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The Relationship between Movie Scores, Visual Stimuli, and Physiological Response

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Abstract

Both movies and music have been shown to alter physiological response in audiences. Research has also found that changing the music behind a film scene affects the way audiences interpret the scene. Composers have used this fact to “mismatch” scores and movie scenes to guide viewer’s emotional reactions. The present study investigates the ability of the score to alter the way audiences physiologically react to a specific scene in a film by changing the music behind the scene, and therefore changing the mood or the feel of the scene. Few studies have investigated the relationship between “mismatched” film scores and the viewer’s physiological response. This study hypothesized that there will be a physiological response to “matched” pairings and that the two conditions will be different from another (i.e., Sad Scene with Sad Music versus Fear Scene with Fear Music). The second hypothesis is that physiological response, specifically Heart Rate (HR), Systolic Blood Pressure (BPS), and Diastolic Blood Pressure (BPD) to matched pairings (i.e., Sad Scene with Sad Music) will differ from “mismatched” pairings (i.e., Sad Scene with Happy Music). The results showed no significant correlations in the matched conditions (Fear- Fear vs. Sad- Sad) although the data for Heart Rate (HR) showed trends in the predicted direction. For the mismatched clips, the Fear Condition showed significant results for emotion rating of the clip. Change in HR, change in BPS, and change in BPD were not significant, though there were trends in the hypothesized direction for HR. For the sad condition, significant correlations were found for clip rating and change in HR. Change in BPS and BPD were not significant.
The Relationship between Movie Scores, Visual Stimuli, and Physiological Response

History of Movie Scores

Standing in a crowded theatre on the opening night of the latest box office hit, one will likely hear young girls giggling in anticipation of finally seeing their favorite actor saunter across the screen for a whole hour and a half. Their parents, not far behind, may be commenting on the director and his ability to live up to the reviews in local papers. The teenage boys will be sharing opinions about the new computer graphics effects. Yet, we see no one grasping their ticket in their hand, jittering with excitement over the composer of the film’s score. The general feeling about films is that movie going is primarily a visual experience. While we take in much of the film through our eyes, we also experience essential nuances of the movie through our ears (Fischoff, 2005). Many of us are not even aware of a movie score unless there is a breakout hit, such as James Horner’s hit “My Heart Will Go On” from Titanic (Fischoff, 2005). Yet the soundtrack is key because it allows the director to provide a dimension of meaning that is implicit rather than explicit (Fischoff, 2005).

In his book The Soul of the Cinema, Larry Timm writes, “The music is the soul of the movie” (Timm, 2002, p 1). The power and effect of music is undeniable. Imagine Star Wars without its recognizable theme, Rocky minus Bill Conti’s famous score, or the opening of Chariots of Fire missing the opening titles. Audiences often do not realize the power of film scores. Ask any skeptic to watch a scary movie with the sound muted. Without the score, horror films are stripped of their terrifying edge.

Curiously though, many moviegoers usually take the film score for granted and five minutes after the movie ends they cannot even tell if they heard music or not, let alone hum the theme (Fischoff, 2005). Remembered or not, the score is often vital to the
film. The music enhances, accentuates, and completes the film because there is only so much an actor can express with his face, body, or dialogue. The scoring is often more effective and emotionally evocative because the music goes straight to our limbic system, virtually bypassing the cognitive mediation (Fischoff, 2005).

Film scores have not always been utilized in such a significant way. Much like the movies they accompany, soundtracks have improved and changed over time. Film score composition has a rich history. Even the very first films used music, which was often played by live musicians. During the era of “silent movies” an entire music industry was built around the cinema (Bottin, 2001). Much of the music was live at this time and was used mainly to mask the sound of the movie projector. Though occasionally it accompanied the action on screen it usually had no significant connection. The music simply had to accompany the silent film and create an atmosphere, much like music in a restaurant (Fischoff, 2005). Toward the end of the 1920s, it became clear that the “go to” pieces of music were taking away from the film because they did not always match perfectly. For example, while Tchaikovsky’s Romeo and Juliet was utilized for most love scenes, it did not always perfectly match. At the request of audiences, critics, and studio heads, conductors began to synchronize the onscreen actions and rhythms with the music (Fischoff, 2005).

The film score industry experienced a struggle when “talking films” were first introduced. The film industry was concerned that having music behind the dialogue and sound effects would confuse audiences because it is unrealistic (Bottin, 2001). In other words, there is no “soundtrack” for our own daily lives; we do not hear Beethoven’s 5th symphony in the background predicting our doom as we march to final exams. In the
spirit of realism, filmmakers removed all music from films (Bottin, 2001). However, it quickly became clear that something was missing. The film industry realized that the score did not detract from the action on the screen; in fact it enhanced the viewing experience (Bottin, 2001). As the idea of the talking motion picture developed, film score technology developed along with it. While a lot has been done to study the intricacies of film music, specifically how it interacts with film scenes and how it “communicates” with viewers, there is still uncharted territory (Bottin, 2001). The present study seeks to enhance our understanding of the influence of film scores on audiences by investigating participant’s physiological responses to a variety of film clip and musical score pairings.

Functions of Movie Scores

In order to truly appreciate the effect of scores on viewers, it is essential to have at least a basic understanding of the many potential functions of movie scores used in the cinema. Many composers and film industry professionals have compiled lists of the functions of scores, but composer Aaron Copland’s comprehensive list is often utilized. Copland argues that music creates a more convincing atmosphere of time and place (Fischhoff, 2005). In other words, the music is used to transport audiences into the world and time period of the film. Next, the soundtrack can underline psychological refinements. The music gives the audience insight to the unspoken thoughts of a character or even the unseen implications of a situation by foreshadowing danger. Scores can also serve as background filler when dialogue is absent. Fourth, the music can build a sense of continuity throughout a film by connecting all the parts. This device is employed when composers use the same motif for a specific character or place regardless of the action on screen. This connects with the next function, the soundtrack’s ability to build up a scene
or give it a sense of finality. Sixth, the score can let audiences in on the inner feelings of a character without alerting other individuals in the film. Scores can also create a general mood. Finally, the soundtrack can be used as “wallpaper” to cover deficiencies in the script or film (Fischoff, 2005). Though there are many functions of the film score, the present study investigates the ability of the score to alter the way audiences physiologically react to a specific scene in a film by changing the music behind the scene, and therefore changing the mood or the feel of the scene. Music has an ability to change how the audience feels about a scene and can even trick us, such as when the music is menacing and the audience fears for the character only to have cat jump out of a box, as in the film *The Exorcist*.

Films have been shown to Alter Physiological Response

In order to extrapolate a connection between physiological response and film scores, it is necessary to connect physiological response to movies in general. Studies have shown that there are specific physiological responses that correlate with emotional states. For example, a 2005 study revealed that in general, heart rate decelerates the most in response to negative stimuli as compared with responses to positive and neutral stimuli (Anttonen & Surakka, 2005). Furthermore, these reactions vary depending on the emotional content. A 2007 study investigated the physiological response of participants when watching fear and sadness films, with no elements (such as score) altered (Kreibig, Wilhelm & Roth et al., 2007). Sylvia Kreibig and her team found that HR acceleration and elevated blood pressure were present while viewing fearful film clips. They also found a decrease in HR while viewing sad clips (Kreibig, Wilhelm & Roth et al., 2007). The study also revealed that it is possible to identify the emotional content of a film
relying solely on physiological responses, though fear elicited a stronger response than sadness (Kreibig, Wilhelm & Roth et al., 2007). A 2009 study investigated viewers’ biometric response, specifically arousal (HR and Galvanic Skin Response (GSR)) to emotionally rich segments in films. The study found that when participants viewed a film their physiological responses were similar. Increased HR and peaks in GSR were associated with arousal. In all cases, the measures of similarity between viewer’s responses to the same film were 89% or more. The differences were credited to the film effects and not the social factors such as the participants viewing the film together (Smeaton & Rothwell, 2009).

**Music Has Been Shown to Alter Physiological Response**

It is also imperative to note that music (in a general sense) also induces a physical change in the listener, both in behavior and physiological response. In terms of human behavior, music can be utilized to change public behavior in ways many of us do not realize. For example, a study by North and Hargreaves found that when playing faster, more upbeat music in the grocery store shoppers moved quickly, but spent less money than when slow tempo music was played. The study also demonstrated that fast music promoted faster eating in restaurant patrons, but slower paced music elicited more spending at the bar (North & Hargreaves, 1966).

Not only does music affect our behavior, is can also alter our internal state. A study investigating the relationship between musical structure and psychophysiological measures of emotion measured respiration, GSR, and HR, and their relationship with music (Gomez & Danuser, 2007). The study found that increased tempo was significantly correlated with an increase in breathing and HR (Gomez & Danuser, 2007). The
researcher concluded “musical features differentiated more clearly between low-arousal and high-arousal emotions than between negative and positive emotions (Gomez & Danuser, 2007). A 2004 study investigated the theory that intense emotions are correlated with increased levels of physiological arousal. Participants were exposed to relaxing music and emotionally powerful music. The powerful music elicited a significant increase in skin conductance and the number of “chills” (Rickard, 2004).

There is debate about whether these associations between music and body are hardwired (as theorized by Gestalt psychologists) or are learned (as promoted by Behaviorists). Gestaltists support the idea that our brains are hardwired to associate certain musical elements (such as key) with moods, which mimic human behavior (Fischoff, 2005). In BBC Music Magazine, John Sloboda argues that music and emotion are attached by association (the “darling, they’re playing our song” theory of musical emotion) (as discussed in Smith, 1998). Research has found that people, when listening to the same music clips, will associate the same emotions with each piece (Smith, 1998). For example, happiness is commonly associated with high pitch, fast, bouncing music, which is the way humans act when they are happy. Conversely, feelings of sadness are associated with low pitch and slower tempo. We appear to parallel musical energy levels with mood state (Fischoff, 2005). Behavioral psychologists argue for a learned approach to the connection between music and emotion.

Learned or innate, the association between music and physical response is capitalized on by composers. The score can prime viewers for what they are about to witness. Once a fearful musical passage starts, even if the screen has not faded from black, we begin to tense up and get frightened as our body prepares us to experience a
terrifying situation. The pitch, melodic line, or atonality, can create nervousness in the audience. As we begin to anticipate, our adrenaline increases and our blood starts circulating more heavily in our blood stream, much like hearing the first whirring of a drill at the dentist’s office (Fischoff, 2005).

Changing the Music Behind a Film Scene Alters Participant’s Semantic Appraisal

If movie scenes have a physiological effect on the viewer, and music has a physiological effect on the listener, it would be logical to conclude that film scores have a similar effect, especially when shown simultaneously with the scene. Researchers have delved into the relationship between film scores and the audience’s reaction to the film scene. A 2001 study investigating musical context effects in film perception examined how changing the music for a neutral film scene affected the viewer by analyzing the participant’s written continuation of the scene. The study found that “viewer’s/ listener’s anticipations about further development of a sequence are systematically influenced by the underlying film music, which helps determine the reality of the scene.” (Vitouch, 2001, p. 70). A similar study investigating pleasure and arousal, rather than emotion, found that adding music to a movie scene is significantly correlated with semantic ratings of the film/music and changing the score changed their appraisal (Bottin, 2001). Research by Thompson, Russo and Sinclair (1994) found that merely altering the final note of the score (whether up or down) significantly influenced a perception of closure and thus resolution in a scene. It is clear that movies elicit physiological responses. While many researchers are interested in establishing the link between film, music and emotion, most studies concentrate on verbal reports of feeling, often ignoring physiological changes (Gomez & Danuser, 2007; Vitouch, 2001).
Mismatching the Music for a Scene can Alter Viewer’s Response

It has been established that “Film music can substantially alter the spirit of a scene” (Vitouch, 2001, p. 70). The previous studies examined emotional response to a film when the viewed film “belonged with” or matched, the film score. However, mispairing the cues can change the entire tone of the scene. The pairing of graphic violence with music that is pleasant or romantic causes cognitive dissonance, and therefore enhances our emotional reaction (Fischoff, 2005). Contrasting the music with the action in the film is not a new phenomenon; composers have employed this technique for decades. Take, for example a scene from A Clockwork Orange. A group of men beat an older couple in their home. The scene without the music is terrifying. However, when the leader of the group begins singing the tune “Singing in the Rain,” from the famous Broadway of the same name, the scene takes on a new level of horror. In this instance, mismatching the music heightens the dominant emotion.

In other films the music entirely changes the feel of the scene. For example, in the film Platoon, a scene from the Vietnam War is depicted. As with most war scenes it is scary, militaristic, and a bit heroic. However, the haunting melody of “Adagio for Strings” by Samuel Barber adds an entirely new emotional element. Another example is found in the film Face/Off. In one scene a young boy is caught in the middle of a shootout. To keep him from getting scared an adult places headphones on the child’s ears, with Somewhere over the Rainbow playing. The scene continues with high levels of violence, yet the child (and the audience) is much more collected listening to this peaceful tune. The contrast brings a sense of calm to an otherwise chaotic scene.
Movie Scores and Physio Response

Few studies have investigated the relationship between “mismatched” film scores and physiological viewer’s response. To close this significant gap in research, the main goal of this study is to investigate the physiological response to mismatched film scenes and film scores. Therefore the first hypothesis is that there will be a physiological response to “matched” pairings and that the two conditions will be different from another (Sad Scene with Sad Music versus Fear Scene with Fear Music). The second hypothesis is that physiological response (Heart Rate (HR), Systolic Blood Pressure (BPS), and Diastolic Blood Pressure (BPD)) to matched pairings (Sad Scene with Sad Music) will differ from “mismatched” pairings (Sad Scene with Fear Music).

Methods

Participants

Seventy one participants were recruited for the study. All were Marietta College students who voluntarily participated in this study. Consent was obtained verbally and participants received no psychology credit for their participation.

Seven individuals participated in the preliminary survey. Sixty-four Marietta students participated in the experiment. There were forty-five female participants and nineteen male participants. All participants were treated in accordance with the “Ethical Principles of Psychologists and Code of Conduct” (American Psychological Association, 2002). Participants received one hour of credit toward psychology course requirements in exchange for participation.

Materials

The materials needed for the preliminary study included: paper surveys, pencils, and an iPod. The purpose of this survey was to select the film scores to be used in the
experiment. To prepare for the experiment the researcher selected nine clips of film scores that we rated as predominantly “happy,” “sad,” and “fearful” as possible (three of each). Preliminary ideas for the most appropriate soundtracks were obtained from a variety of “top ten” lists from the internet. Because the tracks were to be mixed with multiple film clips it was essential that the tracks fit as well as possible with any movie clip. Therefore any tracks with cues referring to the film they were scored for were eliminated. These factors included: cues about historical context (this eliminated the soundtracks for The Last of the Mohicans, The Patriot, etc.), cues about geographic location (Blood Diamond, Motorcycle Diaries, Crouching Tiger Hidden Dragon), references to the military (Saving Private Ryan), and finally tracks that would be recognizable (Lord of the Rings, Pirates of the Caribbean, Jaws, Braveheart, Titanic, The Notebook, Psycho, and any Disney Movie). The researcher then selected the top nine tracks with help from Music Education major Nick Giebel. The top nine were: soundtracks from Saw, Apocalypto, and Texas Chainsaw Massacre for the fear tracks; Pearl Harbor, We Were Soldiers, and Letters from Iwo Jima for the sad tracks; and The Holiday, Benny and Joon, and I Heart Huckabees for the happy tracks. These were the tracks to be evaluated in the preliminary survey in which participants rated nine tracks for emotional content.

The materials needed for the large experiment included: paper questionnaires, consent forms, pencils, eighteen new film clips and audio created for the experiment, a computer lab with four computers, iTunes software to run the film clips, headphones, four blood pressure cuffs, and four stopwatches.
To create the film clips to be shown during the experiment the researcher began by selecting film clips, three for each condition (Fear and Sad). The study might have been stronger if the same clip was used with each of the three songs, but watching a clip three times would likely have caused habituation in participants. When choosing movies the researcher chose films that were likely to not have been viewed by participants before, were as similar to one another as possible, and clips that would evoke the desired emotion in most people. For the fear condition the researcher chose chase scenes from 80s “slasher” films, including *Black Christmas, Halloween II*, and *Prom Night*. For the sad conditions the researcher selected clips of funeral scenes from the films *Year of the Dragon, Steel Magnolias*, and *Looking for Alibrandi*.

The researcher used iMovie software to strip the film clips of all sound (film score and dialogue) and overlay the new music. Every movie clip was paired with all three tracks, producing eighteen clips (six matched and twelve mismatched). For example, fear clip + happy music; sad clip + sad music; fear clip + fear music and so on. The clips plus the new score were each about a minute and a half. It was essential that all the movie clips be the same length and limited resources made it impossible to find six clips that were all significantly longer than a minute and a half. This was deemed to be an adequate length of time because this was the length of some movie trailers, which are meant to emotionally capture audiences.

*Procedure*

During the preliminary survey, a panel of unbiased judges for emotional content rated the nine tracks. Each track was rated on a scale of one to ten for each emotional element (fear, sadness, and happiness) because the track may have strong elements of
fear, but also elements of sadness. For this experiment it was essential that the selected tracks were purely one emotion so as to not confound the data. The “strongest” song in each category was used in the experiment. The top three tracks were: The Holiday composed by Hans Zimmer, Texas Chainsaw Massacre by Steve Jablonsky, and Pearl Harbor by Hans Zimmer.

The experimental design was a mixed subjects design. Sixty-four participants were recruited to participate in two conditions, which were labeled based on the emotional content of film clips participants viewed: Sadness and Fear.

The experiment was conducted with one to four participants at a time in an hour-long experiment. Before the participants entered the computer lab the researcher randomly assigned each participant to a condition to reduce confounding variables. For the sake of time, participants were only exposed to one condition: Fear or Sad. The random assignment within each condition ensured each movie clip was paired with a different score and presented in a different order. For example, one participant in the fear condition saw Black Christmas paired with the happy score, then Prom Night paired with the fear score, and finally Halloween II with the sad score. Another participant in the fear condition viewed Prom Night paired with the sad score, then Halloween II paired with the happy score, and last Black Christmas paired with the fear score. For a complete description of films and clips, see Table 1. The researcher recorded each participant’s group and the order in which they were to view the clips on the data sheet. The researcher laid, facedown, the consent forms and the questionnaire next to the computer. The clips were cued to be played. There was an online stopwatch on the computer desktop.
computers were adjusted to the same volume level, the screens tilted away from each other, and all the desktop backgrounds were set to the same, dark neutral color.

The participants came in and chose where to sit. Once everyone had entered, the researcher welcomed the group and thanked them for their participation. The researcher explained what would take place during the study without mentioning the music or alluding to the fact that the clips may have been altered in any way. The participants then turned over their consent forms and signed one copy to be returned to the researcher. The researcher also noted that participants should not adjust the volume and requested that they not look at other participant’s screens. The researcher taught the participants how to calculate their own heart rate (HR) using the stopwatch on the computer screen by finding their pulse and counting the beats for thirty seconds, then doubling the number. The participants were instructed to immediately calculate their heart rate when the clip ended and not wait for prompting, as the researcher would be busy taking the participant’s blood pressure (BP). It was important that the readings were taken immediately after the clip ended, so the participants did not return to baseline. The researcher then offered to answer any questions.

The researcher, or an assistant if there was one present, took each participant’s baseline blood pressure and the participant took his or her own baseline heart rate (all researchers taking blood pressure were trained by a registered nurse). These numbers were recorded on the data sheet. While the researcher was working with other individuals the participants answered the pre-experiment items on their questionnaire. These questions collected demographics (gender, year in college, etc.) but also included questions meant to lead the participants to believe that the study was investigating
emotional response to films only. Items asked participants to rate how emotionally they react to films and how many films they viewed, on average, per week.

The participant was then shown their first film clip. As soon as the clip had finished the researcher or an assistant took BP, while the participant calculated his or her own HR. These numbers were recorded. The participant then completed the items on the questionnaire that corresponded with the first clip, which asked the participant to interpret what they thought was occurring during the scene and asked them to rate it for emotional content. This allowed the researcher to take the BP of other participants and gave the participant’s body time to return to baseline. The researcher then repeated the same process for the second and third clips. After all participants had viewed all the clips, and completed all items on the questionnaire, the researcher asked participants to turn over their questionnaire and write on the back what they thought the study was investigating. This served as a manipulation check. If the participant mentioned anything about the music or sound they were considered to not have been deceived. Participants were debriefed via email at the conclusion of the study.

Results

To analyze the first hypothesis, which investigated matched clips (Sad-Sad versus Fear-Fear) the researcher used a one-way ANOVA. Refer to Table 2 for mean scores and participant numbers. The dependent variables were: Change in Heart Rate (HR), Change in Systolic Blood Pressure (BPS), and Change in Diastolic Blood Pressure (BPD).

ANOVA results were: Change HR $F(1,62) = .442$, $p=.509$; Change BPS, $F(1,62) = .464$, $p=.498$ and Change BPD, $F(1,62) = .093$, $p=.762$. Refer to Table 3 for other ANOVA results. Although no significant results were found, there were trends in the
hypothesized direction for HR (See Figure 1). Change in BPS and BPD increased in both the Fear-Fear and Sad-Sad conditions, as was predicted.

The second hypothesis compared matched clips to mismatched clips for both the Fear and Sad conditions. The researcher used a one-way ANOVA to examine the effects of the matched and mismatched pairings on physiological responses. The dependent variables were: change in HR, Change in BPS, and Change in BPD.

For the Fear Condition, the ANOVA test revealed significant results for Clip Rating $F(1, 87) = 4.887, p=.010$. Refer to Table 4 for mean scores and participant numbers. Change in HR, Change in BPS, and Change in BPD were not significant. The Post-Hoc LSD tests revealed significant results for clip rating: for Fear-Fear vs. Fear-Happy $p=.003$ (See Figure 2). See Table 5 for Post-Hoc results for the Fear Condition. Although no other significant results were found, there were trends in the hypothesized direction for HR (See Figure 3).

For the Sad Condition, the ANOVA test revealed significant results for Clip Rating $F (1, 99) = 11.535, p=.000$ and Change in HR, $F (1,99) = 3.088, p=.050$. Change in BPS and BPD were not significant. Refer to Table 6 for mean scores and participant numbers. There were significant results in the Post-Hoc analysis for clip rating in the, Change in HR, and Change in BPS. For Clip Rating, Sad- Sad vs. Sad-Happy $p=.000$ and Sad- Fear vs. Sad- Sad $p=.005$ (See Figure 4) For Change in HR, Sad- Sad vs. Sad- Fear $p=.034$ and Sad- Happy vs. Sad- Fear $p=.034$. For Change in BPS, Sad- Sad vs. Sad- Happy $p=.045$ (See Figure 5). See table 7 for Post-Hoc results.
Discussion

The results of this study found no significant differences in the effects of the stimuli on physiological responses conditions (Fear- Fear vs. Sad- Sad) although the data for HR showed trends in the predicted direction, which was consistent with previous research. Change in BPS and BPD increased in both the Fear-Fear and Sad-Sad conditions. For the mismatched clips, the Fear Condition showed significant results for clip rating with Fear- Fear being rated the most scary followed by Fear- Sad, and Fear-Happy. Change in HR, Change in BPS, and Change in BPD were not significant, though there were trends in the hypothesized direction for HR, which is consistent with previous research. For the Sad Condition, significant correlations were found for Clip Rating and Change in HR, in predicted directions. Change in BPS and BPD were not significant. Post-Hoc tests revealed that when participants rated level of sadness, Sad-Sad was considered the saddest, followed by Sad-Fear and Sad-Happy.

However, there were several threats to the validity of this experiment. These limitations included concerns with the experiment itself, the participants, and the experimenter. The limitations of the experiment included the design of the experiment and length of the clip. Due to time constraints, not every participant was exposed to all six conditions (three fear and three sad); they only viewed one condition (fear or sad). This prevented the use of a within-subjects repeated measures design. Another limitation was the length of the clip. Finding movie clips that were similar, without extraneous plot elements, limited the researcher in that it was difficult to find clips to longer than a minute and a half after editing. This was deemed acceptable since many movie trailers are about a minute and a half. If movie trailers are able to emotionally capture an
audience in a minute and a half, it is arguable that clips lasting the same length were acceptable.

The major limitation concerning the participants was the failure of the manipulation check. Only twenty four of the sixty four participants were deceived, in that they did not suspect that the study had anything to do with the background music. To heighten the realism of the clips they could have been embedded in a longer clip so that the participant was not as focused on the specific scenes. Also, it was difficult to place the music so that it meshed seamlessly with all three clips in the condition. The researcher tried to time the music according to the action on screen, but for the sake of consistency across the clips the ability to time the music perfectly was limited. Though this was a limitation, efforts were made to combat this issue. For example, in the Prom Night clip, the music was timed along with the actor turning off a light before attacking and chasing the actress. This meant that the music started a few seconds later than in other clips.

Another reason the number of deceived participants was so low could be attributed to the fact that the dialogue in the clip was stripped. To remove the background score the researcher also had to eliminate the speaking parts; there was no way to separate the two with the available software. If the participant realized that the dialogue was missing (mouths were moving, but there were no words and no screaming) it might have alerted them to the fact that the clips had been altered, which then may have drawn their attention to the different music. These factors likely contributed to the low rate of deception.
Second, the participant’s physiological response to the clips could have been confounded by other factors. For example, the participants were touched (while taking HR) by a researcher that they may not have known. This may have created nervousness in the participant, which may have influenced the results. Physiological responses may also have been influenced by participant’s current mood. To control for this, the researcher took about ten minutes to greet participants, explain the study, and collect consent forms. This was meant to allow participants to return to a baseline state after other stressors, such as being late to the study or feeling anxiety about finding the location. Last, the major limitation concerning the experimenter was the possibility of human error when taking HR and BP. Though all researchers were trained by a healthcare professional, there was still room for error. It would have been ideal to have more professional equipment to gather the physiological data, but the equipment was not available.

Though there are limitations involved with this study, it does have application for everyday life. Specifically, this study could be used by movie score composers when attempting to elicit a specific response in viewers. If a scene is not scary enough, a composer may use elements of this study to promote heightened heart rates in viewers. In a much broader sense, this study adds to the body of work investigating how humans react to music. This area of research may be used to alter mood in the workplace, airports or in other high stress environments. It could also be applied in treatment settings. For example, a person suffering from a depressed mood could refrain from listening to music that depresses the body. On the other end of the spectrum it could be used as a potential coping mechanism for someone who experiences anxiety attacks. If certain kinds of
music are found to lower that individual’s heart rate, the client could carry a music player to use when they feel anxious. This study can also be used to lay the groundwork for future research. To improve these experiments researchers could address the limitations above as well as running a “no music” group. Another future study may investigate which sensory element dominates (music or visual).

In his book *The Soul of the Cinema*, Larry Timm compares a movie without music to a bath without water; something crucial is missing (Timm, 2002, p 1). Composers have come a long way from simply using the same “stock” music in films. Directors and audiences alike are beginning to appreciate a film’s score and its contribution to the movie. Though there is limited experimental research in the field of film scores, it is improving. However, much remains to be discovered about the nature of the relationship between movies, the score, and their audiences.
References


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Figure 2. Mean Clip Rating for Fear Condition
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Appendices

Appendix A. Assessment of Emotional Quality
Appendix B. Informed Consent
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Table 1. *Film and Score Pairings*

<table>
<thead>
<tr>
<th>Movie Clip</th>
<th>Movie Score</th>
<th>Clip Code</th>
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<td><em>Texas Chainsaw Massacre</em></td>
<td>Fear- Fear</td>
<td>Fear- Fear</td>
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<td><em>Pearl Harbor</em></td>
<td>Fear- Sad</td>
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<td>Fear- Happy</td>
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Table 2. Descriptive Statistics for Fear-Fear vs. Sad-Sad

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Table 3. ANOVA Results for Fear-Fear vs. Sad-Sad

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* The mean difference is significant at the 0.05 level.
Table 4. *Descriptive Statistics for Fear Condition*

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Table 5. *Post Hoc Results for Fear Condition*

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<th>Std. Error</th>
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* The mean difference is significant at the 0.05 level.
Table 6. Descriptive Statistics for Sad Condition

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<th>Change in BPS</th>
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Table 7. Post Hoc Results for Sad Condition

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* The mean difference is significant at the 0.05 level.
Figure 1. Mean Change for HR, BPS, and BPD for Between-Subjects

Mean Change for HR, BPS, and BPD

Variables

Mean Change

-3 -2 -1 0 1 2 3 4 5 6 7

BPS BPD

Mean for Fear-Fear
Mean for Sad-Sad
Figure 2. *Mean Clip Rating for Fear Condition.*

![Bar chart showing mean clip rating for fear condition](image)

Figure 3. *Mean Physiological Responses for Fear Condition*

![Bar chart showing mean physiological responses for fear condition](image)
Figure 4. *Mean Clip Rating for Sad Condition*

![Graph showing mean clip rating for sad condition](image)

Figure 5. *Mean Physiological Response for Sad Condition*

![Graph showing mean physiological response for sad condition](image)
Appendix A

Assessment of Emotional Quality of Compositions

**Track 1**

1.) On a scale of 1-10 how terrifying does this song sound?
   1 2 3 4 5 6 7 8 9 10
   Not at all  Very Terrifying

2.) On a scale of 1-10 how sad does this song sound?
   1 2 3 4 5 6 7 8 9 10
   Not at all  Very Sad

3.) On a scale of 1-10 how happy does this song sound?
   1 2 3 4 5 6 7 8 9 10
   Not at all  Very happy

**Track 2**

1.) On a scale of 1-10 how terrifying does this song sound?
   1 2 3 4 5 6 7 8 9 10
   Not at all  Very Terrifying

2.) On a scale of 1-10 how sad does this song sound?
   1 2 3 4 5 6 7 8 9 10
   Not at all  Very Sad

3.) On a scale of 1-10 how happy does this song sound?
   1 2 3 4 5 6 7 8 9 10
   Not at all  Very happy

**Track 3**

1.) On a scale of 1-10 how terrifying does this song sound?
   1 2 3 4 5 6 7 8 9 10
   Not at all  Very Terrifying

2.) On a scale of 1-10 how sad does this song sound?
   1 2 3 4 5 6 7 8 9 10
   Not at all  Very Sad

3.) On a scale of 1-10 how happy does this song sound?
   1 2 3 4 5 6 7 8 9 10
   Not at all  Very happy
Track 4

1.) On a scale of 1-10 how terrifying does this song sound?
Not at all  
1 2 3 4 5 6 7 8 9 Very Terrifying 10

2.) On a scale of 1-10 how sad does this song sound?
Not at all  
1 2 3 4 5 6 7 8 9 Very Sad 10

3.) On a scale of 1-10 how happy does this song sound?
Not at all  
1 2 3 4 5 6 7 8 9 Very happy 10

Track 5

1.) On a scale of 1-10 how terrifying does this song sound?
Not at all  
1 2 3 4 5 6 7 8 9 Very Terrifying 10

2.) On a scale of 1-10 how sad does this song sound?
Not at all  
1 2 3 4 5 6 7 8 9 Very Sad 10

3.) On a scale of 1-10 how happy does this song sound?
Not at all  
1 2 3 4 5 6 7 8 9 Very happy 10

Track 6

1.) On a scale of 1-10 how terrifying does this song sound?
Not at all  
1 2 3 4 5 6 7 8 9 Very Terrifying 10

2.) On a scale of 1-10 how sad does this song sound?
Not at all  
1 2 3 4 5 6 7 8 9 Very Sad 10

3.) On a scale of 1-10 how happy does this song sound?
Not at all  
1 2 3 4 5 6 7 8 9 Very happy 10

Track 8

1.) On a scale of 1-10 how terrifying does this song sound?
Not at all  
1 2 3 4 5 6 7 8 9 Very Terrifying 10

2.) On a scale of 1-10 how sad does this song sound?
Not at all  
1 2 3 4 5 6 7 8 9
Not at all

3.) On a scale of 1-10 how happy does this song sound?
1 2 3 4 5 6 7 8 9 10
Not at all Very happy

Track 9

1.) On a scale of 1-10 how terrifying does this song sound?
1 2 3 4 5 6 7 8 9 10
Not at all Very Terrifying

2.) On a scale of 1-10 how sad does this song sound?
1 2 3 4 5 6 7 8 9 10
Not at all Very Sad

3.) On a scale of 1-10 how happy does this song sound?
1 2 3 4 5 6 7 8 9 10
Not at all Very happy

Track 10

1.) On a scale of 1-10 how terrifying does this song sound?
1 2 3 4 5 6 7 8 9 10
Not at all Very Terrifying

2.) On a scale of 1-10 how sad does this song sound?
1 2 3 4 5 6 7 8 9 10
Not at all Very Sad

3.) On a scale of 1-10 how happy does this song sound?
1 2 3 4 5 6 7 8 9 10
Not at all Very happy
Appendix B

CONSENT FOR PARTICIPATION IN PSYCHOLOGY STUDY
Project Title: The Relationship Between Visual Stimuli and Physiological Response
Principal Investigator: Katy Black

What is the purpose of this research study?
I am investigating the relationship between films and physiological state. This study is being conducted as a senior honors thesis under the supervision of Dr. Alicia Doerflinger (ad001@marietta.edu) at Marietta College. This study has been approved by the Marietta College Human Subjects Committee.

How many people will take part in the study?
I anticipate that approximately 60 people will participate in this study.

How long will your part in this study last?
The study should not take longer than one hour. Therefore, a one hour credit will be awarded towards your psychology class research participation. If you decide at any point that you do not wish to continue, you may leave with no negative consequences. In this case, you will receive credit for the time spent in the study.

What will happen if you take part in the study?
You will be asked to view film clips while the researcher collects Blood Pressure and Heart Rate data. A questionnaire will be used to record your responses as you progress through the study. Please note that one clip has about a second long depiction of gore. You are always free to look away or discontinue your participation.

How will my privacy be protected?
The researchers will make every effort to protect your privacy. Your name will only appear on the informed consent form and in the records for the Marietta College Participant Pool. Your responses to the survey and physiological data will only be associated with a code number that we assign, but that number is not and will not be connected in any way with your name. Thus, your personal information is anonymous. The data will only be accessible to the researcher, and will be stored separately from consent forms.

Participants Agreement:
I have read the information provided above. I have asked all the questions that I have at this time. I voluntarily agree to participate in the research study. I understand that I may contact the researcher Katy Black(kcb001) with questions about the study, and Dr. Alicia Doerflinger (ad001) with questions about research participant rights.

____________________________  __________________________  ________________
Participant’s Signature       Printed name of participant    Date

__________________________
Investigator Signature
Appendix C

Condition __________ Participant Number ______

Please circle the appropriate response or fill in the blank when prompted

Pre-Experiment Item

1. On a scale of 1-10 how emotionally do you tend to react to films?
   1  2  3  4  5  6  7  8  9  10
   No emotional response
   Very emotional response

2. Gender: ____ Male  ____ Female

3. Year in College __________

4. On average, how many films do you watch per week?
   0-1  2-4  5 or more

5. Which class would you like your participation to count toward? __________

Experiment Items

Clip 1
Had you ever seen this film? ______

On a scale of 1-10 how fearful did you feel about clip 1?
   1  2  3  4  5  6  7  8  9  10
   No emotional response
   Very emotional response

Describe the plot of the scene. What was the relationship between the characters?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Clip 2
Had you ever seen this film? _______
On a scale of 1-10 how fearful did you feel about clip 2?

1  2  3  4  5  6  7  8  9  10
No emotional response

Very emotional response

Describe the plot of the scene. What was the relationship between the characters?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Clip 3
Had you ever seen this film?  ________

On a scale of 1-10 how fearful did you feel about clip 3?

1  2  3  4  5  6  7  8  9  10
No emotional response

Very emotional response

Describe the plot of the scene. What was the relationship between the characters?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Thank you for your participation!
Appendix D

Condition ____________  Participant Number__________

Please circle the appropriate response or fill in the blank when prompted

Pre-Experiment Item

2. On a scale of 1-10 how emotionally do you tend to react to films?

<table>
<thead>
<tr>
<th>1</th>
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<th>3</th>
<th>4</th>
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<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Very emotional response</td>
<td></td>
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</tr>
</tbody>
</table>

2. Gender: ____ Male  ____Female  3. Year in College____________

4. On average, how many films do you watch per week?

| 0-1 | 2-4 | 5 or more |

5. Which class would you like your participation to count toward? ____________

Experiment Items

Clip 1
Had you ever seen this film? _________

On a scale of 1-10 how sad did you feel about clip 1?

<table>
<thead>
<tr>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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</tr>
</tbody>
</table>

Describe the plot of the scene. What was the relationship between the characters?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Clip 2
Had you ever seen this film? _________
On a scale of 1-10 how sad did you feel about clip 2?

1 2 3 4 5 6 7 8 9 10

No emotional response

Describe the plot of the scene. What was the relationship between the characters?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Clip 3
Had you ever seen this film? _______

On a scale of 1-10 how sad did you feel about clip 3?

1 2 3 4 5 6 7 8 9 10

No emotional response

Describe the plot of the scene. What was the relationship between the characters?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Thank you for your participation!