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THE AFFECT OF THE DETAILS: THE EFFECTS OF SOUNDTRACKS' MODIFIED INTONATION ON AUDIENCE'S EMOTIONAL REACTION TO FILMS

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ABSTRACT

Music has always had an important role in cinema, giving films an additional dimension, while being indispensable for the film's emotional character. However, in what ways can music express emotion? Several researchers have investigated the relationship between musical elements, such as tempo, rhythm, melody, harmony, etc., and emotions. One of the less investigated musical elements is intonation, something considered fundamental for emotional expression.

This study aims to explore what effects different intonation choices for a soundtrack may have on audience's emotional reactions to a film. To do so, extensive literature on the topics of film music, music and emotions, and intonation was reviewed, and an experiment was conducted where participants reported their emotional reactions to film clips. The results show that music enhances and directs the scene's emotional meaning, with some intonation choices supporting this role more than others do. Just Intonation seemed to be preferred for calmer scenes, while unconventional intonation seems more appropriate for horror scenes. The findings of these trends in this study may help fill the gap between the topics aforementioned and inspire film composers to utilize different methods to express emotions.

Keywords: Film music; emotions; intonation; experiment.

SAMMENDRAG

Tittel på norsk: Affekten i detaljene: effekten av lydspors modifiserte intonasjon på publikums opplevelse av film

Musikk har alltid spilt en viktig rolle innen film ved å tilføre en ekstra dimensjon og være uunnværlig for filmens emosjonelle uttrykk. Men på hvilke måter kan musikk uttrykke følelser? Flere forskere har undersøkt forholdet mellom musikalske elementer, slik som tempo, rytme, melodi, harmoni osv., og følelser. Noe det er forsket mindre på er intonasjon, et musikalsk element som ansees som grunnleggende for det emosjonelle uttrykket.

Denne studien søker å undersøke hvilken effekt forskjellige intonasjonsvalg i et lydspor kan ha på seernes følelsesmessige reaksjoner på en film. For å gjøre dette, ble omfattende litteratur innen tematikkene filmmusikk, musikk og følelser, og intonasjon gransket, og det ble gjort et eksperiment hvor deltakerne ga sin emosjonelle respons på diverse filmklipp. Resultatene viser at musikk forsterker og gir retning til scenens emosjonelle innhold, og at enkelte intonasjonsvalg støtter opp under denne rollen mer enn andre. Renstemt intonasjon så ut til å bli foretrukket for roligere scener, mens mer ukonvensjonelle intonasjonsvalg virker mer hensiktsmessig for skrekk-scener. Funnene av disse tendensene i denne studien kan bidra til å minske avstanden mellom de tidligere nevnte tematikkene og inspirere filmkomponister til å benytte ulike metoder for å uttrykke følelser.

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1 SETTING THE SCENE

1.1 INTRODUCTION

Despite the extensive literature written about the topics of film music, music and emotions, and intonation, there is still a lack of literature discussing the interconnection between them. Film music literature considers music's impact in the expression and interpretation of emotion in the film without, however, explaining through which musical elements the film's emotions are actually perceived. In order to answer that question, we have to turn to literature on music and emotions on a more broader scale. There we find vast research on the topic, ranging from performance expressivity to emotional perception in music, detailing the psychological mechanisms utilized in the perception and communication of emotion, as well as which emotions are evoked and/or represented by which musical elements, hereafter referred to as cues. Within this research, intonation is one of the musical cues that is less discussed, probably due to the fact that it is a performative cue, i.e., not written in the score, and that it involves small variations, which make it difficult to be perceived. Both of these factors make intonation a more difficult and less straightforward topic to investigate.

By reviewing the written literature on these three topics, it appears that changes in intonation should, at least, have some impact on how the viewers emotionally react to a film. However, since films include both visual and auditory stimuli, thus allowing for several methods of representing and evoking emotions, and since these intonational modifications are small and most often imperceptible, film viewers may not be able to actually articulate the changes in their reactions, if there are any. Therefore, in order to shorten the gap between the interconnection of these topics, the current study concentrates on how different intonation choices in a film's soundtrack may influence the audience's emotional reactions to film as a whole, and aims to explore the following research questions:

- What emotional effects are triggered on the participants by the use of different intonation choices?
- Can the participants' perceived emotional reactions to a film be enhanced or weakened by the use of different intonation choices?
- Will traditional intonation choices, such as expressive intonation and Just Intonation, have a more positive impact on the emotional reactions of viewers when compared to unconventional intonation?

In order to answer these questions, an experiment was conducted where participants reported the emotions that they felt or recognized after viewing several film clips, with the soundtrack of each clip having a different intonation. It is not expected that intonational changes would completely alter the participants' perception of the film's emotion. However, it is possible that their perception of the emotion becomes enhanced or weakened. This study focuses primarily on this issue, while still allowing for the possibility of a drastic emotional change.

1.2 CLARIFICATION OF CONCEPTS

In order to better understand this study, the central concepts need to be clarified. These consist of: *emotional reaction*, *emotion v.s mood*, and *intonation*.

Emotional reaction

The concept *emotional reaction* is probably one of the most crucial in the current study. However, it is probably the most difficult concept to explain. The way someone emotionally reacts to an object or event can differ tremendously from person to person, and sometimes it can be extremely difficult to put into words what the person felt (Gabrielsson, 2010). A person's emotional reaction can be measured and reported in

different ways: the person can express how they felt and how strong the emotion was in words; the person's physiological responses can be recorded and measured, such as laughter, shivers down the spine, tears, yawning, etc.; the person can demonstrate behavioural changes which actually express the emotion that is being felt, for example, being unpleasant toward someone when angry; among others.

Emotional reactions are also dependent on several variables, namely the person themselves, the stimulus to induce the emotion, which in our case is music, and the situation during the reaction (Chion, 2019; Cohen, 2010; Gabrielsson, 2010; Juslin & Laukka, 2004; Sloboda, 1992). As Juslin et al. (2011) put it, "emotional reactions to music can never be predicted from the characteristics of the music alone. Different listeners react differently to the same piece of music. Moreover, a listener reacts differently to the same music in different situations" (p. 175). Each person has had different personal experiences, probably has a unique cultural background, has acquired specific knowledge on different subjects, and may be in a different mood before the musical event. Thus, it is understandable that different people would react differently to the same stimulus. Additionally, as it will be discussed later on, different musical cues may provoke different emotional reactions, mainly through cultural conventions. For example, the association between the major and minor modes and the emotions of happiness and sadness, respectively, is so ingrained in Western culture that we automatically link them together. Lastly, the situation around the musical event also influences the emotional reaction. For example, a happy music may evoke happiness in a person when they first listen to it. However, if they listen to the same music in another situation, such as when remembering their past, the same music may evoke sadness or another emotion.

It is also important to note that we usually have these emotional reactions subconsciously, and when we ask listeners to try to express what they felt, we are forcing them to bring into their conscious mind something that was experienced subconsciously. Thus, it can happen that what they express they may be slightly different from what they actually felt. Therefore, when discussing the current study's experiment, the participants' reported emotional reactions are actually their perception of their emotional reactions,

which, hopefully, does not differ greatly from the actual reaction.

Emotion vs. mood

The concepts of emotion and of mood are both related to the domain of affect and appraisal as well as to how one responds to certain events. However, they can be differentiated by the presence or lack of an object, i.e. things, persons, events, conditions, etc., both real or imagined (Barrett & Russell, 1999; Cohen, 2010; Juslin, 2016; E. S. Tan, 1996). Experiencing a certain mood does not require an object. For example, we do not need an object of happiness to experience a general mood of happiness. However, to say that we experienced an emotion, we need an object to which the emotion can be directed to. For example, we can feel happy because our friend won the gold medal on a competition, the event being the source of the emotion.

According to these definitions, music that is meant to be listened to without the presence of any other media, hereafter referred to as "pure music"[1], can only express moods or generalized emotions, and not specific emotions, since it lacks an intentional object to direct them to - a hypothesis defended by some theorists and philosophers, such as Langer (1951). However, in films, music can attach its emotional associations to the visuals and the narratives that are in focus, turning them into the needed emotional object (Cohen, 2010). This allows film music to bypass the problem of emotional ambiguity that pure music may have, and produce the "finer shades of expressive meaning that we usually associate with real-world experience" (Smith, 1999, p. 152). Thus, film music can express an overall mood of the scene (we feel something without actually being able to pinpoint what is causing it) and an overall emotional tone, both of the scene and of the characters. Interestingly, we, as the audience, are able to understand, and sometimes even feel, the represented emotion, even if our past experiences differ from those depicted in the film. For example, in a scene where a character recalls a traumatic event that the spectator

[1]The term "pure music" is commonly used in film music literature to refer to music that stands on its own. See, for example, Chion (2019), Gorbman (1987), and Smith (1999).

has never experienced (e.g. in the form of a flashback), the spectator can still understand and perceive the communicated emotion (Smith, 1999). Nonetheless, sometimes, besides understanding the communicated emotion, we actually feel it and relate to it. It is not uncommon to tear up after watching a specially dramatic and emotionally heavy scene. Thus, music plays a double role of both representing and eliciting emotions.

When discussing the current study's experimental material and results, the concepts of emotion and mood will be differentiated. However, several researchers, mainly on the topic of music and emotion, use both terms interchangeably. This choice is probably related to the fact that they usually discuss pure music, which does not possess an object to direct the emotion to.

Intonation

When looking up the term *intonation* in relation to music, one of the first search results is Wikipedia's (n.d.) definition: "In music, intonation is the pitch accuracy of a musician or musical instrument". However, this definition is incomplete and somewhat incorrect. Even though intonation is related to pitch accuracy, and it can be discussed as how much the pitch deviates from its supposed "in-tune frequency", pitch accuracy is not its definition.

Leedy and Haynes (2001) define intonation as: "The treatment of musical pitch in performance" (p. 1). This definition is better than the previous one as it characterizes intonation as "the treatment of musical pitch", be it to be in tune or out of tune. It also establishes that intonation occurs during a performance, thus, in real-time (although, nowadays, intonation can be programmed in music software).

Parncutt and Hair (2018) present a more complete definition of intonation: "Intonation ... is the real-time adjustment of perceived pitch in music performance" (p. 477). Just like Leedy and Haynes (2001), the authors use the term *pitch* instead of *frequency*, even though *frequency* appears, at first glance, to be the most correct term, since the performer

can manipulate the frequency of the sound. However, as listeners (and the performer is also a listener in this sense), we do not perceive sound waves as the absolute frequency that is being played. On the contrary, we categorize all the perceived frequencies into *pitch*, a subjective parameter, whereas frequency is objective. Our perception of pitch depends on several objective and physical factors that are all synthesized by our brain. Two different instruments can be playing the exact same frequency, but one can sound higher or lower depending on other physical factors, such as timbre and loudness (Heller, 2013; Parncutt & Hair, 2018; Vurma et al., 2011; Williamson, 1942). It is also important to note that even experienced listeners have difficulties to distinguish between frequency and timbre, and thus, what we perceive is a combination of both (together with other phenomena), which encompasses pitch (Madsen & Geringer, 1981). Another physical limitation in the perception of intonation is that the just-noticeable difference (JND) between two pitches, which is the "minimum pure tone frequency change required for a listener to detect a change in pitch" (Heller, 2013, p. 473), lies between 10 and 20 cents[2], and can go as low as 2 or 3 cents for expert listeners. Thus, even if there is a change in intonation, if it is less than 10 cents, then the probability of it being noticed is low (Loeffler, 2006; Parncutt & Cohen, 1995).

Even though Parncutt and Hair's (2018) definition of intonation is very well-thought, it does not fully apply to recorded and produced music, since it is not in real-time neither in a performance. Therefore, for the purpose of this research, intonation will be defined as *the adjustment of sounding pitch in music*.

[2]Cent is a measurement unit used for musical intervals. In the 12-tone Equal Temperament, a semitone consists of 100 cents.

1.3 LITERATURE REVIEW

1.3.1 PITCH AND INTONATION

Our perception of pitch, and thus intonation, is subjective and dependent on different factors, such as experience, sociocultural norms, expectancy, and physical factors, both related to sound and to our anatomy. In our inner ear, sound is processed and analysed in the cochlea, which contains the basilar membrane. Every point along the entire length of the membrane vibrates in response to a specific frequency, converting the sound waves into nerve impulses that send information to the brain. This *frequency analysis*, as it is termed, also allows for a spacial decoding, since each frequency is processed in its own point in the membrane. This way, we are able to deconstruct a complex tone into its frequency components, or partials[3], which aids in our perception of timbre (Heller, 2013; Helmholtz, 1895; Leimu, 2016; Rasch & Plomp, 1999). Yet, when we listen to a note, for example on the piano, we do not distinguish every single partial that makes up the note. Our brain compiles all the frequencies and reduces them into a single fundamental frequency, through a process called *fusion*. This way, our perception of the world is simplified and our brain does not get overwhelmed with information (Brean & Skeie, 2019).

Our perception of pitch has a limited range of about 20 - 5000 Hz. This does not mean that we do not hear higher or lower frequencies, but instead that we do not perceive them as pitch[4]. "Tones that have higher frequencies are audible but without definite pitch sensation. Low tones in the range of 10 - 50 Hz can have the character of a rattling sound"

[3]The term "partials" is employed in this context instead of "harmonics" because the frequency of a harmonic has to be a natural multiple of the fundamental frequency, whereas the frequency of a partial can be any multiple, including the fundamental frequency itself.

[4]Since the basilar membrane has a finite thinness and elasticity, it has a limit to how fast it can vibrate, and thus, has a limit to how well it can process very high frequencies. Additionally, as we get older, its elasticity is reduced, which explains why we start losing our hearing in higher frequencies (Brean & Skeie, 2019).

(Rasch & Plomp, 1999, p. 95). Additionally, the ear's frequency analysis has a *dominance region*, approximately from 500 Hz to 2000 Hz, where partials that fall within that region are the most influential for the perception of pitch (Plomp, 1967; Ritsma, 1967; Yost, 2009). Rasch and Plomp (1999) explain the impact of the dominance region with tones with inharmonic partials: "Assume a tone with partials of 204, 408, 612, 800, 1000, and 1200 Hz. The first three partials in isolation would give a pitch of 204 Hz. [However,] All six [partials] together give a pitch of 200 Hz of the relative weight of the higher partials, which lie in the dominance region" (p. 96). In other words, our perception of low pitches is dependent on their higher partials (and can differ from the fundamental frequency), while the perception of higher pitches is determined by their fundamental frequencies, since they already lie within the dominance region. This region is so influential in our pitch perception that our inner ear can infer a fundamental frequency without it actually being present, the so-called "missing fundamental"[5]. All of these factors lead to pitch perception's subjectivity.

In order to discuss our perception of intonation, we have to consider how we perceive the relationship between two pitches, preferably within a musical context. When researchers examine people's capability to perceive if a pitch is in tune or not within a lab setting, the JND can go as low as 3 cents, as previously mentioned. However, within a musical context, the threshold for the discrimination of in-tuned pitches can vary greatly between different individuals (Leimu, 2016). These results are usually is comparison with 12-tone Equal Temperament (12ET)[6]. According to Vurma and Ross (2006), melodic intervals can differ from 12ET on average 20 to 25 cents sharper or flatter. Intonational deviations flatter than 12ET are more often regarded as out of tune, while deviations sharper than 12ET can vary up to 70 cents and sometimes still be considered in tune (Burns, 1999).

[5]For research about this phenomenon see Houtgast (1976), Licklider (1954), Schouten et al. (1962), and Smoorenburg (1970).

[6]The 12-tone Equal Temperament is a tuning system where the octave is divided into 12 equal parts.

A justification for the preference for sharper intonation can be attributed to the relationship between intonation and tone-quality. In a study by Wapnick and Freeman (1980), participants "associated darkness (when preceded by brightness) with flatness, and brightness (when preceded by darkness) with sharpness" (p. 182), and in a study by Geringer and Worthy (1999), intonation was rated higher when the stimulus of pair tones became brighter on the second tone, particularly when the change was more pronounce, such as from a dark timbre to a bright timbre. In a more recent study by Geringer et al. (2001), the authors examined participants' perception of intonation compared to tone-quality in two different experiments. Both experiments presented a stimulus which consisted of a trumpet melody, played with either good or bad tone-quality, and a piano accompaniment. In the second experiment, in which the trumpet's intonation was modified in 6 different versions for both good and bad tone-quality, the researchers noticed something unexpected. Within the bad tone-quality condition, the version with sharper intonation by 15 cents was rated significantly higher than the in-tune version. The authors explained this result through a spectrographic analysis, where they found that the bad tone-quality trumpet sound file contained very low harmonic energy above the 10^{th} harmonic, which cause the timbre to sound darker. "Listeners' ratings demonstrate that they heard examples in which the bad quality versions were made slightly more sharp (such as the 15 cents sharp version), as more "in-tune" with the accompaniment than the actual in-tune example (which may have sounded relatively flat)" (p. 74), due to the association of dark timbres to flat intonation.

Additionally, psychoacoustic and sociocultural factors also drastically influence our perception of intonation. Western music has been tuned to 12ET for so long that our ears and brains are extremely accustomed to music in 12ET, and, in order to conform to this norm, instruments with fixed tuning, like the piano, are tuned to 12ET. However, expert performers of non-fixed tuning instruments, such as string instruments, are free to explore and perform in other tuning systems. This leads to people preferring one tuning system over another depending on what instrument they play. According to Loosen (1995), pianists tend to prefer scales tuned to 12ET, while violinists tend to prefer scales tuned to

Pythagorean tuning, a system based on the ratio of the perfect 5 (3:2). In other words, we compare the perceived pitch to our idea of how the intonation should be. Experience, besides shaping the intonation that we prefer, also determines to what degree we are able to perceive small pitch and intonational differences: the more we practice one non-fixed tuning instrument, the better we become at detecting small changes (Yarbrough et al., 1995). Furthermore, the instrument that we play conditions how we are aware of music. Traditionally, string players and vocalists tend to regard music horizontally, while brass players tend to consider it vertically. This difference in tradition can affect the performers' perception of intonation. If we approach music horizontally, then it would be more natural to play in a more melodic way, raising or lowering the intonation of notes depending on the direction of the melody. On the other hand, if we regard music vertically, then playing in a beatless manner[7] seems more natural.

Just like pitch, the perception of intonation is subjective and can vary greatly between individuals. For example, Elliott (1987) noticed that the comments from professional judges to the same recording's intonation varied greatly, as both positively and negatively. Besides these physical, psychoacoustic and sociocultural factors, the listener's preference, previous knowledge, the style of the piece, and even the composer's assumed intentions can affect how one perceives intonation (Parncutt & Hair, 2018).

Intonation's natural occurrence in performance

Nowadays, almost all the music that we listen to is supposedly tuned to 12ET. However, when music is performed live on instruments with non-fixed tuning, it is expected that the pitch of certain notes will vary from 12ET (or any other tuning system), either due to mistakes or artistic and stylistic preferences. For example, in vocal ensembles, singers may employ non-standard intonational techniques when singing in a more soloistic way,

[7]When the ratio between the frequency of two notes is not a natural number, then we may experience beats in the form of amplitude variation. Playing in a beatless manner is trying to play in a way that best minimizes the creation of beats.

as well as utilizing Just Intonation[8], in order to minimize beats, when approaching music in a more harmonic way (Havrøy, 2015).

Interestingly, it is quite common for performers to not play exactly in tune with any tuning system, although unconsciously (Parncutt & Hair, 2018). For example, one interval that we take for granted as always being in tune is the perfect octave (P8). Ever since the Ancient Greece, the P8 has had the ratio of 2:1, first introduced by Pythagoras. The interval has been considered so crucial for music that all of the most known tuning systems developed throughout the centuries have tried to keep this ratio intact and temper the rest of the intervals[9]. However, in performance, P8 are most frequently stretched wider than 2:1, both harmonically and melodically (Burns, 1999; Burns & Ward, 1978; Kantorski, 1986; Parncutt & Hair, 2018; Sundberg & Lindqvist, 1973), and the human ear seems to prefer melodic P8 that are ca. 20 cents wider (Dobbins & Cuddy, 1982). Other intervals are also "mistuned" unconsciously, when compared to 12ET. It has been discovered, in several studies (Burns, 1999; Gabrielsson, 1999; Rakowski, 1985; Vurma & Ross, 2006), that intervals equal to or smaller than a perfect 4^{th} are compressed, whereas intervals equal to or larger than a perfect 5^{th} are stretched. The way these intervals are played also depends strongly on context. For example, if the tritone is written as an augmented fourth, which generally resolves outward, then it will be played some cents wider than if it were written as a diminished fifth, which usually resolves inward (Burns, 1999).

[8]Just intonation consists of tuning intervals between two or more notes as whole ratios of frequencies, following the harmonic series, and thus avoiding the creation of beats.

[9]Even though tuning systems try to keep the interval intact, instrument builders and tuners need to take into consideration that the materials used are not perfect, and that they will not create exact harmonic modes of vibration. This lack of precision can create the phenomenon called inharmonicity: the degree to which a set of overtone frequencies deviates from an exact harmonic series (M. Campbell, 2001). Piano tuners, particularly, deal with this phenomenon when tuning the low and high registers of the instrument (Keener, 1997). For example, the pitch shift caused by inharmonicity on the low piano notes can be as much as two semitones (Anderson & Strong, 2005).

To Bregman (1990), this distinction of intonation between small and large intervals arises from the fact, to the listener, larger intervals divide melodies, while smaller intervals belong and promote the same melody. Thus, in order to make this consequence more prominent, smaller intervals are kept close together while larger intervals are stretch apart to create a more obvious contrast. Our ability to distinguish events, in this case melodies, arises from the brain's horizontal analysis of sound and categorization. If the distance between two notes is small, then our brain will group both notes together, whereas if the distance is big, then the brain will most likely separate the two notes into different groups, i.e., melodies[10]. However, the way we categorize events is cultural dependent and learnt, which can explain why we may still perceive a note a major sixth apart to be in the same melody (Brean & Skeie, 2019).

1.3.2 MUSIC AND EMOTION

Ever since Ancient Greece, philosophers and music theorists alike have been questioning how and why can music express or even evoke emotions (Gabrielsson & Lindström, 2010; Juslin, 2016; Juslin et al., 2010). It has been proposed that several musical cues contribute to enhance the perception of the emotional expression. These cues originate from both the composed structure, usually represented by conventional musical notation, such as pitch, melody, harmony, rhythm, tempo, dynamic markings, among others, as well as from the performance's proprieties, which involve small modifications of the composed structure, such as tempo and dynamic alterations, articulation, and intonation. Both of these sources of musical cues must be taken into consideration since the perceived emotional expression of a piece is most often judged from its performance (Carvalho, 2019; dos Santos-Luiz, 2018; Gabrielsson, 2016; Gabrielsson & Lindström, 2010; Juslin & Timmers, 2010; Quinto et al., 2014). Different cue combinations can express different emotions. A summary of some of these cues, both compositional and performative,

[10]Other aspects that condition our categorization of melodies are time (if notes are far apart or close together in terms of time), rhythm, and harmony (Brean & Skeie, 2019).

can be seen in Table 1, applied to five basic emotions[11] and a neutral emotion.

Cues	**Emotions**					
	Anger	*Fear*	*Happiness*	*Neutral*	*Sadness*	*Tenderness*
Articulation	Staccato	Staccato	Staccato	Legato	Legato	Legato
Average interval size	Small	Unclear	Large	Small	Small	Small
Harmony	Dissonant	Dissonant	Consonant	Consonant	Dissonant	Consonant
Intensity	High	Low	High	Low	Low	Low
Intensity variability	High	High	Low	Low	Low	Low
Intonation	Unclear	Sharp	Rising	In-tune	Flat	Unclear
Mean F0	High	High	High	Low	Low	High
Modality	Minor	Minor	Major	Major	Minor	Major
Range	Unclear	Large	Large	Small	Small	Small
Rhythm	Complex	Jerky	Regular	Regular	Firm	Flowing
Tempo	Fast	Fast	Fast	Slow	Slow	Slow
Tempo variability	Small	Large	Small	Small	Large	Large

Table 1. Summary of musical cues for six emotions (Gabrielsson, 2016; Gabrielsson & Lindström, 2010; Juslin & Lindström, 2016; Juslin & Timmers, 2010; Quinto et al., 2014) (adapted from Quinto et al., 2014, p. 5).

However, what does "perceived emotional expression" exactly mean? The word "perceived" relates to the listener's recognition of the emotional expression through musical and cultural conventions. "Emotional" derives from "emotion" which, as explained above, belongs to the domain of affect and appraisal and requires and object to be directed

[11] *Happiness, sadness, tenderness, anger,* and *fear* have been considered basic emotions by researchers, such as Paul Ekman, a psychologist and a pioneer in the study of emotions and facial expressions. These emotions are also regarded as simple and broad emotions by participants (Shaver et al., 1987), and they appear as expressive markings in musical scores (Juslin & Timmers, 2010).

to. Additionally, emotions can be represented by the relation between *valence* and *activity*, where valence refers to the listener's judgement of the object of the emotion as positive or negative, and activity refers to a sense of energy that the emotion carries[12] (Barrett & Russell, 1999; Cohen, 2010; Juslin, 2016; Juslin et al., 2010; Juslin & Timmers, 2010; Schubert, 2010; Zentner & Eerola, 2010). This representation can be visualized in a two-dimensional plane, with valence as one of the axis and activity as the other, as seen in Figure 1, where the same five basic emotions are represented. Lastly, we need to clarify "expression". In literature on music performance (Gabrielsson, 1999, 2003; Juslin, 2003; Juslin & Timmers, 2010), the term has been described as:

> (a) the relationships among a performer's interpretation of a specific piece of music and measurable small-scale variations in timing, dynamics, vibrato, and articulation that make up the 'microstructure' of the performance, and (b) the relationships among such variations in the performance and the listener's perception of the performance (Juslin & Timmers, 2010, p. 454).

However, contrarily to what was initially thought, expression is not a simple and homogeneous category, but can rather be explained as a multifaceted phenomenon, derived from five main sources, titled the GERMS model by Juslin (2003):

[12] In some studies, *valence* is referred to as *pleasure* or *pleasantness*, and *activity* is referred to as *activation* or *arousal* (Barrett & Russell, 1999; Juslin & Timmers, 2010)

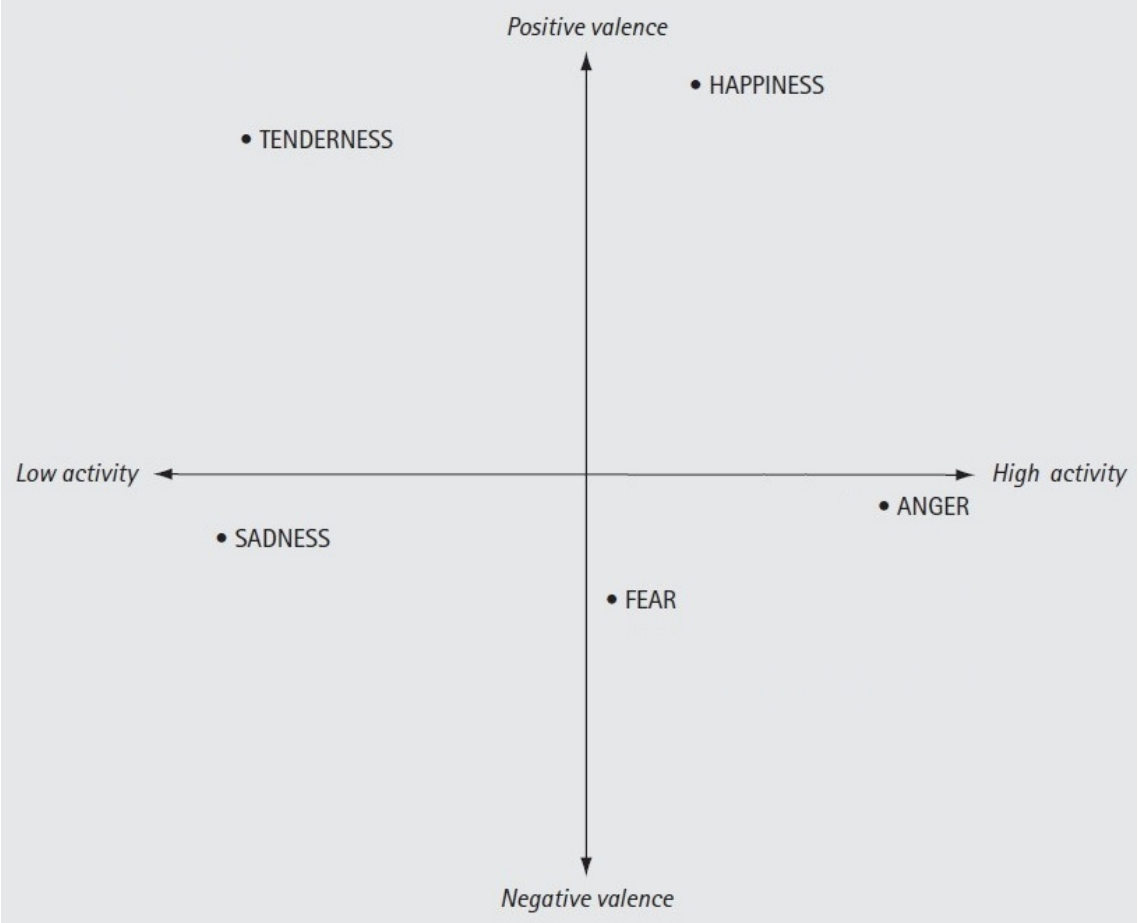


Figure 1. Visual representation of the relation between valence and activity for five basic emotions in a two-dimensional plane. The position of each emotion is based on findings from a study involving the rating of emotions by participants done by Whissell (1989, as cited in Juslin and Timmers, 2010) (adapted from Juslin and Timmers, 2010, p. 463).

Generative Rules (G)

Since one of the major purposes of a musical performance is to communicate the score's musical structure, the performer visualizes patterns and a hierarchical structure within it and tries to convey them to the listener by manipulating some musical cues, such as timing, articulation, and dynamics (Juslin, 2003; Juslin & Timmers, 2010; Sloboda & Clarke, 1988).

Emotional Expression (E)

Another major purpose of musical performance is to provide an emotional expression to the piece in such a way that the listeners are able to understand the communicated emotion (Juslin, 1997; Shaffer, 1992). Performers may achieve this goal explicitly or implicitly by manipulating cues such as loudness and tempo (Juslin, 2003; Juslin & Timmers, 2010).

Random Fluctuations (R)

The human body is not a machine, so it is predictable that some random fluctuations may occur, specially in regards to motor precision, even though professional musicians practice in order to minimize these small errors (Juslin, 2003; Juslin & Timmers, 2010). Regardless, these small fluctuations "contribute to the 'living character of music'" and their "slight unpredictability [is what] makes each performance absolutely unique" (Juslin, 2003, p. 282). It would be a mistake to discard them when discussing performance expression and thus, they are even taken into consideration when creating computational models of musical performance (Friberg, 1991; Juslin et al., 2001).

Motion Principles (M)

The relationship between music and movement is clearly and firmly ingrained in human nature, to such an extent that young infants are able to recognize the meter and rhythm of music due to its regularity (Hannon & Johnson, 2005). This beat recognition can induce motion, specially biological motion, i.e., specific patterns of movement

characteristic to human beings (Juslin, 2003). Performers use this intrinsic knowledge to bestow their performance with a natural and flowing expression. As Shove and Repp (1995) concluded, "An aesthetically satisfying performance is presumably one whose expressive microstructure satisfies basic constraints of biological motion while also being responsive to the structural and stylistic requirements of the composition" (p. 78).

Stylistic Unexpectedness (S)

The violation of musical expectation can evoke certain emotional reactions (more thoroughly explained in section 2.2 Music-induced emotion), and the performer may deliberately choose to deviate from the stylistic expectancies of the piece, thus adding tension and unpredictability (Juslin, 2003; Juslin & Timmers, 2010). One of clearest opportunities for this conscious deviation from expectations can be seen in Renaissance music, where the ornamentation and the cadenzas were invented by the performers in the moment of the performance, and so giving the performer complete liberty (Meyer, 1956).

After understanding how the emotional expression of a a performance may be perceived by the listener, we may ask ourselves which emotions can be expressed, and hence recognized and even induced, by music.

Besides the five basic emotions described in Table 1 and Figure 1, music has the ability to arouse a wide range of emotions, including both basic and complex emotions, such as pride, nostalgia, amusement, etc.[13]. These complex emotions are produced by a mixture between several basic emotions. For example, nostalgia may involve a combination of sadness and tenderness. However, the communication of a complex emotion is not that easy to achieve, and it is specially difficult without any additional context (Gabrielsson & Juslin, 1996; Juslin & Timmers, 2010).

Furthermore, from all of these emotions, music mostly evokes positive valenced emotions. Gabrielsson (2010) shows that, from the 24 listed emotions, the most fre-

[13]For a comprehensive list of emotions and their correlation to musical events, see Gabrielsson (2010), Juslin et al. (2008) and Juslin et al. (2011).

quent emotions felt by participants were joy-happiness and enjoyment-sweetness. The same result can also be seen on a study by Juslin et al. (2008), where the emotions calm-contentment and happiness-elation were quite frequent in musical events. Nonetheless, as explained previously, the emotional reactions provoked by music are not only dependent on the music itself, but also on other variables.

1.3.3 FILM MUSIC

Music has had an indispensable role in cinema since the beginning of silent movies. In these initial films, it can be said that music had different functions, such as: filling the gap of silence that the film could not overcome (Fischoff, 2005); making a bridge between the spectator in the real world to the imagined world of the film (Adorno & Eisler, 2007); helping to understand movement, since we are not accustomed to seeing movements without any sound (Prendergast, 1992); enhancing the emotional mood of the scene, as well as explaining the action (Fischoff, 2005); or even just to disguise the noise from the loud film projectors (Cohen, 2010). Additionally, if we look at the history of music and drama, we see that both arts have always shared a tight relationship (Gorbman, 1987; Prendergast, 1992), so it feels natural to have music accompany silent films.

However, due to the fact that music's role in films is not always recognized, directors started to neglect the use of music with the emergence of the *talkies*[14] (Cohen, 2010). Understandably, if the sound of the *talkies* could already fill the gap of silence, accompany movement and mask the noise of the projector, why spend budget with music? This idea also lead to an aesthetic movement of realism in the 1950's, where non-diegetic music was unwanted (Fischoff, 2005). This movement based itself on the premise that the film would be more relatable to the spectator if it only consisted of diegetic music and sounds.

But what does diegetic and non-diegetic mean? Diegetic music is music that originates from the *diegesis*, i.e., the narrative world of the film. For example, the music of

[14]First films with recorded voices and sound effects synchronized with the image.

a concert that the characters are attending. Conversely, the *non-diegesis* is the world outside of the narrative. For example, a voice-over narration or accompaniment music are both non-diegetic sounds, considering that they cannot be referred to the narrative (Chion, 2019; Cohen, 2010; Gorbman, 1987). Understandably, why should directors choose to include non-diegetic music in their films? In real-life we do not have music to accompany us, so why should the characters' lives have it? This idea seemed so natural that directors followed it. Even Alfred Hitchcock, one of the most well-known and significant directors in the history of cinema (Ursell, 2016), is said to have neglected the importance of music in film. Quoting David Raksin, a composer working on Hitchcock's film *Lifeboat* (1944) (as cited by Kalinak, 1992):

> One of [Hitchcock's] people said to me, "There's not going to be any music in our picture" and I said, "Why?" "Well,... Hitchcock says they're out on the open ocean. Where would the music come from?" So I said, "Go back and ask him where the camera comes from and I'll tell him where the music comes from!" (p. xiii)

Directors soon realized that films without music lacked something (Kracauer, 1997). The two-dimensional film screen needs the third all-around spacial dimension of sound and music (Cohen, 2010). Additionally, "music is the simplest and most direct way of making a statement, even though it is often registered subconsciously" (Fischoff, 2005, p. 3). Thus, we can say that sound, be it dialogue, noises, or music, contributes to the image of a film in terms of emotional and informative meaning. Chion (2019) defines this concept as *added value* and, according to him, it is "what gives the (eminently incorrect) impression that sound is unnecessary, that sound merely duplicates a meaning" (p. 5). The author argues that, contrary to this incorrect assumption, sound is what helps generate that meaning, either on its own or by comparison with the image's meaning (as congruent or incongruent). Additionally, "Added value works reciprocally" (Chion, 2019, p. 19), i.e., sound and image influence each other, and its byproduct can convey a different meaning from that of the audio and visual tracks separately (Cohen, 2010; Smith, 1999). For example, in a study by Sirius and Clarke (1994), the authors concluded that music possesses additive effects when applied to visual images, in such a way that the combination of

audio and visual produced higher ratings from the participants than the audio and visual tracks by themselves, producing a synergistic effect[15]. The phenomenon of added value becomes more evident in moments of synchronism of sound and image, since it creates an immediate relationship between what the spectator sees and hears.

But why is sound so important in these moments of synchronism? First, visual perception and auditory perception have different processing speeds and dimensions. The human ear can process sound faster than the eye processes images (Chion, 2019). The ear can isolate the source of the sound that it wishes to investigate from the auditory space and follows it in time, while the eye has to assimilate and explore the whole visual space and then follow it in time. Thus, since the ear can pinpoint the source of the sound more accurately and faster than the eye, the use of sound aids the spectator to focus on certain aspects of the image and not get overwhelmed by too much visual information (Cohen, 2010; Marshall & Cohen, 1988; Munday, 2007; Smith, 1999). "Why, for example, don't the myriad rapid visual movements in action movies create a confusing impression? The answer is that they are 'spotted' by rapid auditory punctuation, in the form of whistles, shouts, bangs, or pings that mark certain movements and leave a strong audiovisual memory" (Chion, 2019, p. 11).

[15] "A synergistic effect is the result of two or more processes interacting together to produce an effect that is greater than the cumulative effect that those processes produce when used individually" ("What is a Synergistic Effect?", 2017).

2 THEORETICAL PERSPECTIVES

2.1 FILM MUSIC'S FUNCTIONS

Film music is something we usually take for granted. It is ... a presence we register but don't always notice, a wash of sound to which we respond but whose meaning lies just beyond conscious recognition.

- Kathryn Kalinak[16]

Music has been extremely important in films, accompanying it from the very beginning. However, what are film music's functions in sound cinema? What does music add to cinema that makes it so crucial? Cohen (1998) identified eight functions of music in multimedia context:

1) Masking external noises

As it was previously explained, one of music's functions in the silent films era was to disguise the noise of the film projectors. Nowadays, music has a similar function but to general external noises, such as machinery, external voices, environment sounds, etc. By masking these unwanted sounds, music helps immerse the spectator in the film. According to Munday (2007), when referring to video game music, music acts like a "wall of sound" that blocks potentially distracting sounds to enter the multimedia's situation. In cinema's context, film composers need to take into consideration other sounds within the film, primarily speech, in order to not overpower those sounds, which are arguably more important for the narrative (Cohen, 1998).

2) Endowing a sense of continuity and temporality

Since our auditory perception works in a more temporal and linear way, the contri-

[16]Kalinak (1992, p. xiii)

bution of music to images helps organize and connect the visual events in a continuous fashion. "The music is used as a kind of glue" (Cohen, 1998, p. 14). Sound can then establish this sense of temporality via "temporal linearization", where sound imposes a sense of succession. Sometimes, the visual part of films consists only of "stills" (single, static images), but they are still perceived with continuity due to the music and sounds used, even if the stills themselves do not denote any sequence. Sound can also apply a sense of linearity through a dramatization of the image, i.e., directing it to a future goal by creating a sense of expectation (Chion, 2019). For example, in the prologue of *Persona* by Bergman (1966) at 2 minutes and 37 seconds, a light growing brighter is accompanied by two tones getting louder and louder. This gives the audience a sense of expectation for what is coming up next.

3) Directing attention

Music's ability to direct the spectator's attention to particular aspects of the visual image can be explained with two different, but complementary, points of view. First, we have the *cognitive and structural point of view*, elaborated by Marshall and Cohen (1988). According to the authors, the focus of attention can be directed to different features of the image that are in temporal congruence with the music, usually through accent patterns in moments of synchronism. Then, a semantic meaning from the music would be ascribed to the visual feature that is in focus. On the other hand, we have the *semantic point of view*, defended by Boltz et al. (1991) and Bolivar et al. (1994). In this case, the correlation between music and visuals would depart from semantic congruences, which would then look for temporal structural congruences that would justify them. For example, a lullaby might directed the spectator's attention to a cradle instead of to a bowl of fruit when both objects are equally depicted in a scene. Both of these points of view are also explained by the concept of added value by Chion (2019).

4) Communicating meaning and furthering the narrative

By guiding the spectator's attention to certain aspects of the diegesis, music can

create the emotional and semantic information that the spectator requires in order to make a coherent story. For example, in *The Public Enemy* by Wellman (1931), there is a scene where protagonists are standing outside a saloon, and the music of the saloon's piano can be heard faintly. As the characters enter the saloon and move towards the piano player, the music becomes louder. This change of loudness in the music gives a sense of depth to the image (the third spacial dimension), and advances with the narrative by directing the spectator's attention to the piano, where the story will focus (Gorbman, 1987). The musical conventions associated with different genres can also influence the audience's interpretation of the visual meaning at the outset. For example, "Horror music may predispose viewers to judgments of fear, terror, and anxiety within a scene" (Smith, 1999, p. 166). Moreover, in horror films, sound can convey meanings that are "forbidden" to be shown by the visuals, and that are, therefore, avoided. The overall effect of sound, together with a certain degree of uncertainty that the lack of image gives, can be even stronger and more impactful than if the image was actually shown (Chion, 2019).

5) Creating memory associations

"Music can take on the meaning of that which it accompanies" (Cohen, 1998, p. 16). Directors can create associations within the spectator's subconscious by linking a certain musical characteristic (melody, timbre, rhythm, etc.) to a character, setting or another narrative aspect (Carvalho, 2019; Freitas, 2017; Kassabian, 2001), through the technique of *leitmotifs*[17]. Additionally to leitmotifs, studies have found that the use of music enhances the participant's capability to recall the visual information in different ways depending on mood congruency (Boltz, 2004; Boltz et al., 1991). Only mood-congruent music improves memory when music is used to accompany the visuals, whereas when music is foreshadowing an event, then mood-incongruent music yields superior memorability - "these effects reveal that expectancy violations are better remembered than are scenes

[17]Leitmotif is a Wagnerian term defined as "a theme, or other coherent musical idea, clearly defined so as to retain its identity if modified on subsequent appearances, whose purpose is to represent or symbolize a person, object, place, idea, state of mind, supernatural force or any other ingredient in a dramatic work" (Whittall, 2001, p. 1).

conforming to a viewer's expectancies" (Boltz et al., 1991, p. 601).

6) Heightening arousal and absorption in the film

As explained previously, music's function of masking external noises leads to a better immersion and absorption in the film. According to cognitive psychology, the human brain is divided into different areas that carry out different perceptual and cognitive tasks, and it is thought that music occupies the area that seeks out non-linguistic sounds (Munday, 2007). Thus, music not only involves the spectator in the bubble of the film, but it also causes more activity in the brain. "Increased activity of the brain may increase concentration on the primary attentional focus and filter out distractions" (Cohen, 1998, p. 16). Additionally, absorption in a film and higher arousal on the spectator can also be derived from an emotional bond between the film and the spectator, usually legitimatized by the film's music. The soundtrack, then, binds the audience to the story (Smith, 1999).

7) Adding aesthetic value

Since music is an art form, its presence will aesthetically enhance any event, including cinema (Münsterberg, 2002). As Gorbman (1987) said, "Whatever music is applied to a film segment will *do something*, will have an effect" (p. 15). Even though this function will not be expanded upon, it cannot be overlooked or forgotten.

8) Inducing and expressing moods and emotions

It has been studied and proved that music, by itself, can alter the mood or emotion of the listener (Pignatiello et al., 1986), so it is safe to say that the same musical ability can be applied to films. On the other hand, music has the capability of representing an emotion or mood without actually arousing it on the spectator (Juslin, 2016; Smith, 1999). In film, two ways that allow music to represent and/or arouse emotion are *empathetic* and *anempathetic* music (Chion, 2019). Empathetic music follows cultural and social codes for the depiction of emotion, and the emotion that it is portraying is in accordance with the film's narrative tone. In this way, empathetic music is bolstering the emotion inherent in

the visuals by adding its value. Anempathetic music is music that displays "conspicuous indifference to the situation" (Chion, 2019, p. 8). This discrepancy between the sound and the image helps intensify the emotion of the character or the scene. Furthermore, we can infer that anempathetic music's carelessness in an emotionally strong scene amplifies the scene's emotion by simply not giving that much importance to it. This indifference roots the scene in reality, where there is no specific majestic or sombre music to accompany our day-to-day feelings. The spectators grasp this representation of reality and relate to it even more. This can be seen in scenes where diegetic music, such as a car's radio or a music box, continue playing, indifferent to the narrative. Chion (2019) also adds that noises and sounds also possess the same effects, such as the sound of the shower running after the murder in *Psycho* by Hitchcock (1960).

Cohen's (1998) proposal of music's eight functions in a film offers a framework for understanding artistic intentions and choices. Nevertheless, in order to properly understand the relation between film music and emotion, we need to explore the difference between representing or expressing an emotion or mood, and making the spectator actually feel and resonate with it.

Cognitive vs. Emotivist Approaches

Peter Kivy (1989), one of the strongest advocates of the cognitive theory of pure music expressiveness (Cumming, 2001; Smith, 1999), argues, in his book *Sound sentiment*, that there is an essential distinction between *expressing* something and *being expressive of* something. The theorist argues that music acts as the latter, that it is being expressive of a particular affective quality, since neither the listener nor the composer actually experience the emotions that music expresses. Therefore, when we attribute a certain emotion to a piece of music, it does not mean that we are feeling that emotion, but instead that we are recognizing the expressiveness of that emotion through the analysis of "intersubjective, public criteria for particular musical conventions" (Smith, 1999, p. 153). Essentially, we "feel sad", i.e., we recognize the emotion of sadness, because sadness is convention-

ally associated with a specific set of musical cues. Kivy claims that music cannot arouse emotions because it lacks an intentional object to direct them to[18].

However, this argument can be refuted in two ways. First, as explained previously, film music differs from pure music in the fact that, by accompanying visuals, it possesses an intentional object for the emotion (Smith, 1999), just like in program music from the Romantic Period, to which Kivy's theory does not apply, where composers would deliberately make music represent the feelings associated with the program, making, in that way, the program the object of the emotion (Gabrielsson, 2016). Second, we should not mix the object of emotional arousal with its cause. According to Radford (1989), who considers himself "an emotivist regarding sad music" (p. 69), when we experience hormonal changes, we may feel agitated or sad. Yet, these hormonal changes are not what we are sad about. Likewise, music can be expressive of sadness and, at the same time, make listeners feel sad without being aware of what they are sad about. As Coker (1972) explains,

> when we perform or listen to music, the tone of the musical gestures - the attitudes they carry - affect us. Each gesture and attitude of the music is a stimulus to our adjustive behavior. ... We adjust to the tone of gesture instinctively and without thought of awareness of our adjustment. ... If the tone of the gesture appears aggressive or angry, our most natural tendencies of response are a physiological mobilization for fight or flight. (p. 149)

Therefore, music can evoke emotions on the listener, not because it is the object of the emotion, but because it is the cause of the emotion.

Nevertheless, regardless of how disputed it may be from emotivist theorists, the cognitive approach presents an explanatory foundation for some of film's dramatic func-

[18] "We are not just angry, or frightened, or sad: we are angry *at* someone, frightened *by* something, sad *about* some state of affairs. ... We are certainly not angry *at* the music, or frightened *of* it, or sad about *sounds*. There is not the object or context for us to feel emotions such as these in the concert hall or opera house" (Kivy, 1989, p. 32).

tions. In sum, through the recognition of the emotional characteristics that certain musical cues exhibit, the spectators can utilize that information to assess the characters' emotional state or the mood of the scene (Smith, 1999).

On the other hand, if music is only *being expressive of something*, i.e., representing, but not arousing, an emotion, how could we explain when the spectator undeniably feels the same emotions as the characters? For example, the song "Dos Oruguitas", by Lin-Manuel Miranda, from the film *Encanto* (Bush & Howard, 2021), by itself can be seen as a neutral- or happy-feeling traditional song about two caterpillars growing to become butterflies and finding their own future. As the composer puts it, "What I really wanted to do was, kinda, write a song that felt like it always existed. A very *campesino* feeling, folk song." (MsMojo, 2022, 10:38). However, when put in the cinematographic context, "Dos Oruguitas" becomes the most emotionally driven song of the whole film, making spectators feel all kind of emotions, such as sadness, nostalgia, compassion, grief, and love. If the cognitive approach perfectly fit film music, then the arousal of these feelings would be dependent on factors other than music, since music cannot express an emotion. Yet, if we take the music out of the scene, it becomes less emotionally charged - we still understand the story and the emotions of the characters, but we do not actually feel what they are feeling. Thus, the addition of music to a scene can not only change the emotional meaning of the music, but also enhance the emotion expressed by the visuals (Chion, 2019; Cohen, 2010).

In the context of film music, since it tries to both represent the emotional states of the characters, or the moods of the scenes, as well as induce certain feelings on the spectators, it would be more beneficial to view the cognitive and the emotivist theories as complementary, each describing different aspects and levels of engagement with the emotional expressiveness of music. The cognitive theory explains our *judgment* of the musical experience, an essential aspect to understand musical affect on a more surface level. On a more deeper level of music's emotional engagement, the emotivist theory illustrates how *arousal* may or may not happen, depending on different and particular aspects of the listening situation (Smith, 1999). Interestingly, these distinct levels may

express different emotions. We may feel something different than what is being communicated by the scene. This difference may stem from divergent points of view. As spectators, we experience the film as an outsider, while the characters experience it from within the film's narrative. Additionally, as spectators, our past experiences differ among ourselves and from the characters', which can lead to different perceptions, and experiences, of emotions (Cohen, 2010; Juslin et al., 2010).

Taking into account all of the aforementioned arguments, in order to create a theory for film music, we have to consider the "components of recognition, judgement, and arousal that make up any emotional experience" (Smith, 1999, p. 156). Thus, it seems more efficient to take the cognitive theory, rather than the emotivist approach, as a basis for a film music theory because, in order for music to arouse emotions, the spectators must first recognise its affective qualities, through the musical cues and their associated cultural conventions. Only then can the spectators judge and make inferences about the diegesis, and, afterwards, experience the physiological changes that signal the arousal of an affective response, i.e., of an emotional reaction (Cohen, 2010). This kind of emotional communication causes the spectators to claim the emotions as their own, and in this way, film music "binds the spectator to the screen by resonating affect between them" (Kalinak, 1992, p. 87).

2.2 MUSIC-INDUCED EMOTION

Of all the arts, music makes the most direct appeal to the emotions.

- Elmer Bernstein[19]

Throughout the last half century, researchers have been exploring several psychological mechanisms involved in the arousal of emotions through music listening. In order to compile and specify these mechanisms, Juslin and Västfjäll (2008) outlined a framework which includes six psychological mechanisms, in addition to cognitive appraisal[20]: (1) brain stem reflex, (2) evaluative conditioning, (3) emotional contagion, (4) visual imagery, (5) episodic memory, and (6) musical expectancy. This framework was later updated by Juslin et al. (2010) and then by Juslin (2013), featuring, in total, an additional two mechanisms: rhythmic entrainment, and aesthetic judgement. The framework is thence referred to as the BRECVEMA model.

The mechanisms described in the BRECVEMA model are part of a number of brain networks that were gradually developed in order to assist human evolution. This idea bases itself on an evolutionary perspective of human perception of sounds, where it is theorized that, in order for human beings to survive, they had to rely on their ability to detect sound patterns, extract meaning from them, and behave accordingly, either with simple reflexes or complex judgements (Juslin, 2016). It is important to note that, since humans derived meaning from sound in different ways, these psychological mechanisms are not mutually exclusive. On the contrary, they should be considered as complementary (Juslin & Västfjäll, 2008). The mechanisms are:

[19] Bernstein (2004, p. 501)

[20] Cognitive appraisal refers to an individual subjective evaluation of an object of emotion in relation to its effect on the individual's goals, motives, values, needs, etc. Depending on the object's importance, this evaluation may lead to different emotional reactions (Juslin, 2013, 2016; Juslin & Västfjäll, 2008; White, 2016)

Brain Stem Reflex (B)

As one of the simplest arousal mechanisms, it evokes an emotion in the listener when certain acoustic phenomenon, such as a sudden loud or dissonant sound, goes beyond the threshold limit defined by the auditory system as acceptable, or safe, which then alerts the brain to a potentially important event (Juslin, 2016; Juslin et al., 2010; Juslin & Västfjäll, 2008). As Coker (1972) puts it, "[Sound] alerts us and arouses our most primitive instinctual tendencies of behaviour" (p. 149). The emotional reactions that arise from brain stem reflexes are innate in the human brain and do not require any past associations. This was noted by Webb (1769), when he wrote, "I have observed a child cry violently on hearing the sound of a trumpet, who, some minutes after, hath fallen asleep to the soft notes of a lute. Here we have evident marks of the spirits being thrown into opposite movements, independently of any possible associations of ideas" (pp. 2-3). In a study conducted by Sloboda (1991), the author concluded that sudden dynamic or textural changes mostly provoked shivers and goose pimples on the participants.

Rhythmic Entrainment (R)

The concept of entrainment is defined as the adjustment of two rhythmic processes towards a 'lock in' phase or periodicity. This process of entrainment can only happen with autonomous rhythmic processes and when they interact with each other (Clayton et al., 2005). This phenomenon has been observed in several different contexts, such as in fireflies flashing in synchrony, sleep-wake cycles synchronized to the daily cycles of light and darkness, or even in the synchronization of applause by the audience after a concert (Muller, 2021; Strogatz, 2003). In music, rhythmic entrainment may evoke an emotion when a piece possesses a powerful enough rhythm that influences the listener's internal rhythm, for example the heart rate, in such a way that the latter adjusts itself towards synchrony with the former (Juslin, 2016; Juslin et al., 2010; Sloboda, 1991).

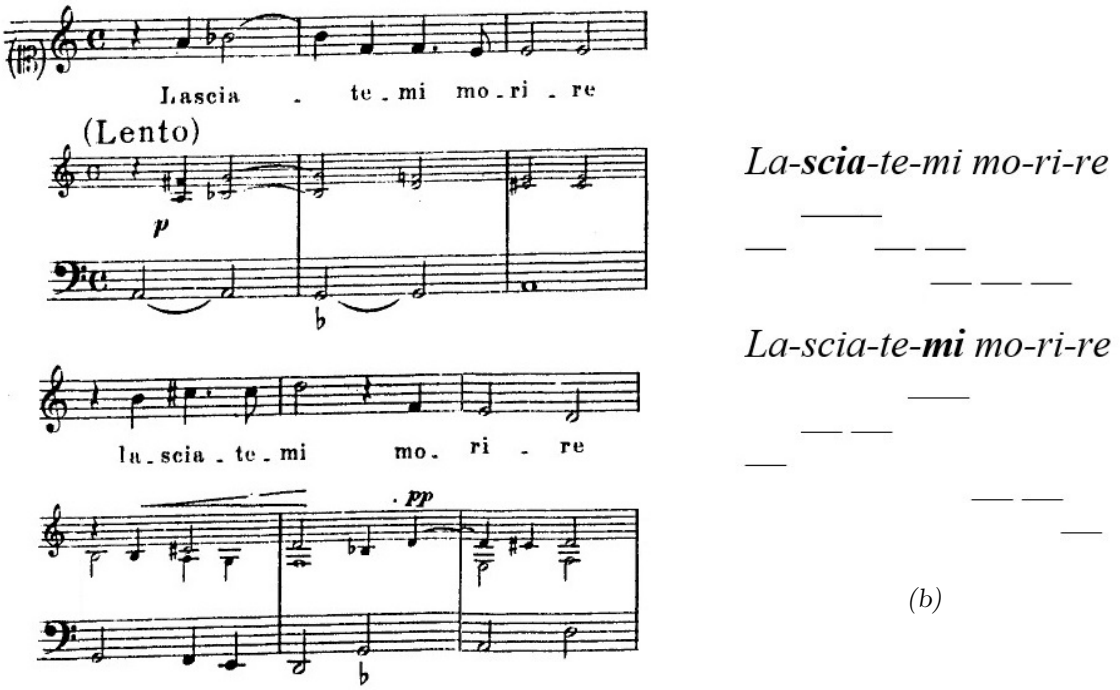
Evaluative Conditioning (E)

This mechanisms "refers to a process whereby an emotion is induced by a piece of

music simply because this stimulus has often been paired with other positive or negative stimuli. For example, a particular piece of music may have occurred repeatedly together in time with a specific event that always makes you happy" (Juslin, 2013, 2016; Juslin & Västfjäll, 2008, p. 241). In simpler terms, when we experience A (in this case, listening to a particular piece), we may feel the emotion related to B, if those two events were repeatedly experienced together in the past. This may happen even in the absence of B (Kivy, 1989). In music, the use of leitmotifs is one of the major contributors to the arousal of emotions through evaluative conditioning. For example, in the TV-series *Pose*, by Murphy et al. (2018–2021), there is a recurring musical theme that plays whenever something bad or sad happens to the main character. This theme was paired so many times with sad scenes that, in the last season, whenever it was played I would start to feel sad, even if it was a happy scene. The relationship between the theme and the emotion of sadness was so ingrained that the music itself evoked the emotion.

Emotional Contagion (C)

The arousal of an emotion by a musical piece can also be caused by the listener perceiving its emotional expression and then 'mimicking' it internally. This effect is extremely prominent when the piece has several voice-like features (Juslin, 2016; Juslin et al., 2010; Juslin & Västfjäll, 2008). In a study by Curtis and Bharucha (2010), the authors found that, when conveying sadness, speech patterns tend to underline an interval of minor third, which as been historically associated with sadness. Composers in the sixteenth-century discovered this psychological phenomenon of the association between speech and music, even if they did not label it, and started composing pieces in a manner that better resembled the speaking voice, titled *stile rappresentativo*, also called *recitative*. In this style, by making the melodic line closely follow the natural intonation of the speaking voice, specially in moments of more emotional intensity, the music would express the emotions of the speaker. This phenomenon can be clearly seen in an excerpt from *Lamento d'Arianna* (1607-1608), of Monteverdi, where the singer sings the text "Lasciatemi morire", which translates to "Let me die". In order to express the character's emotional state, the melodic line closely resembles the melodic contour of the same



(a) (b)

Figure 2. (a) First six bars of the aria *Lamento d'Arianna.* (b) Contour of the same text if declaimed, with emphasized syllables in bold.

text if declaimed in Italian, as seen in Figure 2 (Kivy, 1989). We know that the goal of this style was to express emotions from writings of composers and philosophers from the Renaissance. For example, Roger North, an English musician (b. 1653 - 1734), states that the composer "is to consider what manner of expression men would use on certain occasions, and let his melody, as near as may be, resemble that" (North, 1959, p. 111). Philosopher Francis Hutcheson (b. 1694 - 1746) writes about the same idea, even using the term "contagion" (Hutcheson, 1973):

> The human voice is obviously varied by all the stronger passions: now when our ear discerns any resemblance between the air of a tune, whether sung or played upon and instrument, ... to the sound of the human voice in any passion, we shall be touched by it in a very sensible manner, and have melancholy, joy, gravity, thoughtfulness excited in us by a sort of *sympathy* or *contagion*. (p. 81)

Visual Imagery (V)

As we saw previously, there is a very strong relationship between music and visual images, referred to as "audio-visual contract" by Chion (2019). This relationship can sometimes be so strong that, while listening to music, the listener may conjure up inner images, without any visual input (Juslin, 2013, 2016; Juslin et al., 2010; Juslin & Västfjäll, 2008). Avison (1775), an English composer (b. 1709 - 1770), also mentions this effect, with reference to evaluative conditioning: "music, ... by any other method of association, *bringing the objects of our passions before us* (especially when those objects are determined, and made as it were visibly and intimately present to the imagination by the help of words) does naturally raise a variety of passions in the human breast" (pp. 3-4, italics added). Naturally, the extent to which the mechanism of visual imagery arouses emotion on the listener varies from person to person[21].

Episodic Memory (E)

"Sights and sounds, tastes and smells, can, we all know, remind us of events or places, and make us feel a certain way, if they are associated with events, or places, or experiences in our pasts" (Kivy, 1989, p. 29). The relationship between music and memory was already discussed in section 2.1 Film music's functions. Additionally, there is a need to distinguish between *evaluative conditioning* and *episodic memory*, since both work with the human memory. Evaluative conditioning depends partially on short and long term memory: when listening to music we can feel an emotion that was always pair with that music, either from our past (long term memory), or since the beginning of the musical event that we are participating in (short term memory). Episodic memory, on the other hand, depends solely on long term memory: we may feel a certain emotion when listening to a piece of music because that music reminds us of a certain moment or event in our past, and not necessarily because it was repeatedly associated with it (Baumgartner,

[21]It needs to be noted that not everyone may be able to conjure up said images. People that are visual-impaired from birth or from early childhood, most likely do not visualize any image when listening to music. The same may happen to people with *aphantasia*, a phenomenon in which sighted people are unable to conjure images in their mind's eye (Cherry, 2021)

1992; Juslin, 2013, 2016; Juslin et al., 2010; Juslin & Västfjäll, 2008).

Musical Expectancy (M)

As explained in the GERMS model for performance expressiveness, music performers are able to express emotions by choosing to depart from the expected stylistic norms. The same effect can be induced when unexpected features occur in the musical structure. In other words, an emotion may be evoked on the listener when "a specific feature of the music violates, delays, or confirms the listener's expectations about the continuation of the music" (Juslin & Västfjäll, 2008, p.568). In the same study by Sloboda (1991) mentioned previously, the author concluded that both "new or unprepared harmony" and "prominent event earlier than prepared for" provoked shivers and goose pimples in the participants, which are physical responses connected to emotional reactions.

Aesthetic Judgment (A)

As the last mechanism to be added to the framework, aesthetic judgment may arouse an emotion on the listener when their evaluation of the music's aesthetic surpasses a certain cut-off value (Juslin, 2016). In Figure 3 we can see that, first, the musical event that reaches the listener through perceptual, cognitive and emotional inputs, is filtered and weighted by subjective aesthetic criteria, which constitute the aesthetic judgment. The outcome of these judgment will imperatively be either positive or negative, in the form of liking or disliking. An emotion will only be evoked, as an additional outcome, if the music's judgment exceeds the aesthetic threshold (Juslin, 2013, 2016). In other words, we will only be emotionally moved by the music if we evaluate it as extremely good or bad. This mechanism corroborates with both the cognitive and emotivist theories of emotion arousal through music: the cognitive theory is related to judgment while the emotivist theory relates to the actual arousal of emotion.

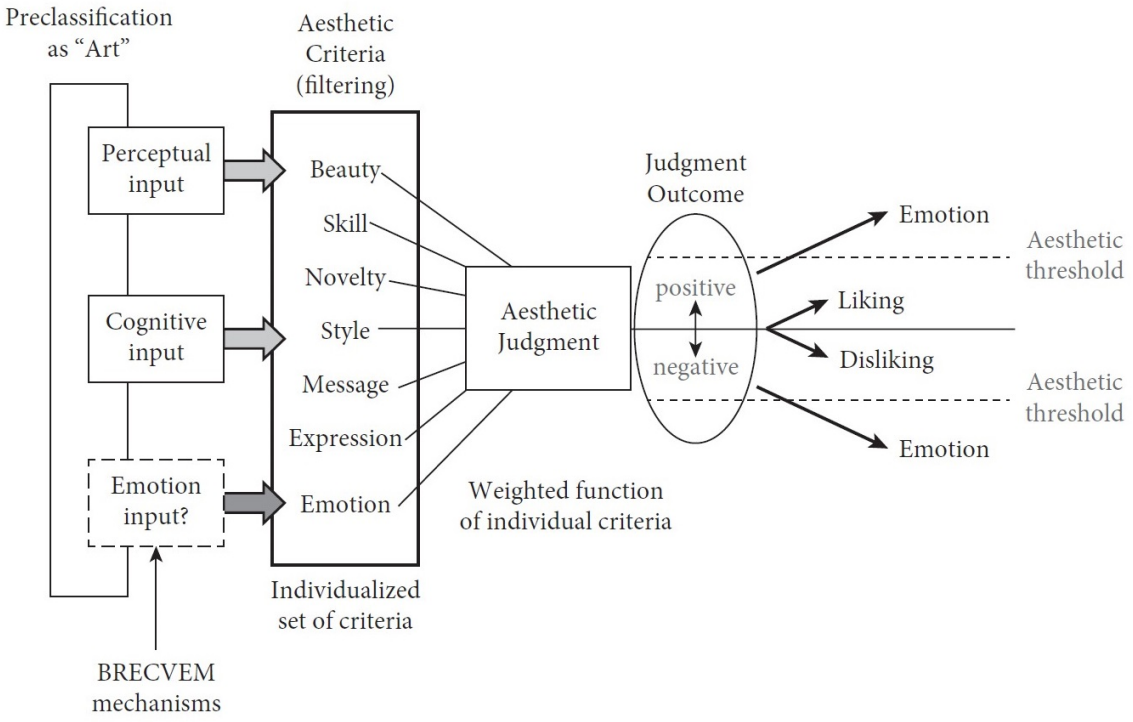


Figure 3. Schematic model of the aesthetic judgment's process (Juslin, 2016, p. 205).

Hevner's adjective circle

In order to aid the research in experimental aesthetics, Hevner (1936) arranged 67 adjectives into 8 groups around an imaginary circle (see Figure 4). Each group consists of adjectives that are closely related and that express an almost identical feeling. Then the groups were arranged so that "any two adjacent groups should have some characteristics in common, and that the groups at the extremities of any diameter of the circle should be as unlike each other as possible" (p. 250).

The author utilized her own circle in an experiment with 450 participants (Hevner, 1936). The participants were asked to select an adjective group for several compositions with different and contrasting pairs of musical cues, such as major and minor mode, ascending and descending melody, simple and complex harmony, and firm rhythm and flowing rhythm. The results were then summarized in four graphs, one for each pair of musical cues (see Figure 5).

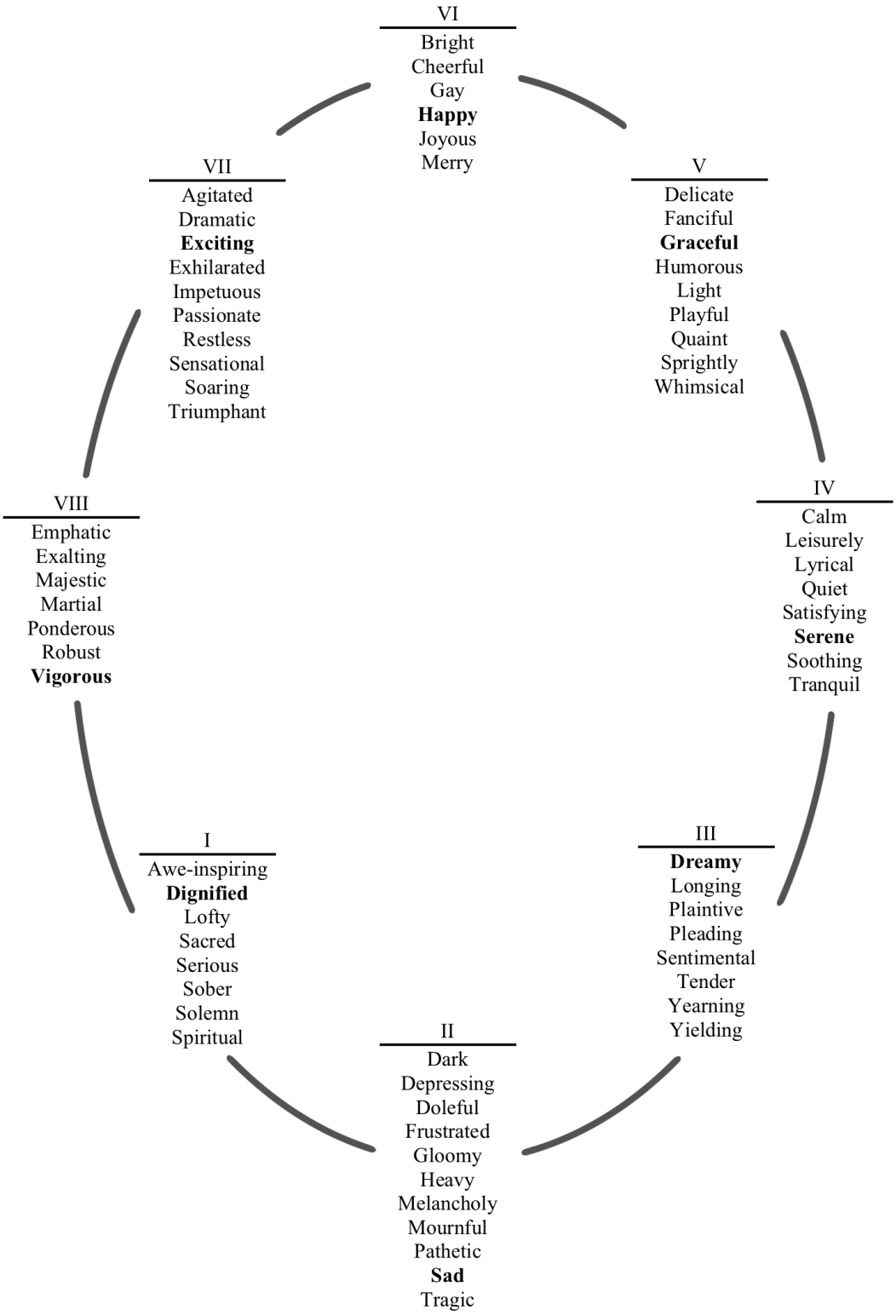


Figure 4. Hevner's adjective circle. Adjectives used by Hevner to represent each group are highlighted in bold (adapted from Hevner (1936, p. 249)).

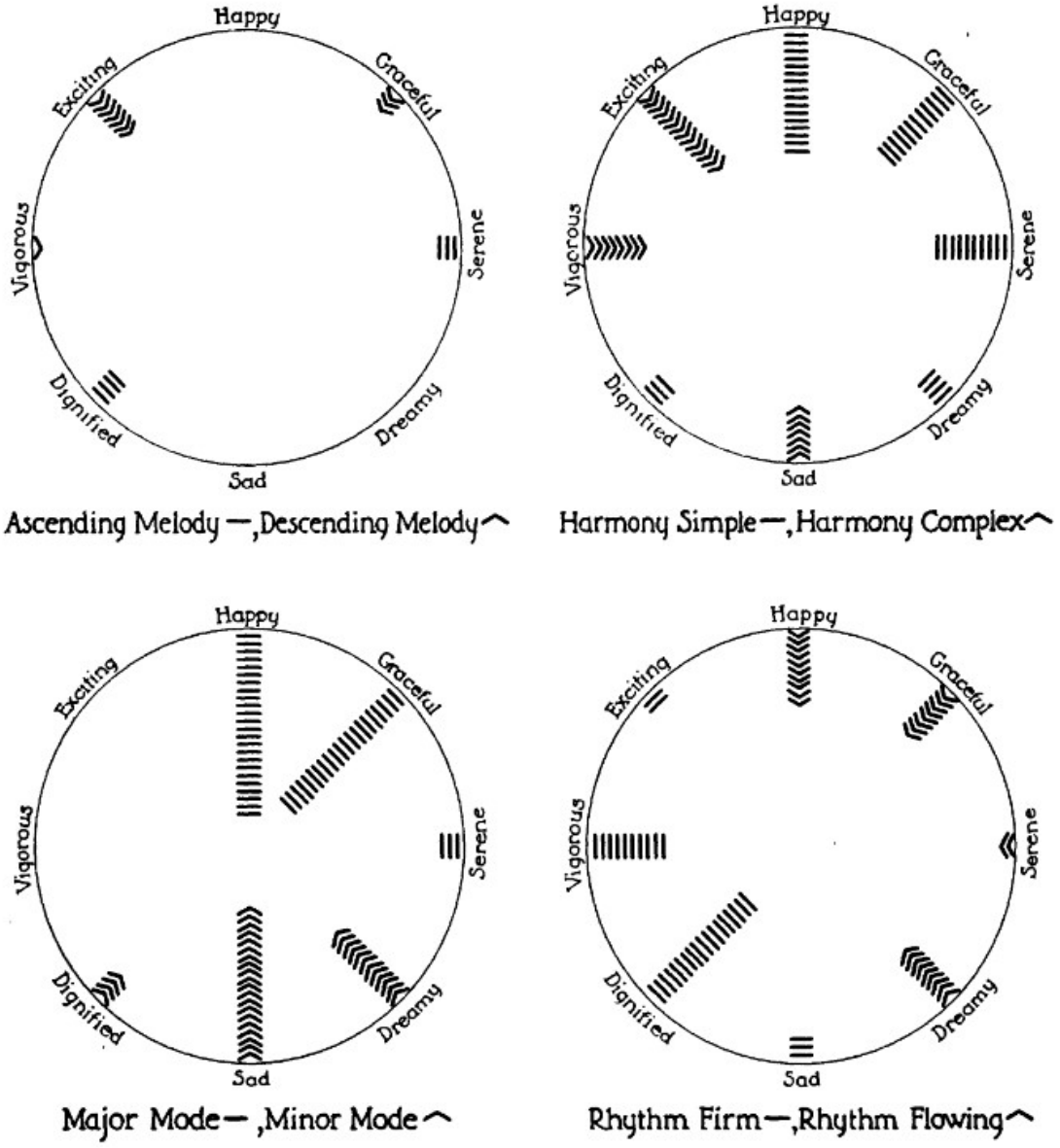


Figure 5. Graphs summarizing how much the adjective groups were chosen in regards to compositions with different pairs of musical cues (Hevner, 1936, p. 265)

Hevner's adjective circle allows researchers to have a quantitative data analysis when dealing with subjective topics such as aesthetics. This way, small disagreements among participants' responses about the exact definition of certain words, which may not matter for the researchers, as well as external factors that may slightly modify the mood produced by the music on the participants, are nullified, since the adjectives are not treated as 67 separate entries, but arranged into 8 easy-to-manage groups (Farnsworth,

1954; Hevner, 1936).

One important aspect to note is that, even though these emotional reactions to music are more or less universal, there is not any specific foolproof characteristic that will ensure a specific emotional reaction, since no two individuals are the same (Sloboda, 1992). As previously explained, the individual factors that cause variations in emotional responses can consist of the listener's prevailing mood before the musical event, their previous knowledge, or even their cultural background, since "these effects do not act automatically, and they don't spring from nothing" (Chion, 2019, p. 21).

2.3 INTONATION AND MUSICAL EXPRESSION

The modes in which we express ourselves musically ..., though in theory series of sounds bearing a fixed pitch relation to one another, are in practice tempered by every musician just as the proportions of the human figure are tempered by a sculptor.

- Bernard Shaw[22]

Emotion can be conveyed and evoked through several different musical cues. In the majority of studies, researchers focus mainly on cues such as articulation, loudness, harmony, melody, tempo and rhythm. However, intonation, a musical characteristic that is not that well studied in relation to emotion, "has an indispensable role in musical expression" (Leedy & Haynes, 2001, p. 1). An overview of its use to convey specific emotions can be seen in Table 1, in page 13. Nevertheless, since intonation is a performance cue, its relationship with emotion is vast and varies depending on the instrument being played, the situation, and the performers themselves.

When discussing intonation and musical expression, the term *expressive intonation* may come to mind. This term is often linked to Pablo Casals (1876-1973), one of the greatest cellist of the 20th century. To Casals, intonation was an extremely important aspect of musical expression. According to him:

> Intonation must be the proof of the sensitiveness of an instrumentalist. Neglecting it is not acceptable for a serious performer and it lowers his standard, however good a musician he may be. ... Intonation, as it is conceived today, has such sensitiveness and subtlety that the intonation of note must affect the listener, quite apart from any stimulating accent. The necessity of observing it is understood and observed by all good instrumentalists. ... Singers are taught "tempered" intonation, but I have noticed that the most gifted and the most artistic ones realise the importance and the subtlety of perfect intonation (Corredor, 1957, pp. 196-197).

[22] Shaw (1931, p. 291)

For Casals, good intonation was dependent on what he called *magnetic notes*, i.e., notes that draw neighbor tones to them. These magnetic notes are the octave, fifth, and fourth of the scale, and they intonationally influence their neighbor notes. For example, in a major key, the third and the leading note are highly influenced, "needing to rise to expressively indicate location of the magnetic notes" (Lewis, 1998, p. 39). This idea of magnetic notes corroborates with the performing mythology and instructions of his time. Cadek (as cited by Lewis, 1998), a contemporary of Casals, found that string players have a tendency to play sharpened notes sharper and flattened notes flatter. In other words, in major keys, the third, sixth, and leading tone are raised, while in minor keys, the third, and the sixth are lowered. As a rule of thumb, when teaching, Lewis (1998) recommends starting by raising notes with sharps and lowering notes with flats, thus creating this magnetic attraction to the octave, fifth, and fourth (see Figure 6). This suggestion also corresponds with the Pythagorean scale, with wider whole-tones and narrower semitones (Geller, 1997). Friberg (1991) and Sundberg et al. (1989), in their research for the development of rules for performance with music software, also confirm this tendency for sharpened notes to be raised and flattened notes to be lowered, being more prominent when compared to 12ET.

However, in a study on wind instrumentalists' intonation by Duke (1985), the authors discovered that wind performers have a tendency to compress ascending intervals and expand descending ones. This tendency to compress ascending intervals goes against Casals concept and previous research findings on string players' intonation. The difference between both tendencies in wind and string players can be related to how the performers perceive music and the score, as it was previously explained. Since string players often approach music horizontally, the tendency to sharpen ascending intervals conveys a sense of directionality that wind players do not require, since wind players often favor a vertical musical awareness.

In terms of expression, the human voice has always been considered one of the most effective means of the communication of expression. Unsurprisingly, the expressive codes employed in singing for representing emotions are similar to the ones used in speech,

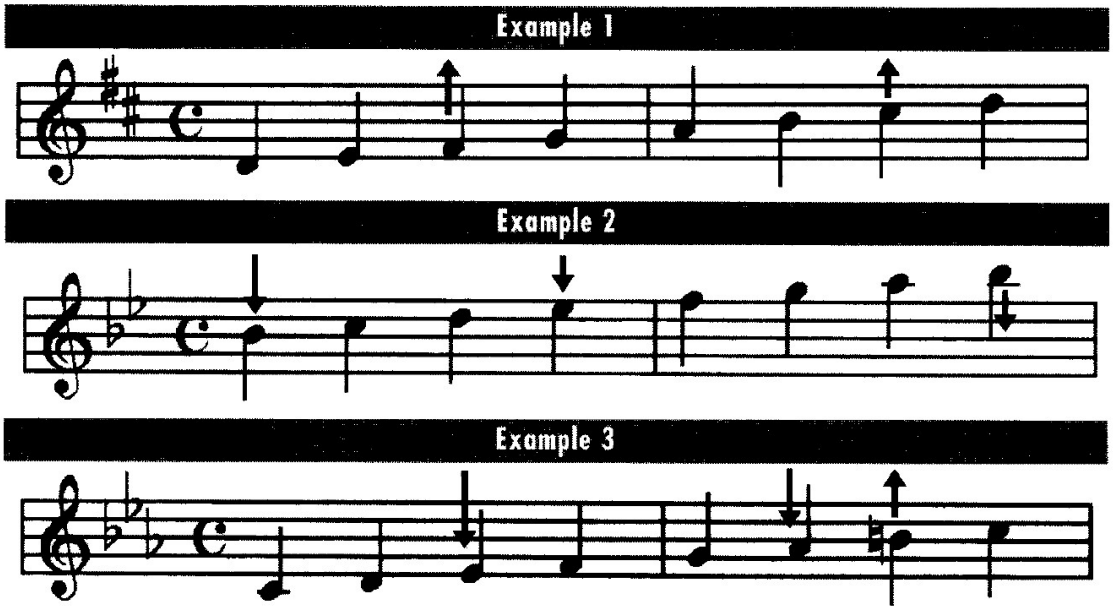


Figure 6. Three scale examples with arrow indications for the altered notes (Lewis, 1998, p. 42)

although singing is more limited by the score in regards of pitch and duration (Sundberg, 1998), as seen with emotional contagion.

> Intonation in speech serves as a means of emotional expression — the counterpart in music is the melodic line, written by the composer along with the other cues discussed above. The singer uses microintonation in a very methodical way as his or her means of expressiveness beyond the written score (Rapoport, 1996, pp. 112-113).

In a study by D. Tan et al. (2020), skilled vocalists were asked to perform the same melody with four different emotions *a cappella*, and certain notes of the melody were analysed in isolation due to their possible scale-degree ambiguity. The authors found that these notes were tuned flatter in sad and angry performances, and sharper in happy performances. One important finding was that "even when performers are constrain by the performance ... they nevertheless use intonation to distinguish between positive and negative emotions" (p. 509).

One technique that performers use to express emotion through intonation consists

of sharpening the tone, either if the tone began flat and was corrected or if it began in tune and was sharpened afterwards (Parncutt & Hair, 2018; Sundberg et al., 2013). This effect can be seen in Figure 7, where the tenor singer started the highest note in tune with 12ET, but deliberately and steadily sharpened it, more than 50 cents. In order to thoroughly test to what degree intonation in singing can aid expressivity, Sundberg et al. (2013) conducted a study with two experiments. In the first experiment, the authors analysed the deviation from 12ET of the phrase-peak tone in two versions of several excerpts recorded by a opera baritone *a cappella*, one version with the intent of being as devoid of musical expression as possible (neutral version), and another sang as in a concert situation (concert version). In the second experiment, participants were asked to rate the expressiveness of a pair or stimuli, consisting of the concert version and a modified version, in tune with 12ET version.

In the first experiment, the authors found a systematic trend. In the excerpts that had been previously categorized as expressing excitement, the deviation from 12ET of the phrase-peak tones in the concert version ranged from +31 to +82 cents, a significant difference when compared to the neutral version, that ranged from -7 to +51 cents (the concert version was always sharper than the neutral version). Interestingly, the same was not observed for the excerpts categorized as peaceful. Afterwards, the second experiment demonstrated that listeners did not perceive this sharpness as mistuning, but as an addition to the performance's expressivity. "The results [from both experiments] supports the frequently made assumption that intonation is used as an expressive mean in music performance" (Sundberg et al., 2013, p. 391.e7).

Another musical element that is extremely utilized to communicate musical expression, specially in singing and string instruments, is vibrato. When relating vibrato to intonation, studies have found that listeners tend to rate out-of-tune intervals performed with vibrato as more in tune than those performed without vibrato. Thus, vibrato helps mask out-of-tune tones, even with vibrato extent from ±34 to ±123 cents (Besouw et al., 2008; Geringer et al., 2015; Prame, 1997)[23].

[23]It is important to note that not all instruments produce vibrato by pitch manipulation. Vi-

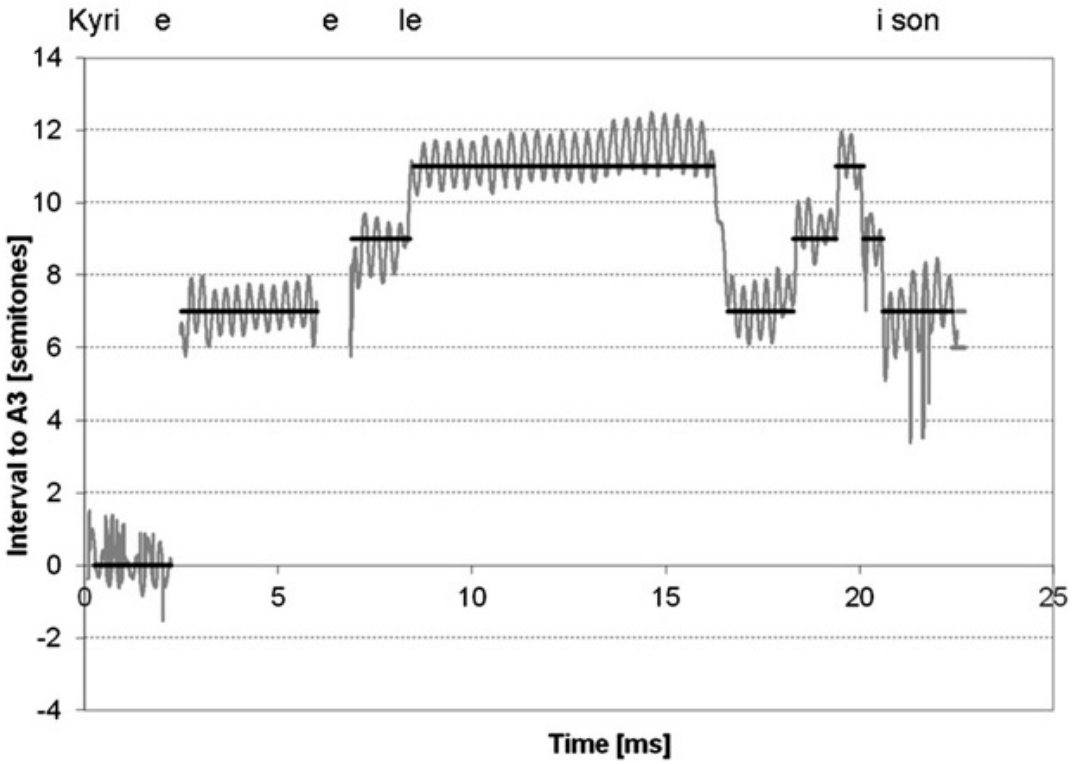


Figure 7. Depiction of the fundamental frequency of the singer's interpretation of the first Kyrie from Verdi's *Messa da Requiem* while accompanied by an orchestra. Fundamental frequency values are shown as black lines, and are in accordance to 12ET (Sundberg et al., 2013, p. 391.e2).

brato on brass and woodwind instruments will mainly create a loudness effect, another subjective parameter. Therefore, since the note's pitch stays nearly the same, if the pitch is out of tune, then the addition of this type of vibrato will not help to mask it (Geller, 1997).

3 METHOD

In order to determine the effects of modified intonation on audience's emotional reactions to film soundtracks, an experiment was designed where participants reported the emotion that they felt, or recognized, after viewing a film clip. By presenting the same film clip five times, each time with a slightly different soundtrack, it is possible to analyse how each modification was perceived by the viewer.

The experiment took place at the Norwegian Academy of Music, in Oslo, Norway. One of the lecture auditoriums was chosen as the location for the experiment due to its similarities with a cinema. The setting as similar to an actual cinema setting as possible, since the aim of the study focuses on real-life scenarios, and not lab-like conditions. Therefore, the lights were dimmed and several participants could take part in the experiment at the same time, although, due to logistical reasons, the majority of the participants undertook the experiment alone.

3.1 DESIGN

In the experiment, the participants were asked to watch clips from two films, *The Man with the Answers* (drama/romance), by Kammitsis (2021), and *The Blair Witch Project* (horror/mystery), by Myrick and Sánchez (1999), each with *an original soundtrack* written purposefully for the film clip, henceforth called OST. These OSTs were written by two students of the Bachelor program of Music in Composition at the Norwegian Academy of Music, Ola Ur Sæbø and Arian Pedersen. The composers were asked to write a piece specifically for the film clip and they were given nearly total creative freedom, with the only restriction being that the music should be in 12ET. Afterwards, these compositions were modified several times by the researcher, and listened to by the participants. Even though having two film clips from different genres added a new parameter to be analysed, the intonational changes made for each clip were different in order to better

suit the emotional character portrayed by the music and intended by the composer. The communication with the composers was mainly done in a written form, where they were told the specifications for the OST, they shared the audio and the score, and expressed their emotional goal of the OST.

Three modifications, out of several, were chosen for each clip, in order to not make the experiment too long and tiresome. Therefore, for each film, the participants saw a total of five clips: the clip without any music; the clip with the OST; and three clips, each with a different version of the intonation of the OST. The order of the versions for the last three clips were:

The Man with the Answers

1. Version *Just Intonation (JI)*;
2. Version *Everything ♭ (Et ♭)*;
3. Version *Just Intonation + Tempered Intonation (JI+T)*.

The Blair Witch Project

1. Version *Beats (B)*;
2. Version *Compressed Melody (CM)*;
3. Version *Beats Inverted (BI)*.

A more detailed explanation of each version is described in section 3.4 Experimental material.

As previously mentioned, the number of clips with modified intonation was limited at three clips in order to make the experiment more engaging. If the participants watched the same visual clip several times, then there was a possibility that they would be tired of it and either start paying less attention to the experiment as a whole, or they would start to

try to decipher the changes between each clip. Both outcomes would be disadvantageous and harmful to the experiment's objective.

3.1.1 EXPERIMENTS

Yet, why use an experiment at all? Experiments are used to examine how one variable affects another variable. In other words, with an experiment, the researcher examines what happens when one variable is present to a subject and compares it to when it absent. For example, researchers can test what happens to participants that take a specific medicine and compare it to participants that did not take it. In order to make a reliable comparison, according to the positivist research traditions, an experiment needs to fulfill three requirements: there should be at least two groups, the experimental group and the control group; the participants should be randomly distributed among the two groups, and they should be tested before and after the variable is presented (Babbie, 2021; Hellevik, 2002).

In the current study's experiment, it did not seem feasible to have a control group, as the experiment examined how the participants would emotional react to different intonation choices. Thus, the experiment can be classified as a quasi-experiment, since one of the requirements was not met (Babbie, 2021; Hellevik, 2002). The design of the experiment fits what D. T. Campbell and Stanley (1963) call the *one-group pretest-posttest design*. The pretest consisted of questions where the participants answered which emotion they felt after seeing the film clip without music, and after seeing the one with the OST, thus establishing initial results. Then, these results were compared with the posttesting, which consisted of the participants' reports of which emotion they felt after watching each clip with modified intonation of the OST.

Experiments are not foolproof methods, and can have some invalidity sources if they are not properly taken care of. Internal invalidity refers to the fact that the results may be influenced by other variables. Some sources of internal invalidity include, for

example, historical events, selection biases, demoralization, or the test itself (Babbie, 2021). In order to nullify some of these sources, the current study's experiment was only around 30 minutes long, which made it so that the participants did not feel demoralized and that outside events did not interrupt the experiment between the pretesting and the posttesting. The test itself can the participants, making them more prone to pay attention to the emotions that they were feeling, but that was the actual objective of the experiment. Also, the repeated viewing of the clips can increase the participants' awareness of the visual and narrative details. Additionally, when examining the results from an experiment, the researcher needs to be aware that "just because two variables of which [the researcher has] measurements appear to be related, this does not mean that they are. ... In order to demonstrate causality, [they] also have to find, or at least suggest, a mechanism linking the variables together" (Blaxter et al., 2001, p. 196). In the current study, the researcher was aware of this effect of causality from other sources, due to the complexity of several influencing parameters.

Invalidity can also take the form of external invalidity, "which relates to the generalizability of experimental findings to the "real" world" (Babbie, 2021, p. 241). In other words, how valid are the results outside the experimental condition. The current study was designed with the notion that the generalizability of the results would not be possible in mind. The nature of the experiments and the likelihood of a small number of participants would not allow for it. However, this consequence still needs to be taken into consideration.

In order to realize the current study's experiment, two software were utilized: Microsoft PowerPoint, through which the film clips were presented, and Google Forms, where participants answered a questionnaire for the pre- and posttesting. The questionnaire was chosen as the tool for data collection due to its versatility of qualitative and/or quantitative research. Other methods were also considered, but ended up not being chosen, such as interviews. Even though the small number of participants would make interviews a viable tool for data collection, it was discarded due to the objective of the

experiment: the analysis of the participants immediate response. With a questionnaire, the participants are enticed to write concise and immediate answers. In an interview, participants are usually asked to elaborate on their reflective thoughts, which is not the aim of this study. Additionally, questionnaires allow for an easier data analysis. Since questionnaires are done in a written format, their questions, and thus answers, are more standardized. This standardization allows for an easier analysis of the responses, specially the ones of closed questions. With the help of software, the responses can be easily visualized and analysed in different ways, either as graphs, percentages, or others. This way, the comparison between different variables is also easier to grasp (Debois, 2022).

Nevertheless, due to the very nature of questionnaires, since they can never be as rich as interviews, the data collected is limited by the asked questions. This way, it is possible that some interesting facts or information may be lost due to the standardization of the questionnaire (Debois, 2022; Jacobsen, 2015).

3.1.2 QUESTIONNAIRES

Even though questionnaires give the possibility for either a qualitative research, with open-ended questions where participants can write what they want, they way they want it, questionnaires "do, however, lend themselves more to quantitative forms of analysis" (Blaxter et al., 2001, p. 193). This is due to the fact that their primary design is to gather small items of information (Blaxter et al., 2001; Jacobsen, 2015). In order to collect reliable data from different participants, questionnaires should not be modified after they were first sent out. Thus, they require careful planning. One of the main elements that needs to be taken into consideration when creating a questionnaire is the wording of the questions (see, for example Babbie (2021), Jacobsen (2015) or May (2001)).

In order to obtain the information that we need from the questionnaire, the questions have to be phrased carefully. Researchers highlight some general rules that the author tried to follow when drafting the questions for the current study's questionnaire.

Questionnaires should consist of simple and concrete questions, as to prevent any unambiguity on the part of the participants, specially since the questionnaires' main objective is to gather quantitative knowledge. The language should also be as neutral as possible, as to not influence the participants' answers (Babbie, 2021; Thagaard, 2003). In addition to simple questions, the concepts used should be understandable by the participants. If, by any chance, a more complex or broad concept needs to be included in the questionnaire, it should be explained, as to avoid different interpretations (Jacobsen, 2015). In the current research, the researcher was in the same room as the participants during the experiment and was able to provide more detailed instructions and clarifications. For example, even though the concept of "absolute pitch" was described in the questionnaire itself, some participants still had some doubts as to whether or not they had absolute pitch since they did not fully understand the concept. In order to answer their question, the researcher was able to perform a small demonstration of the concept by producing a sound and asking the participant whether they were able to identify the produced tone or not. By being present in the same room, the researcher was able to minimize possible misunderstandings that the participants had.

The questions should also focus on the present. People have difficulties recalling things from the past with great detail, specially if they are asked to compare something of the present with something of the past. Thus, the questions should be written in a way that focuses on the present, being it the immediate present or a relatively close present (Jacobsen, 2015). In the current study, due to the small differences between each film clip, the participants were ask to compare the emotion that they had felt after watching one clip to the emotion they had felt in the previous clip, and not to the first clip, making the comparison much easier.

Questionnaires should also begin with easy questions, and leave the more difficult and sensitive questions to the end. This way, the participants are more likely to have a positive experience with the questionnaire (Jacobsen, 2015; May, 2001). Thus, the questionnaire began with questions about personal background and with simple questions, such as *"Which overall emotion did you feel after viewing the clip? (1 to 3 words)"*, only

asking about the comparison later on.

However, easy questions, such as personal background, genre, age, etc., and repeated questions can also be considered boring, which can lead to disinterest and fatigue in the participants. If the participants are answering the same questions over and over, they might get tired and lose interest in finishing the questionnaire. Therefore, the researcher should strive to achieve a balance in order to keep the participant interested in the questionnaire (Debois, 2022; Jacobsen, 2015). In this questionnaire, boredom was evaded by interspersing watching a clip with answering questions about the clip.

By following these general rules, the questions can be both open or closed. In open questions, the participants can write how much they want, allowing for a more qualitative research. Closed questions consist of several options from which the participants need to choose one, or sometimes several, and these questions lend themselves to be more quantitative (Blaxter et al., 2001; Thagaard, 2003). In the questionnaire, both types of questions were utilized, in order to not tire the participants, and to gather different types of information, as recommended by Jacobsen (2015).

Another advantage of questionnaires as data gathering tools is how anonymous the participants may be. There is a higher degree of anonymity of the participants in questionnaires. The questionnaires can be filled when the participants are completely alone, they do not have to write down their personal information and, thus, their anonymity can be maintain. It is important to know that a completely anonymity may not be attainable when the number of participants is smaller (Debois, 2022; Jacobsen, 2015).

3.1.3 Design of the experiment's questionnaire

In the first section of the questionnaire, which can be seen in Appendix A, the participants were asked some background questions, such as their age, how many years of musical education they had had, if they possessed absolute pitch, and the frequency to

which they listened to film, TV-series, or video game soundtracks. Additionally, before watching the film clips, the participants were instructed to write down their immediate and instinctive impressions of each clip.

The two following sections consisted of the clips of each film, one section per film. The first clip presented in each section was the film's original clip, without music, with the intent of giving some context to the participants, and allowing them to get a understanding of the experiment itself. After watching the clip, the participants had to write down which overall emotion they felt (see Figure 8). For the second clip, which consisted of the clip with the unaltered OST, the participants were asked the same question, as well as if they had any comments.

The last three clips were the ones with the modified OST. After viewing each of these clips, participants were asked two questions: (1) did the emotion that they felt shift to another; (2) if so, to what emotion, or, if not, was the emotion enhanced, weakened, or did it not change. In addition, the participants were asked if they noticed any changes in the OST and, if so, to describe them. The questions were exactly the same for both films (see Figure 9). In Chapter 5 Discussion, some of the comments left by the participants in this section were transcribed in order to explain some of the results. These comments were left intact, even with some misspellings.

Initially, the questions were designed as multiple choice questions, with several emotions as options to choose from. However, these questions were changed to open question as to give the participants the freedom to answer in a more comfortable manner (Babbie, 2021; Jacobsen, 2015), and, following the idea of Hevner's adjective circle, the responses would still be comparable. Thus, the participants were given the possibility to write as much as they wanted, although recommended to write between one to three words, and they could write in either English, German, any Romance language, or any Scandinavian language. It was hoped that, by being able to utilize their preferred language, the participants could answer in a more spontaneous and instinctive way. The questions were also formulated in a broad manner, as to condition the participants' an-

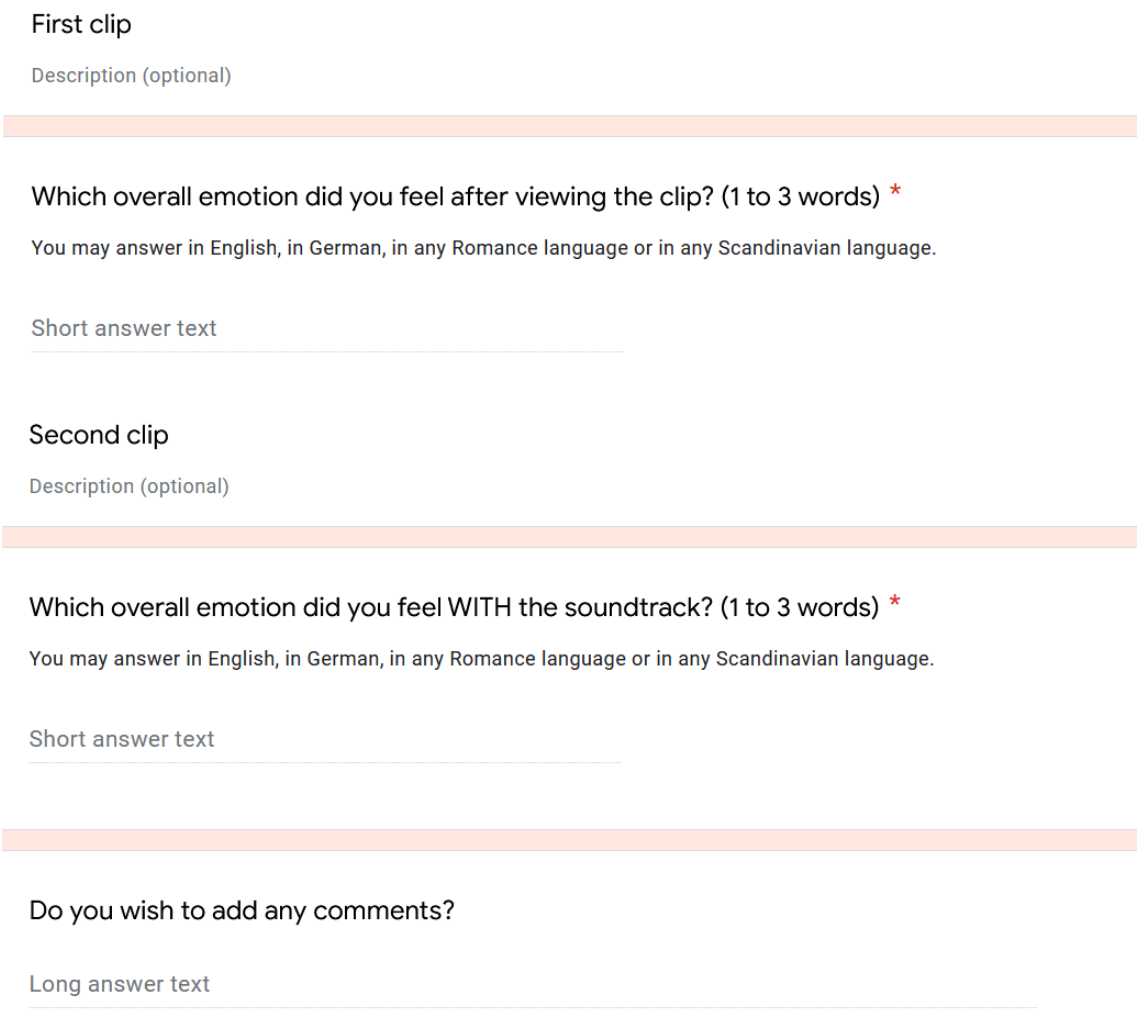


Figure 8. Question for the first and second clips.

swers as little as possible (Thagaard, 2003).

The fact that the questionnaire contained open questions, together with the fact that each participant had a different personal background, and with the small number of participants, gives the initial impression that the data should be dealt with qualitatively. However, the closed questions where the participants had to select if the emotions were enhanced or weakened, along with the vary nature of a questionnaire, and the researcher's distance from the study's object, by only intervening when asked questions, suggest that the data analysis should be done quantitatively (Blaxter et al., 2001; Thagaard, 2003).

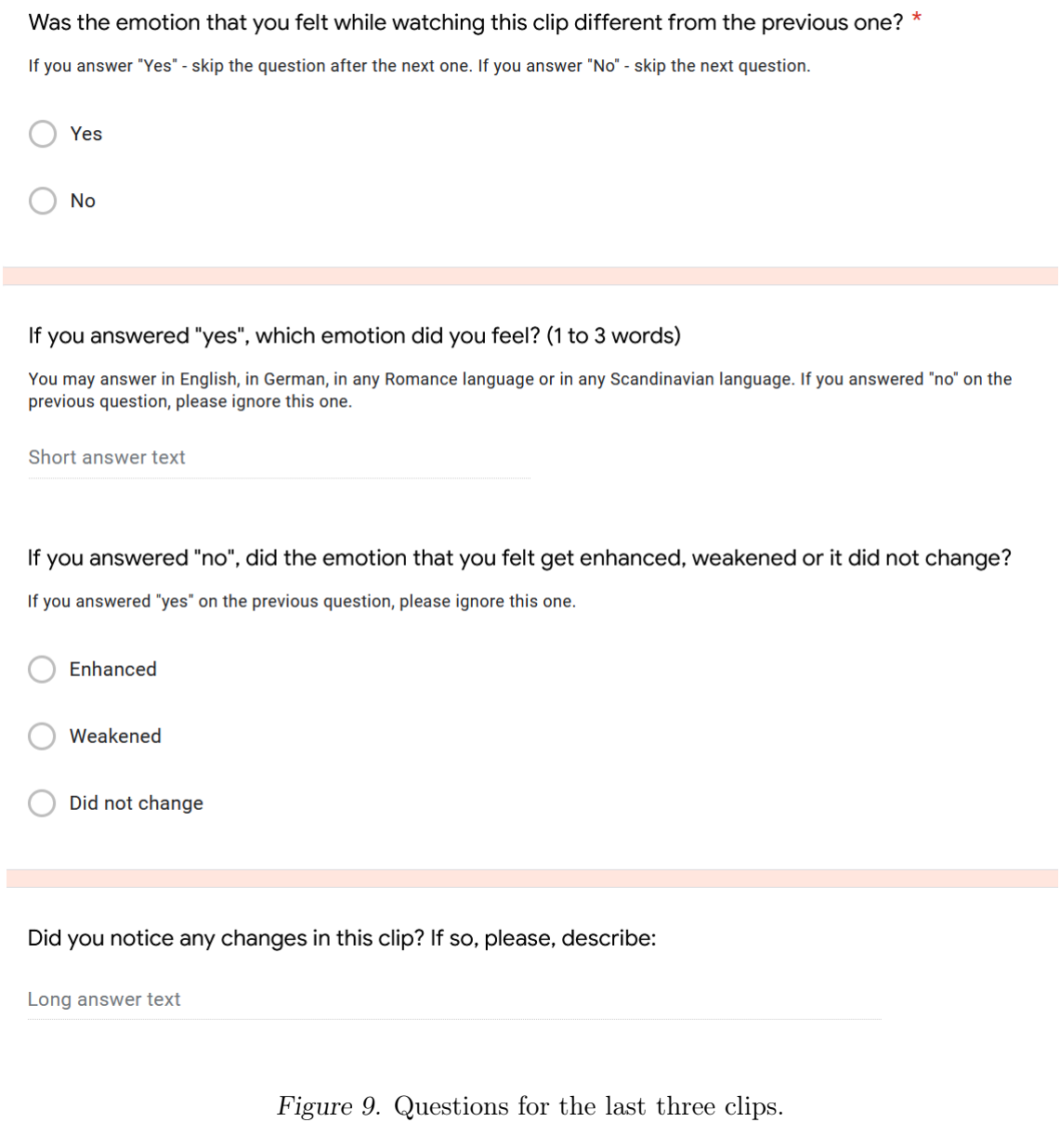


Figure 9. Questions for the last three clips.

Since the objective of the experiment was to determine if the emotional reaction of typical filmgoers could be affected by different intonations, the participants were *not* told what musical parameter was changed in each clip, as to also not condition people to try to pay attention solely to the intonation.

Pilot

The experiment was piloted once before the actual data collection. Based on the received feedback, a few modifications were made to the design. During the pilot, the clips of the film *The Blair Witch Project* were presented first before the ones from *The Man with the Answers*. The order was then changed due to the fact that emotions expressed by *The Blair Witch Project* had a higher activity level, which could condition the participants' own mood right before watching the clips from *The Man with the Answers*, which communicates emotions with lower activity.

Another significant modification was the addition of some seconds to the first clip of each film. Since the goal of watching that clip was to familiarize the participants to the film itself, approximately one minute of film was added to the beginning of the clip, thus giving more context to what happened prior to the scene in question in the other clips.

3.2 PARTICIPANTS

A total of 16 international participants took part in the experiment. The participants were recruited in the city of Oslo, by advertising the experiment via a poster shared on social media, and the participation was restricted to 18 year-old people or older, due to the age restriction for the film *The Blair Witch Project*. When participants agreed to take part in the experiment, the only knowledge that they had about the purpose of the experiment was that its aim was to investigate the relationship between some musical cues in film soundtracks and emotional reactions.

The participants ages ranged from 20 to 46 years-old, with 75% of them being 25 years-old or younger. The majority had had some type of musical education, with 50% of them having had at least 5 years of musical education. The frequency to which they listened to soundtracks had a mixed response, but at least 50% reported that they either listened only "occasionally" or "never". No participant reported having absolute pitch.

3.3 ETHICS

When working with information gather from participants, the way researchers deal with this information must take into consideration several aspects related to ethics. Jacobsen (2015) explains three ideal requirements when conducting a questionnaire: informed consent, privacy, and faithful data presentation.

Participants must voluntarily decide to take part in the experiment, and even before they decide to participate or not, they must be made aware of everything that is involved in their participation: the experiment's objective, their benefits and consequences by participating, how the gather data will be handled, etc. However, it might not be beneficial to share all of this information, as it can both overload the participant with information, and condition them to answer the questionnaire based on their knowledge of the experiment, which can lead to false results. Most importantly, the participants must make an informed and voluntary decision on whether they which to take part in the experiment or not, thus giving an *informed consent*, which was done in the current study. However, as explain previously, the participants were not told the full scope of the experiment until after it was done, as to not condition their answers.

Additionally, the participants always have their right to *privacy*, i.e., information that they wish to not disclose. Participants may be reluctant to disclose sensitive and/or private information. Thus, when researching these topics, the researcher must remember that the consent given by the participant can be withdrawn at any moment. It is also important to verify if an individual person can be identified from the data, and, if so, some

measures must be taken, such as deleting less relevant information for the researcher that helps to identify the person (Jacobsen, 2015). The current study does not involve any subject that could be considered sensitive or private, and the only personal question that could identify an individual participant asks their age. Therefore, there was no need to report the project to the Norwegian Centre for Research Data (NSD).

Lastly, when presenting the data, the researcher should be as *faithful* to it as possible. The context behind the experiment, and thus, the responses to the questionnaire, should always be taken into consideration, and the more precise and unambiguous the presentation is, the more reliable the results will be (Jacobsen, 2015; Silverman, 2011; Thagaard, 2003). In the current study, sometimes, organizing the several responses into the adjective groups (as explained in Chapter 4 Results) proved to be somewhat difficult, and thus called for an awareness regarding faithfulness to the data.

Besides these requirements related to data collection, the approval for the reproduction of both films, *The Man with the Answers* and *The Blair Witch Project*, also had to be acquired, due to both films being copyrighted. The approval was granted for the sole reproduction in educational contexts within educational facilities. Hence, only the music and the scores are available for the readers of this thesis.

3.4 EXPERIMENTAL MATERIAL

The experimental material for the experiment consisted of two film clips with added soundtrack. As explained before, the chosen films were *The Man with the Answers*, and *The Blair Witch Project*. Each clip was around three minutes long and was taken from a scene that did not include any soundtrack. These scenes were chosen in order to a allow for the compositions of the OSTs. The reason behind utilizing a completely new OST instead of one already present in the film was twofold: first, a new OST would be easier to manipulate without tampering with the film's sounds (dialogue, ambient sounds, sound effects, etc.); and second, if, by any chance, the participants had already seen the film

and knew how the music should sound like during the specific scene, they could find the difference between the film's soundtrack and the OST too disturbing and start judging their emotional reaction in relation to the subversion of their expectation instead of the intonational differences. The score for both OSTs can be found in Appendix B and C.

All modifications made to the OSTs were done in the Digital Audio Workstation (DAW) Reaper (Cockos, 2021). The audio files of each instrument were manipulated using Melodyne (Celemony, 2019), thus obtaining new versions of each OST. Melodyne allowed for a tremendous versatility in the modification of the audio files, since the pitch of each individual note could be altered as pleased. One unavoidable effect of shifting the pitch of some notes was that the harmonic spectrum would also change, which could lead to unwanted effects on the note's timbre or pitch contour. This issue was neutralized by utilizing other tools present in Melodyne, such as pitch modulation and formant tools. The volume of both the film clip and OST was also edited in Reaper, such as lowering the volume of the OST in sections when the characters were speaking, raising it other sections, lowering the volume of the film clip when sound effects were obfuscating the music, thus creating a more coherent narrative, as well as fading out both the film clip and the OST at the end. The OSTs, together with all modifications, can be listened to on YouTube[24]. The link to each individual video containing the music and the score can be found in Appendix D.

The evaluation of the cents deviation's effect had to be done while listening to the OST in connection with watching the film. By just listening to the OST, sometimes the modification sounded clearly out-of-tune and too drastic. However, when verifying it with the images from the films, the OST no longer sounded bizarre and out-of-tune. This can be explained by the concept of added value, where the visual and audio can, reciprocally, change each other's meanings.

Since each film clip, as well as the OSTs and the intonational changes, were com-

[24]A YouTube playlist with all the videos can be found in this link: https://www.youtube.com/playlist?list=PLy-lrzcr0zWddlELHK7537r7CA1CdUXzA.

pletely different, it is more beneficial to analyse each clip and OST individually, in order to fully explain the choices for intonation and how these different parameters may influence the final results of the experiment.

The Man with the Answers

This film was directed and written by Stelios Kammitsis, and it premiered in 2021. The film is a drama/romance, and a synopsis of the story goes as follows:

> Greek ex-diving champion Victor (Vasilis Magouliotis) lives with his sick grandmother in a seaside town in Greece. Working in a furniture factory to make a living, Victor is left devastated when she dies and her death prompts him to make a road trip to Germany to visit his estranged mother. On a ferry to Italy, Victor meets enthusiastic German student Matthias (Anton Weil), and he reluctantly agrees to let him come along for the journey. As the two men clash, with their personalities proving to polar opposites, they unexpectedly find common ground and quickly grow closer (Ellwood-Hughes, 2021).

The particular scene used in the clip can be found at 29 minutes and 05 seconds, and plays until 31 minutes, and consists of the two main characters, Victor and Matthias, having a conversation and swimming on a lake. As explained before, this scene was chosen due to lack of any music, with the only sounds present being voices and ambient sounds, such as birds chirping and the sound of water. It is also a scene that communicates the feeling of calmness, with few audio stimuli, smooth camera movements, and relaxed characters. The composer of the OST for this clip, Ola Ur Sæbø (2021), stated that, when he was writing the OST, he tryed to portray exactly those emotions: calmness and carefulness. This way, the added value of the music will perhaps direct the emotional character of the film to the said emotions, thus fulfilling one of Cohen's (1998) film music's functions: expressing moods and emotions.

Description and Analysis of the OST

This OST was written in the DAW Logic (Apple Inc, 2022) with Logic's built-in virtual instruments "Classic Suitcase MK IV" and "Steinway Grand Piano". To make it sound more natural, the input of each instrument was done by playing in a MIDI-keyboard, which inserted the desired notes with all their nuances, such as tempo, dynamics, and articulation, and neither instrument was quantized [25]. The "Steinway Grand Piano", henceforth referred to as simply *piano*, played the melody while the "Classic Suitcase MK IV", henceforth referred to as *electric piano*, accompanied it.

The OST revolves around the key of E♭ major, and the accompaniment consists of several pedal 9th chords. The piano melody is quite simple with several long held notes, normally on chord tones. It also consists of several jumps, always orbiting the note B♭, usually beginning and ending each musical phrase on it, performed in a *legato* manner (see Figure 10). The music is always in a low and soft dynamic, to both give room for the acting and to set the mood. The whole score can be found in Appendix B.

The long pedal notes in both the accompaniment and in the melody, together with the timbre, register, melodic movement, dynamic, and other cues, give a sense of calm and relaxation. By comparing the musical cues present in the OST with a collection of results of several studies done by Gabrielsson and Lindström (2010), we can conclude that the overall mood and emotion communicated by the OST is peaceful, carefree, and tender, as it can be seen in Table 2.

[25] Quantization is a function present in almost all DAWs nowadays that allows for the mathematical adjustment of MIDI information into a set temporal grid. This function may be quite effective in some styles, but may completely ruin the human character of the music (Trumm, 2020).

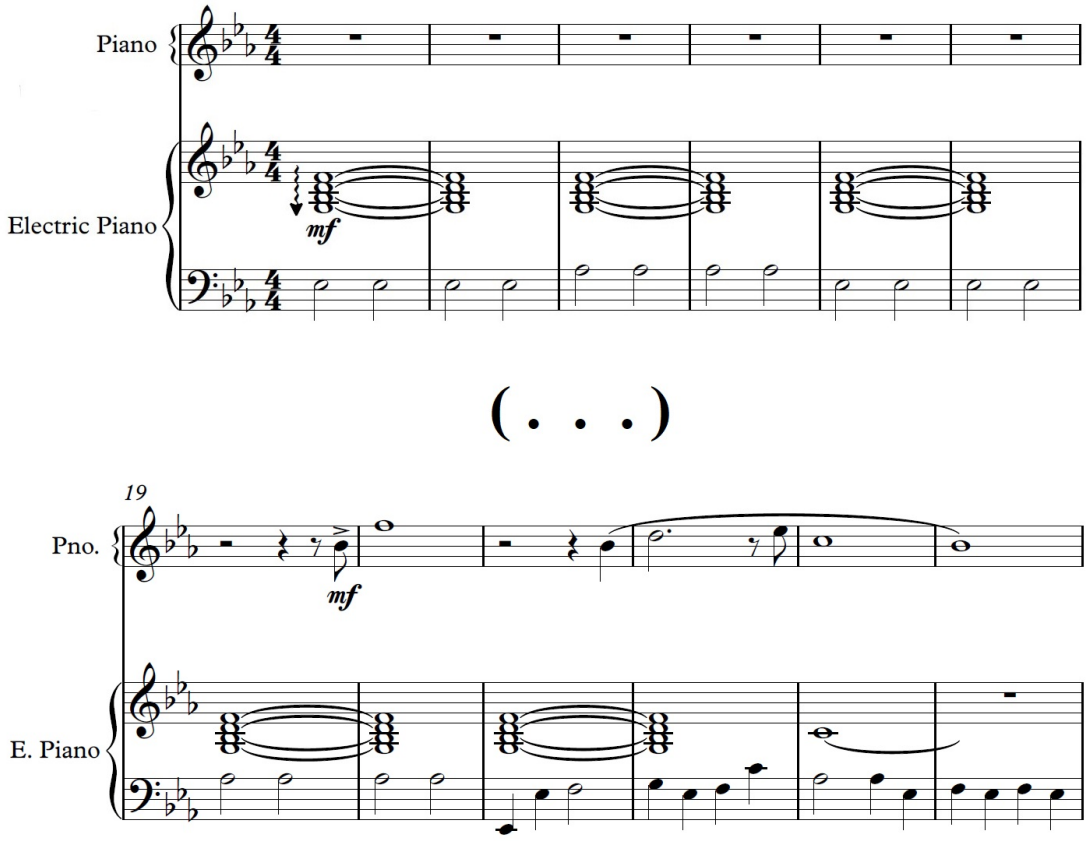


Figure 10. Bars 1 to 5, and 19 to 24 from OST for *The Man with the Answers.*

Cue	**Variable**	**Emotional Expression**
Articulation	*Legato*	Solemn, melancholy, lamentation, longing, softness, **tenderness**, sadness
Intervals	Perfect 4^{th}, perfect 5^{th}, major 6^{th}, minor 7^{th}, perfect 8^{th}	**Carefree**, positive, strong
Loudness	Soft	Melancholy, delicate, **peaceful**, softness, **tenderness**, among others
Loudness variation	No changes	Sad, **peaceful**, dignified, serious, happy
Melodic motion	Stepwise + leaps	**Peacefulness**
Mode	Major	Happy, graceful, solemn, serenity, **tenderness**
Rhythm	Regular	Happiness, serious, **peaceful**, majestic
Tempo	Slow	Serene, **tranquil**, dreamy, **tenderness**, **peace**, among others
Tonality	Tonal	Joyful, dull, **pleasantness**

Table 2. Identification of the musical cues of *The Man with the Answers*' OST and their corresponding emotional expressions, according to Gabrielsson and Lindström (2010). The emotions that best suit the OST are highlighted in bold.

Versions of the modified intonation

Since the composer's main idea when writing the OST was to express calmness and carefulness, the modifications of the intonation were chosen due to their capability of aiding the intended expressed emotion. Thus, four versions were created:

1) Just Intonation (JI)

The lack of beats in tuning systems based around Just Intonation usually gives a sense of peace (Johnson, 2000). Considering the composer's intention, it seemed natural to create a version where the beats were minimized. This reasoning appeared to be specially important for this specific OST due to accompaniment's chords containing tertian extensions up to the 9th. Thus, minimizing the beats created by all the chord notes should enhance peacefulness. In order to modify the intonation in this manner, the root notes of each chord were left intact and all the other notes of the chord were tuned in relation to the root note, according to Table 3.

Semitones:	0	1	2	3	4	5	6	7	8	9	10	11
Deviation in cents:	0	5	4	16	-14	-2	-10	2	14	-16	18	-12

Table 3. Cent deviations applied to the version *JI*. The upper line indicates the number of semitones above the root of the chord, and the bottom line indicates the deviation in cents applied to each specific note (adapted from Friberg (1991)).

In order to create different versions and more variety, some versions of the OST had to be made in a way that deliberately increased tension. Thus, the next modifications were made with that intent.

2) Everything ♯ (Et ♯)

In this version, the piano part, i.e., the melody, was raised uniformly by 15 cents, while the accompaniment was left intact. A 15 cents deviation lies above the JND, which would make it possible to be recognizable, but, at the same time, it is not a drastic change

that risks alienating the listeners.

3) Everything ♭ (Et ♭)

This version is the exact opposite of the previous one, i.e., the piano was lowered uniformly. However, in this version, the deviation was of 20 cents. The cent deviation is bigger in this version because listeners tend to regard flatter intonation as out-of-tune more often (Burns, 1999), and thus, it can be predicted that it will create more tension.

4) Just Intonation with Tempered Intonation (JI+T)

Since the modifications in the intonation are not dependent on performability, similarly to how several film and video game soundtracks are written, it is possible to have each instrument playing with a different intonation. In this case, the electric piano is set to Just Intonation, just like version *JI* and the piano was tempered in an unconventional manner:

- The first note of each musical phrase, which acts as an anacrusis, was tuned to in Just Intonation in relation to the root note of the accompaniment;
- Every other note was raised by around 20 cents.

The purpose of this unconventional intonation was to create a version that the participants would probably not have experienced before, and, this way, test if it could actually be beneficial or not.

At the end, version *Et ♯* was discarded due to the limit of three versions, and because it was the less favourable of the four versions. Since the threshold for regarding a note as out-of-tune is bigger on the sharper side (Burns, 1999; Sundberg et al., 2013), and since the idea of this version was to create tension, it was discarded and version *Et ♭* was favored.

The Blair Witch Project

The film *The Blair Witch Project* was written and directed by Daniel Myrick and Eduardo Sánchez, and it premiered in 1999. The film is a horror/mystery and a synopsis goes as follows:

> Found video footage tells the tale of three film students (Heather Donahue, Joshua Leonard, Michael C. Williams) who've traveled to a small town to collect documentary footage about the Blair Witch, a legendary local murderer. Over the course of several days, the students interview townspeople and gather clues to support the tale's veracity. But the project takes a frightening turn when the students lose their way in the woods and begin hearing horrific noises ("The Blair Witch Project", n.d.).

This film is considered to be within the genre of "found footage", i.e., "a film presented as recorded events, seen through a camera (or multiple cameras) operated by characters involved" (Taylor, 2019). Thus, the only sounds that a found footage film has are diegetic sounds. Non-diegetic sounds, such as a soundtrack, would ruin the effect of realism of the genre.

The chosen scene for the experiment can be found at 45 minutes and 21 seconds, and plays until 46 minutes and 45 seconds, and consists of the three main characters being scared by noises that they hear outside their tent and then running away. As it is expected from a climatic scene in a horror film, the major emotion portrayed in scene is fear. The darkness of the night, the shaky camera, the screams, and the unknown source of scary noises communicates anxiety, fear, discomfort to the viewer. When writing the OST for this clip, the composer, Arian Pedersen (2021), says that he "wanted to convey the fear of not knowing what is out in the dark, and to make the music run away along with the characters. The fact that we never get to see any of the creatures making the noises in the clip was something [he] wanted to imitate in the music - an unawareness of some sort". By being utilized in this manner, the music may direct the viewer's attention, while endowing a third all-around spacial dimension to the film.

Description and Analysis of the OST

The OST for this film was written in Sibelius (Avid, 2020), with the playback engine NotePerformer 3 (Wallander Instruments, 2021). The OST's instrument ensemble consists of flutes, oboes, clarinets in B♭, basson, French horns in F, trumpets in B♭, trombones, tuba, timpani, violin I, violin II, viola, cello, contrabass, and double bass. The piece has a key signature of B♭ major, or G minor, but it seems to revolve around the key of D phrygian, with several altered notes throughout the piece, such as C♯, A♭, and F♯ (see Figure 11). The melody is played by the French horns and it is an almost direct quote of plainchant *Dies Irae*. The *Dies Irae* "liturgical text comprises vivid imagery of burning ash, illustrating the final day of judgement, and its modal music fits comfortably within a tonal context, highlighting the lowered third and seventh scale degrees" (Ludwig, n.d.). The use of the beginning motif of this plainchant has been use in film and game scoring since at least the 1920's, and it is employed in scenes of stress, evil, or foreboding. Unsurprisingly, the use of this motif fits perfectly the mood that Arian Pedersen wanted to convey with this OST, and can be aroused through the mechanism of emotional contagion. There is also a dichotomy between the melody, which revolves around the mode, and the accompaniment, which changes from a simple perfect 5^{th}, when the melody has more movement, to D major (with an added F natural) during the last notes of the melody. In order to suit the characters' emotional state of curiosity and anxiety in the beginning of the scene, and then of fear and panic at the end, the music changes drastically the tempo and dynamics. The whole score can be found in Appendix C.

By doing another comparison between the musical cues of the OST and the results collected by Gabrielsson and Lindström (2010), we can see that fear and tension are the emotions that are more prominent in the OST. By looking at Table 4, fear appears to only expressed by a few musical cues in the score. However, it is important to remember Chion's (2019) concept of added value: the audio and the image in a film reciprocally add meaning to each other. Thus, even though the music by itself may not represent the feeling of fear as accurately as possible, that feeling is better expressed when the audio and the visuals are experienced together.

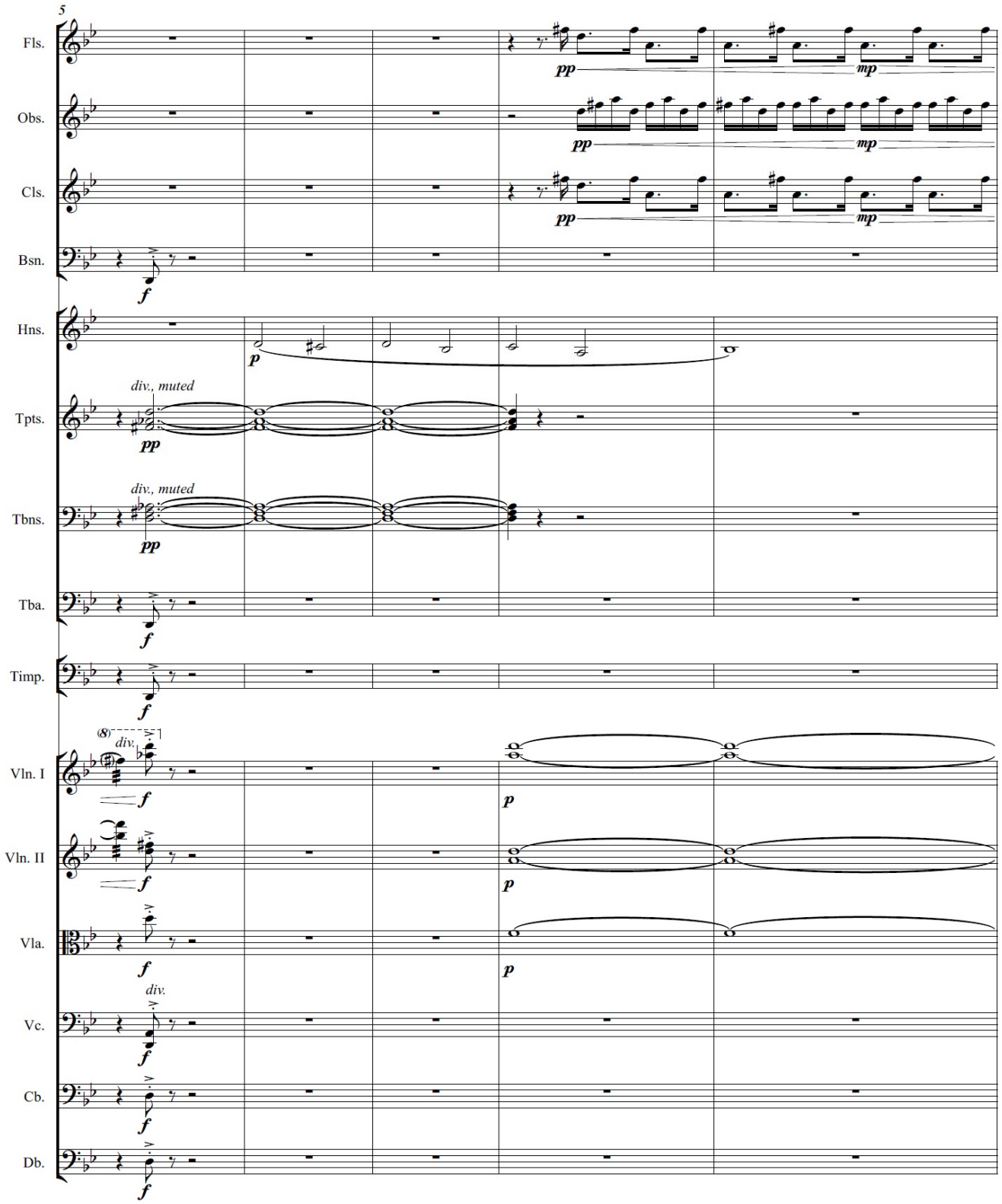


Figure 11. Bars 5 to 9 from OST for *The Blair Witch Project*.

Cue	Variable	Emotional Expression
Harmony	Complex and dissonant	**Agitation**, vigorous, gloom, **tension**, **fear**, anger
Loudness	Soft	Melancholy, delicate, peaceful, softness, **fear**, among others
Loudness variation	Large and rapid changes	**Fear**, playful
Mode	Minor	Sadness, **agitation**, **fear**, dreamy, **tension**, anger
Pitch variation	Small	**Fear**, disgust, anger, boredom

Table 4. Identification of the musical cues of *The Blair Witch Project*' OST and their corresponding emotional expressions, according to Gabrielsson and Lindström (2010). The emotions that best suit the OST are highlighted in bold.

Versions of the modified intonation

The versions created for this OST consist of unconventional intonation choices, with the intent of enhancing the sense of fear from the unknown. Due to the complexity of this score - complex and dissonant harmony, more instruments, and fast rhythms - the modifications were only done to the melody, played by the French horns in two musical phrases. The melody is the part of any music that we recognize, pay attention to, and memorize first. Additionally, performers do more variations in intonation when playing or singing the melody (Brean & Skeie, 2019; Geller, 1997). These two facts justify why the modifications of the intonation were only applied to the melody. At the end of the clip, when the bpm[26] increases to quarter-note equal to 120, the trumpets and the trombones play a motif that can be considered a melody. However, because of the vigorous chromatic accompaniment, and the harmonic nature of the motif, this section was left unaltered.

Thus, five versions were created:

[26]Bpm stands for "beats per minute" and it establishes the speed of a piece.

1) Eveything ♯ (Et ♯)

Similarly to what was done with the OST of *The Man with the Answers*, in this version, the melody was raised uniformly by 20 cents.

2) Everything ♭ (Et ♭)

Once again, akin to the previous OST, the melody of this version was lowered uniformly by 20 cent.

Due to already having this type of modification in the other OST, and to the limit of three versions, these two versions (*Et ♯* and *Et ♭*) were discarded.

3) Beats (B)

The idea of this version was to purposefully create beats between the melody and the accompaniment. In the first musical phrase, since the accompaniment is playing a quite dissonant chord (D - F♯ - A♭), the first notes of each bar were left intact while the second ones where raised by 20 cents. This way, the leaps sounded too narrow and the notes achieved by stepwise movement upwards sounded out-of-tune, even though they were not manipulated. Additionally, by raising the leading note (C♯), it mimicked Casals's expressive intonation.

The modifications in the second phrase were different, since the accompaniment now was simpler, playing a simple D minor chord. In order to create beats with the accompaniment, the notes in the melody that belonged to the D minor chord were raised by 20 cents and the other notes were left intact. However, since there were two non-chord tones in a row, C - B♭, the B♭ was lowered by 10 cents, in order to create some difference. The justification for lowering this note, instead of raising it, can be related again to expressive intonation, where flattened notes are played lower. Lastly, even though the last note of the melody is a chord-tone, because it is a long note, it was only raised by 10 cents, as to not sound too out-of-tune and alienate the listeners.

4) Beats Inverted (BI)

This version is the complete opposite of version *B*. Every note that was raised in version *B* was now lowered, and vice-versa.

A summary of both versions *B* and *BI* can be seen in Figure 12, where the deviation, in cents, for each version can be seen together with a reduction of the score.

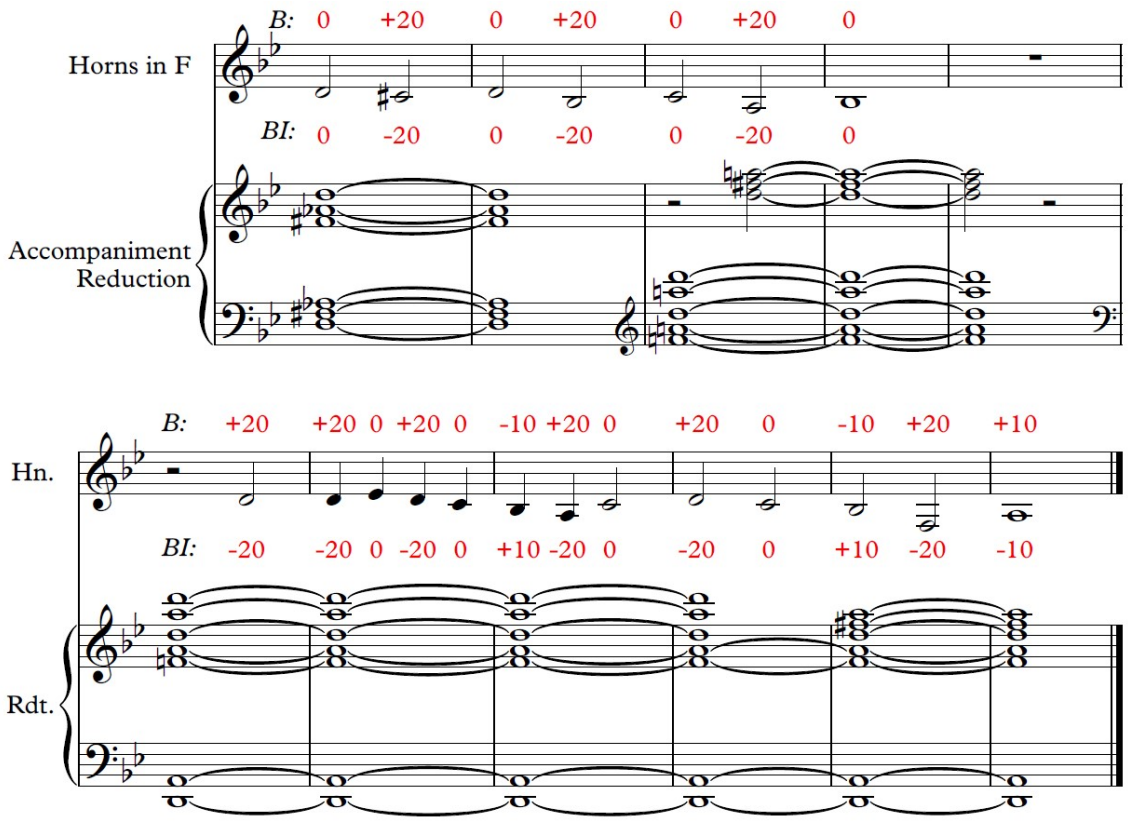


Figure 12. Reduction of the score for both musical phrases of the horns, with the cent deviation applied to each note. The numbers above the horn's staff refers to version *B*, and the numbers beneath refer to version *BI*.

5) Compressed Melody (CM)

In this version, the melodic phrases were compressed, i.e., the lower notes of the melody were raised and the higher notes were lowered. For example, in the first melodic phrase, that spans from A3 to D4, the notes A, B♭, and B were raised while the notes C, C♯ and D were lowered, with the outer notes having the biggest cent deviation. In the

beginning, the cents deviation of each note was half than the outer note closest to it, as it can be seen in Table 5.

Notes	D	C♯	C	B	B♭	A
Deviation in cents	-20	-10	-5	+5	+10	+20

Table 5. Example of the first idea of cent deviation for version *CM*.

However, if the smallest deviation was to be kept at 5 cents, then this method would be inadequate for melodies that span a bigger range, such as the second melodic phrase, since the outer notes would be modified by ca. 100 cents, which would make it sound too out-of-tune and could distract the listener. Therefore, the equation for finding the deviation for each note was changed to $x = n - n/4$, where x is the note in question, and n is the outer note closest to it. Following this equation, the first phrase was compressed by 40 cents (-20 cents for highest note and +20 cents for the lowest note), and the second phrase was compressed by 60 cents (-30 cents for the highest note and +30 cents for the lowest note). The compression of the second phrase is bigger because, if it were kept at 40 cents, then the difference in cents between the middle notes of the range would be too small to be noticeable. Table 6 shows the final cent deviation for each phrase.

Phrase	**Note**	**Deviation in cents**
	D	-20
	C♯	-15
First	C	-11
phrase	B	+11
	B♭	+15
	A	+20
	E♭	-30
	D	-22
	C♯	-16
	C	-12
	B	-9
Second	B♭	0
phrase	A	+9
	A♭	+12
	G	+16
	F♯	+22
	F	+30

Table 6. Deviation in cents for each note in version *CM*. Even notes that do not appear in the melody are present in the table in order to show the logic behind it.

4 RESULTS

In order to aid in the analysis of the data, and due to the similarity between this research and the one by Hevner (1936), the responses to the open questions were categorized into one of the groups in Hevner's adjective circle[27]. However, Hevner's circle lacks a group that encompasses emotions similar to fear, i.e., negative valenced emotions with high activity levels. Thus, an additional group entitled IX was created which included the adjectives: fear, confusion, dread, alert, disturbing, nervous, distress, terror, fright, uncomfortable, startling, tension, and on-edge. This new group was positioned in such a way that it was connected to groups VII (exciting) and II (sad), since it contains emotions with high activity, like group VII, and with negative valence, like group II. The adjective that represents each group was changed to better depict the experiment's results. The updated circle can be seen in Figure 13. A *neutral* group was also added to the data analysis, in order to accommodate the participants' responses that did not include any felt emotion.

Even though the gathered data was provided by only 16 participants, since they could write several words that described what they were feeling, sometimes one participants would end up writing different emotions that belonged to different, but adjacent, groups. This leads to a bigger sample of emotions to be analysed.

The Man with the Answers

Figure 14 shows a graphical representation of the reported emotions for both the original clip without soundtrack and the one with the OST. By comparing the reported emotions from both clips, we can see a clear overall increase of emotional reactions towards the clip with the OST, mainly for both groups III (nostalgic) and IV (calm). Additionally, there are no reports of a neutral emotion in the second clip. Both of these facts

[27] The adjectives *curiosity* and *suspense* were added to groups V and VII, respectively, due to their prevalence in the participants responses and their similarity with other adjectives of the respective groups.

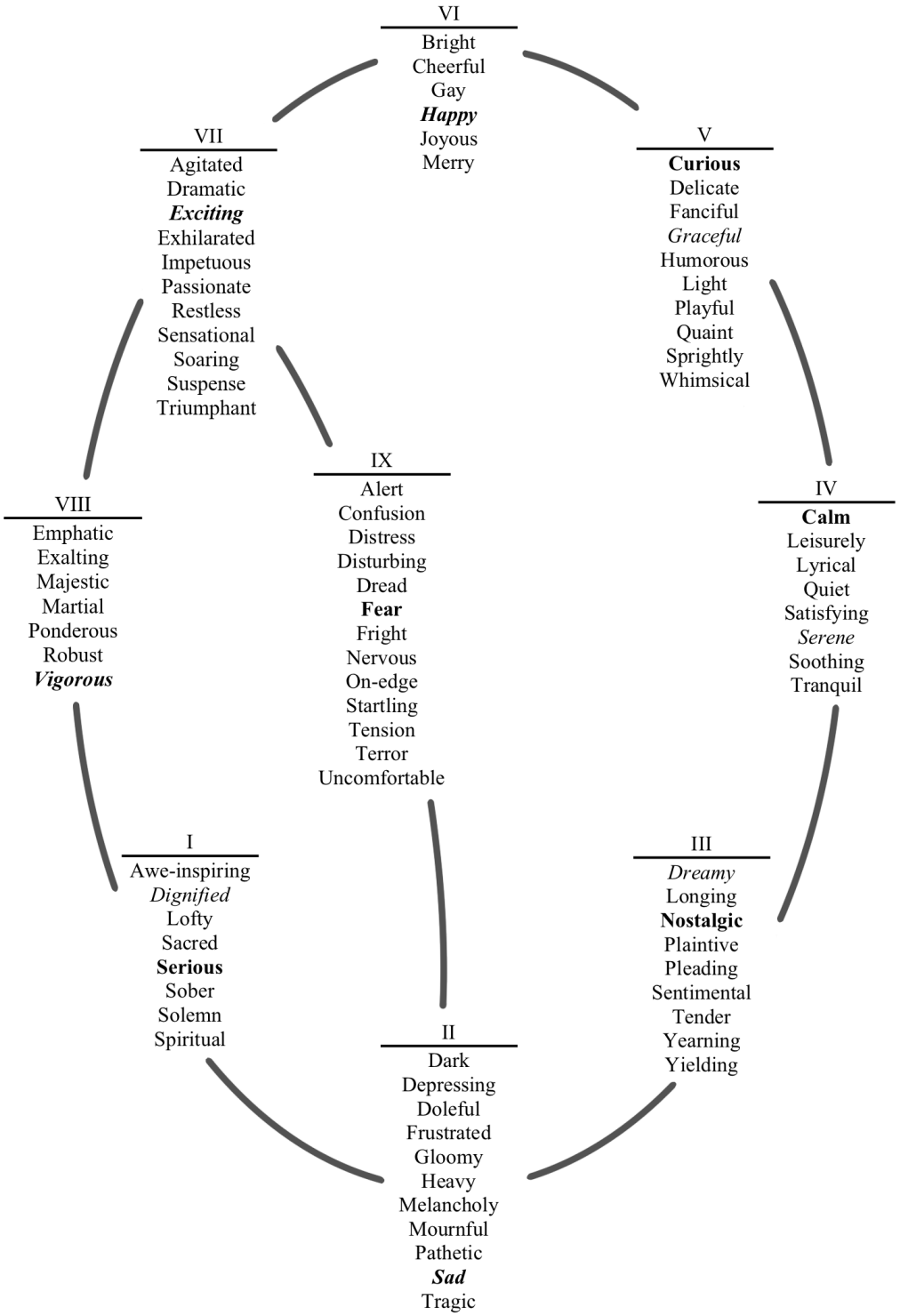


Figure 13. Updated adjective circle use for the data analysis. Adjectives in italic are the ones used by Hevner (1936) to represent each group. Adjectives in bold are the ones that better represent each group in this experiment.

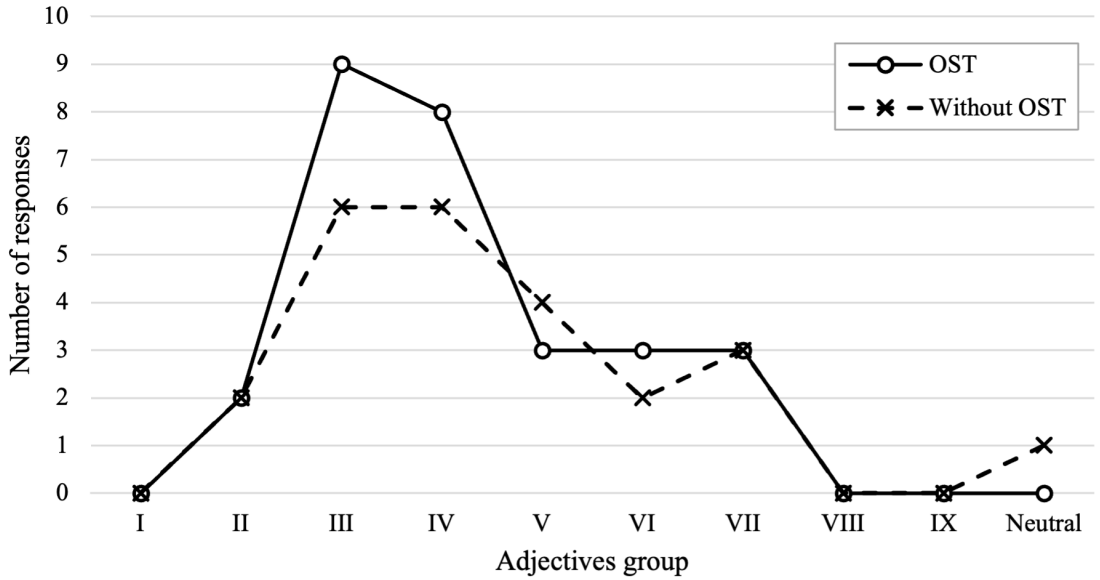


Figure 14. Graphical representation on responses for the first and second clip of *The Man with the Answers*.

corroborate the concept of added value: music gave meaning to the images.

In order to see the overall reported emotions for the clips with modified intonation, Figure 15 consists of the responses for the clip with the OST and the last three clips. The upper graphical representation shows how many responses each adjective group got for each clip. It is important to note that the clips were watched in succession, and that the questions asking which emotion the participants felt were in comparison to the clip watched previously (and not to the one with the unaltered OST). Therefore, the interpretation of the data has to take this information into consideration. In order to make the changes in responses from one clip to the next easier to see, the bottom graphical representation shows the response variation. In other words, by looking at the bottom graphical representation it is easier to examine how the reported emotions varied from one clip to the next. With both these graphical representations we can see that the clip with version *JI*, and all subsequent clips, reported less emotions, with a considerable decrease of groups III and IV, and increase of group II (sad).

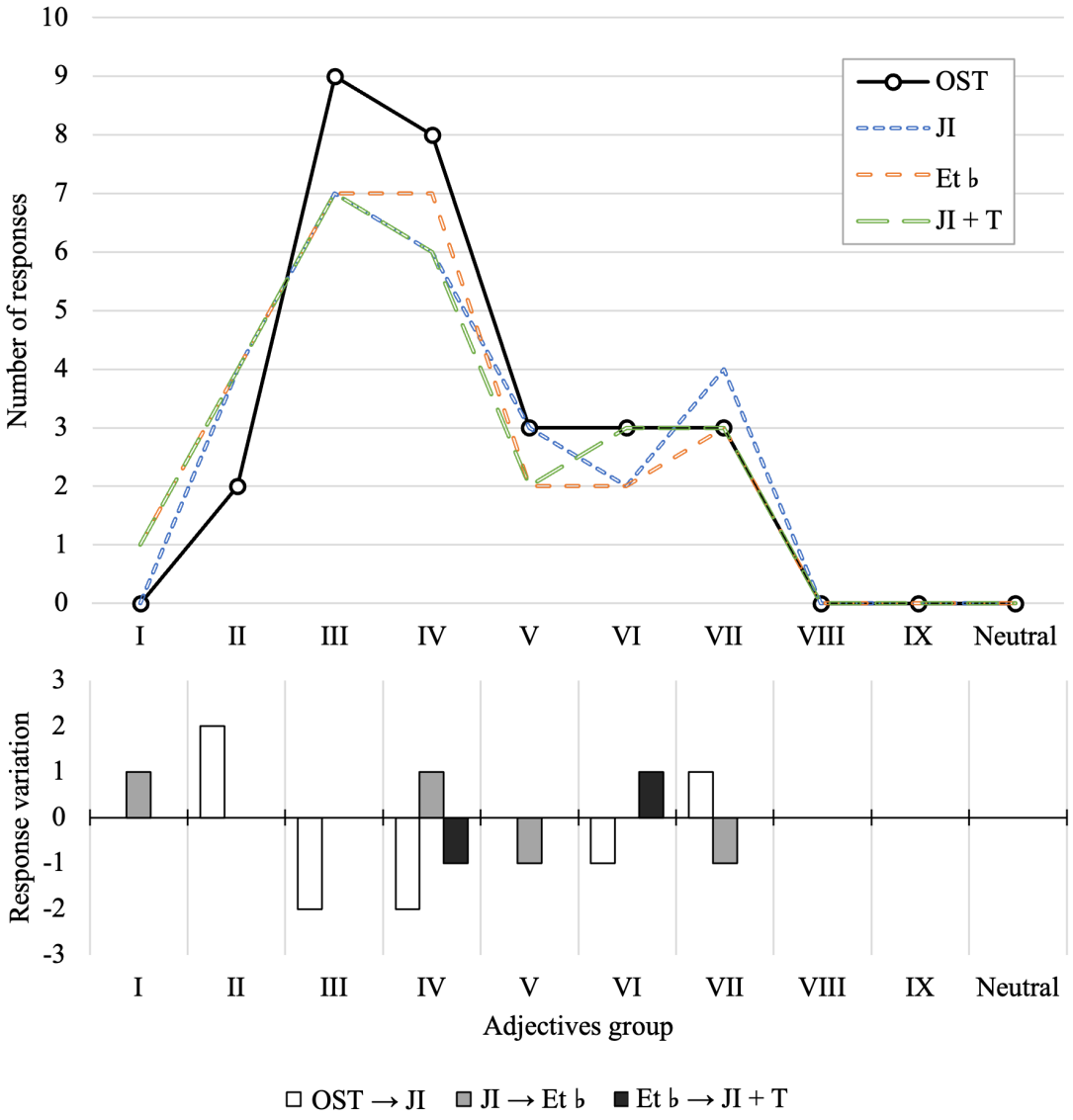
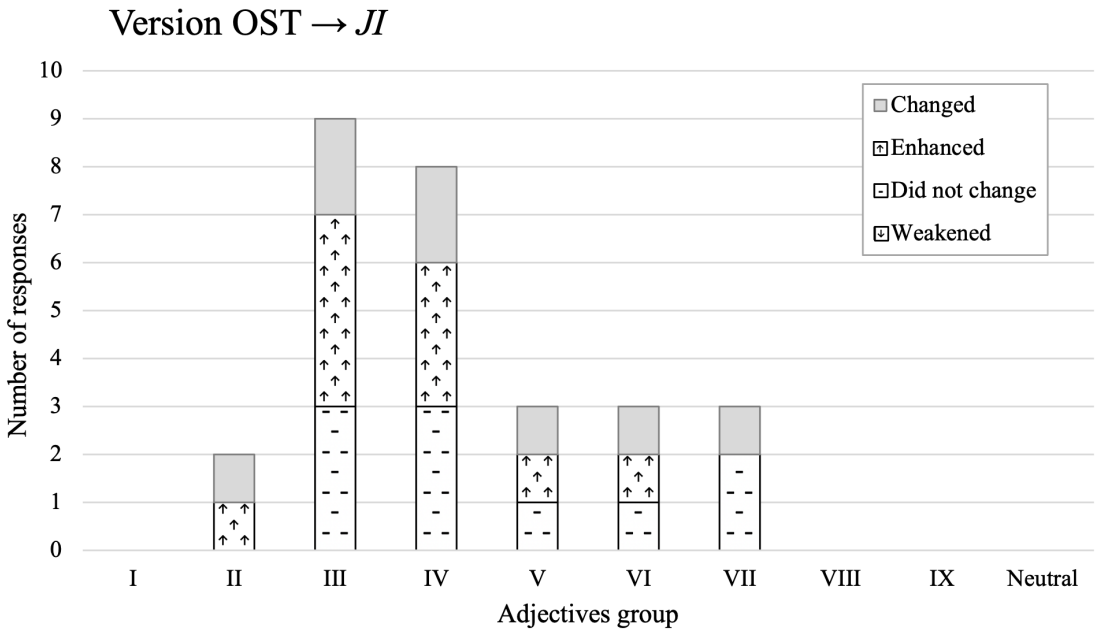
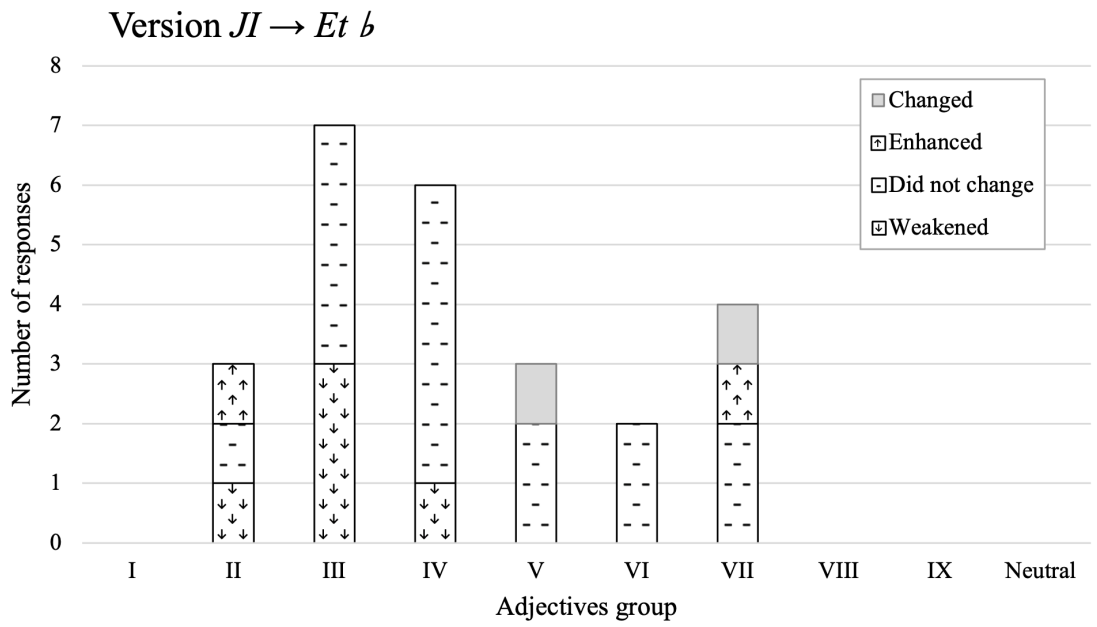


Figure 15. Graphical representation of the responses for the second to the last clips of *The Man with the Answers*. The bottom graphical representation shows the response variation from one clip to the next

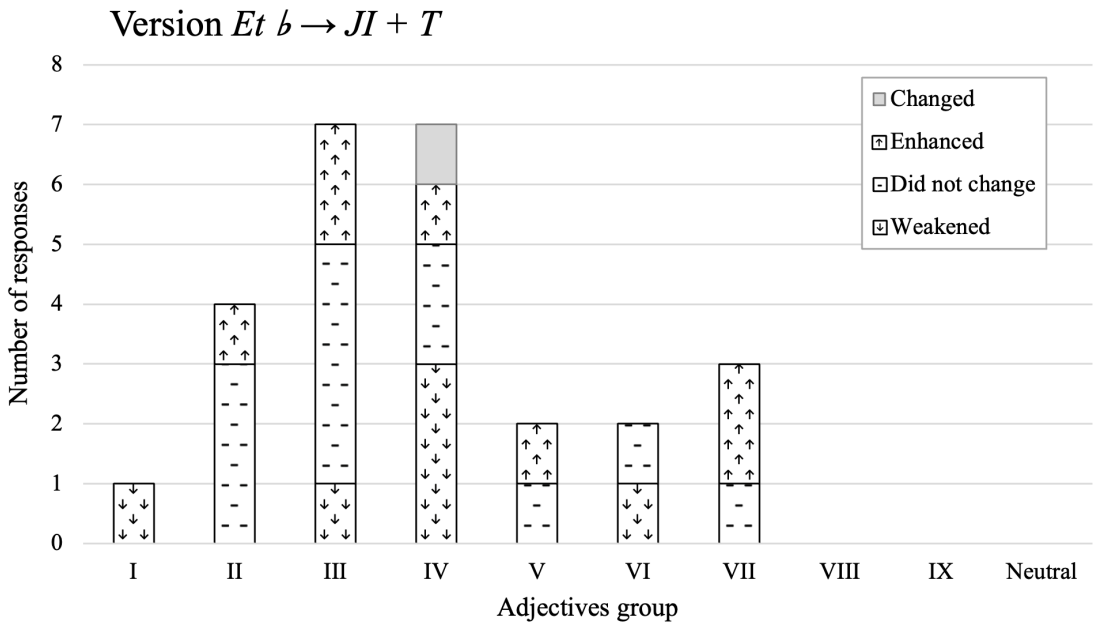
For each clip with modified intonation, if the emotion that the participants had felt did not shift to another, they were asked if it was enhanced, weakened, or if it did not change. The representation of these responses can be seen in Figure 16. Interestingly, the results show a preference for version *JI*, with no participants reporting that the emotion got weakened, and a disfavor for version *Et* ♭, with the majority of participants reporting that it did not change the emotion or that it weakened it. Version *JI* + *T* received a mix of responses.



(a)



(b)



(c)

Figure 16. Graphical representation of the responses of the changes within each modified intonation for *The Man with the Answers*.

The Blair Witch Project

Just like with the previous film, Figure 17 shows a graphical representation of the reported emotions for both the original clip without soundtrack and the one with the OST. Again, the concept of added value is put into action by directing the scattered emotional meaning of the film to groups IX (fear) and VII (exciting). The adjective from group VII that was most utilized by participants for the clips of this film was *suspense*, probably due to its negative connotation.

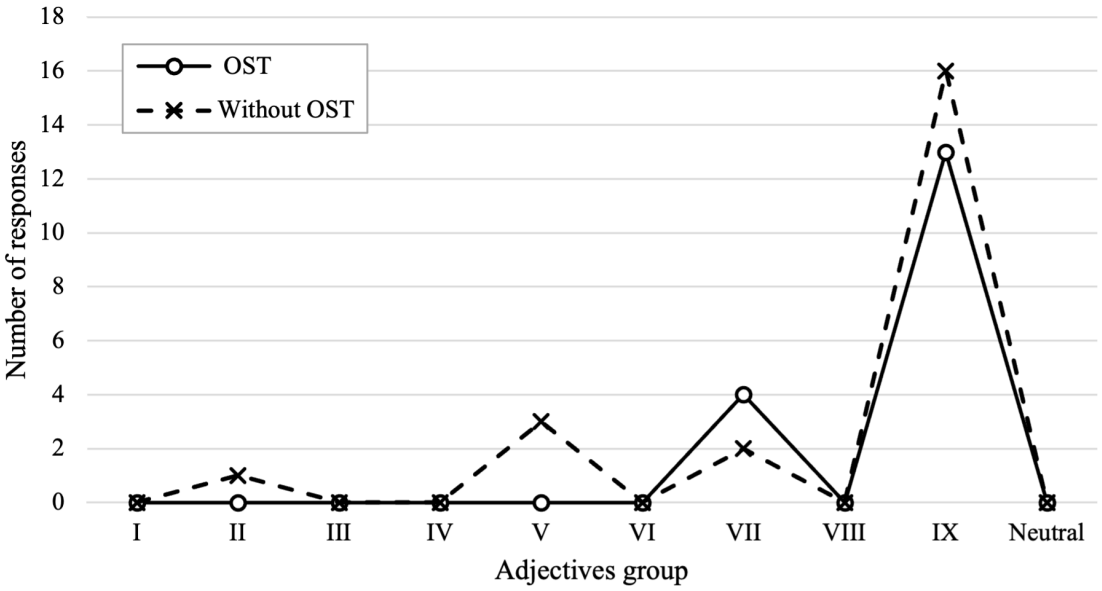


Figure 17. Graphical representation on responses for the first and second clip of *The Blair Witch Project.*

The graphical representations in Figure 18 show only a slight, and most likely insignificant, change in the reported emotions for the clips with modified intonation. It is possible that the weight of the emotion fear is already so high in this scene, that the effect of the music is overshadowed, thus explaining the lack of changes in the reported emotions.

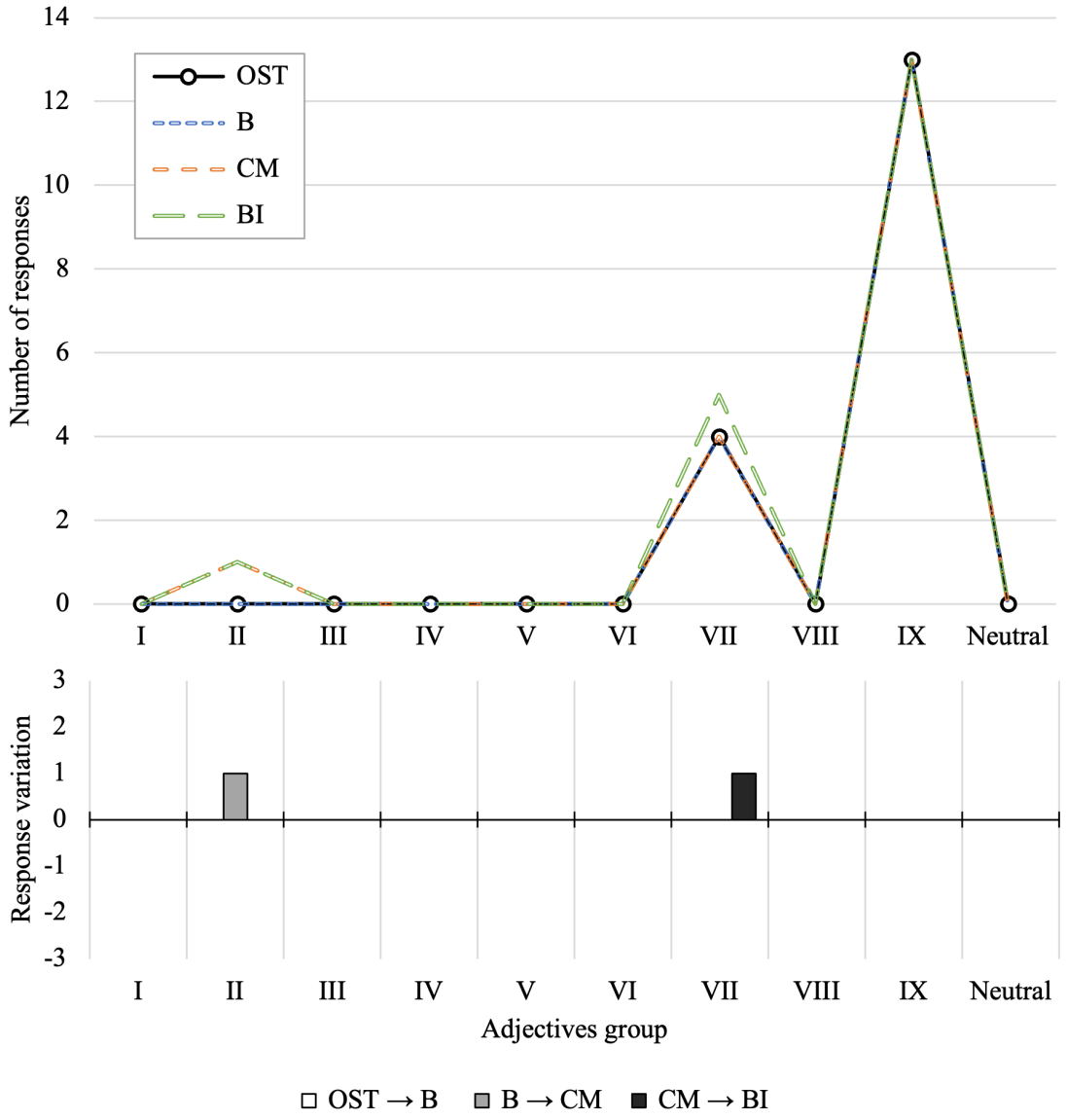
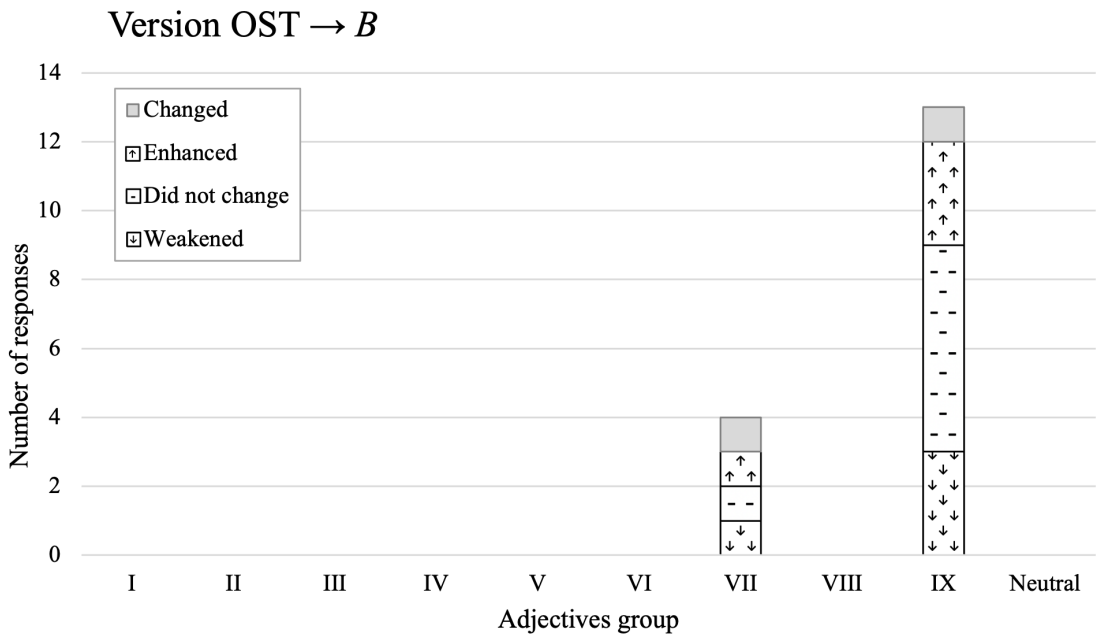
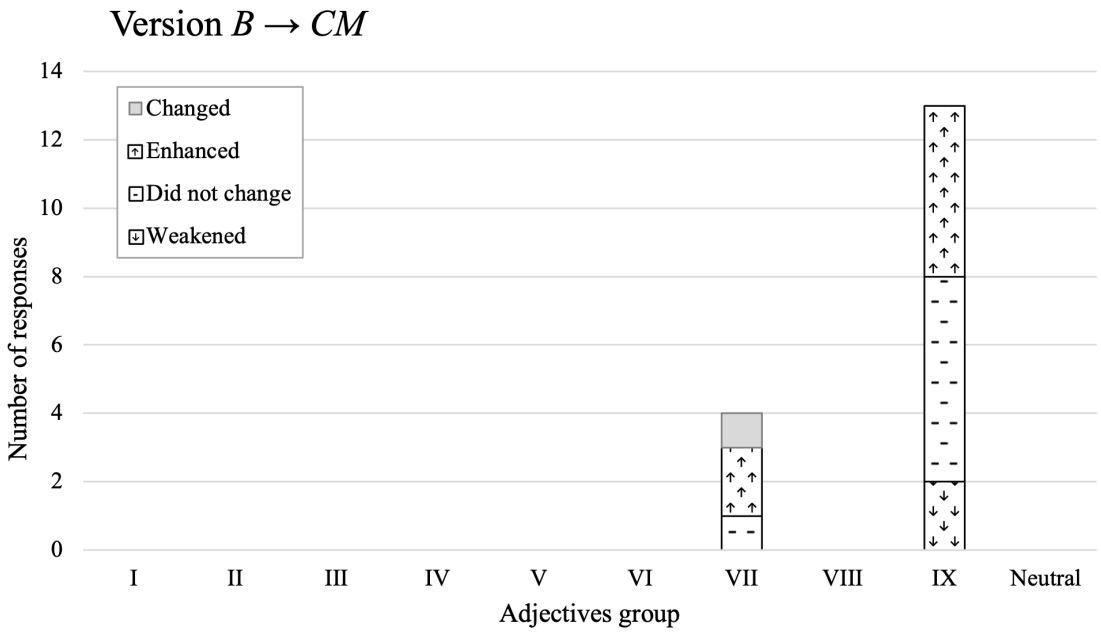


Figure 18. Graphical representation of the responses for the second to the last clips of *The Blair Witch Project*. The bottom graphical representation shows the response variation from one clip to the next

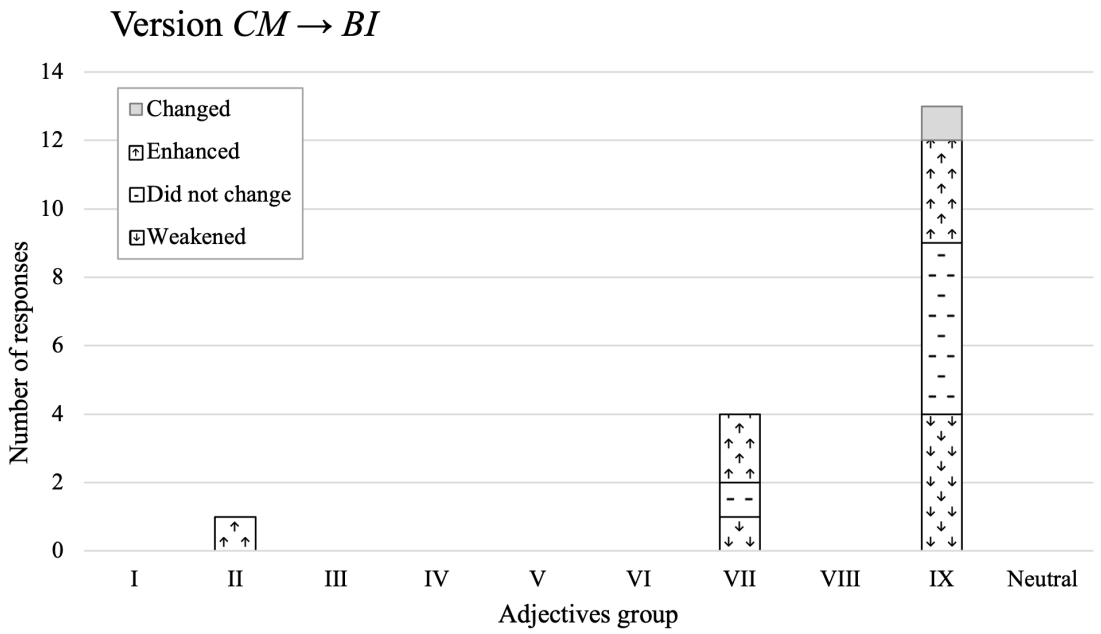
Regarding the emotions that did not shift to another, the responses on whether they were enhanced, weakened, or did not change, were quite mixed for the three clips with modified intonation. The version that reported less negative responses was version *CM*, which goes against our most intuitive thought. A graphical representation of these responses for each version can be seen in Figure 19.



(a)



(b)



(c)

Figure 19. Graphical representation of the responses of the changes within each modified intonation for *The Blair Witch Project*.

5 DISCUSSION

The current study aimed to explore in what ways different intonation choices may influence the audience's emotional reactions to film soundtracks. Since the interconnection between the topics of film music, music and emotion, and intonation has not been previously explored, no formal hypothesis was formed. However, based on findings from previous research on intonation, it was expected that some kind of emotional reaction would occur. Thus, an experiment was carried out, with two contrasting films, which showed that different intonation choices affect participants differently. Since the intonation choices employed in each film were so distinct, it is preferable to analyse the data within the context that originated it. In this chapter, the results for each film are going to be discussed in connection with the theoretical perspectives reviewed in Chapter 2. Later on, critical reflections on the methodology will also be undertaken.

5.1 FINDINGS

The Man with the Answers

As it was previously mentioned, the clip with the OST reported a considerable increase in emotional reactions when compared with the clip without OST, with an emphasis on groups III (nostalgic) and IV (calm) (see Figure 14 in page 74). This increase can be explained by the concept of added value. As one of the participants wrote as a comment in the questionnaire: "It is interesting to see how soundtracks sets the mood".

By looking at the participants' comments, we can see that the OST also fulfilled several of the film music's functions defined by Cohen (1998) (see from page 21). The functions of *masking external noises* and *adding aesthetic value*, which people are usually not actively paying attention to, but that nonetheless are present, as well as the function of *creating a sense of continuity*, which was not that necessary in the presented clip, were

not reported. However, we can see that the OST *directed the participants' attention* ("The music made me focus less on the scene such as the background nosies of birds etc, but focus on the characters more"), *communicated meaning* ("I feel like the clip with the music adds to the feeling of romance in the scene"), *heightened absorption in the film* (for the clip without soundtrack, a participant reported "I feel disconnected to the movie for some reason", but right afterwards, for the clip with the OST, the same participant reported "Right from the first second, I felt melancholic and nostalgic"); and, as expected, *induced and expressed emotion* ("The music gives the scene a lot more meaning, and allows a lot more emotion to it").

In the majority of the comments, the participants wrote that they "felt something", either an emotion or a mood. Due to the very nature of the experiment, which consisted on watching just a scene from one film several times, it is possible to assume that the participants did not create an emotional attachment to the characters or the scene itself, and, thus, when they report that they "felt something", they are most likely reporting that they recognized that "something" in the film. This interpretation would be in accordance with the cognitive theory of emotion in music. However, some comments still support the emotivist theory, such as "With the soundtrack ... I did not feel the uncertainty and stress that I felt during the first clip", while one participant reported actually feeling something while recognizing another emotion in the characters: "Although I could still feel the peace, chemistry and sensuality of the scene, the music turned everything much more romantic and meaningful for both characters".

If we try to analyse how the music evoked emotions in the participants with the BRECVEMA framework, we see that only a few mechanisms were involved: episodic memory, visual imagery, musical expectancy, and aesthetic judgement. Visual imagery and aesthetic judgement were utilized by every participants, since the OST was accompanying the visuals, and all participants reported recognizing or feeling an emotion or mood. Musical expectancy was reported with comments such as "the music built some suspense around the jump [into the lake]" and "The different music made the clip feel different despite it being the same clip. It felt as if a ‚life changing moment' was about

to happen for the character". Episodic memory could be related to the responses of group III (nostalgic), since the emotion usually entails some kind of longing for something in the past. This can specially be seen in one participant's response: "Sentirsi a casa", which translates to "feeling at home". Even though the participants did not report that they were reminded of any event in their past, the emotion itself has that connotation. Interestingly, the majority of reports for group III were done by older participants, 25 years-old or older. The other mechanisms for emotional arousal were not engaged in this OST as a result of the OST's very nature: it was completely new, there were no loud and sudden sounds, the melody was not voice-like, and the rhythm was calm and free-flowing.

When looking at Figure 16 (pages 76 - 77), we can see how the different intonational changes affected each adjective group, for the participants that reported that their emotion did not shift. In order to properly analyse this data, we need to take into consideration that the information represented in each graph is always in relation to the previous clips, hence the heading "Version X $\rightarrow$ Y".

Thus, in graph (a) of Figure 16, we can see that the majority of the emotions were enhanced in version *Just Intonation (JI)*, mostly in groups III (nostalgic) and IV (calm). Just Intonation, the choice made for version *JI*, due its purposeful lack of beats, gives off a sense of peace and neutrality (Johnson, 2000). This may justify its preference for this film, and specially for groups III and IV.

Graph (b) shows that version *Everything ♭ (Et ♭)* was the least preferred, with the highest number of "weakened" responses out of the three versions. This dislike towards this version is more evident in group III. One reason behind this displeasure toward version *Et ♭* can be attributed to the fact that people in general tend to have a smaller tolerance for flatter intonation (Burns, 1999; Geringer et al., 2001). For example, a participant that reported that the emotion got weakened commented saying that "Although I still think that romance is the main emotion present in the clip, I could feel a bit of "tension" that wasn't there before".

Lastly, version *Just Intonation + Tempered (JI + T)*, as the most unconventional intonational choice received a mix of responses, as it can be seen in graph (c). The mixed responses do not allow for a proper interpretation, leaving the question of whether an uncommon intonation choices could be beneficial or not to film scoring open. Perhaps, the mixed responses in this version were due to the fact that this version was preceded by an unfavorable version, which made it be perceived as a better option. If it followed the OST, for example, then it could possibly be rated as undesirable. However, in this current study, it is impossible to argue for any justification.

Interestingly, no participant ever mentioned intonation in any section of the questionnaire. Additionally, throughout watching the clips, several participants tried to pinpoint what musical cue was causing the emotions that they were recognizing when asked what changes they noticed in each clip, with the majority mentioning loudness.

In sum, the OST provided more meaning, both narrative and emotional, to the film, and the different intonation choices received different responses, with the version *JI* being the one with higher ratings, and version *Et* ♭ with the lowest ratings. No conclusions could be drawn for version *JI + T* due to mix responses.

The Blair Witch Project

Once more, the concept of added value can be seen taken into effect in the clip with OST with the concentration of the emotional responses in groups VII (exciting) and IX (fear) (see Figure 17 in page 78). One reason that possibly justifies why the reported emotional reactions for these clips are mainly concentrated in one adjective group can be attributed to the fact that the chosen scene is more action-driven and the portrayed emotion can be characterized with more activity. This can also explain the mixed responses for the clips with modified intonation (explained further on), and the scarcity of comments, since the visuals usually take precedence over the audio (Chion, 2019).

Nonetheless, with the small number of comments, we can still see that the OST

was able to fulfil some of Cohen (1998) film music's functions: *communicating meaning* ("The music adds the buildup that the clip lacks when you don't watch it in context (the full film)"), and *inducing and expressing emotions* ("The emotion is the same of before but the soundtrack enhanced it"). The lack of comments referencing the other functions can be associated with the scene itself - one continuous shot with extremely dark visuals that does not allow for anything in particular to be identified -, and with our subconscious perception - we are not specifically paying attention to the addition of aesthetic value by the music. Additionally, we can see in one of the comments how the cognitive and emotivist theories work together ("Although fear is the main emotion present in the characters, the music leads us to a permanent sensation of thriller and suspence").

In order to understand how the OST evoked emotions in the participants, using the BRECVEMA framework, we need to analyse the piece itself, since the participants did not leave any comment that mentions any mechanisms. Similarly to the OST for the previous film, this OST does not have any sudden loud sounds that are not properly prepared, as well as any particular rhythmic pattern. Additionally, since it is a new soundtrack, it did not evoke any specific memory in the participants. However, we can say that the emotions were evoked by *evaluative conditioning*, *emotional contagion*, *visual imagery*, *musical expectancy*, and *aesthetic judgement*. Just like with the OST for *The Man with the Answers*, visual imagery and aesthetic judgement were utilized by every participant subconsciously. Furthermore, the very nature of the harmony and melody of the OST creates some kind of musical expectancy for what is to come. More interestingly were the mechanisms of evaluative conditioning and emotional contagion, which are associated with the melody. As explained previously, the melody consists of the motif of *Dies Irae*, a plainchant associated with stress, evil and foreboding. The melodic contour of the motif mimics how the text of the plainchant would be declaimed, and its descending melody, consisting of minor seconds and minor thirds, may express a sense of sadness and grief (Curtis & Bharucha, 2010). Moreover, the fact that this motif has been associated with negative emotions for centuries may conditions us, subconsciously, to feel these emotions when we hear the motif. In other words, if the listener has experienced this association

of the motif with negative emotions, then this musical convention may, once again, entice the listener to feel the emotions mentioned.

Regarding how each emotion was affected by the modified intonation, we can see in Figure 19 (in pages 80 - 81) that the three intonation choices received mixed responses. Once again, this can be attributed to the emotional charge of the visuals. Version *Beats (B)* had essentially a neutral outcome, with the same number of responses for both enhanced and weakened, as it can be seen in graph (a). Interestingly, nearly all participants that had had between 10 to 15 years of musical education, formal and/or informal, reported that this version weakened the emotion that they felt. Possibly, their musical experience gave them the capability to perceive intonational changes, or, in this case, if something is out-of-tune or not, to a higher degree. However, similar to the responses for the previous film clips, the participants never mentioned intonation in any section of the questionnaire.

Intriguingly, as we can see in graph (b), the majority of the participants gave positive ratings to version *Compressed Melody (CM)*, while only two participants said that it weakened the emotion that they had felt. One participant commented that "It felt like the music building more and more throughout the clip". However, how do we explain this phenomenon? Version *CM* is the only one that has fluctuating intonation, with different notes in the melody having different cent deviations ascribed to them. Since these deviations were defined in a way that compresses the outer notes of the melodic range into its centre, the melodies' intonation may give a sense of revolving around its centre. This effect is more prominent on the second melody, where the majority of notes lie above the melody's center (the note B♭), specially since the melodic contour revolves around that note. Perhaps, this directionality of the melody itself and of the intonation creates this build-up mentioned in the participant's comment. Additionally, the biggest cent deviation applied to any version can be found in this one, with a maximum of ±30 cents. Possibly, these two factors, together with the fact that this version with an unconventional intonational choice was preceded by one that received mixed responses, may justify its positive ratings. However, further research should be conducted in order to reach any proper conclusion, such as conducting a new experiment with possible interviews with

the participants to understand why they the answered the way they did.

Lastly, similar to the version *B*, version *Beats Inverted (BI)* received mixed responses (see graph (c)). This similarity does not feel so unexpected considering that the latter is the inversion of the former. For version *BI*, one participant commented "Somehow, I felt that the soundtrack was not so impactful in this clip".

In short, the OST directed the emotional meaning toward two main groups, VII and IX. Possibly due to emotional charge of the scene, the responses to the several clips were not that different, since we usually gather the majority of emotional meaning from the visuals (Chion, 2019). This made it so that the different intonation choices mainly received mixed results. However, version *CM* stands out with mostly positive ratings.

5.2 METHODOLOGY AND DESIGN

Designing the experiment proved to be a challenging task. In order to properly test if different intonation choices in a soundtrack could be beneficial or not for the emotional character of a film, several variables should be considered, such as different film genres, different intonation choices, different soundtracks, different instrumentation of the soundtrack, among others, and all of these variables should be tested separately. Additionally, since the emotional character of a film is based on the whole narrative, using a simple, out of context, scene should ideally be avoided. However, if an experiment were to be conducted along these lines, it would be extremely long and tiresome for both the participant and the researcher.

Therefore, some compromises had to be made. The films were limited to two genres and only one scene from each film was presented. Each of these two films only had one OST to accompany it, each OST with different instrumentation. Furthermore, the intonation of each OST was only modified three times. These choices already conditioned the experiment tremendously. How could we be sure that the results obtain from one OST would still hold true for another soundtrack for the same scene? Or that the same

OST would produce the same responses in another film? These and other questions were considered when creating the experiment, but had to be set aside due to logistic reasons, since it would be impractical to ensure that all of these questions were accounted for. On top of this, all the intonation choices were different for each clip. This was done with the assumption that a certain choice would be better for one OST than to the other. Yet, the experiment did not test if this assumption was correct or not. There is still a possibility that version *CM* would fit better the OST for *The Man with the Answers* than the one for *The Blair Witch Project*.

All of these choices in the design of the experiment were made with the participants in mind. If the experiment consisted of a lot of variables, with small changes between each clip, then the experiment would be long and dense, making the participants tired and the results less reliable. Even presenting five clips for each film already produce some undesired, but inevitable, effects: for the clips of *The Man with the Answers*, as each clip was played, there were fewer reports of shifting emotions, probably due to the fact that participants were still figuring out the experiment itself; and for *The Blair Witch Project*, some participants reported that the emotion that they felt got weaker each clip they watched. Additionally, the fact that the participants had to fill the questionnaire after watching each clip did not allow them to be fully immersed in the film, which perhaps hindered their emotional reactions. This lack of immersion in the film, together with the repetition of the clips, created a type of familiarity with the film that can lead to internal invalidity in the experiment, such as an increased awareness towards the visual and narrative details. For example, in the clips from *The Man with the Answers*, participants started noticing some ambient sounds ("Noticed animal sounds, not sure if thats because of the experiment or anything new in the clip" and "The nature sounds seemed more present and mixed with music. Previous clip seemed to only have music and voice"), and in the clips from *The Blair Witch Project*, one participant thought that some visuals were added ("A part was added where they get camera and put on clothes").

With some alternative designs of the research, perhaps some limitations could be lifted, while maybe restraining it in another way. For example, the composers could

be instructed to meet the musical cues conventionally associated with specific emotions, in order to better regulate and consider the musical cues employed besides intonation. This design would help narrow down the effects of different intonation choices. Another possible design would be to have the participants always compare the emotion that they felt after watching a clip with modified intonation with the clip with the unaltered OST. This design would, however, require either a longer experiment or less clips with modified intonation, since the participants would have to watch a bigger total number of clips. Lastly, a control group could be implement where the participants would only listen to the clips, without any visual stimuli. This way, the research could test the effects of the concept of added-value.

Another aspect that needs to be considered is the inevitable impact of the researcher. This study was done with the assumption that intonation could affect the audience's emotional reactions to a film, and that possibly conditioned how the questionnaire was written. Perhaps, the questions could have been written in a more broad way that have a lesser influence on the participant. Moreover, the way that certain responses were categorized in the adjective groups of Figure 13 was dependent on the researcher's interpretation of them, which was conditioned by his own understanding of the terms. However, the responses to the open questions were decisive for a better interpretation of what the participants were reporting, as well as for the identification of film music's functions in the experiment. Nevertheless, the description of the process, from the design of the experiment and of the questionnaire to the presentation and interpretation of the results, has been done with the utmost transparency and faithfulness to the participants' reports.

In sum, the experiment design can be considered successful, as it was simple and straightforward, and none of the participants reported any difficulty completing it. Additionally, the data gathered allowed for the discovery of some trends which can be used as a starting point for further research.

6 CONCLUSION

This study aimed at exploring the effects of different intonation choices on audience's emotional reactions to film soundtracks. Even though the results from the conducted experiment suggest some trends, it must be acknowledged that it still possessed some flaws.

Nevertheless, these trends can still be beneficial. In summary, we can see that, as discussed in the literature, the addition of music to a film helps to not only guide the narrative, but also provide a more concrete and higher emotional meaning to the film. As two participants commented "the music helps set the feeling the movie wants you to feel without guessing your emotions. ... [Music] leads you to feel the emotion the creators wanted you to feel", and "The soundtrack changes everything in scene. Some feelings just need that extra to deliver the message of the scene and overall of the movie". Regarding how the intonational changes were received by the participants, they showed a preference for a more beatless intonation for the calmer scene, while preferring an unconventional intonational choice for the scene with an emotional character with higher activity. We can also conclude that the experiment's design suited better the *The Man with the Answers* than for *The Blair Witch Project*. This can be explained by the higher emotional energy that the visuals of the scene from the latter film possessed, which did not allow for alternative emotions to be conveyed, since the emotional meaning communicated by the visuals usually outweighs the one expressed by the audio.

Being aware of how intonation may influence the audience's emotional reactions can be quite beneficial for film composers. With this knowledge, composers can increase their arsenal for achieving a certain mood or provoking a certain emotion with their music. For example, if their goal is to portray an extreme calmness, then, beside designing the melody, the harmony, and all the other musical cues in a way that suits that goal, they can also steer away from 12ET and experiment with Just Intonation. These results also aid in advancing the research on the connection between intonation and emotion, and between

film music and emotion.

However, this study still leaves some questions to be answered, among others: Would these trends continue with a bigger number of participants? Would they differ if the experiment were conducted in a different geographical area, where the communities had different cultural backgrounds? What intonational choice would better suit other film genres, such as comedy, action, or historical films? Thus, in order to reach a more robust conclusion, and a possible theory, of how intonation influences audiences' emotional reactions to films, further research needs to be made, with more and different experiments. Nonetheless, this study hopefully helped filling a small gap in intonation research, and starting a discussion on the interconnection between intonation, film music, and emotions.

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APPENDIX

A - QUESTIONNAIRE

Emotional Reaction to Films' Soundtrack

The aim of the study is to investigate if changing certain aspects of the soundtrack can enhance or weaken the overall emotion felt.

You will be asked to watch several excerpts of films, some with music and some without, and to answer question regarding the emotions that you felt through watching the excerpts.
Please do not think too much about each answer. Simply choose the most instinctive option.

The answers are completely anonymous.

* Required

1. Do you consent to participate in this survey? *

Mark only one oval.

- ◯ Yes
- ◯ No *Skip to question 38*

Background information

2. How old are you? *

3. How many years of musical education have you had? *

Every kind of musical education counts, such as private lessons, formal education, self-taught, etc..

Mark only one oval.

- ◯ 0
- ◯ Just a few classes
- ◯ 1 to 4
- ◯ 5 to 9
- ◯ 10 to 15
- ◯ > 15

4. Would you say that you have "absolute pitch"? *

Definition of absolute pitch: the ability to recognize and produce a pitch, without an external reference.

Mark only one oval.

- ◯ Yes
- ◯ No

5. On a scale from 1 to 5, how often to you listen to Original Soundtracks? *

Music composed specifically for a TV-show, film, or video game, but listen to separately from its intended medium.

Mark only one oval.

- ◯ Never
- ◯ Occasionally
- ◯ Sometimes
- ◯ Often
- ◯ Every day

The Man with the Answers

The clips that you are about to watch are from the film "The Man with the Answers" (2021).
Please choose the most instinctive option.

6. Have you seen this movie before? *

Mark only one oval.

- ◯ Yes
- ◯ No

First clip

7. Which overall emotion did you feel after viewing the clip? (1 to 3 words) *
You may answer in English, in German, in any Romance language or in any Scandinavian language.

_____

The Man with the Answers

Second clip

8. Which overall emotion did you feel WITH the soundtrack? (1 to 3 words) *
You may answer in English, in German, in any Romance language or in any Scandinavian language.

_____

9. Do you wish to add any comments?

_____

_____

_____

_____

_____

The Man with the Answers

Third clip

10. Was the emotion that you felt while watching this clip different from the previous one? *

If you answer "Yes" - skip the question after the next one. If you answer "No" - skip the next question.

Mark only one oval.

- ◯ Yes
- ◯ No

11. If you answered "yes", which emotion did you feel? (1 to 3 words)

You may answer in English, in German, in any Romance language or in any Scandinavian language. If you answered "no" on the previous question, please ignore this one.

_____

12. If you answered "no", did the emotion that you felt get enhanced, weakened or it did not change?

If you answered "yes" on the previous question, please ignore this one.

Mark only one oval.

- ◯ Enhanced
- ◯ Weakened
- ◯ Did not change

13. Did you notice any changes in this clip? If so, please, describe:

_____

_____

_____

_____

_____

The Man with the Answers

Fourth clip

14. Was the emotion that you felt while watching this clip different from the previous one? *

If you answer "Yes" - skip the question after the next one. If you answer "No" - skip the next question.

Mark only one oval.

- ◯ Yes
- ◯ No

15. If you answered "yes", which emotion did you feel? (1 to 3 words)

You may answer in English, in German, in any Romance language or in any Scandinavian language. If you answered "no" on the previous question, please ignore this one.

_____

16. If you answered "no", did the emotion that you felt get enhanced, weakened or it did not change?

If you answered "yes" on the previous question, please ignore this one.

Mark only one oval.

- ◯ Enhanced
- ◯ Weakened
- ◯ Did not change

17. Did you notice any changes in this clip? If so, please, describe:

The Man with the Answers

Fifth clip

18. Was the emotion that you felt while watching this clip different from the previous one? *

If you answer "Yes" - skip the question after the next one. If you answer "No" - skip the next question.

Mark only one oval.

- Yes
- No

19. If you answered "yes", which emotion did you feel? (1 to 3 words)

You may answer in English, in German, in any Romance language or in any Scandinavian language. If you answered "no" on the previous question, please ignore this one.

20. If you answered "no", did the emotion that you felt get enhanced, weakened or it did not change?

If you answered "yes" on the previous question, please ignore this one.

Mark only one oval.

- ◯ Enhanced
- ◯ Weakened
- ◯ Did not change

21. Did you notice any changes in this clip? If so, please, describe:

_____

_____

_____

_____

_____

The Blair Witch Project

The clips that you are about to watch are from the film "The Blair Witch Project" (1999).
Please choose the most instinctive option.

22. Have you seen this movie before? *

Mark only one oval.

- ◯ Yes
- ◯ No

First clip

23. Which overall emotion did you feel after viewing the clip? (1 to 3 words) *

You may answer in English, in German, in any Romance language or in any Scandinavian language.

The Blair Witch Project

Second clip

24. Which overall emotion did you feel WITH the soundtrack? (1 to 3 words) *

You may answer in English, in German, in any Romance language or in any Scandinavian language.

25. Do you wish to add any comments?

The Blair Witch Project

Third clip

26. Was the emotion that you felt while watching this clip different from the previous one? *

If you answer "Yes" - skip the question after the next one. If you answer "No" - skip the next question.

Mark only one oval.

- Yes
- No

27. If you answered "yes", which emotion did you feel? (1 to 3 words)

You may answer in English, in German, in any Romance language or in any Scandinavian language. If you answered "no" on the previous question, please ignore this one.

28. If you answered "no", did the emotion that you felt get enhanced, weakened or it did not change?

If you answered "yes" on the previous question, please ignore this one.

Mark only one oval.

- Enhanced
- Weakened
- Did not change

29. Did you notice any changes in this clip? If so, please, describe:

The Blair Witch Project

Fourth clip

30. Was the emotion that you felt while watching this clip different from the previous one? *

If you answer "Yes" - skip the question after the next one. If you answer "No" - skip the next question.

Mark only one oval.

- Yes
- No

31. If you answered "yes", which emotion did you feel? (1 to 3 words)

You may answer in English, in German, in any Romance language or in any Scandinavian language. If you answered "no" on the previous question, please ignore this one.

32. If you answered "no", did the emotion that you felt get enhanced, weakened or it did not change?

If you answered "yes" on the previous question, please ignore this one.

Mark only one oval.

- Enhanced
- Weakened
- Did not change

33. Did you notice any changes in this clip? If so, please, describe:

The Blair Witch Project

Fifth clip

34. Was the emotion that you felt while watching this clip different from the previous one? *

If you answer "Yes" - skip the question after the next one. If you answer "No" - skip the next question.

Mark only one oval.

- ◯ Yes
- ◯ No

35. If you answered "yes", which emotion did you feel? (1 to 3 words)

You may answer in English, in German, in any Romance language or in any Scandinavian language. If you answered "no" on the previous question, please ignore this one.

_____

36. If you answered "no", did the emotion that you felt get enhanced, weakened or it did not change?

If you answered "yes" on the previous question, please ignore this one.

Mark only one oval.

- ◯ Enhanced
- ◯ Weakened
- ◯ Did not change

37. Did you notice any changes in this clip? If so, please, describe:

_____

_____

_____

_____

_____

The End

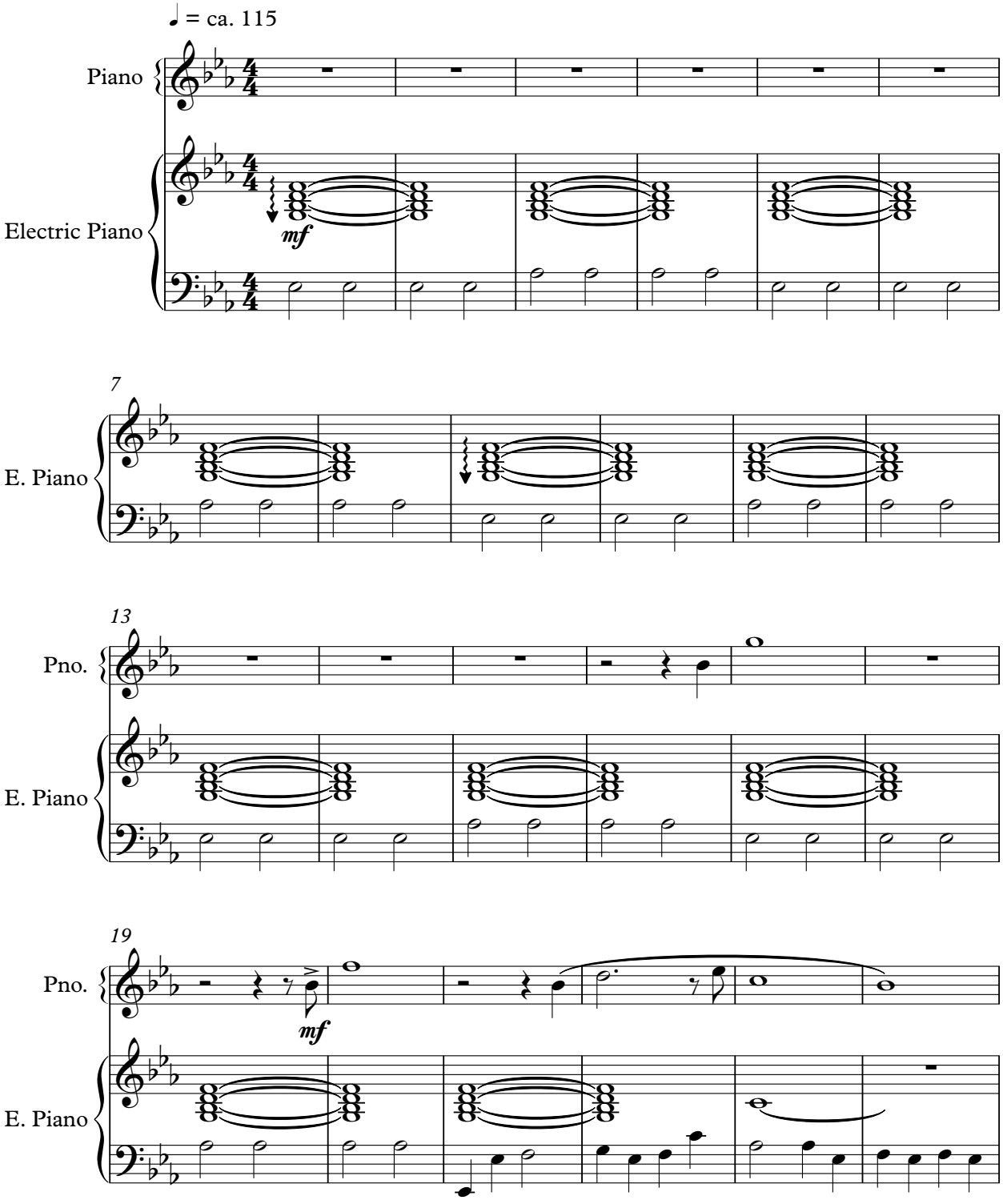
Thank you very much for your help!

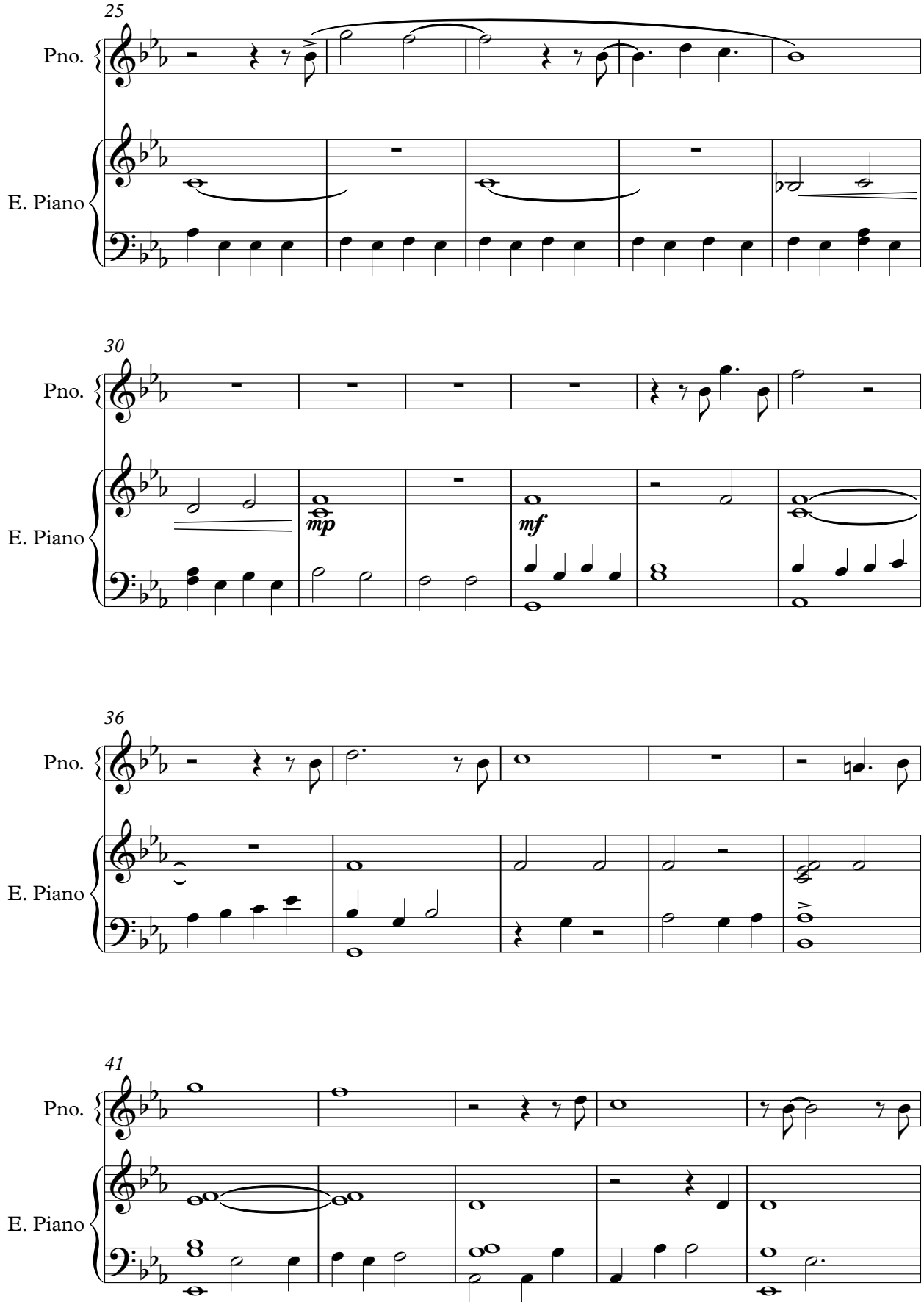
38. Do you have any last comment?

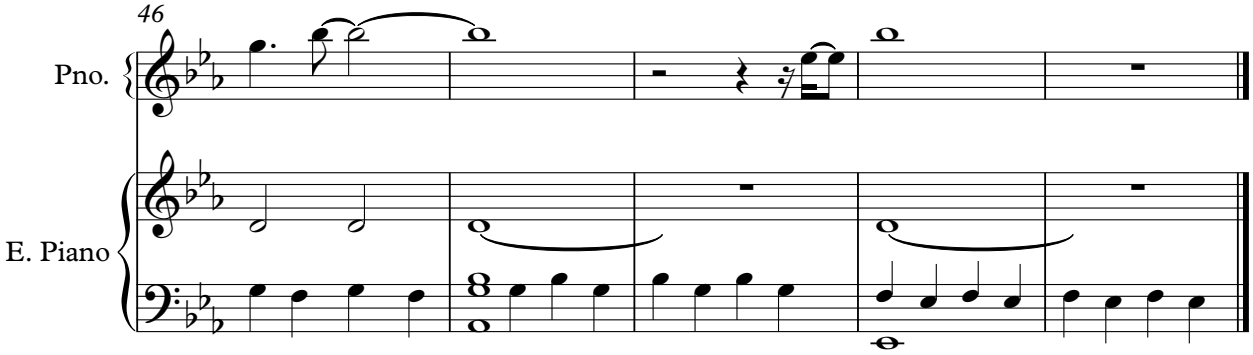
B - Score of the OST for *The Man with the Answers*

The Man with the Answers's OST

Ola Ur Sæbø



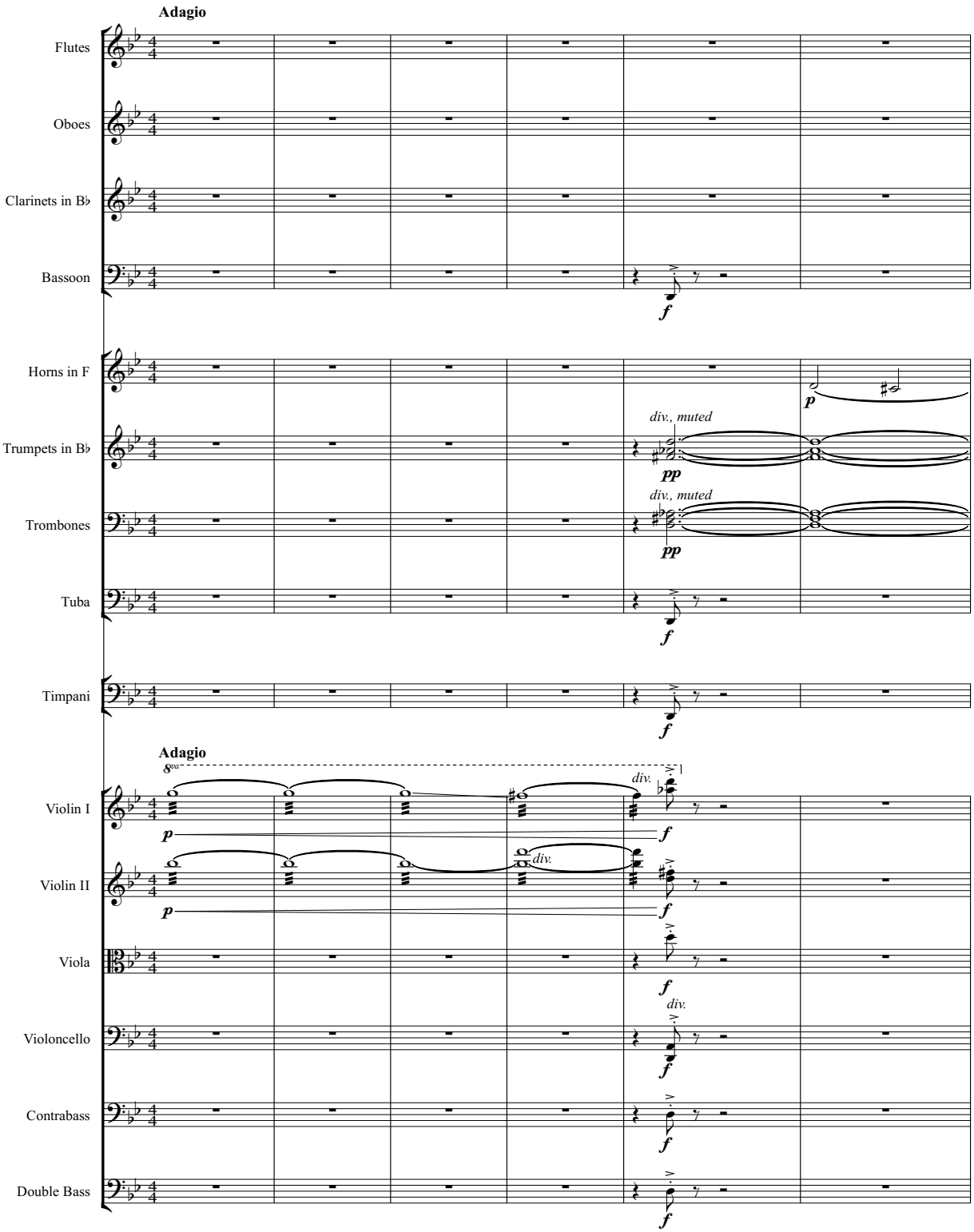

25
Pno.
E. Piano
30
Pno.
E. Piano
mp
mf
36
Pno.
E. Piano
41
Pno.
E. Piano

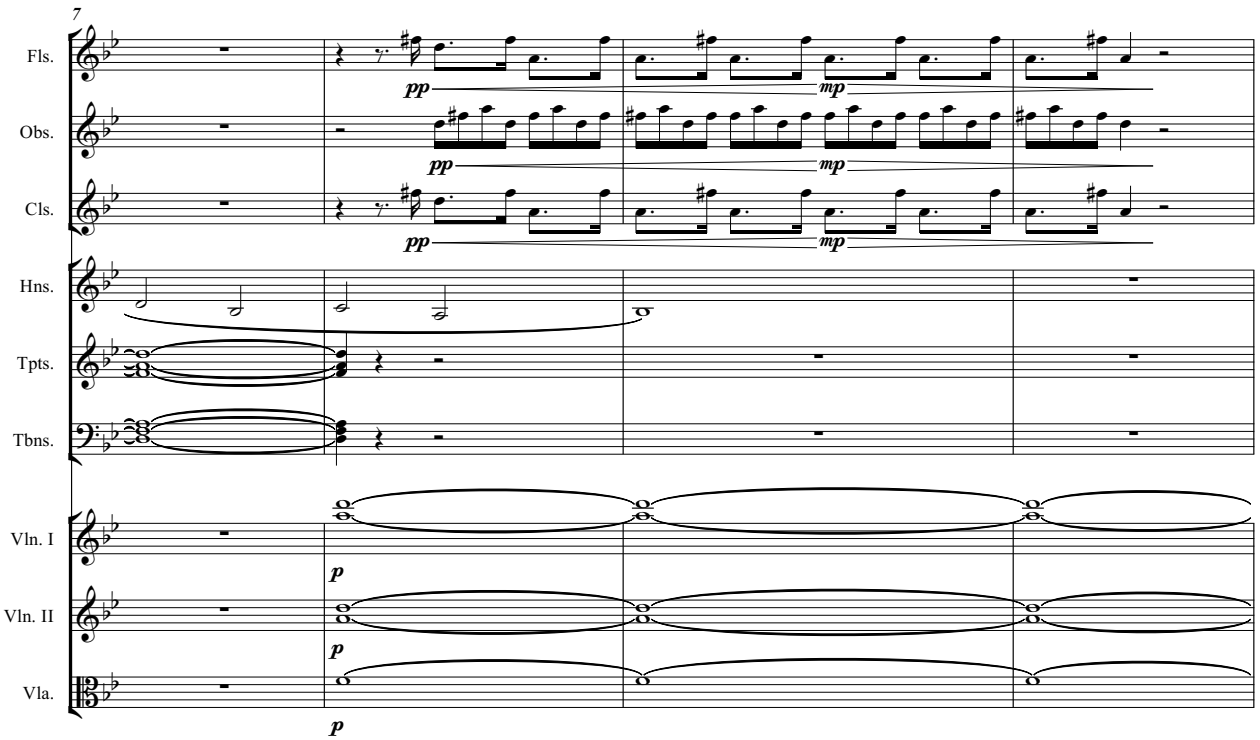

46
Pno.
E. Piano

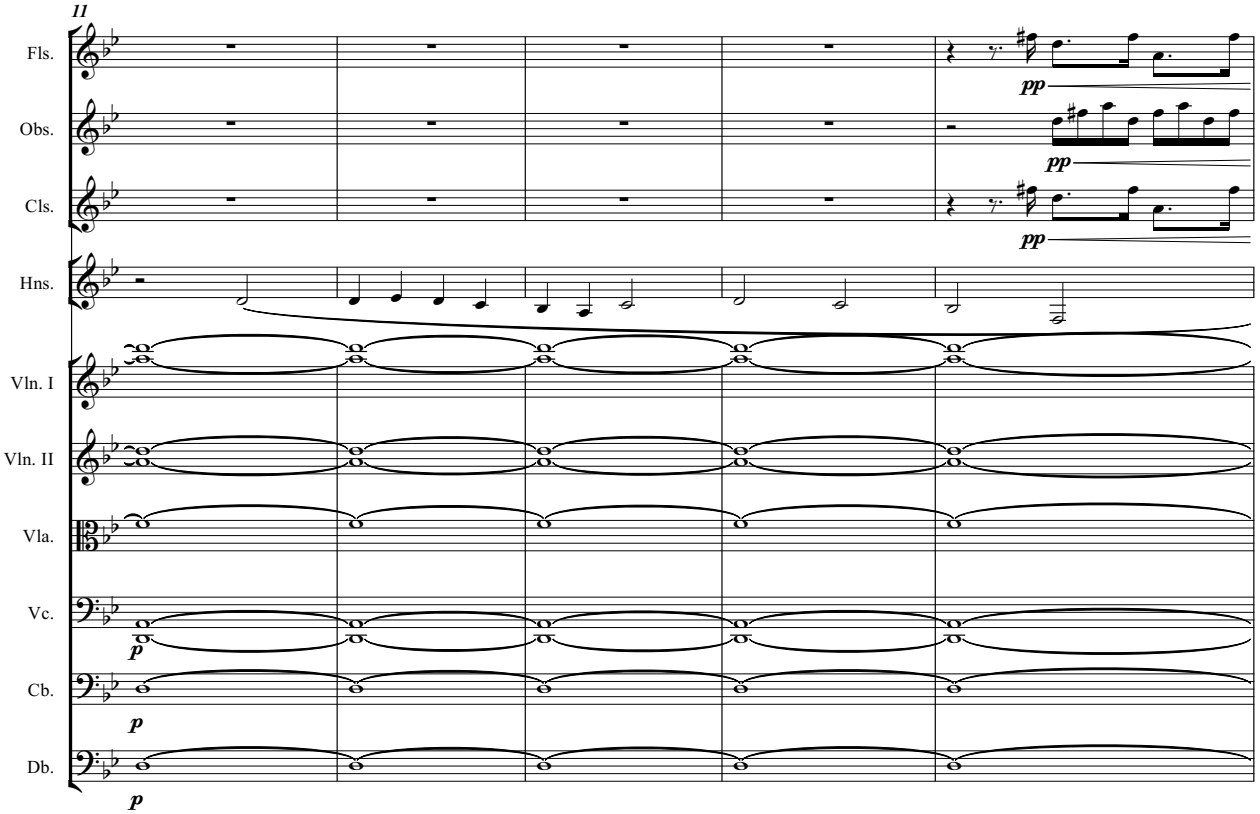
C - Score of the OST for *The Blair Witch Project*

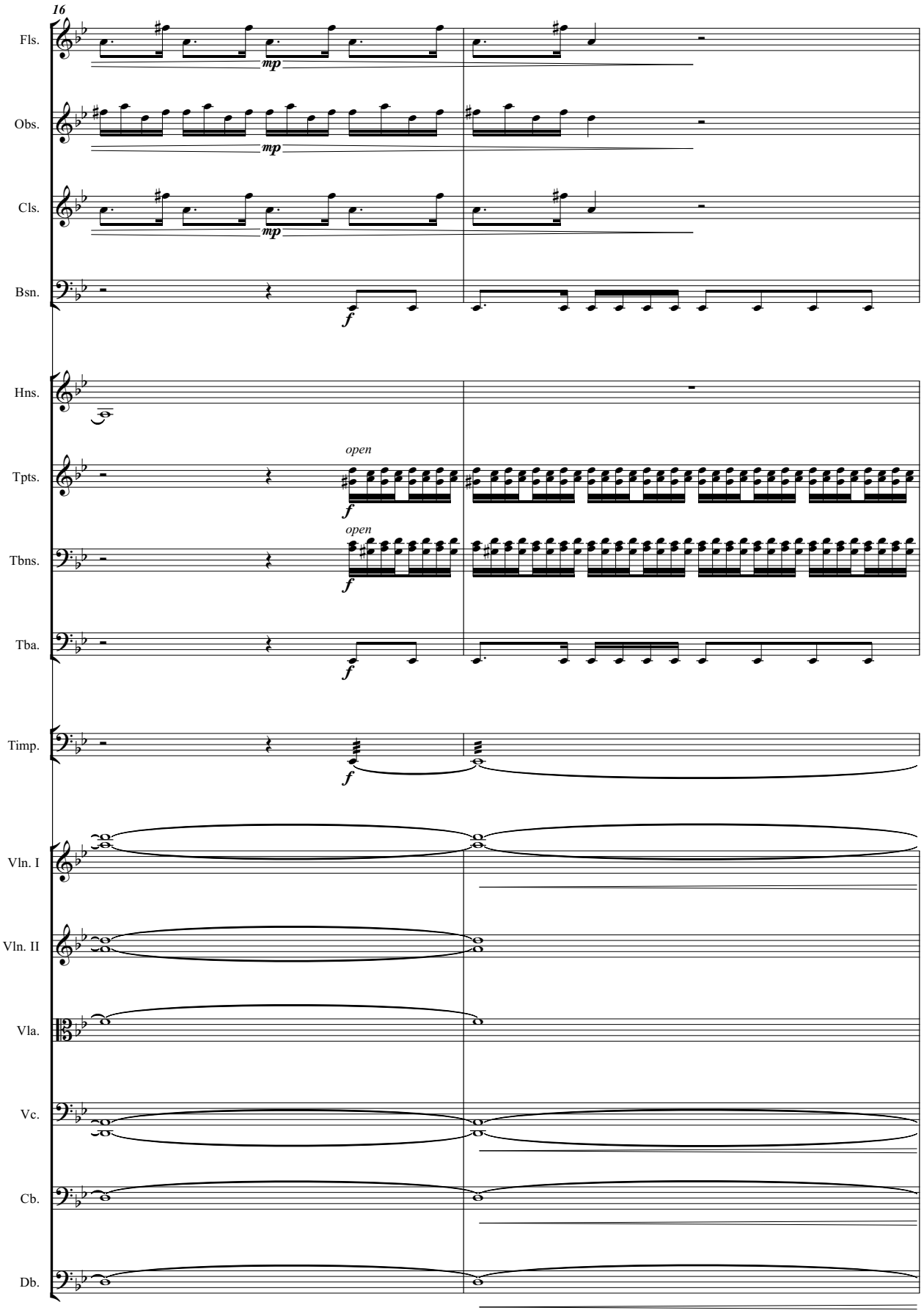
The Blair Witch Project's OST

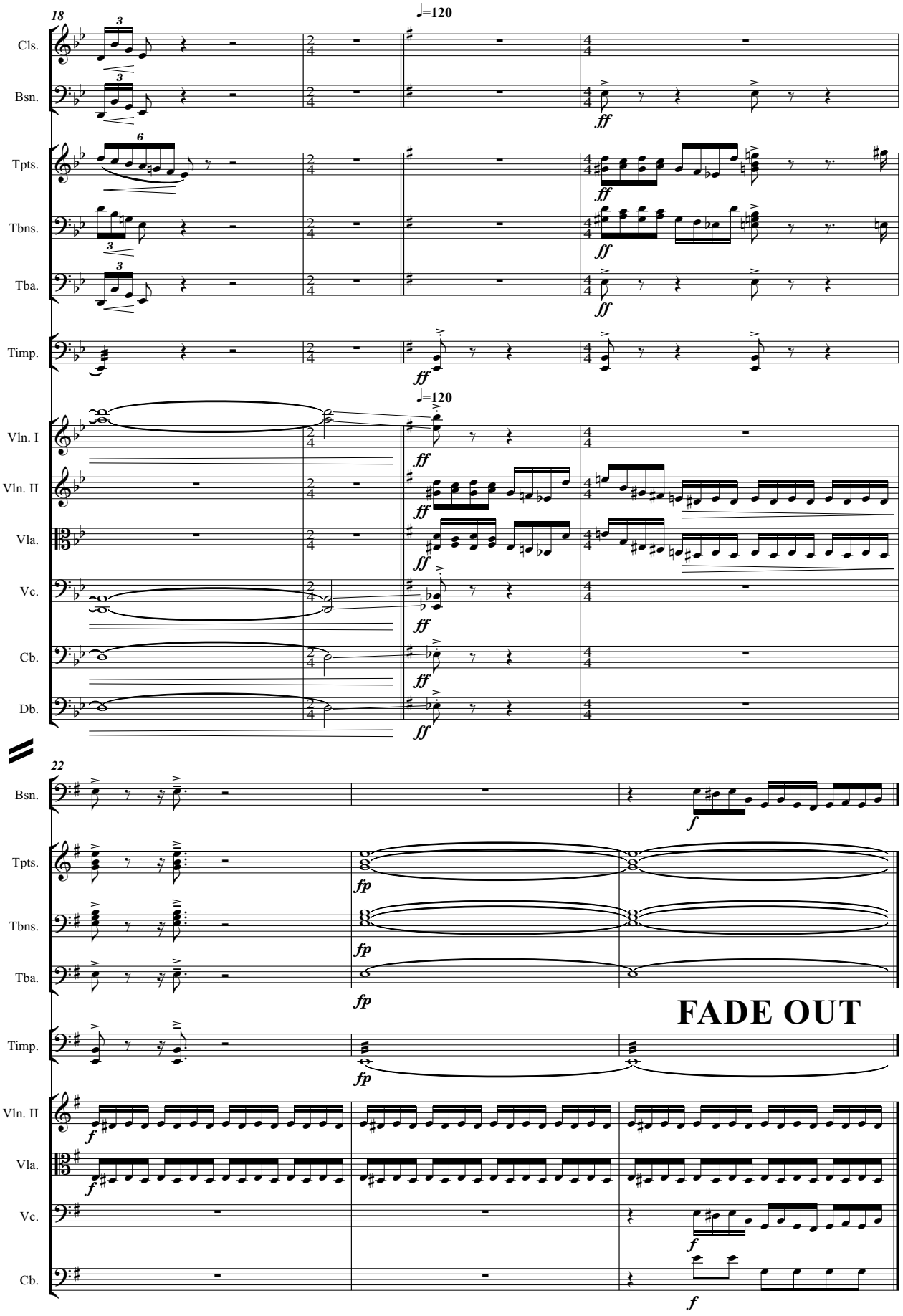
Arian Pedersen




7
Fls.
Obs.
Cls.
Hns.
Tpts.
Tbns.
Vln. I
Vln. II
Vla.
pp
mp
p


11
Fls.
Obs.
Cls.
Hns.
Vln. I
Vln. II
Vla.
Vc.
Cb.
Db.
pp
p


16
Fls.
Obs.
Cls.
Bsn.
Hns.
Tpts.
Tbns.
Tba.
Timp.
Vln. I
Vln. II
Vla.
Vc.
Cb.
Db.
mp
f
open


18
♩=120
Cls.
Bsn.
Tpts.
Tbns.
Tba.
Timp.
Vln. I
Vln. II
Vla.
Vc.
Cb.
Db.
22
FADE OUT

D - Links for the OST and the versions

Playlist with all the videos:

https://www.youtube.com/playlist?list=PLy-lrzcr0zWddlELHK7537r7CA1CdUXzA

OST for *The Man with the Answers*:

https://www.youtube.com/watch?v=BLhgz0G-Y4Q

Version *Just Intonation (JI)* of the OST for *The Man with the Answers*:

https://www.youtube.com/watch?v=GwsNskhSrSg

Version *Everything ♭ (Et ♭)* of the OST for *The Man with the Answers*:

https://www.youtube.com/watch?v=cEe23Duu3h8

Version *Just Intonation + Tempered (JI + T)* of the OST for *The Man with the Answers*:

https://www.youtube.com/watch?v=ZhIUnoZ_cDY

OST for *The Blair Witch Project*:

https://www.youtube.com/watch?v=2AzsAza8c24

Version *Beats (B)* of the OST for *The Blair Witch Project*:

https://www.youtube.com/watch?v=dhbTiw3-zEQ

Version *Compressed Melody (CM)* of the OST for *The Blair Witch Project*:

https://www.youtube.com/watch?v=-E91uA1JFL4

Version *Beats Inverted (BI)* of the OST for *The Blair Witch Project*:

https://www.youtube.com/watch?v=4N2qcsUzRS8