Tampere University of Applied Sciences

Dissecting a Song

The Psychology of Music

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BACHELOR'S THESIS
November 2023

Media and Arts
Music Production

ABSTRACT

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Degree Programme in Media and Arts
Music Production

BACKUS, ZYGIMANTAS:
Dissecting a Song: The Psychology of Music

Bachelor's thesis 52 pages, appendices 1 page
November 2023

The purpose of this study was to provide an overview of the psychological and emotional impact of music on the audience. The study was conducted due to the lack of attention and focus on this field of study in musical education programmes of music schools, conservatories and universities. Primarily, composers, producers, and songwriters, have been considered as the reader. However musicians of all specializations may benefit from the findings presented here.

This thesis investigates the psychological effect of core song components on the human brain. These components include rhythm, harmony, melody, lyrics, and arrangement. The compositional form of song has been chosen because of the inclusiveness of lyrics, in addition to the other common core elements present in musical works. Resources used in this study include books on music psychology, philosophy, songwriting, and composition, as well as articles from scientific journals, related to fields of biology, medicine, neuroscience and psychology.

Study findings show undeniable evidence of emotional and psychological impact of music on listeners. People have an implicit knowledge of music, which is already developed in childhood, formed mostly by mere exposure to music. Such knowledge develops regardless of musical education later in life. Not all findings are valid cross-culturally, as the formation of music perception is culture-specific. However, while all studies, considered in this thesis, provide valuable information, further research is needed to make definitive conclusions. This thesis also contains a media part of two songs, which have been composed to display the possible implementations of the study findings presented, serving as examples.

Key words: music, song, psychology, emotion, music theory

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1 INTRODUCTION

Music is enjoyable. However, why that is, is still a mystery. It seems to affect our emotions and psychology, which interested scholars since ancient times. Aristoxenus, an Aristotelian philosopher of ancient Greece, has been noted to disagree with the Pythagoreans, arguing that musical intervals should be classified by their emotional and psychological effects on listeners, rather than merely in terms of their mathematical ratios (Levitin, Grahn & London 2018). Music has been shown to be ubiquitous in all cultures known throughout the world. Various musical instruments, such as flutes and percussion have been dated as old as 30,000 years. Even cultures that have not been subjected to any outside influence, have music as part of their daily lives. Without any clear links to survival mechanisms or biological needs, music proved to be a conundrum to scientists of many fields, including evolutionary biology, neuropsychology and even musicology. Taking that into consideration, last few decades have seen strides made in answering the many questions associated with the issue of how music affects people.

Bispham (2006) provides a lot of evidence of music being inherently a part of collective mass gatherings, such as ceremonies of all kinds, religious, ritualistic events and many more, giving clues to why people are so fond of dancing, singing and otherwise collectively participating in music. It is suggested that advancements in the arts may have been associated more with advancements in technology over time, rather than with advancement in talent or ability. And as brain scientists started taking an interest into music as a phenomenon of human existence, especially in the late 20th century, possible evidence for this cross-cultural ubiquity of music started to emerge. Research in music by neuroscientists and researchers of other branches alike reveal that music has a deeply engrained function in the biology of human beings, not found in any other species of mammals. The human brain has a dedicated neural circuitry for music perception and reception, and it has been associated to a specific and highly complex brain architecture. Thaut (2005) explains:

> We may suggest that the brain engages in the arts because the arts, including music, create a particular type of sensory input, a specific perceptual language that is necessary for the appropriate regulation

> of arousal and activation states. The brain needs to engage in combining forms of lines and colors, creating horizontal and vertical layers of sounds of different timbres, building physical shapes and movements of the human body in dance, in order to build, sharpen, maintain, and create order in its perceptual machinery as an essential aspect of brain function. – – The purposeful and adaptive connection between perception and movement forms part of the essential core of all of the human brain's mental operations. (Thaut 2005, 25.)

Thaut's (2005) findings of music to be paramount in the brain development of infants and children, regardless of their future involvement in music professionally, adds to the evidence.

Interestingly, music affects human emotion directly, not through a representation of a concept, compared to other art forms, or even language. It is an intangible art, one that is fragile in its existence due to being invariably attached to time, because, in fact, it is sound organized across time, which is the definition of music (Levitin et al. 2018). Listening to music does indeed produce autonomic changes associated with emotional processing. For example, adults report shivers down the spine, laughter, tears, and 'lump in the throat' as some physiological responses to music. (Kaminska & Woolf 2000; Trainor & Schmidt 2003.) In humans, sensitivity to music and the associated expressions appear very early in one's life, without any conscious effort exerted. Synchronization of movement to music is shown in infants even below the age of 2, meaning this process is natural and does not require training of any sort (Levitin et al. 2018). Thaut (2005, 34) mentions research showing neurobiological substrates related to music, which are organised in networks of neurons in the human brain. He then argues that music is a perceptual language based on aesthetics, and that humans engage in music because "we can, because it is a part of our basic brain architecture." (Thaut, 2005.)

It has long been considered that music is a form of communication. That is because both music and speech are based on syntactical systems, which organize sounds and their patterns into structures, according to specific rules. The symbolic meaning, or "message," of a particular piece of music is subject to cultural and environmental circumstances, where a person might "read into" a composition differently, based on his/her particular social context. How we hear music is directly influenced by what we listen to, a particular musical culture that one is a part of, and the listening habits adopted are the determining factors behind how music is perceived by that individual (Huron 2016, VIII). That is because certain emotional and psychological associations that have been engrained into the memory of one culture, might not be a part of another. Zeiner-Henriksen (2010, 124) says that “if we grew up moving to music with a four-to-the-floor bass drum, moving becomes a likely affordance of this kind of music whenever we hear it later on”, noting, however, that under the opposite circumstances “this music may be meaningless or even annoying”. Abel (2014, 129) adds to the discussion by talking about the importance of coming to conclusions at regular intervals in musical phrasing, stating that it makes more sense to the brain when musical phrases are mimicking human speech, where the speaker must take a breath once every so often to continue speaking, which implies calculated choice of words between inevitable pauses to maximize meaning. (Thaut 2005.) The meaning in music seems to be that of an emotional experience and the search for it is apparently due to physiological arousal:

> Cognitive processing of stimulus information involves prediction of forthcoming events on the basis of existing evidence, and the interruption of a predicted pattern by an unexpected event raises levels of neural arousal, which in turn triggers a search for meaning. (Kaminska & Woolf 2000.)

Some scientists hypothesize that the origin of music has other social reasons, such as mate selection, coordination of group work, auditory development, motor coordination refinement or even story preservation of tribal origin, while some others provide compelling evidence for the idea that even Neanderthals had proto-musical ability, suggesting that the commonly associated link between music and language, could be the primordial “Hmmmm”. In other words, the communicative aspect of music might have started with primal hums, cries, and shouts, including various voice inflections, before language was developed. Hence the direct connection to emotion – if the shout or cry is to alert of danger, one needs to react quickly, and emotions are a much faster acting mechanism than thought. (Perlovsky 2010.) This is a hypothesis that scholars have investigated with varying results (Cook & Fujisawa 2006). One example is the link between melodic contour and voice inflection in particular context. When asking a question, the pitch contour in the human voice tends to go up towards the end of the sentence, creating tension and demanding resolve by an answer. The same is observed in melodic contour of music, where pitch proceeding upward indicates tension, whereas a melodic line descending in pitch commonly signifies an end or a closing to a phrase. In music composition, in fact, a concept of “question and answer” does exist. Some sounds are inherently pleasant, such as a birdsong, or unpleasant, like the sound of a buzz saw. This can be linked to harmonicity and inharmonicity of a sound, as well as the difference between tonal and atonal. For example, a singer might put one’s mind at ease with a clear tone of the voice, while the complex texture of a bear’s growl is a clear signal of danger, therefore creating tension. (Jackendoff & Lerdahl 2006.) This suggests that at some point music and language was one and the same, which many scientists agree with. However, while language was developing in a direction of conceptual differentiation ability, attaching concepts to words for easier and more precise communication, as well as not being associated as much with emotions, the other half of human communication evolved the other way, having more emotional directivity and not being as conceptual, precise, or even comprehensible at all, beyond pure emotion. (Perlovsky 2010.) Connecting these two parts, one conceptual and one emotional, may provide a powerful mix, which then would help explain the popularity of musical genres, containing vocals and singing. Vocal music is at the top of the list, when it comes to popularity, and one is hard-pressed to find popular music that is not written in some form of song.

It is no secret that popular music, be it in the genre of rap, country, or mainstream pop, is most of the time in the form of a song. There may be many reasons for this, however it is important to note that human voice always commands more attention than any other instrument (Huron 2016, 116). Even infants have been shown to be sensitive to musical structures in human voice (Perlovsky 2010). The timbre of a human voice stands out to the audience, even without any lyrics sung. Instrumental music and vocal music have mostly the same core components, apart from the added lyrical component in vocal music. Wanting to delve as much as possible into the psychology of music, one would be remiss not to include all possible components into the research. And due to many professionals devising the same core components of the song, namely rhythm, harmony, melody, lyrics and form (Perricone 2000, 110; Kachulis 2005; Julien & Levaux 2018, 148), I wanted to investigate each of these core elements separately in terms of their psychological effect on people, so that a deep understanding of how each of them contribute to the sum of musical composition would be developed.

Music can only communicate meaning through previous association of meaning to specific patterns and structures in music. Knowing this, it is of utmost importance to have devised the syntactical elements that are used to create the potentially meaningful sound patterns. And according to most scholars and artists, rhythm is one of the two main pillars of musical syntax, the other one being polyphony. Both rhythm and polyphony are responsible for organising sounds horizontally and vertically, sequentially and simultaneously, respectively, into meaningful patterns that can then be interpreted by the human brain as language. However, distinctly from speech, rather than being an associative or referential language, music is a perceptual language, where the meaning of the symbols depends on other symbols in the interplay of patterns of sounds. And in this context rhythm and polyphony become the paramount elements of structure for meaningful organisation of patterns and sounds. (Thaut 2005.) Therefore, my investigation starts with rhythm and harmony (polyphony). A delve into melody follows soon after, and lyrics and form are explored next.

The reason and the purpose of this research was the noted lack of educational focus in music schools, conservatories and university degree programs on the topic of music psychology. Music theory, philosophy, analysis of renowned works of the past and mastery of instruments seem to predominate the curriculums, while many graduates, working in the industry, stay uninformed about the psychological and emotional implications of their craft. I believe this research, based on scientific evidence, will shine the much-needed light on the impact of our profession on the audience and help explain why the world of music is the way it is today. This thesis was written for and aimed specifically at professionals and students of music, who are responsible for compositional decisions in the making of a musical work, such as composers, producers and songwriters. However, I believe that people specializing in any branch of music will benefit greatly from the information presented and will walk away with a stronger and better understanding of their craft.

2 STRUCTURAL ANALYSIS

2.1. Rhythm

In music, rhythm is used to establish a sense of time, which is different from the general sense of time of the human being's existence in the real world. For a piece of music to have coherency and be immersive for the listener, rather than to be interpreted as sonic chaos or simply noise, a new virtual universe must be created, where a listener could then exist in by his/her living experience for the duration of the composition. And therefore, a new sense of time in that virtual universe must be established, otherwise there would be no space for individual sounds to exist. Which means that the use of rhythm in this case is to create space for sounding events. The word "space" in this case is not used in a physical sense, rather in a sense of timeline, on which the sounds can be placed at precise points. After establishing "space" for the sounding events, rhythm can have a secondary role – as a time-keeping mechanism. In other words, a clock, by which the sounding events would be organised in that space to have measurable distances from one another, for the purpose of coherency. These distances can be even or uneven, producing different results perceptually for the potential listener. However, it must be stressed here that, according to Abel (2014), rhythm is not necessarily metrical or even. When a sense of time has been established, measurability between sounding events will not be a problem, however an objective meter, tempo, pulse, and periodicity between events is not a necessary part of the established rhythm, only a possible one. (Abel 2014.)

In modern popular music, especially in today's songs, rhythm has two main elements of purpose, when discussing symbolic meaning in music. Firstly, discernible organisation and distribution of sound events allows for better and easier perception of periodicity by the human brain. In Gestalt psychology and in the neuroscience of perception, the human brain has been shown to have an innate drive for search of structures and patterns. This is because after putting all the patterns together, like a puzzle out of individual pieces, which in this case are recognisable patterns, the human brain builds a gestalt global structure, from which a meaning could be extracted. Secondly, if rhythmic patterns are used in a cyclical or periodical fashion, then predictability and anticipation can be created in the brain, which can have strong psychological effects on arousal and excitement in the brain. Arousal, as explained by Thaut (2005):

> ...is a term referring to multiple processes in the nervous system relating states of heightened physiological activity expressed, for example, in the autonomic nervous system (e.g., heart rate, blood pressure), neuroendocrine system (e.g., hormones), or central nervous system (muscle activation, brain waves, sensory perception channels, increased activation in brain regions mediating attention, executive functions, motor control). The term "activation" refers to behavior states associated with physiological arousal states. (Thaut 2005, 20.)

That is especially true, when, after recognisable patterns have been identified and etched into memory, temporary violations to periodicity in compositional structure of music are introduced. For example, if an unexpected cadence is placed where a resolution to a period was thought to happen. This, however, means that memory must be involved in the process of consuming music, otherwise patterns, even if recognised, will not have any emotional or psychological impact when violated. In essence, in music communicating its sonic shapes and patterns lies the pleasurable experience of music listening, when the syntax of said shapes and patterns is recognised and comprehended. (Thaut 2005, 5, 6, 114.)

An interesting finding by Thaut (2005, 7), suggesting further evidence on the biological nature of music, is that "periodicities of rhythms would be determined not by the measurement of discontinuous time elements", in other words, not by conceptual clocks or pulse counters in the human brain, but by "categorical entrainment of interval-based time modules, coded in the neural firing rates of the auditory system and projected into other resonant brain tissue." Expanding further, Thaut (2005) argues that:

> Based on the evidence for periodicity entrainment and discrimination, however, it follows that the perception of rhythms is not an event-based process, but an interval period-based process, with pulses simply serving as event markers demarcating rhythmic intervals. (Thaut 2005, 7.)

This explains why time-bending performance techniques, such as **rubato** (played freely with slight disregard of strict tempo) or **accelerando** (gradual increase of tempo), when employed, do not negatively impact the ability to follow time for the listener.

Knowing that, we must also establish the definition of pulse, which is a term used commonly in discourse on music, when rhythm is the topic. Pulse, in music, is a series of **perceived** time points which are equal in distance of time between each other. Each point in time of a pulse is called a "beat." It serves to divide the flow of time into equal intervals. From pulse, we can devise tempo, which signifies the amount of time-distance between each beat, in other words, the size of the gap between recuring points. This then makes the pulse appear as fast or slow, comparatively. Generally, across cultures, slow tempos have been shown to be associated with sadness and reflection, while fast tempos were associated with happiness and movement – a distinction successfully made even by children as young as 5 years of age (Levitin et al. 2018). Similar findings appear in Kratus's (1993) study. In modern popular music, tempi vary from 60 to 150 beats per minute (bpm, for short). That is because these tempi have been found to be the most optimal for the human brain to perceive them as pulses. Tempi beyond the boundaries of 30-300bpm have been found to be perceived as subdivisions of other pulses, rather than appearing as the main pulse by which one would count beats. I intentionally stated that pulse is **perceived**, which does not necessarily mean **heard**. Pulse is not usually a sonic occurrence in music, rather it is calculated from the rhythmic patterns that **are heard** and counted internally. Some forms of modern jazz music are known to be rhythmically complex, however the musicians playing it are trained to develop and keep a strict internal pulse counting mechanism to be able to play together. This is what allows the brain to keep the pulse even when the patterns are violated, for example with a long pause, before resuming with the composition. (Thaut 2005, 9.)

But, as mentioned before, since the brain is counting time not with individual beats, rather with chunks of beats compiled into patterns, we must establish how traditionally these beat patterns are measured and understood. In musical notation, as well as in the basic understanding of structure in music, a system of note/beat length is used for dividing time. A whole note is the longest unit. The whole note split in half becomes 2 half notes. Likewise, 2 half notes split in half become 4 quarter notes, those divided in half become 8 eighth notes and so on. A measure (or “bar”) contains a predetermined number of notes, depending on their temporal value, which is to say, it contains a limited amount of time to be dedicated to sound events, after which another measure must start and take its place. This is the essence of cyclicality of musical time, and the recuring pattern of beats (pulses) is what defines the meter (Levitin et al. 2018). Typically, in modern popular music, a composition has the meter of 4/4. It means that there are 4 quarter notes available in one measure. 2/4 time means there are 2 quarter notes of available space, equal to both one half note and 4 eighth notes. Tempo is usually indicated by how long a quarter note lasts, before the next quarter note must sound, measured, as mentioned before, in beats per minute, which means how many beats fit into one minute, or when quarter note is used – how many quarter notes, with equal distance in between them, fit into one minute. A quarter note every second will result in 60 beats per minute, for example. The most prominent element of dance music is the infamous “four-on-the-floor" drum beat. In a measure of 4/4 meter, this would be the bass drum hitting all 4 quarter notes, before moving on to another measure of the same length and hitting all four again, creating a sense of infinite periodicity. But how can the brain distinguish the cycles and patterns in this drum beat if each measure is the same as the last one, with all notes being of equal length, creating a never-ending series of hits? This is where cyclicality needs to be discussed.

If we look at a cycle of a sinusoidal waveform (FIGURE 1), the purest of all sound waves, we can see that there is first a peak and then a dip, before returning to the starting position and another cycle starts.

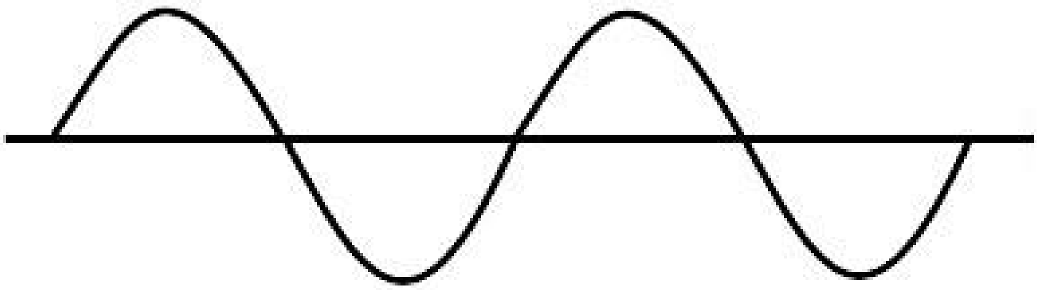

FIGURE 1. 2 cycles of a sine wave.

In essence, there are two movements, one is up, the other one down, effectively creating a cycle. Breathing could be looked at is the same way: inhale – exhale, repeat. Walking is also very similar: one foot forward – another one forward, repeat. In fact, Fitch (2016) argues that the most common meters in music, such as 4/4 and 2/4, come from and are based on this inherent cyclicity of movement. He goes on to illustrate how walking is essentially a 2/2 meter, but when subdivided, inclusive of the action of lifting each foot and then stepping down, becomes 4/4, referring to South American street dances, such as samba, which can be danced by basically walking in place. In this case, as an example, the movement would look like this: left foot down – right foot up – right foot down – left foot up. This pattern could now be analysed in a manner, where beats 1 and 3 would be the common downbeats and beats 2 and 4 – the upbeats. (Fitch 2016.) However, as these biological actions are not necessarily equally divided in time, such as limping could be in the case of walking with an injured leg, they are still rhythmical, even if irregular (Abel 2014, 94). This, however, as will be explored in the section on “groove,” provides difficulty for motor synchronization, based on expectations. But the evidence above suggests inherent cyclicality in nature, in turn suggesting innate fondness for the brain to divide and comprehend rhythm is cycles and patterns. Abel (2014, 50) adds to this by stating that meter is understood better as an oscillation (1 – 2, 1 – 2), where the 2 is “away from one”, rather than the 2 being a “weak” beat, while the 1 is “strong”. In other words, defining beats in terms of strong and weak, is not as accurate in terms of brain perception, as defining them merely as 1 **and** 2, to be able to create a perceptible cycle. The concept of strong and weak beats, however, play an important role in harmonic and melodic movements, which will be explored later.

2.1.1 Groove

When discussing rhythm, or music overall, almost invariably arise the associations with dance. Music and dance are as closely related in many cultures around the world as two artforms can be, and it has been shown that the degree to which a listener feels compelled to move to music is proportional to how much he/she enjoys that music (Witek et al. 2014). In certain languages, there is only one word for both music and dance, they are not separated as concepts (Levitin et al. 2018), as in the case of the Greek “mousike” for example (Fitch 2016). Research in neuroscience displays a strong link between sensory perception of music and the activation of motor neurons in the brain, courtesy of our sensorimotor system (Levitin et al. 2018). In fact, Thaut (2005, 48) suggests that rhythmic information, after decoding in the auditory system, could be projected directly onto the motor tissue, resulting in motor neuron activity. He states that “the neuronal activation patterns that precisely code the perception of rhythm in the auditory system spread into adjacent motor areas and activate the firing patterns of motor tissue” (Thaut 2005, 58). Among other things, this could link to music being significant in evolutionary adaptation, as well as possibly explain why almost every culture have their unique work songs (which are traditionally sung while doing physical chores), war songs (traditionally sung while marching into battle or in preparation for one), and, naturally, songs to dance to, all involving movement to be coordinated with the rhythm of the music. From the perspective of history, the phenomenon of concert music, where the audience is seated and their movement limited, is a relatively novel way of experiencing music, only being a few hundred years old (Ogden, Ogden & Long 2011). Even people, afflicted with stroke or Parkinson’s disease have been shown to have a facilitated recovery when music therapy is used, because of the motor neuron entrainment arising from the engagement in rhythm of the music (Thaut 2005, 115).

One concept that is associated with the danceability of rhythm is groove. Groove is a particularly ambiguous term among musicians, not everyone understands and interprets it in the same way, however everyone agrees that it makes the listener feel good and compels to move one’s body to the music (Levitin et al. 2018). Abel (2014, 1) defines groove as “syncopated music with a prominent, regular beat”. There has been sizeable research done on this concept as well. When discussing groove and danceability, timing becomes crucial. For example, musicians, in the context of groove, display an extreme sensitivity to timing – a few milliseconds could make or break the sense of groove (Danielsen 2010, 9). In groove music, tempo usually falls between 100 and 130 beats per minute (Levitin et al. 2018), and as it usually remains constant and unfluctuating, musicians extract different flavours of groove by adjusting their timing of note onsets against the main metric pulse. Delivering a percussive hit or a note early or late, comparatively to the beat and from the standpoint of the basic pulse, musicians violate the expected landing point of the sound event in the listener's brain, creating arousal and excitement, as we have discussed before. Taken to the extreme, when violation becomes constant and predictability becomes impossible for the listener, another sense of groove emerges, dubbed by its pioneers, the “drunken” groove, popularized by D’Angelo, The Roots and many other 90’s Neo-Soul acts. However, to understand why an extremely unstable rhythmical base can still be musically valid and enjoyable, a deeper look must be taken at how neuron entrainment and motor synchronisation works. (Danielsen 2010.)

Firstly, it must be mentioned that the large majority of dance traditions around the world are formed on the basis of entrainment and synchronisation to an external rhythmic stimulus, even if it is totally possible to dance to music without any discernible rhythmic periodicity or pulse, such as in contemporary choreographed dance or some of the ceremonial classical dance traditions (Clarke 2010, 108). Carlsen & Witek (2010) defines entrainment as “a process by which one periodicity adapts to another, usually after a perturbation has occurred, while synchronization, or near-synchronization, is the result of this process.” In other words, it is possible to have synchronisation while not having entrainment. How this works in the human brain is “as though an oscillator inside us, exposed to the temporal pattern of some other external oscillator, entrains to and synchronizes with this oscillator” (Carlsen & Witek 2010, 54). This means that when hearing external rhythm, the brain entrains and synchronises with said rhythm, developing expectations, for when the next beat will arrive after the previous beat, essentially becoming phase locked. Levitin et al. (2018) state that phase-locking is what allows musicians to recover from errors without losing the sense of pulse and to keep track of multiple musical events simultaneously.

It is quite usual for the brain to look for percussive elements when looking for cues of rhythm. This is because the main proponents of strong rhythmic foundation in modern popular music are percussion instruments, especially the bass drum (Zeiner-Henriksen 2010, 121). In fact, disco producer Georgio Moroder has said, in regards to Donna Summer’s 1975 release “Love to Love You Baby”, that the bass drum was lifted in level to dominate the overall balance of the instruments, noting that the four-on-the-floor bass drum pattern gives dancers the least ambiguity in regards to the basic pulse of the music by being steady, not shifting in time, each beat always delivered when expected. In other words, making it intentionally as easy as possible to synchronize and as inviting as possible to move to the music. (Zeiner-Henriksen 2010, 122.) This is however not necessarily the case outside modern popular music. For instance, in pols/springar styles of Scandinavian folk music, the melody is the main carrier of rhythm, and the musicians keep the melody as their primary external rhythm source for synchronisation. Johansson (2010) explains that for the musicians performing this style of music, the “melody, not the accompaniment, provides the rhythmic reference on which all rely. The accompaniment instead accommodates different ways of articulating this melodic rhythm.” He also mentions that the ability to minimize asynchrony between several musicians in performance might not be as much due to the skill in synchrony, as it is due to the ability to share similar mental structures of the music they are playing. (Johansson 2010, 80-81.) Abel (2014, 25) adds to this discussion by stating that it “is possible for music to be metrical without the presence of a measured pulse, in the way that poetry is metrical”, meaning that the length of notes, while perfectly measurable, do not fall within equal or expected distances from one another, as they would when adhering to a pulse. One phenomenon linked to this is called “free rhythm,” which is observed to be a part of the Islamic “call to prayer” or the Gregorian plainchants (Abel 2014, 25).

Another interesting and important suggestion to the discussion on rhythm perception is made by Danielsen (2010), where in addition to the time point of a single beat being an exact demarcation in time, it can also have duration. This means that depending on the listener’s rhythmic tolerance, a beat can land in the exact mathematically expected point in time, but also thereabouts, without disrupting the global pulse. Carlsen & Witek (2010) calls this the “pulse region”. A hypothesis based on this then can be made that to be able to keep the synchrony of the internal pulse with the external pulse without having to resynchronise at every miniscule micro-temporal deviation from expectation, the brain develops a pulse region, in which a certain tolerance for temporal deviation is allowed, before disturbing the synchrony. This might help explain the slight out-of-sync manner of playing found in the many South American dance music styles and the African diasporic rhythms, where the rhythmic accents are intentionally delayed, or played around the beat. (Chor 2010, 50.) As explained by Carlsen & Witek (2010):

> In accordance with dynamic attending theory, this is then a situation where the pulse in an overarching oscillation actually widens beyond a single point of attack, and the perceiver attends to these pulse regions via a broadened attentional span (and a lowered attentional focus). (Carlsen & Witek 2010, 52.)

However, findings by Senn, Kilchenmann, von Georgi & Bullerjahn (2016) clearly state that for both musicians and non-musicians, grooves rate highest when micro timing deviations are not present or at least present up to a point. They have found that both quantized and well-performed (by humans) rhythms rate objectively higher, than rhythms where micro-temporal deviations were present. Therefore, the common belief amongst musicians that groove needs to have a “human element” to it (meaning natural deviations from the metronomic time and basic pulse), and that quantization removes all qualities of groove from rhythm, were proven wrong and not supported by this study. (Senn et al. 2016.) Moreover, “regularity, indicated by steady tempo, is important for emotional effect in popular music” (Beveridge & Knox 2018).

2.1.2 Syncopation

One particularly prominent part of groove music and, therefore, rhythm in general, is syncopation. Abel (2014, 32) defines syncopation as “the deliberate misalignment of emphasised notes in a musical part with the underlying pulse of the music”, meaning that a normal musical accent is intentionally displaced from a strong beat to a weak one, from beat 1 to beat 2 or simply from an expected point in the timeline to an unexpected point. This violation of expectation of a listener makes the listening process more involving and engaging for the brain, active instead of passive (Levitin et al. 2018). They explain that:

> Syncopation most typically occurs in 4-beat meters in which the beats are divided into eighth-note duplets. In this example, the integers represent the beats proper (the first eighth note of each duplet), and the word and represents the offbeat position (the second eighth note of each duplet): 1 and 2 and 3 and 4 and etc. A syncopation occurs when a note is articulated on one of the ands and is then held through the following eighth note. The characteristic bump one feels from syncopation occurs because the listener fills in the missing beat – –. Amounts of syncopation vary, but too much syncopation effaces the sense of beat, essentially creating an unsyncopated rhythm that has been phase shifted. Moderate amounts of syncopation result in the highest groove responses. (Levitin et al. 2018.)

However, for syncopation to work as intended, which is usually to violate the expectation of a listener, there must be an established powerful sense of a basic pulse beforehand. Therefore, syncopation requires both the rhythmical accentuation of the basic pulse and the accentuation of the contradiction to the basic pulse (Abel 2014, 32).

In their research, Witek et al. (2014) found that it is neither **no syncopation**, nor **all syncopation**, that has the best results of inviting to dance in humans, rather there is a sweet spot beyond which entrainment and synchronization becomes too difficult for the brain, and below which there is not enough incentive to entrain at all. They noticed that the most incentive to dance is achieved by having a medium amount of syncopation, while after having entrained and synchronized to the music, people generally prefer the lower end of the spectrum of syncopation to be present, rather than higher (Witek et al. 2014).

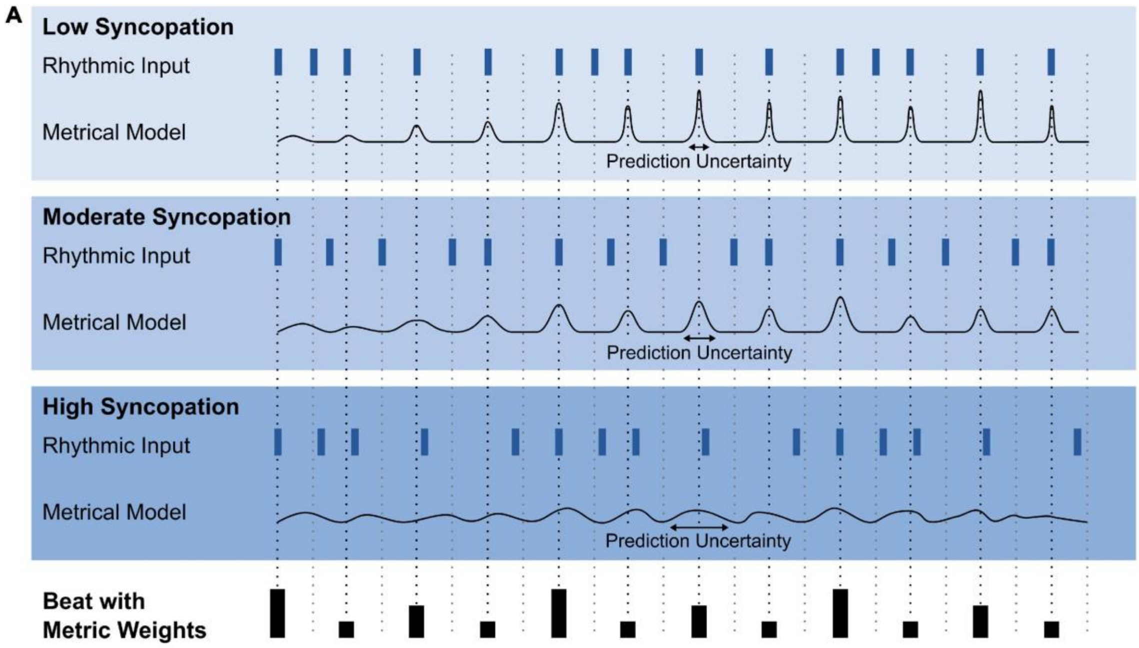

FIGURE 2. Low, moderate, and high levels of syncopation. Stupacher, Matthews, Pando-Naude, Foster Vander Elst & Vuust (2022).

Surprisingly, this is true for both trained dancers and untrained people, while also being true for dancers of different genres, such as ballet and hip-hop (Cameron, Caldarone, Psaris, Carrillo & Trainor 2023). The same findings resulted from Stupacher et al. (2022) study, where they argue that "the sweet spot of the groove experience – – is commonly found in rhythmic patterns that are simple enough for us to interpret and predict, but complex enough to keep us challenged and engaged".

2.2. Harmony

Harmony, in music, refers to a system of generating several pitches simultaneously into a "chord" and then organizing multiple chords in a sequence (Schellenberg et al. 2005). Whereas a melody would have a musician play several notes in succession of one another, harmony on the other hand means that a musician plays several notes at the same time. Before delving into the psychology of harmony, a basic understanding of how harmony works in Western music must be established.

A chord is defined by having 3 or more simultaneously sounding notes. If it has 2, it is called an interval (a “dyad”). If it has 3 notes, it is called a “triad” and is considered a chord. How many notes a chord can have beyond the number 3 is indefinite, but the distinction between 2 and 3 is made clear in the literature of music theory. In modern Western music, the system of tonality is organized by having equal distances between predetermined pitches, called notes. This is called the equal temperament system. These distances are measured to be 100 cents between each note, which equals 1 semitone. There are 12 semitones before reaching the same note that was started on, only twice higher or lower in pitch, depending on the direction. (Tramo, Cariani, Delgutte & Braida 2001.) If one plays the note A4, which has the frequency of 440 Hertz, on a piano, one will have 12 keys (including the black and the white) before reaching A5 (counting upward in pitch), which will have the frequency of 880 Hertz. This is called a chromatic scale, essentially containing all the possible notes (in Western music) within that octave. Octave, using our example, simply means the distance between the low A4 and the high A5. If the A4 and A5 will be played simultaneously, this will now be considered an octave interval. However, even if chromatic scale has all the possible notes, some combinations of those notes sound better than others. Hence, scales – combinations of notes, reduced in number – have been devised. For the purposes of this brief introduction, the major scale is used as an example. It has only 7 notes before reaching the octave, which means that, compared to the chromatic scale, some notes were omitted. The scale in music also has its own hierarchy:

> The in-key notes (i.e. those from the scale) also form a hierarchy, with some notes more stable than others and better suited to end musical phrases. For example, notes that belong to the C major chord (C, E and G) are particularly stable in the key of C and therefore well suited to end phrases, with the tonic note (C, or do) the most stable of all. (Schellenberg et al. 2005.)

The “tonic” refers to the 1st degree of the scale, the note that the scale starts with. In C major it is C. “Tonic” can also refer to the chord that is built on the first degree of the scale. In the key of C major, it would be the C major chord. Likewise, in A minor it would be the A minor chord. It is the most “stable” chord in the **key**. The **key** of the piece of music is based on the scale of the tonic chord used, where each degree has been harmonized (made into a chord according to the global scale), functioning as the global tonality. Chords based on the 4th and 5th degree of the scale are called subdominant and dominant, respectively, and are used as supplementary references to the tonic. These are not as stable in perception as the tonic but are more stable than the rest of the scale-degree-based chords. (Schellenberg et al. 2005.)

It has been noted that certain chords are more occurrent in modern Western music than others, but also more preferred behaviourally by listeners. The preferability of chords have been shown to have clear links to the concept of consonance and dissonance. Consonant sounding chords have been described as agreeable and pleasant, whereas dissonant sounding ones have been associated with disagreeableness and tension. (Kratus 1993; Bidelman & Krishnan 2011.) Even infants of 4 months old show preference for consonance over dissonance (Perlovsky 2010). This concept of consonance and dissonance works by mathematical ratios. Simple ratios of note relation produce consonant sounding intervals while complex ratios do the opposite. (Bones & Plack 2015.) For example, consonant sounding intervals, such as an octave is produced by a ratio of 2:1, perfect fifth – 3:2, perfect fourth – 4:3, while intervals that are considered dissonant, like a tritone has a ratio of 45:32, major seventh – 15:8, minor ninth – 32:15 (Schellenberg et al. 2005). But a musical note, while certainly having a fundamental pitch, is almost never a pure tone, unless it was generated as a sinusoidal wave by a synthesizer. Most of the time, a musical note, played on an acoustic instrument, has a fundamental frequency, while simultaneously having overtones, which are additional frequencies above the fundamental, occurring at integer multiples of the fundamental, making the sound a complex tone. Overtones make frequential patterns in the sound spectrum and based on those patterns the brain distinguishes the source of the sound, for example, whether it is a violin or an oboe. While being much lower in volume compared to the fundamental, these overtones (also called "harmonics") are undoubtedly contributing to the sense of consonance and dissonance. In the case of the interval of perfect 5th, for example, combining A4 and E5, the E note is played a fifth above the A note. The E happens to be the same note as the 2nd overtone of the complex tone of A note, if played on a piano for example, according to integer multiples. So, by combining the A and the E into an interval, there are few additional frequencies generated outside the integer multiples in the frequency spectrum, and outside the harmonic series of these notes separately, hence the sense of pleasantness and stability of consonant sound. (Temperley 2001; Bones, Hopkins, Krishnan & Plack 2014; Bones & Plack 2015.) However, there is another side to this as well. According to Huron (2016, 32), when such consonant intervals are used, the similarity of the harmonic overtone series of the 2 (or more) different notes can mesh the two tones together and be perceived by the brain as a single complex tone. It is important to state that while **harmonics** (harmonic overtones) **are partials** of the complete sound profile, **not all partials are harmonics**, however. Harmonics, as well as consonant intervals, mentioned earlier, are calculated to happen at simple integer multiples. That is what gives a particular instrument its clarity of tone. However, inharmonic partials, not appearing at consonant distances from the fundamental, are also possible. And, in fact, these are what give percussive instruments (drums, bells, etc.) their complex tone. (Huron 2016, 14, 27.) Interestingly, there are no harmonics that have a relationship of a minor third interval with the fundamental in the harmonic series of any complex tone, only a major third (Perricone 2000, 8). This could influence people's preference for major over minor keys in music and help explain why major creates the association with happiness and joy in the brain (Bidelman & Krishnan 2011). Furthermore, Perricone (2000, 129) adds by stating that major chords are more stable in harmony than minor chords, which could add to the cognitive nuances. Beveridge & Knox (2018) have found that "pop music will be perceived as more positively valenced if it is composed in a clearly defined major key".

According to behavioural studies, people clearly prefer some pitch relationships over others, musical education and ability notwithstanding (Bidelman & Krishnan 2011). In fact, people with no prior musical training show extensive implicit knowledge of Western harmony (Temperley 2001). Musicians are trained to be familiar with the complex systems of relationship between the tonic, subdominant, and dominant, as well as other chordal functions in Western music, for example, that the dominant chord needs resolution to the tonic. Such knowledge is explicit for musicians. Untrained individuals, evident in research, know this implicitly due to exposure to Western music (Jonaitis & Saffran 2009). It is also evident that this implicit knowledge is developed relatively rapidly, where even children as young as 7 are able to distinguish these syntactic rules in musical harmony. (Schellenberg et al. 2005.) Cecchetti et al. (2022) have found that listeners make a categorical distinction between the dominant and subdominant chord families on the one hand, and tonic chord family on the other, including their respective substitution chords, involving other scale degrees, as is common in jazz music. The pitch relationships that are preferred by listeners almost invariably are consonant in their sound (Bidelman & Krishnan 2011). The only exception being that older people have been shown to prefer dissonant sounding chords over consonant or even rate them both the same on the scale of pleasantness. This is because aging has been noted to affect perceptual distinction between consonance and dissonance in musical harmony. This however is not the case in musicians of old age, as auditory training seems to protect against such decline in perceptual hearing. (Bones & Plack 2015.) Listeners are shown to prefer major chords over minor chords, and both major and minor chords are significantly preferred over diminished and augmented chords, at least in terms of their perceived consonance (Bidelman & Krishnan 2011), while consonance has been shown to also be linked to general familiarity with the chord (Song, Kowalewski & Friedman 2022). Lahdelma & Eerola (2014) have found certain chords to elicit specific emotions. According to them, the minor triad has been associated with nostalgia and longing. The same was observed for major seventh and minor seventh chords as well. In a later study, Lahdelma & Eerola (2015) talk about how the 7th degree of the major 7th chord is the reason for the sense of nostalgia, since it is the only note creating tension in an otherwise perfectly consonant major triad, desperately asking to be resolved to the 1st degree and therefore creating a sense of longing that is almost “painful”. The minor triad was also noted to evoke feelings of melancholy/sadness, along with diminished and augmented triads. Happiness and joy were linked to the major triad, but to a lesser extent also to a dominant seventh chord. Timbre also has an effect, where strings have been shown to inspire nostalgia/longing and a feeling of tenderness, while the timbre of piano was associated with happiness and joy. Interesting to note as well is that triad inversions, even for the tonic function, evoke expectation and tension, as if it is going somewhere or needs resolving, indicating that even the tonic chord might be manipulated to change its function. (Lahdelma & Eerola 2014.) Schellenberg et al. (2005) argue that since children's songs and lullabies are almost invariably simple in harmonic construction and based in consonance, therefore, being exposed these structures could affect harmonic preference later in life. Trainor & Schmidt (2003) add to this by saying that by caregivers communicating emotionally to their infants through songs and lullabies before they can understand language, they instil in them an emotional connection with music. Overall, the neurobiological predisposition for simple and consonant sounding harmony might explain why it was historically favoured by composers and listeners alike. (Bidelman & Krishnan 2011.) Evidence above also suggests a possibility to invoke complex emotion through combining consonance and dissonance, such as in the case of a major 7th chord, where a major triad is the consonant part and the interval of major 7th, in relation to the 1st degree of the triad, is the dissonant element, creating a sense of nostalgia/longing (Lahdelma & Eerola 2015).

However, since Western harmony is culture specific (Schellenberg et al. 2005), psychological reaction to this music might be different for individuals of other cultures. Athanasopoulos, Eerola, Lahdelma & Kaliakatsos-Papakostas (2021) have found Western harmony to not be relevant for participants unexposed to Western music, and state that major/minor distinctions and their associated emotions and a learned cultural convention. Furthermore, they argue that music in a major key is standard for it being more common, which in turn is because of the major triad's closer semblance to the harmonic series, as opposed to its minor counterpart. Another interesting finding by Athanasopoulos et al. (2021) was that harmony with high levels of "acoustical roughness" was linked to tension, energy, dominance, and anger across all cultures, whether exposed to Western music or not. This quality of "acoustical roughness" was explained as the unpleasant "beating" sensation, produced when dissonant intervals or chords are sounded, creating a pattern of rapid amplitude fluctuations of soundwaves in the auditory system, in particular the basilar membrane (Athanasopoulos et al. 2021; Song et al. 2022). There is also the aspect of auditory resolution, where if two notes are too close to each other in pitch, the frequencies, including overtones, they produce might overlap, creating a complex mix of spectral components and therefore being hard to "resolve" for the auditory system, or in other words, difficult to distinguish all the frequential elements in the sound. This is called **masking**. In essence, the perception of consonance seems to be influenced by the notes being far apart from each other, so that "roughness" and masking is reduced, if not eliminated altogether. (Song et al. 2022.)

Cook & Hayashi (2008) discuss the suggestion that the musical system that we use today is a consequence of how the human auditory system works. However, even if agreeing on the fact that harmony helps to get the message of music across to the listener, it can be completely changed around when rhythm, melody, and, especially, lyrics are added to the composition, suggesting harmony on its own to not be a powerful vehicle for emotional communication, however the harmonic cycle of tension and release is a powerful resource for a composer (Cook & Hayashi 2008).

Lastly, a study by Cook & Fujisawa (2006) provides some interesting points to consider, when it comes to psychology of harmony. First, they argue that studies related to dyads (or intervals) are not fit for purpose in discussions on harmony, because harmony is a three-tone phenomenon inherently, so multiple intervals must be combined, their overtones summed, and only then can one try to answer the questions. An interesting observation is that two intervals of equivalent size always produce tension in a 3-tone chord, such as in the case of the augmented chord. This tension can only be resolved by changing the notes so that the intervals chosen are purposely of unequal sizes. Cook & Fujisawa (2006) then go on to argue that the only way to resolve this tense 3-tone chord, in this case the augmented chord, for example, is to either move one of the notes down or up a semitone. Interestingly, whichever note is moved, will always result in the same. If the note is moved up a semitone, the chord effectively changes to a minor chord, and if the note is moved down a semitone, a major chord is created.

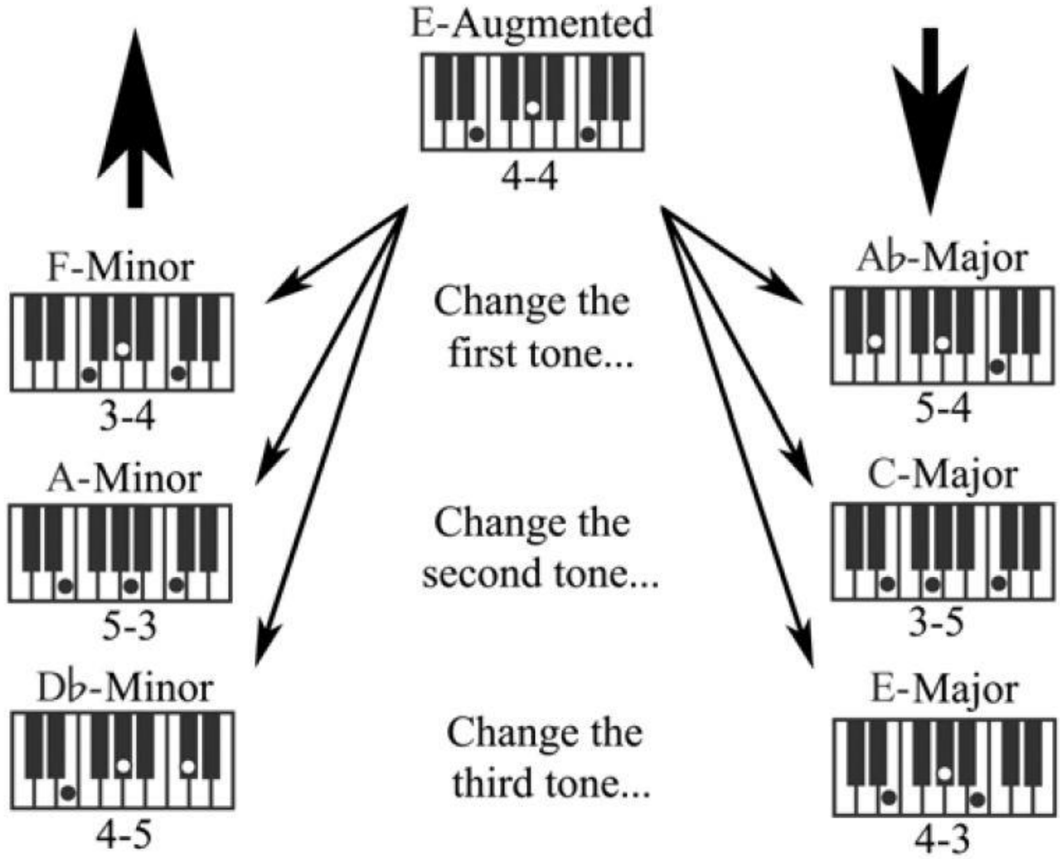

FIGURE 3. Moving the notes of the augmented chord up or down. Cook & Fujisawa (2006).

So, knowing this, a broader perspective on this could be that pitch movement up implies negativity while pitch movement down implies positivity. If we were to accept this, Cook & Fujisawa (2006) then link this to the concept of “frequency code”, which comes from animal behaviour. Explained briefly, low-pitched and rough (having complex relationship between harmonics and overtones) voice of an animal is associated with dominance, territorialism, aggressiveness and strength, such as a dog’s growl for example. Conversely, high-pitched and clear voice is associated with weakness, politeness, submissiveness, and defeat, such as a dog’s whine or yelp. And since the mass of the vibrating membrane impacts the pitch of the voice, it is associated with overall body mass in animals, therefore the lower the voice, the bigger and stronger the signaller is perceived to be in the animal kingdom. The same is true for humans as well. While in both speech and music, phrases going upward or ascending in pitches convey uneasiness and uncertainty, the opposite is true for descending phrases. This is how Cook & Fujisawa (2006) explain emotional links between major and minor to human psyche.

However, this study is not convincing on several points. First is that they found maximal dissonance to be linked to a semitone, medium dissonance with a full tone, and little dissonance for larger intervals. However, clear dissonance is shown for tritone, major 7th, minor 9th, etc., in other studies, which are all "large intervals". As will be discussed later, note movements up and down have been shown to have the opposite psychological effect in other studies. Secondly, for all of this to work, there must be an established augmented chord in one's mind before the actual major/minor chords could follow and musically untrained listeners are unlikely to be able to conjure the sound of an augmented chord in their minds, let alone hearing it precisely on the notes that are required by the following major/minor chords. The augmented chord is also very rare in modern popular music, rarely found outside of the genre as well. Thirdly, this theory implies movement of notes, however, in the case of investigating static harmony and the psychological effects of individual chords on emotions, no notes need moving. But even in harmonic sequences, it would imply having an augmented chord as a reference in the listeners mind, which is impossible. Most musical pieces start with the tonic, which is never going to be an augmented chord, for reasons discussed in this chapter, of which the primary one is dissonance. So, if the tonic chord were the first and the only one sounded, while everyone agrees that it sounds happy, how could this theory be implemented? Fourthly, Costa, Fine & Ricci Bitti (2004) state the opposite relationship of musical register to emotions, namely that higher register is associated with positivity and the lower register – with negativity. Admittedly, in a discussion on melody, some concepts would make sense, however if we talk about static chords, or even harmonic sequences, this theory seems to be inaccurate, based on the evidence of other research, even if very interesting. (Cook & Fujisawa 2006.)

2.3. Melody

As one delves into the psychology of melody, one needs to define the difference between melody and harmony, as both use the same building blocks for their creation, such as pitch and rhythm (Perricone 2000, 2), although pitch has been shown to be of more importance to listeners in terms of emotion perception (Schellenberg, Krysciak & Campbell 2000). The main difference between harmony and melody that helps one identify between them is that harmony is based on vertical combining of pitches and melody is based on horizontal combining. Said another way, a chord has all the notes sounding simultaneously, while a melody has its notes spread in time, appearing in succession of one another. (Patel 2003.) According to Abel (2014, 104), this is what creates the sense of movement in a melody, a sense of progression. Uniform timing of note onsets seemingly helps with that as well since rhythmic regularity and steadiness show clear links to positive emotions (Beveridge & Knox 2018). Perricone (2000, 2) says that melody is usually the most memorable aspect of the song, and it may be so, judging by the fact that, combined with lyrics, this is what the listener will focus his/her attention on and what will be remembered. Stefani (1987) goes as far as to suggest that melody is what “makes” a song, and that crafting a melody singable by everyone is to craft a melody that is supremely memorable. Speaking of memorability, auditory memory is a capacity of human auditory system, and it is used when consuming music. Schmuckler’s (1997) findings show that people have a much greater chance at memorizing melodies if those melodies adhere to expectations. Diatonic movements in melodies are much more expected, as are tonal melodies compared to atonal ones. The endings of melodies were shown to be of particular importance to listeners expectation, where melodies with the expected ending were memorized much easier. The explanation for this was that melodies of high expectancy are better encoded by the listener, therefore processed more deeply by the brain. (Schmuckler 1997.) Phrases that end on a long and stable note, for example, are perceived as particularly complete and resolved (Schellenberg et al. 2000).

2.3.1 Pitch movement

For a melody to be perceived as a continuous auditory stream, however, certain nuances need to be addressed. First, the length of melody notes and the space between them matters for continuity. The longer the melody notes and the closer they are to each other, the more the melodic line is perceived as continuous. This, in musical terms, is referred to as **legato**. Each note is held its entire duration, before being smoothly transitioned into the next note, without a gap of silence in between. Melodies containing very short and snappy notes (**staccato**), are possible, but the auditory memory has only about 800 milliseconds of vivid memory of the last note before the auditory stream is weakened. Long, flowing and seamless melodic lines do away with this issue. (Huron 2016, 66.) Important to note as well is that **legato** articulation is commonly associated with sadness and tenderness, while **staccato** is associated with happiness or fear (Kaminska & Woolf 2000). Beveridge & Knox (2018) found however that short notes, usually performed with **staccato** articulation, create more arousal in listeners, which might suggest that short notes can be used to create tension, while longer notes to create more release and resolve. Secondly, there is the nuance of intervals. If looked at individual steps of melodic movement, there are merely 2 main options: **conjunct** (moving from one note to a neighbouring note) or **disjunct** (leaping from one note to a note that is not a neighbouring one). Conjunct motion is done by using the "2nd" intervals, while disjunct motion is achieved using "minor 3rd" and larger interval leaps. Apart from the fact that disjunct motions are more difficult to produce for vocalists, as well as some instrumentalists, based on their specifics of playing, especially when the intervals are as large as an octave, there are peculiar perception problems in the human brain for these leaping motions. (Perricone 2000, 2.) The brain has a difficulty perceiving large interval leaps as part of a continuous auditory stream, hence the historical predominance of small interval movements in melodies. This is because of pitch proximity effect. Melodic leaps above the "trill boundary" (minor 3rd interval) are at a much higher risk of being perceived as pseudo-polyphony or two separate melodic lines intertwining. (Huron 2016, 72.) However, this can be remedied by lengthening the notes involved in the leap or by slowing down the tempo. The bigger the melodic leap, the slower it must happen for the brain to perceive the connection, according to Fitt's law. In general, if the movement between two notes involved in the leap is faster than a human muscle (including the voice apparatus) could produce, the connection might not be apparent. This is the case cross-culturally. (Huron 2016, 79-–80.) Overall, people of various ages and cultural backgrounds expect and prefer the next note in a melody to be proximate to the note they just heard (Schellenberg et al. 2005; Beveridge & Knox 2018).

Melodies tend to be the uppermost voice in terms of pitch, especially in instrumental music, but almost invariably it is in the middle to high register. This is in part explained by the “high-voice superiority effect.” This effect occurs between two (or more) pitches, where the higher one impacts the lower one more in terms of masking, than the other way around. This is because, since overtones are usually appearing higher in pitch than the fundamental, but not lower, more of the partials of the higher note ring out undisturbed, while more of the partials of the lower note are masked by the higher one. (Huron 2016, 51.)

Just like in harmony, the stable and unstable notes in a key are the same and function the same (Perricone 2000, 92). 1st, 3rd and 5th degrees, for example C, E and G in C major, are the most stable, while the rest of the seven degrees, namely the 2nd, 4th, 6th and 7th are unstable. Generally, the 4th and the 7th are considered the most unstable. Coincidently they also are the only degrees that exist a semitone’s distance away from the most stable degrees of the major scale. Therefore, when discussing traditional music theory, the 4th degree naturally tends to resolve to the 3rd, while the 7th degree naturally goes to the tonic (1st), since both situations are the easiest solutions (semitone movements, rather than full tone movements in the other directions). The 7th degree also has the name of “the leading tone” because it leads to the tonic, which is the most stable note of all, as has been established before. (Perricone 2000, 9; Huron 2016.) Costa et al. (2004) add that “melodies whose notes more strictly adhere to a particular key were evaluated as being more pleasant and expressing more positive emotions and a greater sense of stability”.

Perricone (2000, 98) divides melodies into 2 types, when talking about harmony/melody relationship: **independent** and **dependent** melodies. Independent melodies are the ones that are by themselves intricate enough in their stable and unstable tone choices that they invoke a sense of harmonic direction without having an accompaniment. Said another way, they function perfectly fine without accompaniment as they have enough harmonic information in them. Dependent melodies on the other hand are the opposite, they need harmonic backing to make any sense, such as a melody on one note being backed by a colourful chord sequence. (Perricone 2000, 98.) But as with any component of music, managing tension and release, anticipation and reward, is the most fundamental part of creating interest in music. So, the tension and release interplay between melody and harmony is as important as the interplay between tension and release in melody or harmony separately. (Perricone 2000, 102.)

2.3.2 Phrasing

As was established, melodies are constructed by using pitches in successive fashion. However, a melody does not start and continue indefinitely. One component of the construction of melodies is called a **phrase**. These phrases are essentially “packages” of notes that are grouped together, and a melody is a construct of many phrases. The roots of this concept stem from vocal music, where a vocalist needs to take a breath occasionally, to be able to continue singing the melody. This is in fact the same in speech. To be able to speak large amounts of information, many words may be needed, however, only a finite amount of air can be expended before needing to take a breath. This has shown itself to become an essential part of melody cognition in Western music, and a mainstay in Western musical education. Even instrumentalists are taught the importance of breathing while playing their instruments, just like a singer would, as it is supposed to help with the natural flow of movement, that humans have grown accustomed to from speech and song. (Perricone 2000, 2; Patel 2003.) Research shows that listeners are more likely to identify a familiar song correctly after recognising the notes at phrase boundaries (Jakubowski, Finkel, Stewart & Müllensiefen 2017). Furthermore, combining stable and unstable degrees of the scale in particular ways, one can influence the expectation and anticipation of the listener. Perricone (2000, 12) suggests, for example, focusing on the starting and ending notes of phrases, where one can create a smooth connection between two phrases by purposely using a stable tone as a starting note of the second phrase in order to resolve an unstable tone, strategically placed to end the first phrase. The tension caused by ending the first phrase with an unstable tone creates expectation in the listener’s mind for a resolution to be “just around the corner,” therefore taking a breath between phrases does not disturb the flow of the melody. Moreover, an even number of phrases (of the same length) produces a sense of a balanced section, while uneven number of such phrases does the opposite (Perricone 2000, 27), which is as important for expectation and anticipation.

2.4. Lyrics

Lyrics play a central role in the way people understand popular music (Julien & Levaux 2018, 151). Although there are studies finding melody to elicit listener's emotions more than lyrics, the opposite seems to be true more often. In a study by Ali & Peynircioğlu (2006), they have found lyrics to increase the negative emotion in sad music, while happy music had more emotional effect without lyrics. The stronger emotional impact of happy music without lyrics was also found to be the case by Brattico et al. (2011). The suggested explanation by Ali & Peynircioğlu (2006) was that lyrics and melodies are processed independently by different parts of the brain. This explanation is correct, evident by the findings of Saito et al. (2012), however the results of lyrics having less impact than the melody were disproved by a replication study by Ma et al. (2023), where they found the presence of lyrics to have a significantly greater influence on all emotions. Same findings are mentioned by Mihalcea & Strapparava (2012), where they state that the joint implementation of lyrics and music produce highest classification results. Keeping in mind that most of the music consumed worldwide today is pop, rap, or rock music, which all have their primary form of composition to be the song form, invariably containing lyrics, a suggestion that music with lyrics together have a stronger potential to invoke emotion than music without lyrics, can be made (Brattico et al. 2011). As mentioned before, different brain regions are responsible for decoding music and lyrics, where lyrics are decoded in regions responsible for language processing and semantic memory for object concepts and music, on the other hand, is processed in regions more related with emotions and sensorimotor systems. When people sing along to their favourite tunes, brain regions associated with execution of speech activate as well. Hence no surprise to see results showing people's preference for instrumental music in terms of emotional impact, going as far as to call instrumental music "more beautiful" than songs with lyrics. (Brattico et al. 2011.) A hypothesis then can be made that music is primarily what is responsible for the direct emotional affect, whereas lyrics invoke certain object concepts in the brain, which then, being connected to personal memories or empathic imagination and the emotional content related to that, reinforce the emotional affect or add another emotional component, possibly creating a complex emotion, such as nostalgia, which is defined as having both a sad and happy aspect to it (Hunter, Schellenberg & Schimmack 2010). And keeping in mind the fact that most pop and rap records have two most common topics, namely interpersonal relationship being one, and violence being the other one (Bennett 2016; North, Krause, Kane & Sheridan 2018), both topics inspire strong emotions attached to them, which are universally relatable, possibly explaining the prominence of these topics in popular music. In times of socioeconomic struggle, focus on more meaningful and mature lyrics have been observed, dealing with socially significant, complex, serious and, more importantly, comforting topics (North et al. 2018). Real life associations are powerful as well, where a particular song could be associated with an ex-lover, and invoke sad emotions in a listener, even though the song itself is composed to do the opposite – invoke happiness (Hunter et al. 2010).

When writing lyrics, composers tend to select rhythms to match the inflections of speech. Moreover, when writing melodies, natural rhythms of speech might be beneficial to consider. Interestingly, the native language of a composer could influence the melodic choices due to the inherent rhythmic differences between languages and speech in the world. A few notable examples of relationship between lyrics and the rhythm of music have been defined by Nichols, Morris, Basu & Raphael (2009). Level of syllabic stress is usually found to be correlated with strength of metric position, probability of a melodic peak and note duration. Stop words (that have very little semantic weight) are found to be correlated with weak metric positions, as well as they are much less likely to coincide with melodic peaks. Lastly, short vowels are correlated with short notes in music. Overall, songwriters tend to strategically combine lyrics with music, placing strong accents of words and syllables with strong accents of melody, weak ones with their respective counterparts, making sure to have as much cohesion as possible. (Nichols et al. 2009.) Bennett (2016) adds by saying that “words and music must work together because in performance they are never heard in isolation from one another”. A popular way to start the lyric writing process and to spark initial ideas is to produce a title and start writing “from the title outwards” (Bennett 2016). This seems to help with creativity challenges, as well as with cohesion of the global theme, and strategize the important lyrical points in the song.

2.5. Arrangement

Arrangement is a process of taking the components of a song as ingredients and blending them together. Certain combinations can yield powerful psychological results, such as when tears are invoked by melodic sequences having repeated motifs or when sudden harmonic changes invoke shivers down the spine (Kaminska & Woolf 2000). When a song is constructed adhering to the findings in above chapters, keeping in mind that melody is the "main protagonist," the song has a higher chance of becoming an "**earworm**." The concept of "earworm" refers to the phenomenon of a particular song playing in one's mind from memory, when not listening to music. It is that phenomenon, which people refer to as a song being "stuck in one's head." The scientific term for this is INMI (involuntary musical imagery). A few factors determine if a song can become an INMI. Recent exposure to the particular piece of music and familiarity with it play a big part. Familiarity could be exploited by the use of common practices in a particular musical style, such as a common melodic contour like the arch, longer notes and smaller pitch intervals, which make it easier to sing along to. This increases the chances of it becoming an INMI drastically. Faster tempo helps as well. (Jakubowski et al. 2017.)

2.5.1 Perception of Form

It has been found that listeners prefer being drawn into the music in the first 7 to 20 seconds. To achieve this, music has to be structurally simple and repetitive. Periodicity in general has been shown to be pleasurable in music. (Beveridge & Knox 2018.) And repetitiveness plays a very important role in modern song. Therefore, the perception of form (arrangement) revolves around two main musical activities: repetition and change (Perricone 2000, 85). In groove-based music, an important aesthetic choice is to repeat with a difference. It allows both for repetition and revision to happen at the same time, while the focus is on the difference of the repetition. (Julien & Levaux 2018, 41.) A repetition alone is boring, but variation alone might give too much new information (Julien & Levaux 2018, 159). The issue of repetition is especially important in computer-based music, where exact repetition is not only possible, but is the default. In this case, combining different rhythmic layers or introducing micro-rhythmic tensions works well to remedy the "sameness." (Julien & Levaux 2018, 45.) A natural point of a metric closure, for example, an end of a basic unit, is a great place to introduce a destabilizing feature. It has a driving, dynamic effect that keeps the process going. (Julien & Levaux 2018, 44.) Another important aspect of repetition is the ability to psychologically induce a trance-like state. This is evident in electronic dance music genres such as techno, where four-on-the-floor beats with tempi above 130bpm, played for hours, are able to induce trance in listeners. By being "in the now" with the groove, one might let go of following time, and by staying in the present moment with the music, the repetition of the beat does not feel boring anymore, because the present moment is always new. (Julien & Levaux 2018, 48, 76-77.) Of course, dance is a necessary part of this trance. Synchronizing movement to music has been a part of shamanic rituals of many cultures, possibly involving reaching trance states. In popular music too, consistent tempo and regular backbeat provide the unambiguous platform for movement synchronization (Julien & Levaux 2018, 152).

The forms found in popular songs are simple, most of them are 3 to 4 minutes long and the number of sections vary from 1 to 4. Bennett (2016) suspects that this is due to other durations and forms not being optimal, therefore not surviving in the marketplace. Commonly popular songs revolve around the central statement or the main idea of the song. This central statement can be the **title**, the **chorus**, the **hook** or any part that contains important melodic and lyrical content. The **hook** is defined as an extremely memorable melodic/lyrical phrase. (Perricone 2000, 86.) Form is said to be a result of compositional decisions, rather than predetermined pattern which must be used, according to Perricone (2000, 88). He does, however, list common song forms, such as "Verse – Chorus (repeated)," "Verse – Chorus – Verse – Chorus – Bridge – Chorus" and others, although he does not share what psychological implications these forms have and in what way, which does not provide useful information for this research. The commonly used parts, or sections, in modern song are as follows:

- **The verse** is a section where the story of the song is told, new information is given. The lyrics are arranged in a series of lines with a recurring pattern. Once the number of lines, rhyme and meter are stated, they remain fixed, only the content changes. The lyrics typically do not repeat (apart from the **refrain**), but the repetition is usually done in the melody. (Perricone 2000, 87; Julien & Levaux 2018, 151.)
- **The refrain** is a part of the verse section, when it occurs, it is not a separate section by itself. It is usually a line containing the title or a very important lyrical/melodic statement and usually it appears at the end of a particular verse section. (Perricone 2000, 87.)
- **The chorus** is the main event of a song, usually containing the hook – the "catchy" aspect of the song. Dynamics are at their highest in the chorus, and it is the culminating and the most intense part of the song, usually brighter, louder, with more instrumental activity and higher vocal registers implemented. Typically, it involves repeating lyrics, to which listeners are most likely to sing along to, hence why the chorus is the part that tends to get "stuck in the head." (Perricone 2000, 87; Beveridge & Knox 2018; Julien & Levaux 2018, 151, 160.)
- **The bridge**, as the implication suggests, is a section bridging two other sections. Usually used to modulate or provide contrast to the other material in the song, the bridge works by appearing commonly after the second chorus and providing a refreshing contrast before diving into the last and strongest chorus of a song. (Perricone 2000, 87.) A suggestion worth noting is that, as mentioned before, since the major is more stable than minor in terms of harmony, a smart harmonic move would be to create the bridge of the song in minor but the chorus in major. The transition between the bridge and the last big chorus, the minor to the major, would be very psychologically satisfying. (Perricone 2000, 129.)

One section Perricone (2000) does not list, but one that is of equal importance in today's popular music, is called a "**drop**". A "drop" is a concept that has its roots in electronic dance music genres and signifies an emotional climax section of the song, exchanging a typical vocal chorus for an instrumental hook instead. In pop music, conveniently called the ”pop-drop,” it typically occurs after the chorus. However, the chorus section in this case is usually created as an emotional build-up, not as the culmination, creating anticipation for the “drop” and also for it to feel as powerful as possible in comparison to the chorus and the other sections. Most often the “drop” contains a catchy instrumental melody, while having a strong rhythmic foundation provided by the drums and the bass. (Harding 2016; Goldstein 2019.)

2.5.2 Tonal considerations

The interplay of melody and harmony is important too. In general, one should strive to arrange the tonal aspects of the song in the note range from E2 to G5. This has been shown to have the most “toneness” in listeners’ perception, where the note D4 has the most “toneness” out of all. Beyond the boundaries of C1 to C7, listeners hear more rumble or sizzle, respectively, instead of tonal information. But the range of E2 to G5 is also consistent with most musical repertoire around the world, irrespective of culture. (Huron 2016, 35.) As sonority descends in register though, enough distance in between the voices (notes) of the chords is needed. Too many notes in the bass region being too close to each other could result in unpleasant and incomprehensible rumble which would mask the region from being resolved on the basilar membrane of the auditory system. Clear and spacious sounding tonal arrangements are easier to resolve and comprehend for the ear. (Huron 2016, 47.) When writing a chord progression, Perricone (2000, 110) warns that chords packed too tightly and close together might overshadow the melody, but on the other hand if the chordal arrangement is too sparse, there might not be enough interest created. The relationship between the melody and the bass must also not be overlooked. Apart from bass potentially providing the most prominent counterpoint to the melody, it also provides the greatest harmonic support out of all the harmonic voices, greatly affecting the consonance/dissonance of the melody as well (Perricone 2000, 115). A general guideline for this relationship seems to be that if the bass has enough integrity, meaning it is developed to be quite an independent melodic tool by itself, for example a **riff**, it tends to better support the melody and create more intricacy in the song.

Smoother bassline, incorporating more neighbouring tone movements, is usually preferred over a leaping bassline with large jumps between notes. (Perricone 2000, 117.) A **pedal point** in bass is also highly suggested for creating interest and excitement by building tension. Briefly explained, a pedal point is a repeated or sustained note, usually in the bass part, creating dissonances with the harmonic movements by not moving along with the chords, but rather staying static. (Perricone 2000, 145.) This ties in with a similar suggestion by Costa et al. (2004) where "by repeating the same note, a composer can emphasize the rhythmical aspects of a melody, and, through a succession of beats, convey a sense of insistence, stress, and emphasis".

An interesting phenomenon happens when a large number of different instruments play at the same time. In the context of harmony, for example, if one is arranging for an orchestra, there are a lot of instruments to take notice of. However, if all the instruments were to have the exact same attack onset to their respective notes of the arranged harmony, the human brain would interpret the sum of the sounds as one massively complex texture, rather than many individual instruments. This issue must be known to the arranger so that, dependent on goals, correct outcome could be achieved. If the goal is to have the arrangement as a one big "wall of sound," note onsets should synchronised. If, on the other hand, individual timbres need to be heard, those instruments need note onset adjustment – 100 milliseconds either earlier or later than the rest should suffice. Multiple instruments having a desynchronized note attack gives the brain time to "catch" each individual sound source, building a more correct auditorial image. (Huron 2016, 97-99.) Using instruments with drastically different timbres has been shown to minimize this issue as well (Huron 2016, 115). However, as mentioned previously, Beveridge & Knox (2018) argue that as it pertains to the melody, uniform timing of the note onsets is highly preferable. This is because periodicity has been shown to be regarded as "pleasing." A similar issue happens on a broader scale. Research has shown that, irrespective of musical training, human brain has difficulty following more than three concurrent auditory streams. In other words, three different musical parts, happening at any one time, are the greatest number of independent parts that the brain can successfully follow in an attentive manner. This begs careful consideration by the arranger, where and what important elements one needs followed or taken notice of, otherwise the listener's attention might be somewhere else. The attention is especially drawn to isolated sound events. (Huron 2016, 110, 127.)

2.5.3 General arrangement considerations

While it is true that people have subjective preferences for one genre or another, it is interesting to note that some universalities exist in musical communication of emotions. When several composers were asked to compose melodies based in certain concrete emotions, surprisingly they used very similar musical expressions in achieving their goals, as shown in the study by Thompson & Robitaille (1992). Strong tonal framework was used in joyous examples, a sense of movement was important to create with rhythmic variations too. Slow tempi, minor harmonies and chromatic movements predominated sad melodies. Excitement was signified by fast tempi, melodic leaps, and higher registers. Atonality and rhythmic complexity defined anger. While the examples of each emotion by the 5 composers were not exactly the same, they all showed similar patterns of thought about how emotions relate to sound. Aside from musical education and exposure to Western music possibly influencing the way composers understand this relation, this area brings some interesting points of discussion about the general human association between sound and emotion. (Thompson & Robitaille 1992.) In terms of general aspects, listeners report more arousal when the music is constructed higher in register and bright in timbre, with short notes predominating the melodies (Beveridge & Knox 2018). Emotionally, for example, sadness is conveyed by quiet, slow, legato articulation, large deviations from metrical timing, low note registers and dull timbre, whereas happiness or joy is conveyed by high-pitched, fast, bright, staccato features and small variations from metrical timing. Music associated with fear and anger is said to have a “harsh” timbre. Intense vibrato is used for tenderness, slow and deep for sadness, fast and irregular for fear. Fast tempo is associated with happiness, slow – with sad. (Balkwill & Thompson 1999; Kaminska & Woolf 2000; Trainor & Schmidt 2003; Lindström 2006; Quinto, Thompson & Taylor 2014.)

In general, the most important aspect of arrangement is controlling the listener's anticipation and expectations. As mentioned previously, expectations are formed by exposure. And anticipation is what gives music listening the "fun" element. This is the essence of the concept of tension and release in music. If not addressed, the music might not have enough impact on the listener. This implies the use of a certain amount of commonality in music, for example repetition, which helps minimize violation of listener's expectations. (Huron 2016, 143, 145-146.)

3 EXAMPLES OF IMPLEMENTATION

3.1. Saulės Kliošas – Tam Pačiam Laike (Z.J.Backus Remix)

Before discussing this song, it is important to establish the definition of a **remix**. A remix is a rework by one artist of an original recording done by another artist. This could entail compositional changes, rearrangements of form, instrument interchange or simple sonic enhancements, among other various things. Remixes tend to appear most often as an optimized version of the original for the dancefloor, however this is not a rule. Therefore, this song, being a remix, already had some core components composed in the original version. While changes to those components by the use of modern audio equipment and tools are possible, depending on the goals of the producer, the results could prove to be lacklustre. This is especially true considering previously mentioned evidence for the listener's focus on voice, lyrics and melody, which are all parts of the lead singer's performance. Therefore, in wishing to keep the integrity of these important elements, the vocal performance was not changed, rather it was enhanced. The enhancements of the vocal performance, along with changes to the composition, were done by using several different music production and compositional techniques.

A common technique of duplicating the vocal audio track and digitally changing its pitch, by an octave interval downward, was employed. While the original vocal is unaffected, the duplicate has the formants of the voice pitched as well, creating not only lower notes, but a more rounded and deep timbre. This timbre change helps minimize masking between the two vocals as well as create interest. The placement in the timeline of this newly created duplicate vocal track was not changed, all vocal notes and phrases happen at the same time as the original. Only the compositionally important phrases were left intact, while the rest of the duplicate track was deleted. This has an effect of reinforcing the important lyrical and melodic phrases, appearing as more powerful and "fuller" sounding, demanding more attention from the listener, while, at the same time, creating only a slight change to the arrangement, not intruding on other aspects of the music.

A music production technique of “delay throw” was implemented on the original vocal. “Delay throw” simply refers to an excerpt of the vocal audio track, be it a word or a phrase, which is cut out and duplicated from the original vocal recording, after which being affected by a delay effect, creating multiple repetitions of the affected signal. This technique was used on words at the endings of vocal phrases, primarily to fill the empty space in between those phrases. This helps keep the connection of vocal melody intact, as well as keep the voice as the central focus point in the song, while contrapuntal melodies can be introduced, without the fear of attracting too much attention.

In the last chorus, a new vocal melody is introduced, which has been heavily manipulated. The manipulation consists of duplicating the original vocal audio track, cutting it into small pieces, in some cases, only consisting of one note. Rearranging them in a different order produced a new melody, albeit with an unnatural aesthetic.

Since the main melodic line was prewritten and prerecorded, the harmonic base of the song was altered in its stead, producing a different emotional effect. Chordal functions of low stability, resolving to more stable functions were purposely used, while almost never resolving to the tonic, moving to another unstable chord instead. This creates constant tension and violation of listener’s expectation, while at the same time providing temporary resolutions so that psychological tension is managed. For example, in the verse section, the first chord of E minor (4^{th} degree, from the point of relation to the tonic of B minor) assumes a subdominant function, moving into a substitution of it – the 6^{th} degree (G major), then moving into the 7^{th} degree chord (A major), which functions as a substitution for the dominant chord, before returning to the first chord in the sequence. The last sequential move of the dominant chord’s return to the subdominant is effectively a resolution, since the subdominant is a more stable function, however not as stable as the tonic, hence keeping enough tension, while making an effective impression of resolution. Only in the chorus section a tonic chord is introduced, reinforcing the chorus as the stronger and more important section emotionally. The basic functionality of chords in the last chorus section, serving as another example, is as follows: tonic (B minor) – dominant (substitution – inversion of A major) – subdominant (E minor) – dominant (F# minor) – subdominant (substitution – G major) – dominant (substitution – A major) – subdominant (E minor) – dominant (substitution – A major). After the last dominant chord there is a resolution to the tonic at the start of the new period.

After each vocal phrase, instrumental melodic motives have been strategically placed to fill the gaps in the vocal topline. This serves to provide refreshment as well as new information for the listener, effectively keeping one's attention. This is especially useful when listening to the song multiples times and taking interest in other aspects of the arrangement, after having familiarized oneself with the melody and lyrics.

The rhythm of this song, primarily expressed with percussive instruments, has been composed as a four-on-the-floor dance beat, however introducing a syncopated bass drum hit towards the end of every 2 measures. This disrupts the monotony of the main beat while not being disruptive to the rhythmic flow. Some harmonic parts also play syncopated rhythms; however, they have been sonically treated to not appear as parts of the primary instrumentation.

The first verse provides only a harmonic backing in its first half, while the second half of the verse introduces a relatively mellow rhythmic accompaniment as well. The first chorus is made to be a buildup section, creating tension and a sense of anticipation. The second verse then introduces the main rhythmic flow and provides a sense of a driving force, while the long and mellow notes of the bass synthesizer keep the emotional state relatively calm. The second chorus is also created as a buildup section; however, it is more powerful than the previous one. At the end of it there is an unexpected pause for all instruments, demanding utmost attention due to the abrupt and drastic change, after which the last chorus ensues. This last chorus only has vocal material placed in the second half of it, as an invitation to dance, instead of focusing on decoding lyrical information. Danceability was also considered in terms of instrumentation and arrangement, the last chorus being the densest in instrumentation and the most "driving forward" rhythmically.

Finally, throughout the song there are scattered elements of surprise, however, there are too many to mention. Several places have percussion syncopations introduced, purposely placed to manage monotony. The same reasoning is used for the melodic bass run at 2:37.

3.2. Z.J.Backus feat. Justify – Self-talk

In the case of this second song, the lyrics were written by the singer. However, the melody was composed collaboratively, while the music was produced by the composer. The analysis of this work is as follows.

In the first verse, finger snaps and shaker were used to establish the basic pulse, while keeping the emotional state calm. It is noteworthy to mention that melodic contour is created to specifically manage listeners anticipation. The first phrase ends on a low note, while the second phrase ends on a higher note. This is done to create expectation for continued story, even though a period (of 4 measures) is ending. The third phrase has an expanded melodic arch, followed by the fourth phrase ending on a low note to signify a definite closing to a period of 8 measures. All these vocal phrases follow the same rhythmic figure, to reinforce periodicity, except for the last one, which brings change and manages monotony, while also invoking as sense of anticipation. The last phrase also benefits from vocal doubling, which adds two additional vocal tracks to strengthen the phrase both sonically and emotionally. In the second half of the verse, in addition to denser instrumentation, a rhythmic motif of the bass increases the rhythmic “drive,” leading the listener to develop expectation of a strong groove in the following section. Claps provide a strong sense of backbeat, alleviating some of the rhythmic tension created by the heavily syncopated vocal phrases. Vocal harmonies and doubles help create interest in the vocal arrangements, appearing at every other phrase. The same reasoning is behind the background vocal phrases of “fine” and “my life,” appearing at the pauses of the main vocal line. Finally, after the vocalist ends her part for the verse, a synthesizer plays a melodic motif, signifying a closing to the verse and creating expectation for the introduction of a new section.

While the compositional decisions made in the verse would signal a musically strong section to follow, a major violation of listener's expectation is made in the following pre-chorus. Only a sparse texture of a synthesizer and the voice are left sounding. The synthesizer plays long and reverbed notes, that, while technically defined as a melody due to the horizontality of the playing manner, function as a harmonic accompaniment due to the strategically chosen notes overlapping each other, creating a chordal part.

Additional violation is created at the very start of the chorus, at the first beat. The audience, following the basic pulse, would expect the chorus to start on beat 1 of the first measure of the section. However, this is exchanged for a downward bass slide, landing the effective start of the chorus to be the 2nd beat of the measure, creating a sense of non-comprehension, which is quickly resolved. The chorus is defined by having a repeating harmonized vocal motif of "ooh-ooh" serving as the hook for the song, each motif being followed by a statement of the vocalist with the melody going upwards and ending on the highest note, which displays the tension of worry and concern of the protagonist of the song regarding the subject of the lyrics, symbolizing a cry out. The drum groove is similar to the previous song example, where the beat is a four-on-the-floor with added syncopations, without disrupting the flow. Added instrumentation includes layers of harmonic texture and percussion in this section.

The following sections repeat the order, while introducing more and more tension elements such as abrupt pauses, syncopation and vocal layering. The last section of the song is an outro section, where instrumentation stays mostly the same as in the chorus, however the vocalist is repeating a lyrical line, which is also the central theme of the discussion – "giving everything", meaning the protagonist is giving all the needed love, acceptance and care to herself. The outro then ends with an abrupt audio effect of a vinyl player stopping, suggesting to the listener that the song might have gone on, however it has been cut short, therefore the tension of not having experienced the potential "full" and resolved version of the song potentially invites a need for a second listen.

4 DISCUSSION

There is definitive evidence for the fact that music affects listeners emotionally. However, while emotional effects are undeniable, studies by Kaminska & Woolf (2000), as well as Mihalcea & Strapparava (2012), show that only the basic emotions can reliably be affected, which include happiness, sadness, fear, and anger, hence the predominance of these emotions in the results of referenced studies. The reason for this may be evolutionary, since basic and primal emotions could be linked to the survival mechanism in the brain, which is, and used to be, of the most importance, therefore most highly developed, compared to other mechanisms. Complex emotions seem to be either hard to distinguish or not clearly inferred in music, especially one without lyrics. Perhaps that could be the reason "popular songs express universally understood meanings and embody experiences and feelings shared by many, usually through a combined effect of both music and lyrics" (Mihalcea & Strapparava 2012). Findings of this research certainly suggest so. Further research into the ability of music to invoke clearly recognisable complex emotions would greatly enhance the current body of knowledge regarding this subject. At the present time, however, it is difficult to conclude what elements contribute to invoking complex emotions in the listener or if it is at all possible to do purposely and reliably.

Evidence show that music is also capable of affecting people physiologically. One of the more outstanding physiological reactions to music are "**chills**." Described as a "tingling sensation resulting from a strong emotional experience" (Hunter & Schellenberg 2010), chills can be induced by various types of music, however it has been noted that sad music, in particular, is capable of invoking chills more effectively than happy music (Brattico et al. 2011). Chill-inducing music seems to be akin to an auditory drug because the experience commonly occurs in tandem with a powerful sense of pleasure. However, "chills" are also related to the fight-or-flight response in humans, when faced with a threatening stimulus. Exposure to cold temperatures, for example, can elicit "chills" due to the need of keeping the body warm. Another example is when faced with unexpected hostility – same reaction of hair "standing-up" on the skin can be observed. This is due to piloerection – a process of involuntary hair bristling to appear larger than one truly is, when facing surprise combative situations and needing to appear more threatening as a defence mechanism. It is a part of many animal species, commonly seen in frightened cats. However, if the threat is then subsequently reevaluated not to be dangerous, piloerection could be accompanied by a pleasurable sensation. Hence why sudden surprises in other areas, such as music, can potentially create the sensation of “chills.” In musical works, “chills” have been noted to appear more often at new and unprepared harmonic changes, but also at sudden dynamic and textural changes. (Hunter & Schellenberg 2010.) This area of research, however, also lacks definitive conclusions on reliable production of such physiological reactions in the audience, needing further investigation.

In general, liking for music is higher when listeners respond emotionally to it and when their feelings are the same as the emotion they perceive in music. In this way, for example, sad music could provide a way for listeners to dissipate repressed sad emotions, and, therefore, have a cathartic effect. This might explain the choice of sad music when listeners are fatigued or sad. (Hunter & Schellenberg 2010.)

Only a fraction of the psychological effect of music has been explored in this thesis, as studies of musical effect on the brain continue to be conducted by scientists of various fields. The effect of marketing and social proof, among other potentially influential areas on the psychological perception of music, have not been explored in this research. Only time will tell what new discoveries about the psychological effect of music the science community may find.

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APPENDICES

Appendix 1. Examples of Implementation (links)

Saulės Kliošas – Tam Pačiam Laike (Z.J.Backus Remix):
https://open.spotify.com/track/0SJAb-Fum3OFqg72tFWFvUw?si=2880354217b749c4

Z.J.Backus feat. Justify – Self-talk:
https://open.spotify.com/track/5juXpn4AZ7Do0s0WYtMRFb?si=212becd6e41c46c5