing the connection between the music and a particular event. Classical composers such as Haydn often quoted musical excerpts from folksongs and choral works assuming that the denotative meanings would make the new composition "intelligible" without the direct use of words (cf., Schroeder, 1990). Another aspect of musical meaning is the emotional or affective aspect. It has been shown in a number of empirical studies that listeners agree on emotional connotations of music which we will henceforth refer to as affective meaning (Cunningham & Sterling, 1988; Gardner, Silverman, Denes, Semenza & Rosenstiel, 1977; Levi, 1982; Nielzen & Cesarec, 1981; Riggs, 1964). Both denotative and affective meaning can be accounted for in terms of associationist principles as will be described below.

As discussed earlier with reference to connectionism, one basic associationist notion is that two mental events which are contiguous in time or space will become linked together in the mind such that the presence of one of them will give rise to the other. In more specific terms, if A and B are presented sequentially many times, then eventually A will on its own elicit a representation of B. (This incidentally is the theory consistent with leitmotiv as previously referred to in the discussion of connectionism. It could be added that the film-music theorists who describe the formation of links between a musical theme and the film event, often assume that this occurs in just one presentation, cf. Gorbman, 1987, pp. 27–28). A slight variation of this idea resembles a simplified version of Pavlovian or classical conditioning which exemplifies associationist principles. Here, suppose A is a bell and B is a piece of cheese. The cheese B causes a salivation response, C. Thus, whenever A is

followed by B, C occurs. Eventually, the presentation of A in the absence of B will still generate the response of salivation, C. Salivation is an objectively measureable response to an object. But less overt responses such as images and emotions may also be elicited by objects. For example with respect to denotative meaning, B can be regarded as the New Year's Eve party and C, the image of the party. In the absence of B, the song A which is always sung at the New Year's Eve party may bring to mind the image of the party, C. With respect to affective meaning, a picture of a young child B1 may generate representations of tenderness C1 in a viewer, or the picture of a massacre B2 may bring feelings of rage C2. The conjunction of music A with experiences of certain events, B1 or B2, may evoke representations of the emotional meanings, C1 or C2, aroused by these experiences. That is, music A may evoke emotion C in the absence of event B which typically evoked C. Thus, music A can acquire affective meaning C through association with B. For example, *Auld Lang Syne* may evoke emotions of nostalgia even in the absence of New Year's Eve.

These examples of musically evoked meanings are arbitrarily tied to experiences that are determined by cultural, social, and historical situations. They are not necessarily universal. In Japan, for example, *Auld Lang Syne* is associated with the closing of a department store. There are, however, certain auditory/behavioural contingencies that are universal and could account for universal meanings of music. For example, Sundberg (1982, pp. 146–147) notes a direct relation between human anatomy, emotions and vocal production, what he refers to as the body language of emotions. He said that "It is likely that expressive body movements are translated into acoustic terms in voice production." When one is sad, the musculature is different than when one is happy or angry. Since vocal production depends on the musculature, change in the musculature changes the quality of the sounds that are produced. Thus, humans have constant exposure to correlated information of emotional state and auditory parameters of the voice. In sadness, muscle activity is minimized and reduced activity in specific muscles may result in soft voice intensity, low pitch and non-dynamic pitch contour, impoverished harmonic structure, etc. This does not mean that all low, slow sounds are regarded as sad. Rather, abstracted over many contexts, sadness may be the predominant emotion associated with these parameters. Considerable research shows that humans can categorize auditory patterns into emotional categories on the basis of such auditory parameters (Scherer & Ochinsky, 1977; Sundberg, 1982). Moreover, contingencies between intonation pattern and specific interactional and motivational contexts have been noted in infant directed speech (Stein, Spieker & MacKain, 1982) and infants have been shown to link happy and sad sounding voices with corresponding facial expressions (Walker, 1982). This sensitivity to available contingencies is consistent with the idea that emotional-auditory connections are learned universally through experience. In other words, there is an associationist account for the meaning of simple acoustic parameters in speech and in vocal and nonvocal music.

Changing film meaning by music: three experiments

The previous section suggested that musical meaning is itself the product of associations. The present section examines whether associations can account for the often referred to film-music phenomena in which meaning of the film is changed by the accompanying musical context. More specifically, the object is to

relate the change in meaning of a visual pattern to the acoustic parameters of the musical background, and explicate Gorbman's pronouncement which began this article: "Change the score on the soundtrack, and the image-track can be transformed". We begin with a simple example and then turn to increasingly more complex cases.

1. *Elementary auditory and visual patterns*

In the first example, very simple visual and auditory stimuli were examined in isolation and in conjunction in a number of studies. The visual stimulus was a bouncing ball represented on a computer screen. The bounce varied in two dimensions, height (low, middle or high) and tempo (slow, moderate or fast). The auditory stimulus was a simple melody (repeating tones or broken major or minor triad) which also varied in two dimensions, pitch (low, middle, or high) or tempo (slow, moderate, fast). When the stimuli were presented alone, in control conditions, subjects using a 7-point scale, rated high sounds happier than low, and fast tones happier than slow, confirming Riggs' (1964) earlier observations for more complex musical stimuli. The same pattern of response was shown for the visual stimuli. Figure 1 (top Tempo, bottom Height/Pitch) shows the results for 12 subjects who saw the stimulus and 12 subjects who heard it. For these unimodal conditions, the roughly parallel lines indicate that the emotional rating is controlled by the level on the dimensions in the same way for the two modalities. The effects of combining values on the two dimensions within a modality was also additive. For example, within the visual modality, high values on height and tempo produce a very high rating and a high value on height and a low value on tempo sum to a lower rating. What then would happen when the audio and visual information were combined (a) congruently and (b) incongruently?

The results of 12 subjects shown in Figure 2 (top panel) for tempo reveal for the congruent condition exactly what would be expected, basically the same pattern as for the individual modalities. Since this could be explained by attending to either the auditory or visual modality, the effects of the auditory information on the visual judgment are more easily discerned in a comparison with the incongruent condition. In the incongruent condition, when the high values of the visual modality are now combined with low auditory values, the original effects for the visual values are moved in the opposite direction. Thus, for the incongruent condition, the range of values is greatly reduced as compared to the congruent case. Figure 2 (bottom panel) shows the same counteractive effect of the incongruous Height/Pitch on the emotional judgment, although in this case, the effect of the auditory information is not as pronounced.

Thus, at the level of simple elementary dimensions of tempo and pitch, effects of music on the interpretation of the visual display are predictable. But these were not the only dimensions found to influence visual meaning. Melodic structure was a third dimension that had an independent effect: balls which bounced to a background of ascending-descending major triads were judged as happier than balls which bounced to a background of repeating tones. Minor triads produced intermediate judgments. These influences are schematically represented by Figure 3 which illustrates the effects of the separate components of the two modalities on the final meaning. The components represent only a few of the many possible dimensions.

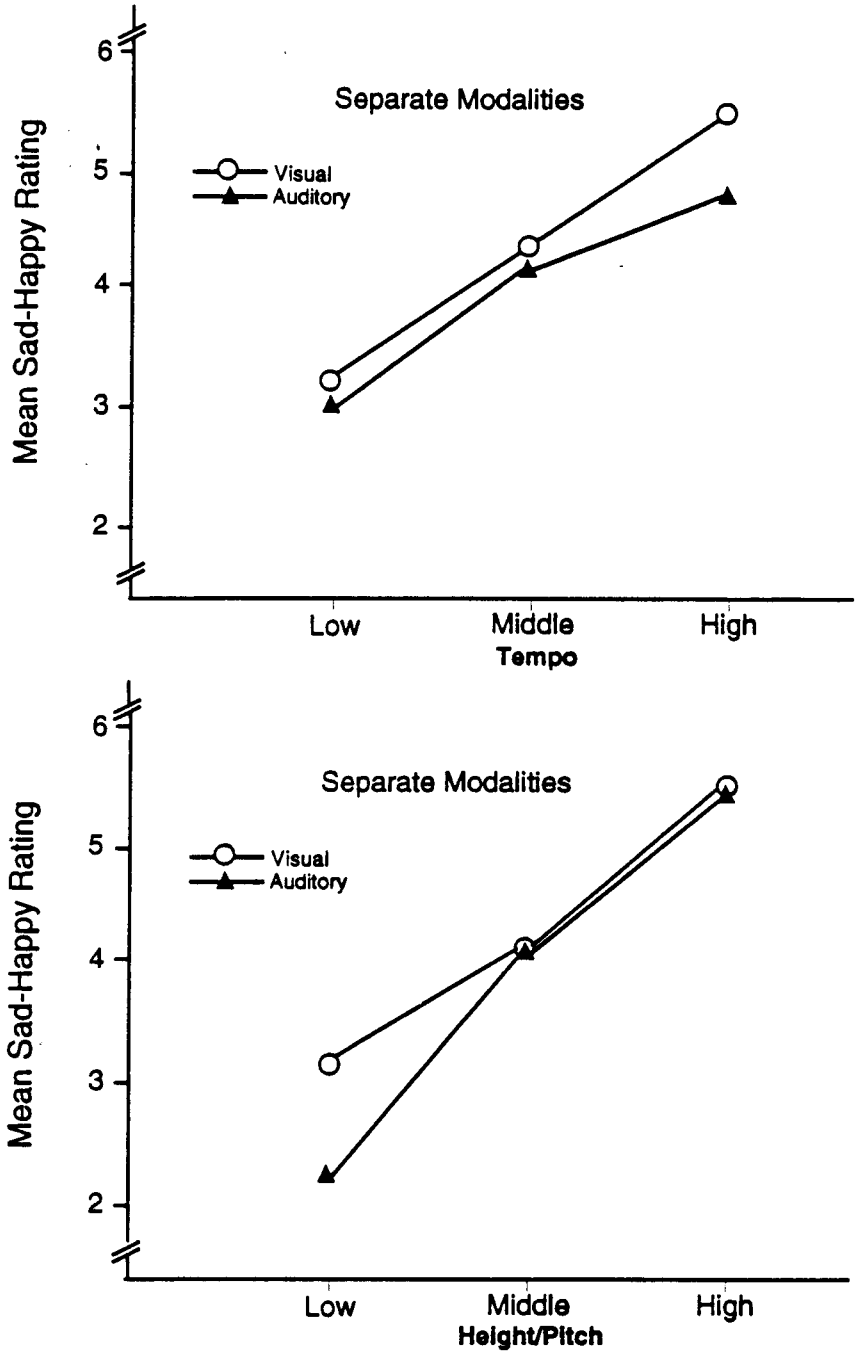

Figure 1 Mean sadness/happiness rating as a function of visual or auditory tempo (top panel) and of visual height or auditory pitch (bottom panel) for a bouncing ball and a simple melody, respectively.

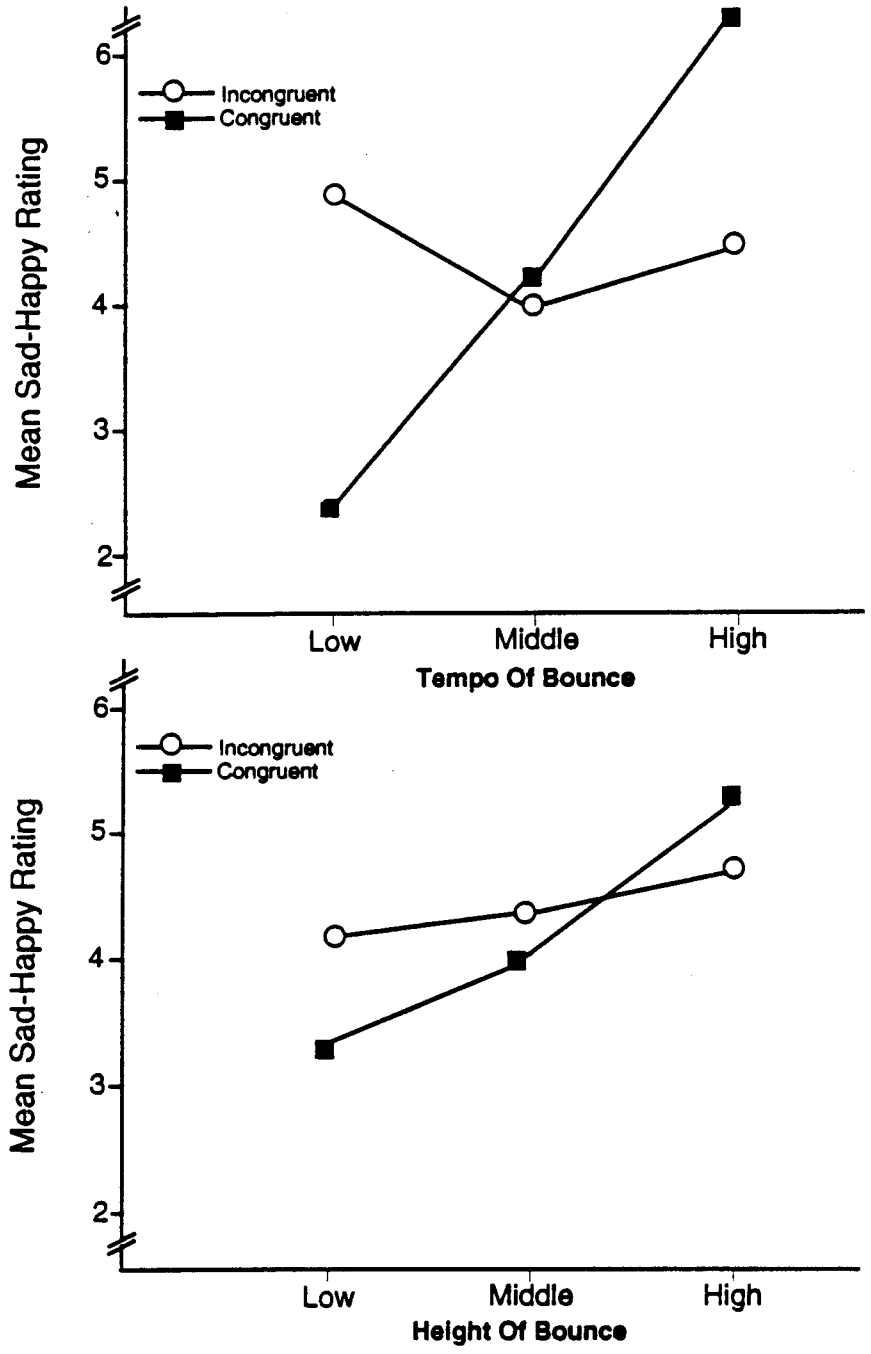

Figure 2 Mean sadness/happiness rating of the bouncing ball as a function of tempo of the bounce and a congruent or incongruent background melodic temporal pattern (top panel) and as a function of height of the bounce and congruent or incongruent background melodic pitch height (bottom panel).

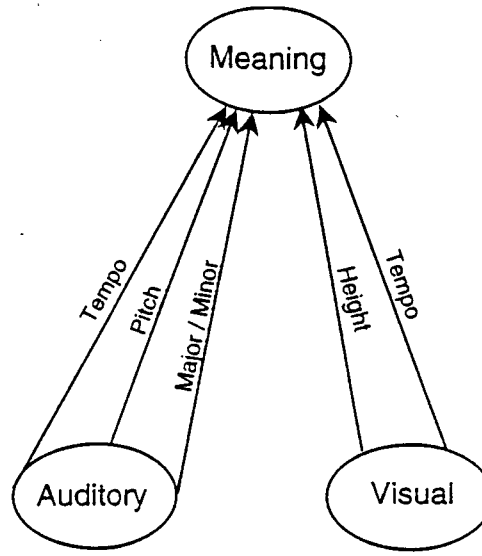

Figure 3 Schematic representation of a simple model of information integration from multiple visual and auditory dimensions which gives rise to the resultant meaning of the audio visual stimulus.

2. *Complex animation*

The previous example examined one rating scale. Another technique developed some years ago uses many rating scales to measure affective meaning on three basic dimensions: Evaluative, Potency and Activity (Osgood, Suci & Tannenbaum, 1957). The technique, called the semantic differential, is associationist, in that it assumes that an object will give rise to affective associations on these dimensions and their strength can be measured through ratings on separate bipolar scales which tap the particular dimension (e.g., fast-slow taps the Activity dimension). In one study (Marshall & Cohen, 1988), individual groups of subjects provided semantic differential ratings for (1) two contrasting pieces of specially composed music, called Strong and Weak (2), a short animated film by Heider and Simmel (1944) involving three geometric figures and finally (3) the film accompanied by the two musical backgrounds. The overall ratings of the film changed in the presence of the music. For the Activity and Potency dimensions, an averaging of musical and film meaning was consistent with the data but the role of music on the Evaluative dimension was more complex and was accounted for in terms of a compatibility factor rather than a simple integration of the visual and auditory Evaluative ratings. As well, ratings of the individual characters in the film (the large triangle, small triangle and circle) also changed as a function of the music background as shown in Figure 4. A simple associationist account of the data was complemented by the proposal of a Congruence-Associationist model in which music governed attention

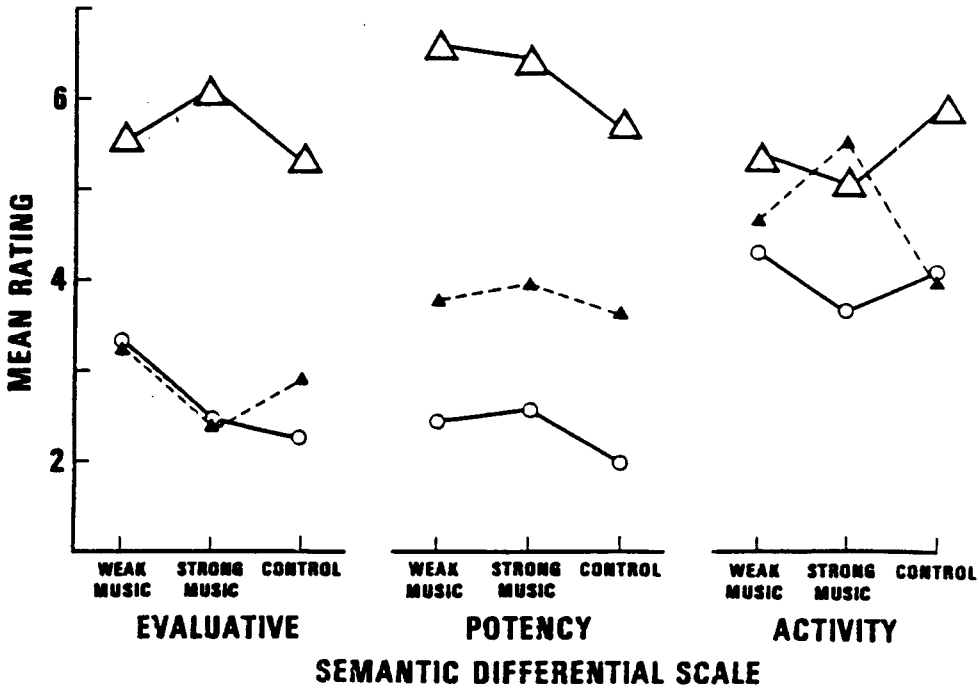

Figure 4 Mean rating on the Evaluative, Potency, and Activity dimensions for the three film characters as a function of the two contrasting musical soundtracks (Weak and Strong) and a condition with no soundtrack (Control). If there were no effect of background music, the data for the two music conditions would not differ from the Control conditions and all lines would be horizontal (Figure © 1988 by the Regents of the University of California, reprinted from *Music Perception*, Vol. 6, No. 1, Fall, p. 107, by permission.)

to certain visual elements. The musical associations were then attached to these attended visual elements. The control of visual attention was thought to be guided by simple intermodal relations, such as temporal similarity.

3. *Realistic materials*

These previous examples have considered abstract visual materials and simple auditory materials. What of more realistic and complex materials that would be viewed in a movie theatre, typical of the everyday film experience? In one study of such complex materials, short (1 min) film music excerpts, entitled *Conflict* (M1) and *Say Hello To Love* (M2), were presented to over 50 students subjects who rated them on semantic differential scales. As a measure of denotative meaning, subjects also rated the appropriateness of various titles including *Say Hello to Love* and *Conflict*. Figure 5 (left top row) shows that the Evaluative, Potency and Activity ratings differ significantly for the two pieces. Figure 5 (right top) shows that the judged appropriateness of the two titles also differed for the two pieces. (Two other titles were also judged, but, for simplicity, are not shown.) As well, two contrasting film excerpts were selected. One (F1) showed a male chasing a female; the other (F2) showed a fist fight between two males. These were rated on semantic differential and titles by another large group of subjects and again, as shown in the second row of Figure 5, the patterns of affective and denotative meanings differ for the two film excerpts. Comparing the judgments for the music and film, it can be seen, for example, that M1 and F2 are denotatively similar and M2 and F2 are opposites. If music influences meaning of film, then the different musical backgrounds should alter judgments of the meaning of the films. To test this, different groups of subjects rated the films in the presence of the different soundtracks. One group rated M1F1, M2F2 and the other rated M1F2, M2F1. As can be seen in the bottom half of Figure 5, the judgments of the combined stimuli reflect the meanings of the individual components in many cases although not all. F1 is influenced directly by M1 but not so obviously by M2 for both affective and denotative meaning. F2 tends to dominate over M1 and M2. These results lead to further questions about the roles of salience and ambiguity of meaning of separate audiovisual components on the direct influence of music on film judgments.[5]

Conclusion

Discourse on film music implies a number of psychological phenomena concerning the interaction of music and film. This discourse often assumes that musical meanings when added to the visual information set a mood, modify the interpretation of an event, provide a narrative function, establish context of time and place, etc. It also assumes that music has a direct path to the emotions and sensations, and that musical meaning can be acquired by contiguity with film meaning, such that the music can take on the meaning of its own and introduce information about the film in the absence of the film itself. It was argued that these assumptions are consistent with the sensationist, reductionist, mechanistic, and connectionist features of associationism and also, still within the tradition of associationism, these assumptions admit to empirical testing. An example of how such empirical work can be conducted was given with respect to the question of the contribution of musical meaning to interpretation of visual information in a film. Three increasingly complex examples were presented. In the first, an auditory pattern varying in tempo and height altered the happiness/sadness judgments of a bouncing ball. In the second example, contrasting music influenced semantic differential judgments

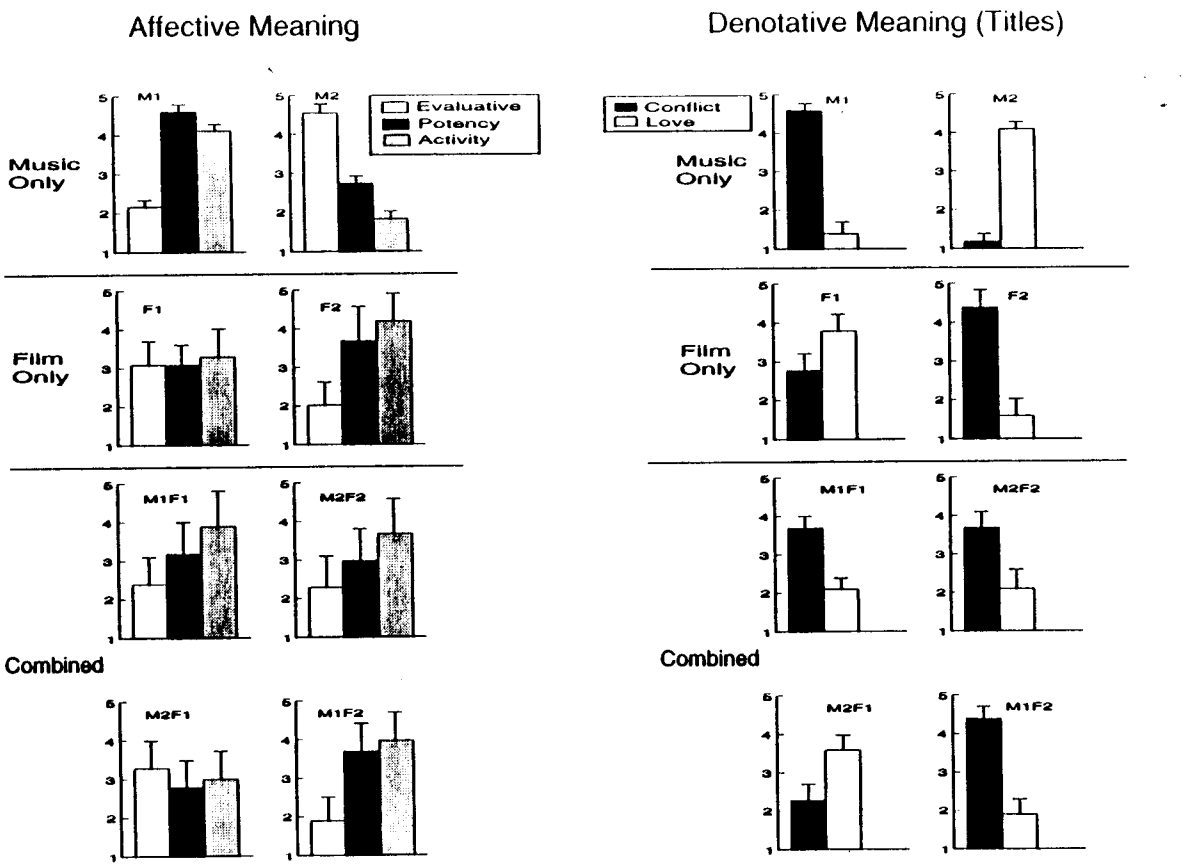

Figure 5 Mean rating on the Evaluative, Potency, and Activity dimensions (left panels) and for title appropriateness ratings (right panels) for two music selections, for two film selections, and for the combinations of music and film selections.

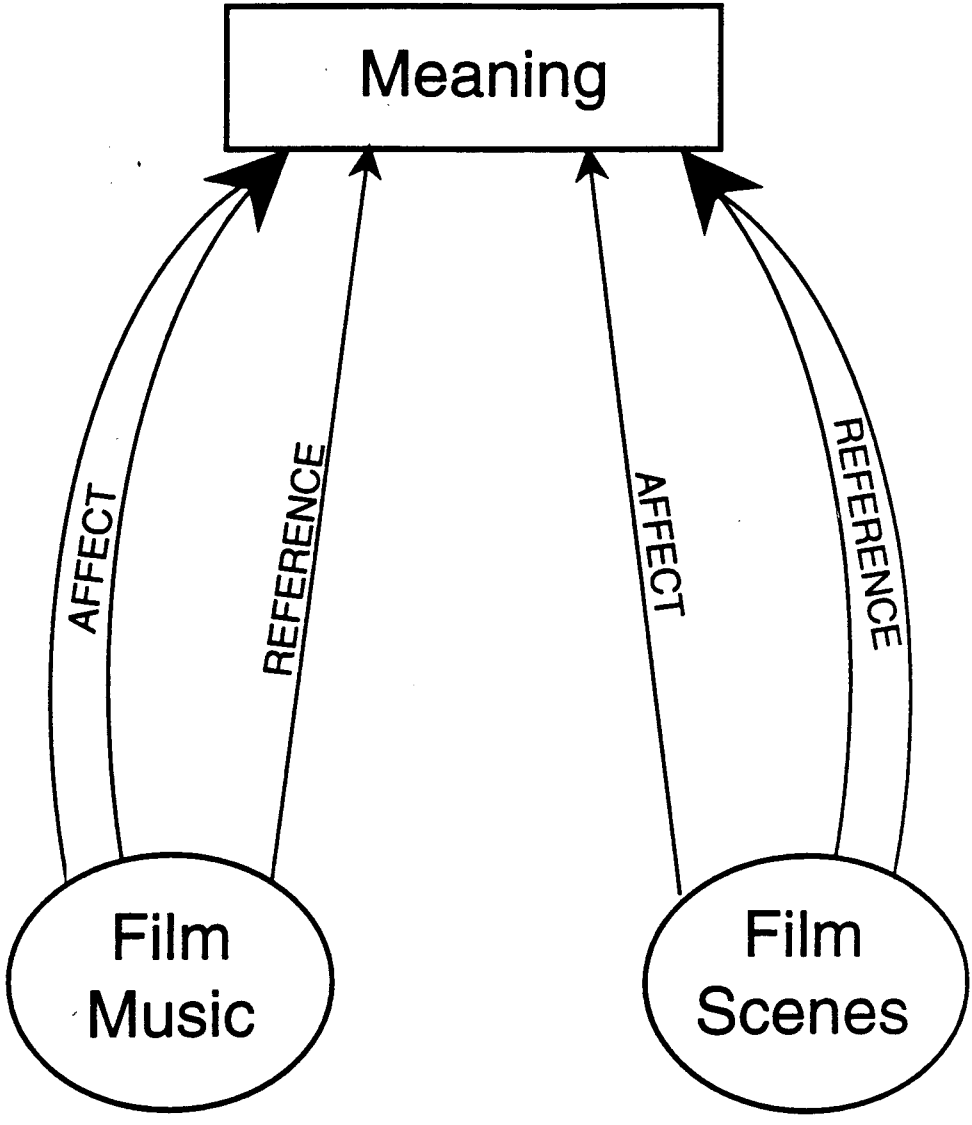

Figure 6 Schematic representation of the simple associative model of meaning of film which integrates affective and denotative meanings from both musical and visual (scene) information from the film.

about a simple animation overall and for the three geometric film "characters". In the final study, with examples of real film music and realistic film excerpts, once again the meaning of the music in some instances shifted both the affective and denotative meaning of the film. Thus all studies substantiated the claim that the soundtrack can transform the image/track.

It is suggested that the principles demonstrated in the simplest experiment (the bouncing ball) are applicable to the more complex experiments which also showed effects of music on the interpretation of the visual information. Thus, all of these examples are consistent with a model that assumes that both music and film generate representations of specific denotation and affect (see Figure 6). These may be weighted according to their salience and clarity and then combined for the final outcome meaning. The associationist framework can help to provide the empirical data needed to fine tune this theory. The data, however, may or may not be most parsimoniously accounted for in terms of associationism. Related and more recent cognitive models may prove to be better candidates, but at present we do not have the appropriate data to judge this. This paper, therefore, does not argue that musical phenomena ultimately will be explained by an associationist theory. The intent of the argument for associationism is instead pragmatic and methodological. If the argument has been successful, the reader will agree that associationism provides a good foundation for exploiting the insights that both film music and film music theorists offer us about complex musicognitive processes.[6]

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Notes

1. The discussion generally addresses background music (also known as underscore, incidental, functional and non-diegetic music) as opposed to music that is part of the drama (also known as foreground, musique de scène, source music, realistic or diegetic music). It is often assumed that background music is unheard by the audience (e.g., Gorbman, 1987; Lipscomb, 1990). That is a separate testable question which has been given preliminary attention (Cohen & Dunphy, 1990; A. Levey, personal communication; Lipscomb, 1990).
2. Fodor and Pylyshyn (1988) claim that all connectionists are associationists but that all associationists are not connectionists. Anderson and Bower (1973) claim that all associationists are connectionists. To argue one way or another would not be a profitable endeavor, when clearly, what is at stake here is precise definitions. Anderson and Bower's notion of connectionism differs in detail from more recent definitions.
3. Montage appears to be regarded by many film theorists as the most characteristically cinematic device. It provides sequence of views that are not related to each other by overlap or common background (Hochberg & Brooks, 1978).
4. The filmscore composer and theorist Hanns Eisler in the early 1940's envisioned a scientific project on film music "with theoretical determination of special problems, experiments, and public tests of the results" and had obtained funding from the Rockefeller Foundation for the project; however, the project did not fully materialize (cf. Marks, 1979, p. 301; Eisler, 1947).
5. Other groups of subjects rated meanings of the music when "accompanied" by the film. No effects of the affective information of the film on judgments of the affect of the music were observed although effects of the donative information of the film on denotative judgments of the music were apparent. Thus, for these particular examples of film and music, the associationist process was asymmetrical for affective meanings. In other words, denotative but not affective information was transmitted from the film to the music interpreter. Denotative and affective meanings thus may be independent. It is also noteworthy that for many film/music combinations, judgments of the music as foreground statistically differed from judgments of the film as foreground. Thus, subjects apparently could direct attention reliably to either music of film.

   Lipscomb (1990) also examined the effect of background music on excerpts from a mainstream film.

He showed that the pattern of semantic differential judgments differed as a function of the background musical excerpt. Although ratings of the sound and visual excerpts were not examined independently, the results for the combined stimuli provide evidence that the musical soundtrack can transform the meaning of the image-track.

6. The present three experiments focused on one issue, the issue of meaning. A more complex question is that of the leitmotiv phenomenona, concerning the links that form between musical meaning and the accompanied film. Empirical work which addresses this question has been recently reported by Boltz, Schulkind, and Kantra (1991); see also Cohen (1990); Cohen and Dunphy (1990).

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