Machine Listening, Musicological Analysis and the Creative Process: The production of song-based music influenced by augmented listening techniques.

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Statement of Authentication

The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material either in full or in part for a degree at this or any other institution.

4th January 2021

TABLE OF CONTENTS

MACHINE LISTENING, MUSICOLOGICAL ANALYSIS AND THE CREATIVE PROCESS: THE PRODUCTION OF SONG-BASED MUSIC INFLUENCED BY AUGMENTED LISTENING TECHNIQUES. I

Acknowledgements ..... **ii**

Statement of Authentication ..... **iii**

List of Tables & Figures ..... **vi**

Abstract ..... **vii**

Stay Still | Please Hear - Track List ..... **ix**

CHAPTER 1: RESEARCH BACKGROUND AND FRAMEWORK 1

CHAPTER 2: DEVELOPMENT OF METHOD 17

Introduction **18**

MIR Analysis Method **18**

Introduction 18

Algorithmic Analysis 22

Musicological Analysis Method **37**

Introduction 37

The Song / Composition 39

The Arrangement 41

The Performance 44

The Production 45

CHAPTER 3: ANALYSIS 55

Introduction 56

Constructing the Database 56

Statistical Analysis 60

Clustering 63

Comparing the larger dataset to new groups 68

Group Analysis Summary 74

Deeper group and individual song analyses 77

List of Features inspired by the development and application of methodology **85**

CHAPTER 4: CREATIVE REFLECTION 87

Introduction 88

Creative Influence – The Song 89

Creative Influence – The Arrangement 92

Creative Influence – The Performance 96

Creative influence – The Production 98

CHAPTER 5: EVALUATION AND CONCLUSION 107

BIBLIOGRAPHY 114

APPENDIX 119

Group 1: Spectral Inharmonicity, Spectral Centroid & Key 120

Group 2: Liveness, Acousticness & Valence 121

Group 3: Spectral Inharmonicity, Energy & Liveness 122

Group 4: Spectral Kurtosis, Spectral Centroid & Speechiness 123

Group 5: Flatness, Tempo & Key 124

Group 6: Crest, Tempo & Valence 125

Group 7: Smoothness, Danceability & Valence 126

Group 8: Echonest Features 127

Group 9: Libxtract Features 128

Group 10: All Features 129

List of Dataset Tracks 130

Stay Still | Please Hear Lyrics 136

Stay 137

Seeds 138

Bold-Faced Lie 139

New Door 140

Another Point of View 141

Other Side 142

Through the Night 143

Daisy Chains 144

First Sight 145

Implications 146

Here's to Hoping 147

List of Tables & Figures

Figure 1.1 Smith & Dean's (2009, p. 20) iterative, cyclic web 10
Figure 1.2: A research-led practice / practice-led research framework 11
Table 2.1 Correlation Heat Map 24
Figure 2.1 Spectral Inharmonicity 'Bully' 27
Figure 2.2 Spectral Kurtosis comparison 29
Figure 2.3 Spectral Flatness comparison 30
Figure 2.4 The Components of a Track 38
Table 3.1 Folk Songs by Year 59
Table 3.2 Genre By Year 59
Figure 3.1 Valence by genre as analysed by Echonest 60
Figure 3.2 Acousticness by Year as analysed by Echonest: 62
Figure 3.3 Artist Similarity Partial Dendrogram 64
Table 3.3 Dataset Release Date Group Representation 69
Table 3.4 Dataset Genre Representation 69
Table 3.5 % of each genre represented in the greater dataset by the groups. 72
Table 3.6 Dataset Location Representation 73
Figure 4.1 Folk Strumming Pattern 95

Abstract

The creative process of making recordings in the popular music sphere is impossible to disconnect from the concept of influence. Whether practitioners are influenced consciously or subconsciously, and push toward, or away from their influences, they are shaped by the music they hear. This research-led practice project augments the influencing factors in the creation of an album of song-based music by foregrounding the listening process. This is approached by conducting an in-depth analysis of a set of tracks using a combined methodology integrating traditional popular music analysis techniques, with music information retrieval (MIR) tools.

My methodology explores the novel applicability of these computational tools in a musicological context, with one goal being to show the value of machine listening in popular musicological research and the processes of composition and production. The emerging field of Digital Musicology takes advantage of big data and statistical analysis to allow for large scale observation and comparison of datasets in a way that would be unrealistic for one person to attempt without the aid of machine listening. Setting aside the intention and reception components of musicology, the goal of musical output suggests a feature-based approach is well suited to the task of investigating these methods.

Utilising the musical ideas generated through the combined analysis of tracks compiled from the *Billboard* Alternative, year-end charts of 2011-2015, the songs written and recordings produced for the album *Stay Still | Please Hear* are a result of allowing a conscious subversion of my usual creative process through the expansion of my field of musical influence. This discursive component shows the development of my combined analysis methodology,

highlights the points where creative influence occurred in the arrangement and production of *Stay Still | Please Hear*, emphasises the value of MIR tools in expanding the scope of musicological analysis, and demonstrates a unique approach to the development of artistic practice from the perspective of a creative practitioner.

Stay Still | Please Hear - Track List

01 Stay	02:19
02 Seeds	03:35
03 Bold-Faced Lie	03:05
04 New Door	03:53
05 Another Point of View	05:12
06 Other Side	03:28
07 Through the Night	03:39
08 Daisy Chains	04:08
09 First Sight	02:57
10 Implications	03:15
11 Here's to Hoping	03:33

All tracks written, arranged and produced by Jonathan Armstrong.

All vocals and instrumentation performed by Jonathan Armstrong except for drums on 'Seeds', 'Bold-Faced Lie', 'Daisy Chains' and 'Implications' which were played by Jess Ciampa.

All tracks engineered by Abraham Box and Jonathan Armstrong.

All tracks mixed by Anton Hagop.

All tracks mastered by Mitchell Hart.

The audio files for this album can be accessed by going to: https://jonarmstrong.dashnexpages.net/ssphdca/
The lyrics for the album can be found in the appendix

Chapter 1: Research Background and Framework

This Doctor of Creative Arts candidature has been undertaken with the goal of creating an album of song-based music that is influenced by augmented listening techniques. These listening techniques come in the form of analysis methods, whereby utilising specific tools, the process of "listening" to music can yield more information than would otherwise be heard. By augmenting this listening / influence process I believe that my creative process has been expanded in directions that I would not otherwise have explored.

Stay Still | Please Hear consists of eleven songs that I wrote over the course of the candidature (two of the songs had been worked on prior to starting) and which I arranged, performed, recorded and produced based on the findings of the research. This discursive component of the submission details the background of the research, the process of developing an analysis methodology, the implementation of that methodology and the manner in which I applied ideas generated through analysis in the creative process.

The concept of generating ideas through analysis is a way of subverting my normal creative practice, being self-aware in my approach to understanding influence, and taking control of some of the influencing factors when developing a track (recorded song). By generating ideas specifically from a pre-existing set of tracks, I believe that I can bring to the foreground some of the often-subconscious influences that musicians, songwriters and recording artists utilise.

The idea of foregrounding influence in a creative project is nothing new. Many artists will discuss the inspiration for what they create, however the idea of utilising analysis methods as a way of generating creative sparks is one that has scope for exploration. The purpose of this approach is to take some of the creative decisions out of my hands, using the analysis findings from a set group of tracks to develop a palette from which I can draw artistic stimulus.

The major fields of research that this project intersects with are music information retrieval (MIR), creative practice, and popular musicology. The field of digital musicology, still in the early stages of development, is focused on bringing together ideas from both musicology and music information retrieval, aiming to find ways of using the technology and methods that are developed in MIR as a way of providing a wealth of information that can be analysed from a musicological perspective (Cottrell, 2018, p. 218). Digital musicology is then grounded in the broader discipline of empirical musicology which as a field encompasses quantitative, data-based analysis methods and provides foundation for some of the statistical and algorithmic approaches to music data collection and exploration as detailed in Cook and Clarke's (2004) *Empirical Musicology: Aims, Methods, Prospects*.

Machine listening refers to the element of MIR focused on the development of computer (machine) based systems for extraction of musical characteristics, the indexing of that information, and the development of search and retrieval systems (Downie, 2003, pp. 308-311)**.** Examples of systems that utilise MIR tools include recommendation algorithms used by music streaming services such as Spotify, and Shazam, a spectrum recognition application (Wang, 2006), and real-time machine listening programs used in music making. The reasons for utilising MIR for this research project lie in its large-scale extraction of musical characteristics, the organisation of the information extracted to show similarities between tracks, pointing to musical assumptions about the data set, and lending a novel approach to grouping tracks that can provide a "new angle on their relationships" (Collins, 2010, p. 177).

This then ties into popular musicological analysis methods of breaking down tracks based on their harmony, structure and timbre (Moore, 2012, pp. 19-90) as well as looking more deeply

at the audio manipulation techniques used throughout the production process to achieve those musical characteristics (Bennett, 2018), (Von Appen, 2015), (Zagorski-Thomas, 2015).

While there are varied and established approaches to conducting analysis using these methods independently, exploration of a combined method that is accessible, particularly to musicologists, is of value as the use of the available technology can provide novel insights into music, especially on a larger scale. The value of using MIR technology to "assist" a musicological inquiry (Collins, 2010, p. 181), by finding patterns in larger sets of music than one musicologist may be able to reasonably listen to without such technology, has yet to be satisfactorily investigated (Cottrell, 2018, p. 218). The main inhibiting factor for this has been that the usage of MIR interfaces (Wiering & Benetos, 2013, p. 3) (particularly on larger scale datasets) requires some level of understanding of both coding and statistical analysis which in the past has not been considered important to musicology (Cottrell, 2018, p. 219). On top of this, a resistance to collaborative digital musicological work (Kent-Muller, 2017, p. 1), has meant that digital musicology as a research field is still in the early stages of development (Selfridge-Field, 2017, p. 224).

I believe that there is much to be gained from the integration of MIR strategies into musicological practice, allowing for large scale analysis over time as seen in Mauch, MacCallum, Levy and Leroi's "Evolution of Popular Music: USA, 1960-2010" (2015). This shows how MIR tools can be applied in a way that provides insight into cultural and historical trends and influence based on arguably "objective" grounds. This can only strengthen the connections drawn between music and its impact on and relationship to society as well as opening up immeasurable opportunities for creative exploration and application as is

explored in undertakings such as the "Darwintunes" project (MacCallum, Mauch, Burt, & Leroi, 2012). *This* is where the novelty of my research lies, in the development of a combined analysis methodology, utilising MIR tools to enhance a musicological, feature-based analysis approach. Whilst my application of these tools is still a work in progress, my goal is to expand upon current digital musicology analysis approaches by creating an exemplar that lends itself to the future refinement of the use of such tools.

My interest in these areas stems from a musicological curiosity about the concept of objectivity in the analysis of music. When looking at music from a purely textual perspective, to be able to place a numeric value on various musical features allows you to compare a recording with any other recording for which you have the same feature values. As Cook states (2004, p. 109)

> The value of objective representations of music, in short, lies principally in the possibility of comparing them and so identifying significant features, and of using computational techniques to carry out such comparisons speedily and accurately

This opens up a world of information to consider and provides a glimpse of objectivity, in what has traditionally been (and will continue to be) a subjective field of study. Conducting statistical analyses on recorded music's features (looking beyond what can be notated) can add weight to the propositions made by musicological analysis. While my focus is on feature-based analysis, these same methods and ideas could be applied in a more ethnomusicological or sociological approach.

Given that my focus is creative practice, I have geared this research toward a creative output, using a combined analysis methodology to yield ideas for creative stimulation within the process of producing an album. This is built upon an understanding of Toynbee's (2000)

application of the concepts of "field" and "habitus" found in Bourdieu's writing. These provide a framework for understanding where a person's actions (and in this case those linked to creativity) come from. Bourdieu's broader description of "field" as it pertains to literary work is as follows:

> [A] field is a separate social universe having its own laws of functioning independent of those of politics and the economy… Put another way, to speak of 'field' is to recall that literary works are produced in a particular social universe endowed with particular institutions and obeying specific laws. (Bourdieu, 1993, pp. 162-163)

These "laws of functioning" that define the structure of a field are determined by the interactions of those within the "universe of belief" (ibid, pp. 164).

> Cultural production distinguishes itself from the production of the most common objects in that it must produce not only the object in its materiality, but also the value of this object, that is, the recognition of artistic legitimacy. This in inseparable from the production of the artist or the writer as artist or writer, in other words, as a creator of value (ibid, pp. 164).

So, a cultural "field" can be described as "a series of institutions, rules, rituals, conventions, categories, designations, appointments and titles which constitute an objective hierarchy, and which produce and authorise certain discourses and activities." (Webb, Schirato & Danaher, 2002, pp. 21-22). Engaging with a field is then dependent on artistic legitimacy which in turn circles back to critical engagement with the field creating a somewhat circular Creator - Cultural Capital narrative defined by "the conflict which is involved when groups or individuals attempt to determine what constitutes capital within that field" (ibid, pp. 26-27).

To Bourdieu, “habitus” is a “system of dispositions… the incorporated and therefore transindividual social” (Bourdieu, 2020, p. 29). Understood in opposition to the “objectified social” or “field” (ibid, p. 29) the effect of “socialisation, of concord between habitus and field … is to produce a kind of orchestration of habitus and field” (ibid, p. 14). “Habitus” is where knowledge, beliefs, values and worldview are constructed (Webb et al. 2002, p. 38). Cultural trajectories mean that we are predisposed to “certain attitudes, values or ways of behaving” (ibid, p. 38). Habitus is generally “arbitrary” and “at least partly unconscious” (ibid, p. 38) and due to inherent differences in every individual’s social conditioning, “no two habitus are alike” (Bourdieu, 2020, p. 30).

Bringing this discussion back from sociological theory to the application of these terms in a model for understanding my creative process, on the concept of habitus from the perspective of song-writing, McIntyre equates it to the cultural capital acquired by a songwriter around the conventions, rules and ideas required to produce a variation on the field of work that already exists (McIntyre, 2008, p. 42). This process of immersion in the existing knowledge allows the artist to develop a “feel for the way things are done” (McIntyre, 2008, p. 42). With the artist’s habitus providing the foundation of time spent engaging with and learning the knowledge required to participate in the act of creating, the field with which the artist chooses to engage provides the direction and spark for creating. As McIntyre writes (2008, p. 49):

> The field decides how a song fits in relation to all other songs. Songwriters draw on the specific domain of songs and songwriting and rearrange it in unique and novel ways. Contemporary Western songwriters, as choice-making agents, therefore work within a structured system that shapes and governs their creativity while they contribute to and alter that system.

McIntyre's focus on songwriting in the popular sphere translates comfortably to the focus on arrangement and production in my own work. Toynbee's use of "habitus" in his model for breaking down the process of music creation presents the artist's creative space as providing a set of "possibles", some more or less likely depending on the creator's "habitus" and the "point of intersection with the creative field" (Toynbee, 2000, p. 40). This concept of "possibles", assesses the likelihood of creative decisions based on the intersection of an artist's "habitus" and "field", which become lower the further from the "habitus" the intersection occurs (Toynbee, 2000, pp. 40-41).

Toynbee suggests that a "musical creator is restricted in how much difference they can make at any given moment, that the unit of creativity in a creative act is a small one" (ibid, p. 35). He proposes that neither the creator's habitus, or the field of works are the points at which creativity exists, but rather it can be found in the "key juncture in the moment of choice before a creative action" (ibid, p. 57). While in live performance this can be observed to some extent, a question more pertinent to this research is: what does this mean for recordings? Studio "performances" are "staged as something performed *by* musicians *for* an audience" (ibid, p. 57), "constructed in a sequence of multiple takes, overdubs and editing before being distributed across different kinds of media" (ibid, p. 55). So who decides which choices are units of creativity? Perhaps this is reading too deeply into Toynbee's method, and descriptions such as "the putting together of voices with aesthetic intent" (ibid, p. 46) and "the selection and combination of what is 'out there'" (ibid, p. 52) give enough definition for the point at which creativity occurs. Applied to designing this project, I can define my standard practice as "habitus" and the dataset as the "field of works". My analysis method is my way of engaging with the "field" seeking unique interactions with the "possibles" of creative

decisions to be made. As suggested earlier, by foregrounding the creative *influence* (where an artist consciously recognises where the "possibles" they applied came from) I can subvert how I as an artist would usually engage with the field and put a focus on the meeting-place of "possibles". I believe it stands as a unique point of research if we agree that creativity "consists in an encounter between the musician-subject and objects in the field of works" (Toynbee, 2000, p. 63)

This concept of "creative influence" is my way of describing the intersection of the field of works, habitus and "possible" through the lens of a "stylistic referentiality" (Arns, Chilla, Karjalalanen, Lilja, Maierhofer-Lischka, Calnes, 2015, p. 197). This is achieved by connecting Toynbee's creativity theory with popular musicological analysis' method of comparing stylistic similarity with other recordings as a way of articulating meaning. As I unpack the idea of creative influence throughout this research, it will be used in both a creative and reflective capacity, consciously observing the influence from the field of works as I create, while also reflecting on how I may have been unconsciously influenced by my habitus.

This can be seen as a way of expanding an existing creative process which has been developed by learning the "rules and conventions" making recordings as an "indie" singer-songwriter. By closely engaging with a consciously selected field, I can subvert the way that I create music (and specifically the choices made in arranging, recording and producing tracks) through the application of various techniques, concepts and ideas that will be gathered using the combined analysis methodology. This subversion of my creative process allows for growth as

an artist, expansion of my habitus and the possibility of creating a repeatable method for inspiring creativity, by directing engagement with new fields.

A focus on creative practice as it is augmented by research provides the starting point. This emphasis necessitates the flexibility and adaptability of outcomes throughout the project, approaches to the research based on findings, and must develop methodologies as an outcome of the research process. Smith and Dean's model (2009, pp. 19-25) provides a functional strategy allowing for creative exploration through the lens of a research project. The model is what they term an "iterative, cyclic web of practice-led research and research-led practice." It includes various phases that allow for either further development of ideas, or output of findings depending on what suits the result of each research phase. Smith and Dean's original framework is outlined in figure 1.1:

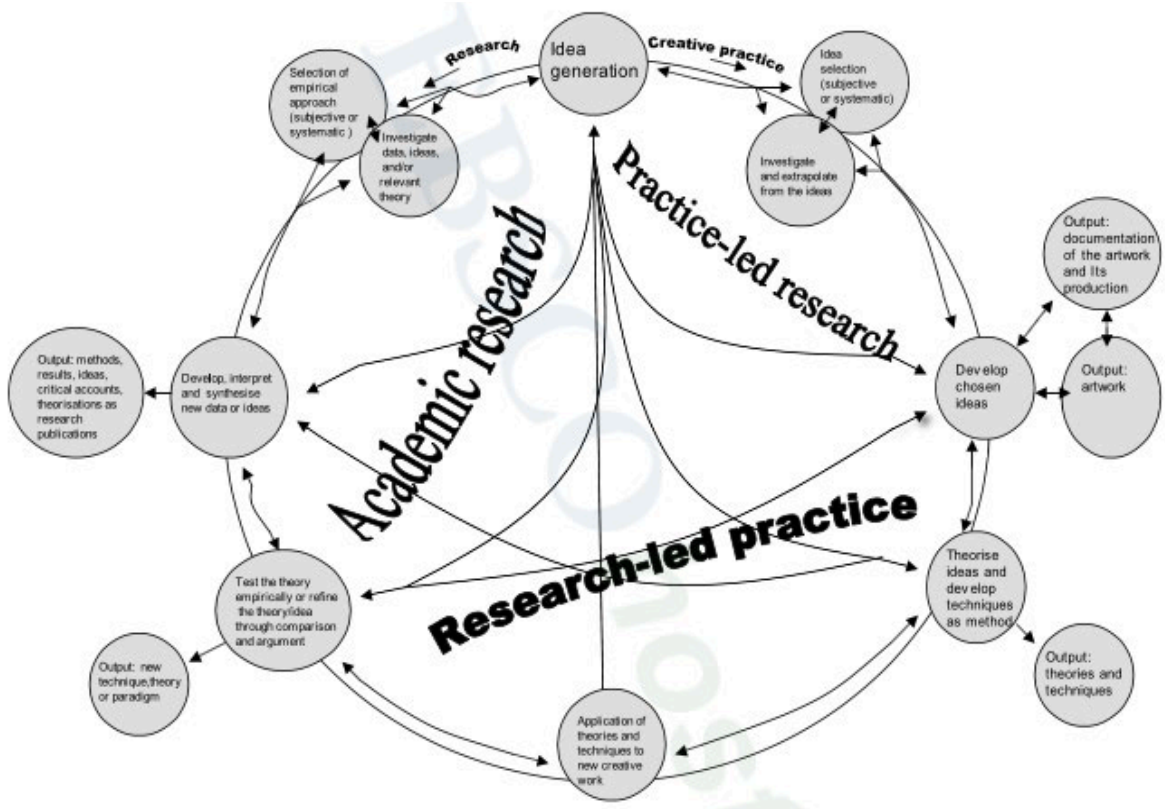

Figure 1.1 Smith & Dean's (2009, p. 20) iterative, cyclic web of practice-led research and research led practice.

I chose this framework because it is fluid and flexible enough for creative research, allowing for various forms of output along the way. In particular by allowing for creative input and output as well as theoretical input and output, this framework encourages the exploration of a range of approaches to generate new ideas. Whether those ideas fit into the building of the analysis methodology, or into generating creative spark, I believe that it provides a strong platform from which to begin, allowing the flexibility for the generation and pursuit of new ideas in a way that suits a creative work. With music creation being the focal point of the project, I constructed a more specific framework to best represent the kinds of output that the project might produce. This is shown in figure 1.2.

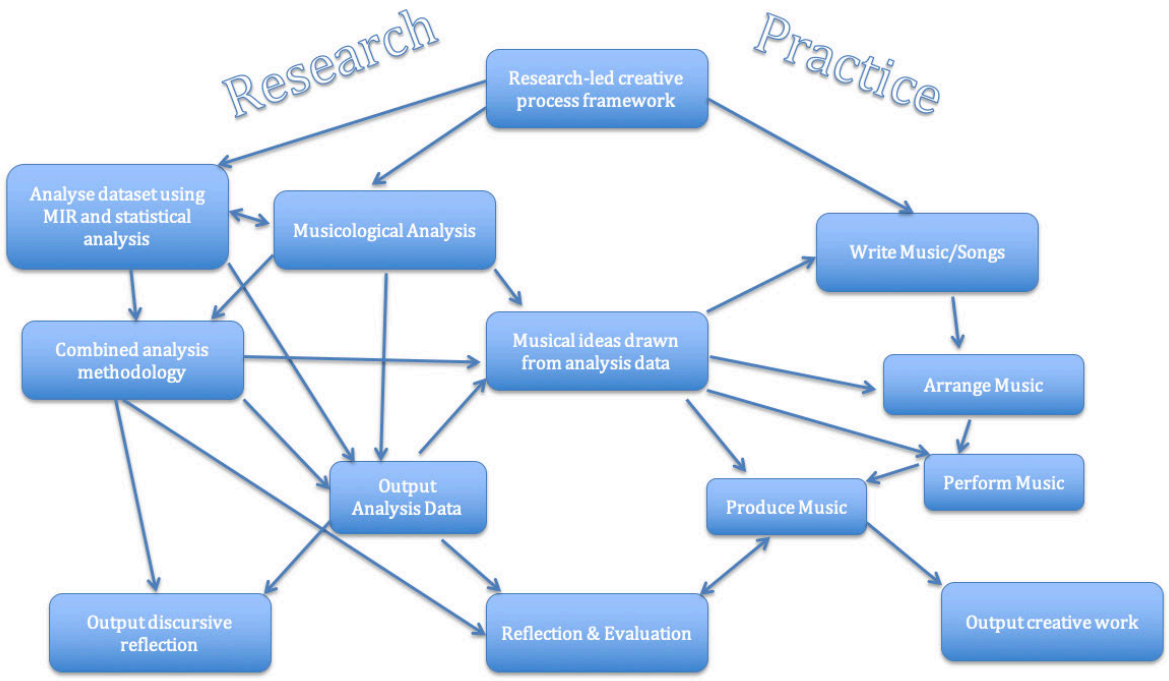

Figure 1.2: A research-led practice / practice-led research framework outlining the directions that my research flows in.

What this opens up for a creative practitioner and researcher is the ability to both conduct research and create at the same time, with each step informing the other steps. In my case, the goal of developing music can coincide with researching and analysing an external set of recordings, with each step along the path of creation informed by developments and findings from my analysis method. So, the impact of research findings on the creative work is not

dependent on having a finalised analysis method, rather the ideas found through time spent refining the method are just as valuable as the ideas generated through the proposed final method. This allows for a creative mindset to be taken into the dataset research, where I am constantly looking for interesting features or ideas that I can use creatively. As Windsor states regarding an exploratory approach to empirical analysis (2004, p. 198)

> It is perfectly acceptable to collect data in a more exploratory manner as long as it is recognized that it may be hard to understand the relationship between different variables. The "real world" is a complex place, and laboratory researchers often pay a price for ensuring that their experimental results are easy to interpret. This price is loss of "realism" or "ecological validity," and can result in findings that only hold under extremely unusual and constrained circumstances (such as those within a laboratory). It may be convenient for analytical purposes to take into account only certain things, such as, for example, the duration and pitch-class of events in melodic sequences, but there is a danger of finding out too late that some other factor, such as melodic contour, was a relevant variable. An experimental approach tends to be reductive, in that it reduces the number of factors involved so as to show more clearly their influence on one another. There is always a danger that such a reductive approach changes the observed phenomenon so much that the findings are hard to apply to the real world.

So, flexibility could leave the actual outcomes of the research somewhat ambiguous, but I will attempt to clearly point out significant outcomes throughout this discursive component, recognising that the *primary* goal is that of influencing creativity in the production and recording of an album. With that focus, some of the choices in the research methodology have been made somewhat arbitrarily, or with a push from where I think the project should

be directed creatively. Keeping that in mind, while I do aim to exhibit how MIR and statistical analysis tools can be used from a musicological standpoint, I do not place much weight in the findings as an analysis in and of itself. What is of importance is that the findings, based on "objective" information, through my subjective lens, have provided a specific set of ideas to create an album that I would not have developed otherwise. This is not to say that my observations are not accurate, or that the tools used are not trustworthy, rather to emphasise that the focus has not been on objective accuracy as far as feature analysis is concerned, but rather on sparking creative ideas.

When I engage with the concepts of objectivity and subjectivity in MIR analysis, I must recognise that algorithmic analysis tools are designed with different approaches to achieve the desired output data. This leads to varying levels of success and accuracy in terms of the musicological understanding of what is being measured. For example, if I were to use an algorithm to determine that the mean tempo of a given song is 130BPM, this does not consider natural variation of tempo within some recordings (due to being a measurement of the mean). Beyond this consideration, one algorithm may render the same track as 65BPM based on a different approach to calculation. Therefore my description of "objective" when it refers to using such data for larger scale comparative and statistical analysis does not mean to indicate that those specific points of data are accurate. However, relative to their consistent use across the dataset, they do provide an "objective" and "replicable" point of reference (irrespective of their accuracy) from which to conduct comparative analyses (Cook & Clarke, 2004, 5).

While musicologists will disagree on meaning, intent, and even harmonic structure (de Clercq & Temperley 2011, 54) the purpose of utilising MIR data in this project is not to assess how accurately it represents my own subjective analyses, but rather to utilise the vast number of datapoints that are accurate unto themselves to compare and group the dataset. I have endeavoured to keep the MIR component of the method largely objective, detailing where each piece of data originated, and maintaining consistency across the dataset. Where more "arbitrary" choices are made regarding this data, I aim to explain my rationale with relation to how those choices are made in context of disrupting my habitus.

Similarly, I have applied the musicological analyses with consistency, but with an eye toward the final goal of creative stimulus rather than musicological interpretation. Acknowledging that perceptual characteristics (those that can be physically perceived, in this case by the act of hearing) are by nature open to interpretation (Windsor, 2004, 199-200), and that this research is not concerned with the differences in perception, the musicological analysis method is grounded in a long history of feature-based popular music analysis method. Moore's broad structural, spatial, harmonic and stylistic tools (2012), Bennett's (2018) work on production, mixing and mastering methods, Zagorski-Thomas' (2010, 2015) insights into spatial staging and Encarnacao's (2013) observations on lo-fi aesthetics contribute further to understanding "creative influence".

Beyond the exploration of "objective" datapoints, the sparking of creative ideas is part of what drew me to using MIR and statistical analysis as a novel way of subverting choices regarding style and genre. The design of the research necessitated time spent finding the best way to use these tools for the task at hand. This development meant that while I had some

understanding of the tools, and more particularly the kind of data they could provide, deciding how they could be best utilised in this given project was a part of the discovery process afforded by the research-led practice model. MIR's value lies in quantifying, arranging and comparing the algorithmic data in ways that differ from how one would traditionally group sets of tracks.

The set of recordings that I chose as the field of works for the sparking of these creative ideas was one of the somewhat arbitrary choices made. Coming from an indie / singer-songwriter habitus of writing and performing, I wanted to explore a field of influence that included a broad range of styles and genres. While the success or popularity of the track was of little importance to analysis findings, I wanted the dataset to be representative of the broader alternative pop / rock field as I have not previously produced music in this area to any great extent, and it is the field that most aligns with my desired creative outcome. The recordings listed in the *Billboard* Alternative, year-end charts from 2011-2015 represent the broad range of styles that I desired to align my creation to and so comprise the dataset that I chose to explore for this project. I discuss this in more detail in the next chapter.

In hindsight more might have been gained with a dataset that was stylistically broader, but my goal was to organise and compare tracks in counterintuitive ways. I believe that the initial intent in including a broad range of styles to allow for a diverse pool of ideas was sound. The novel grouping process provides a less genre-contrived platform from which to compare tracks. A computer-generated music project could look at taking the large-scale data directly into a creative project (MacCallum et al., 2012) however for the purpose of expanding my habitus the "possibles" needed to be practically applicable in a more traditional, musician-

based creative process. Augmentation of the creative process through the comparative grouping method afforded by MIR data is one way of interrupting the normal process of influence in music production. I believe that it was also an effective way of bringing out particular musical traits, and beyond this project I think it would be valuable to observe this in a tighter stylistic dataset as a way of immersing oneself in a field of works.

I have no direct example to follow regarding how to combine MIR, popular musicology and creative practice which are each distinct, but in this project, overlapping fields of research. So, I will focus on how these fields complement each other: how the practical side of my creative process is impacted by musicological analysis, and how can they each be affected by the MIR tools available. My goal through this reflection is to demonstrate how the investigation of some of the many points at which MIR and musicology intersect allowed me to cultivate creative ideas using a non-linear, research-led practice framework for the development and creation of *Stay Still | Please Hear.*

Chapter 2: Development of Method

Introduction

This chapter shows the development of the analysis method and the refinement of how it interacts with my theories around creativity and influence. The first section introduces the variety of MIR approaches that I explored, unpacking the rationale behind my choice of tools and methods, and how that relates to the intended creative output. Following on in the second section I show the development of my musicological method, outlining the feature-based approach, and showing the different areas of the creative process that the analyses can impact. This then leads into the next chapter where I show how this combined methodology is used.

MIR Analysis Method

Introduction

My goal when developing the MIR portion of my combined analysis method was to find ways to enhance the musicological components of the approach. This was achieved by leaning into the strengths of MIR, such as grouping of tracks based on algorithm-determined features to allow for an augmented listening experience when conducting deeper analyses. That being said, the importance of the analysis itself in this project was second to developing potential influencing features from the fields engaged with that could contribute to the overarching creative objective. As outlined in the previous chapter the concept of influence is integral to this project and, beyond exploring the possibilities of a combined method, the reason for conducting these analyses is to find influencing ideas, creative sparks if you will. The term creative influence is my way of defining where the chosen “possibles” from the field of works and field of musical production intersect with the artist’s habitus (Toynbee, 2000, p. 40).

The definition of MIR as a field hinges on its use of algorithmic and computational tools for analysis, as "feature extraction" tools (Downie, 2004). The idea of extracting "features" from the tracks in the dataset, combined with the earlier established concept of creative influence is how I developed the term "influencing features". This describes the function of the musical ideas I find throughout the analysis process in the development of *Stay Still | Please Hear,* emphasising the purpose and methods of the research. While not a term regularly used in musicological analysis, "features" is both specific enough, and broad enough to be considered in reference to a variety of different musical components.

In considering the MIR analysis methods available, my approach underwent a variety of incarnations. My goal was an efficient, effective and repeatable process for analysing a medium-scale, audio track-based dataset (Windsor, 2004), with my creative outcome in mind. Applying the cyclic approach outlined in chapter one, I developed a method to gather data, which in itself provided data that could be fed back into developing the method, or applied to the practical element of the project. By switching from data analysis to creative application and back again, I refined the process by judging the effectiveness of each technique and deciding which methods to move forward with.

In this phase of designing the analysis approaches that would be present in the final methodology, the methods that were left behind, or refined into something more cohesive provided insights that shaped my understanding of the tracks from the data set. That being considered, the influencing features that I chose to use in the creative portion of this project were derived not only from the final methodology that I developed, but also from the approaches that I tested while developing that methodology. To this end, the development

of said methodology contributed valuable ideas to the creative project. This chapter will outline those tools and methods applied and tested throughout the project and the purpose behind their inclusion, while the next chapter will detail the application of the methodology and the influencing features derived from it.

I chose MIR tools partially based on their accessibility to an MIR layperson. They require minimal coding knowledge yet provide a variety of consistent acoustic information to which I could apply statistical analysis. This ruled out MARSYAS (Tzanetakis, 2009) and the MIRToolbox in Matlab (Lartillot, Toiviainen, & Eerola, 2008); I chose to focus on Sonic Visualiser and Annotator for their relative ease of use. Each allowed me to apply pre-built algorithms to the waveforms of the tracks in my dataset. Sonic Visualiser is a graphic user interface that works as a platform from which VAMP plugins can be used to extract features from audio signals (Cannam, Landone, & Sandler, 2010). Sonic Annotator is a code-based program, run through a command-line software such as OSX's Terminal that uses the same plugins to extract a given feature from a batch of tracks, output in raw numbers rather than graphic form (Cannam, 2013). VAMP is a language for audio analysis that features extraction plugins built by MIR researchers that include sets from the BBC, Queen Mary University of London, Matthias Mauch, and Libxtract (Bullock, 2007) available for use by those not as experienced in programming and building algorithms (Cook & Leech-Wilkinson, 2009). They work much in the same way as VST[1] plugins in a DAW[2] and are dependent on Sonic Visualiser or Annotator to display their output.

[1] A VST or Virtual Studio Technology is a plugin format that integrates software effects units and software synthesizers into a DAW.
[2] A DAW or Digital Audio Workstation is a software application used for recording, editing and mixing audio files.

My control over the quality of the quantitative data included ensuring that algorithmic data collected could be defined as “continuous data” and the majority of distributions can be defined as “parametric” (Windsor, 2004, p. 200, 202). The features that can be extracted by these plug-ins can be categorized as low-level (those that look at basic acoustic information related to the spectrum and are based on the physics of sound) and high-level (those that analyse more complex concepts related to what is heard in the track). Firstly, the algorithms that look directly at the spectrum of a track, focus on low-level acoustic features such as spectral centroid, which is defined as the weighted mean of the frequencies present in a signal. This could be understood as the higher the number, the brighter (or more high frequency dense) the sound (Weihs, Jannach, Vatolkin, & Rudolph, 2016). These features provide significant acoustic information that can be used to classify tracks into groups based on spectral similarity, but they do not provide an abundance of accessible musicological information with which observations could be made about said tracks. The spectrums that they make measurements of have been used by musicologists such as Brackett (2000) as a way of visually representing melodic and harmonic content as well as tessitura and timbral brightness. I chose not to utilise them in this way, instead leaving the spectrum-based analysis to the algorithms.

The second category of feature extraction algorithms looks at high-level features. These algorithms aim to understand musical ideas such as rhythmic patterns and harmonic content and are built on low-level features. As an example, Mauch has a VAMP plugin named Chordino which will with some accuracy determine the chords in a given track (Mauch & Dixon, 2010). These tools give insight into the musical make-up of a track (as far as traditional musicological language is concerned) but some, including Chordino, can be difficult to use when considering

a larger-scale dataset due to the large amount of data that is output per track. An accessible set of high-level features is found in the Echonest API[3] (now Spotify API) which has a database containing features already extracted for many tracks. With the simplicity of accessing this data, Echonest's features were the first algorithmic data that I added to my database and conducted statistical analysis on (Jehan, 2011).

Algorithmic Analysis

Regarding the low-level features that I was looking at with Sonic Annotator and Visualiser, I started by playing with various VAMP plugins in Visualiser to get a feel for the kind of outputs (in terms of quantity of data per track and what it represented) I might expect. This quickly moved on to developing a strategy using Sonic Annotator to analyse all the tracks in the dataset as a batch using individual plugins. To begin with this was a process of trial and error, looking for the tools that would provide consistent, useful information about the tracks that could be used to begin grouping them and reducing the larger dataset into something more manageable from the perspective of an in-depth musicological analysis.

The ever-growing number of parameters and algorithms available necessitated restraint in terms of the scope of this research. My use of MIR tools was directed and limited to allow the creative purpose of this research to be the focal point. The tools chosen yielded data that was directed toward sonic development of the recordings rather than the nuts and bolts of songwriting. This was necessitated by the concurrent writing of songs and development of analysis methodology, so that when it came to applying the influencing features, the songs

[3] API stands for Application Programming Interface and defines interactions between multiple software intermediaries. In the case of Echonest / Spotify's API, it is the interface through which I access the data for the tracks contained in the dataset.

were well advanced. Foreseeing the time constraints in the project design, I focused on timbral analysis tools rather than those of melodic contour and lyrical analysis that can be found in large-scale projects such as O'Regan's (2014) work on the Beach Boys' repertoire. One could certainly apply a combined analysis approach, utilising a range of MIR and musicological analysis features for melody and lyric writing to expand songwriting options.

Experimenting with a range of beat and rhythm extraction tools, harmonic analysis, and spectral analysis algorithms, I came to the conclusion that for the purpose of having a consistent, measured method, I would limit the algorithms used to one set of tools that looks specifically at low-level features of tracks in a purely spectral analysis. Based on the consistency of the information across the plugins and the availability of a reasonable number of tools to use, I chose the Libxtract suite of algorithms (Bullock, 2007). Specifically, I chose to measure spectral inharmonicity, spectral kurtosis, sharpness, spectral skewness, spectral standard deviation, spectral variance, spectral centroid, crest and flatness, all of which I will define later in the chapter. Using Sonic Annotator I still had to write a few lines of code to use in OSX's Terminal but the result of the time spent getting that right meant that I was able to obtain a single number representing the mean (Windsor, 2004, 209) of each feature for the duration of each track.

Combining these datapoints with the Echonest features, energy, liveness, tempo, speechiness, acoustiness, danceability, key, loudness and valence I had nineteen points of data for each track. To confirm that each of these data points provided unique information from each other I conducted a correlation (Windsor, 2004, 214) test in the data-focused programming language R (shown in table 2.1) with the goal of eliminating any features that

were not unique. Through this process I was able to eliminate five features based on their similarity to other features leaving me with a total of fourteen.

Those eliminated were spectral skewness (for its similarity to kurtosis), sharpness, spectral standard deviation and spectral variance (for their similarity to spectral centroid and each other) and loudness (for its similarity to energy).

CORRELATION	SI	SK	S	SS	SM	S SD	SV	SC	C	F	E	L	T	SP	A	D	K	L	V
Spectral Inharmonicity	1																		
Spectral Kurtosis	-0.46	1																	
Sharpness	0.51	-0.4	1																
Spectral Skewness	-0.39	0.85	-0.2	1															
Smoothness	-0.03	0.01	-0.3	-0.09	1														
Spectral SD	0.53	-0.6	0.87	-0.5	-0.24	1													
Spectral Variance	0.27	-0.5	0.76	-0.39	-0.21	0.94	1												
Spectral Centroid	0.68	-0.6	0.89	-0.52	-0.25	0.97	0.84	1											
Crest	0.07	0.01	0.06	0.07	-0.02	0.03	0.03	0.02	1										
Flatness	0.02	-0.1	0.12	-0.15	-0.03	0.13	0.12	0.13	0.06	1									
Energy	0.42	-0.4	0.61	-0.16	-0.3	0.45	0.31	0.52	0.12	0.08	1								
Liveness	0.01	-0.1	0.08	-0.02	-0.08	0.04	0.02	0.05	0.11	0.05	0.17	1							
Tempo	0.1	-0.1	0.18	-0.01	0.04	0.14	0.13	0.14	0.04	-0	0.16	0.06	1						
Speechiness	0.26	-0.1	0.16	-0.01	-0.14	0.16	0.09	0.19	0.15	0.06	0.27	0.03	0.2	1					
Acousticness	-0.18	0.14	-0.5	0.04	0.17	-0.4	-0.3	-0.4	0.1	-0	-0.4	-0	-0.1	-0.1	1				
Danceability	-0.27	0.18	-0.3	0.01	-0.05	-0.1	-0	-0.2	-0.1	-0	-0.3	-0.2	-0.4	-0.2	0.29	1			
Key	0.1	0.03	0.11	0.04	0.01	0.08	0.07	0.09	-0.1	0.03	0.03	-0	0.12	0.18	-0.13	-0.1	1		
Loudness	0.46	-0.3	0.52	-0.08	-0.21	0.35	0.18	0.44	0.07	-0	0.66	0.01	0.14	0.18	-0.29	-0.3	0.06	1	
Valence	0.15	-0.1	0.12	-0.12	-0.1	0.18	0.15	0.18	0.03	0.01	0.16	-0.1	-0.1	0.07	0.05	0.4	-0.1	0.14	1

Table 2.1 Correlation Heat Map showing the correlation between each feature with the colours representing how hot (close) each feature is to the one being compared and the numbers showing a correlation coefficient with dark orange-red indicating a high level of correlation.

As the algorithms behind these tools are built from mathematical measurements of spectral features, some of those features are not easily described from a musical viewpoint, even though they are analysing music. I will do my best to explain the different spectral features in a musical vocabulary, however some features will not be as easily relatable to musical concepts as others. To this end, the tracks I have chosen to use as examples are mostly chosen for the fact that they are strongly contrasted in the feature being described. This was done in

an attempt to most clearly show the perceptual characteristics. That being said, rather than enhancing the musicological vocabulary, the value in these different features is that they provide unique reference points from which to do large scale analyses, grouping tracks that may not otherwise be grouped, to subvert the listening process. That is not to say that there is no value in the information provided by the algorithms, but rather that the scope of this research means that the augmentation of the creative process by way of exploring these analysis and grouping methods takes priority over a completely musical understanding of the MIR data.

Low-level features

It is of note that each of the spectral features are related to each other as they are all ways of measuring the information contained within a track's frequency spectrum. Along the same train of thought, Libxtract's measurement of spectral centroid, will (and should) be similar to another algorithm writers' representation of the same, as they are each trying to represent the same idea in the most accurate way. For the sake of clarity, I will define my chosen parameters, recognising their relationship to the others, but also showing their value in terms of providing unique information with which to group tracks.

Libxtract Spectral Centroid (SC)

Spectral centroid is defined as "the barycenter of the spectrum." The way it is calculated is by "considering the spectrum as a distribution [in] which values are the frequencies and the probabilities to observe these are the normalized amplitude"(Peeters, 2004, p. 13). Centroid is often viewed as a clear indicator of acoustic brightness in a track, with a higher average value representative of a brighter recording.

As an example, Vance Joy's 'Mess is Mine' returned a mean spectral centroid figure of 1648hz, which is low compared to a track like The Foo Fighters' 'Rope' which gave a figure of 3730hz. Some of the big differences in instrumentation mean that the central average frequency is much higher in 'Rope' due to the use of cymbals which are largely absent in 'Mess is Mine', and distorted electric guitars whose harmonic partials reach into the higher frequencies compared to the warm, clean electric guitars in 'Mess is Mine'. These major differences mean that the frequency energy in 'Mess is Mine' is much lower than in 'Rope'.

Libxtract Spectral Inharmonicity (SI)

Spectral Inharmonicity is defined as "Representing the divergence of the signal's spectral components from a pure harmonic signal" (Peeters, 2004, p. 17). In terms of analysing music, what we would expect to see is music with less "complex" timbral harmonic content (the simplest being a sine wave) such as ambient or spacious electronic music returning a lower value for spectral inharmonicity compared to music with more "complex" timbral content, for example heavily distorted guitars or complex synthesizer sounds.

According to the documentation from Bullock's dissertation the figure should range from a purely harmonic signal at 0 to an inharmonic signal at 1.0 (Bullock, 2008, p. 68). However an analysis of a 110hz sine wave gave a spectral inharmonicity result of just under 4, while white noise returned a result of 400. In an email conversation with Dr. Bullock (Dec 2020) about how this number should be represented, he suggested that the he believed that the results were out by a factor of 400, possibly related to sample rate. With that considered, the resulting output, while not presented exactly as intended should still maintain the same ratios between tracks, and be between a range of 4 and 400.

We can hear this variance by comparing Coldplay's 'Magic', which returned a mean spectral inharmonicity figure of 10.113, to Shinedown's 'Bully', with a mean spectral inharmonicity figure of 48.47. In that range we go from the "harmonically simple" sounds of bass, clean vocals and timbrally simple synth and guitar tones in 'Magic' to distorted guitars, lots of complex frequency content in cymbals and distorted vocals in 'Bully'. While a snapshot of a timbrally complex moment of music would return a higher result than 48, as shown in figure 2.1 where 'Bully' gets to 341 on the scale, the mean of the track balances out those peaks and troughs.

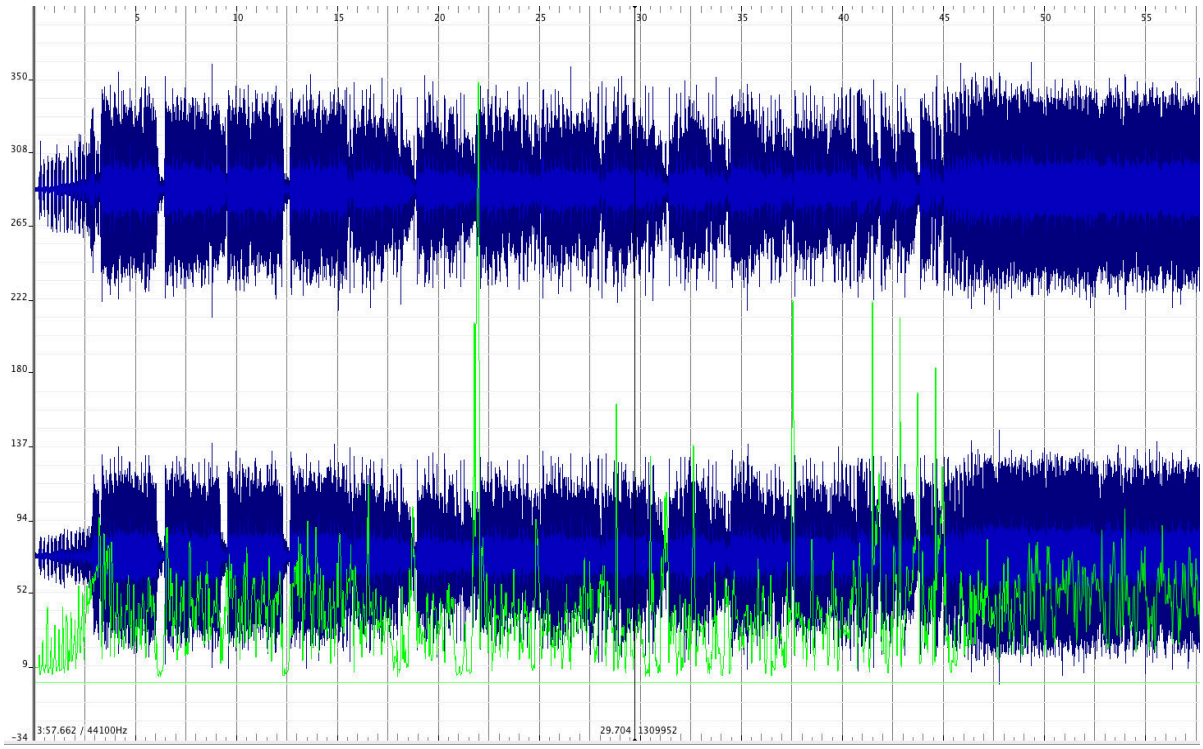

*Figure 2.1 Spectral Inharmonicity 'Bully' - **The blue represents the waveform from 0:00 to 1:00 while** the green points show the level of spectral inharmonicity on the y axis at each point in time on the x axis.*

Libxtract Spectral Kurtosis (SK)

With respect to a track's frequency distribution Spectral Kurtosis is defined as giving "A measure of the flatness of a distribution around its mean value" (Peeters, 2004, p. 14). It is also described with reference to a spectrum's "peakiness"; "In particular, the kurtosis

describes to what extent the spectral shape resembles or differs from the shape of a Gaussian bell curve. For values below zero the spectral shape is subgaussian, which implies that the spectral energy tends towards a uniform distribution. Such a behaviour typically occurs for wide-band sounds. A value of zero points towards an exact bell-curved spectral shape. Values larger than zero characterize a peaked spectral shape which is strongly concentrated around the spectral centroid. Such a spectral shape is typically obtained for narrow-band sounds" (Nagathil & Martin, 2016, p. 150).

The following comparison gives an idea of how "peaky" the spectral shape is, which when related back to what we hear, could relate to the density or sparseness of the track. This can be seen in the following spectrum examples in figure 2.2. 'Royals' by Lorde has a mean spectral kurtosis of 4.6, indicating that the peaks are very prominent, and the highs and lows are dynamic and distinct. In comparison, 'We Come Running' by Youngblood Hawke has a mean spectral kurtosis of -1.1 - clearly a much denser spectral shape with lows and highs being much closer together, likely the result of a fuller mix. Even the timbral difference between the finger snaps in 'Royals' to the snare hits in 'We Come Running' would contribute

to a fuller spectrum. This dataset returned kurtosis values from -1.1 to 13.7 with 197 of the tracks falling between -1 and 2.

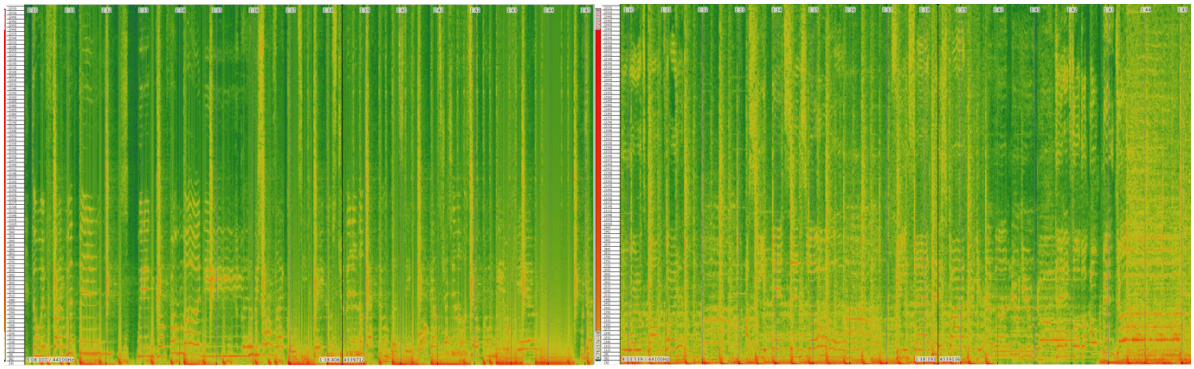

Figure 2.2 Spectral Kurtosis comparison between Lorde's 'Royals' 1:30-1:45 (Left) and Youngblood Hawke's 'We Come Running 1:30-1:45 (Right). Time is represented on the x axis while frequency (low to high) is represented on the y axis with colour from red (high) to yellow (middle) to green(low) designating how much energy is present in that frequency. The axis and colour designations apply to all spectrograms that follow.

Libxtract Smoothness (SM)

"Spectral smoothness is related to the degree of amplitude difference between adjacent partials in the spectrum computed over the duration of the tone. A trumpet often has a smooth spectrum and a clarinet a jagged one, so the former would have a low value of SS and the latter a higher one" (McAdams, 1999, p. 90).

When calculating smoothness, the greater the difference between adjacent partials in an instrument's spectrum, the higher the output value, so sounds that are less smooth will have a higher output.

While this low-level feature is more suited to comparing individual sounds over a shorter period of time as opposed to the full tracks I am looking at, it provides a unique point of difference between the tracks that will allow them to be grouped in stimulating ways.

Libxtract Flatness (F)

Spectral Flatness can be defined as “a measure of the noisiness of a spectrum” (Peeters, 2004, p. 20). Similar to spectral kurtosis, it is related to the peaks of the spectrum. “A higher spectral flatness value points towards a more uniform spectral distribution, whereas a lower value implies a peaked and sparse spectrum” (Nagathil & Martin, 2016, p. 150). As you can see in figure 2.3 The Black Keys’ track ‘Howlin for You’ with a mean flatness of 665 is substantially different from The Arctic Monkeys’ ‘Do I Wanna Know?’ with 160. Comparison between the two shows a stronger distribution of frequencies (strength is indicated by green as weak to red as strong, with yellow in the middle) for ‘Do I Wanna Know’ , while ‘Howlin For You’ has more space and a weaker distribution of frequencies.

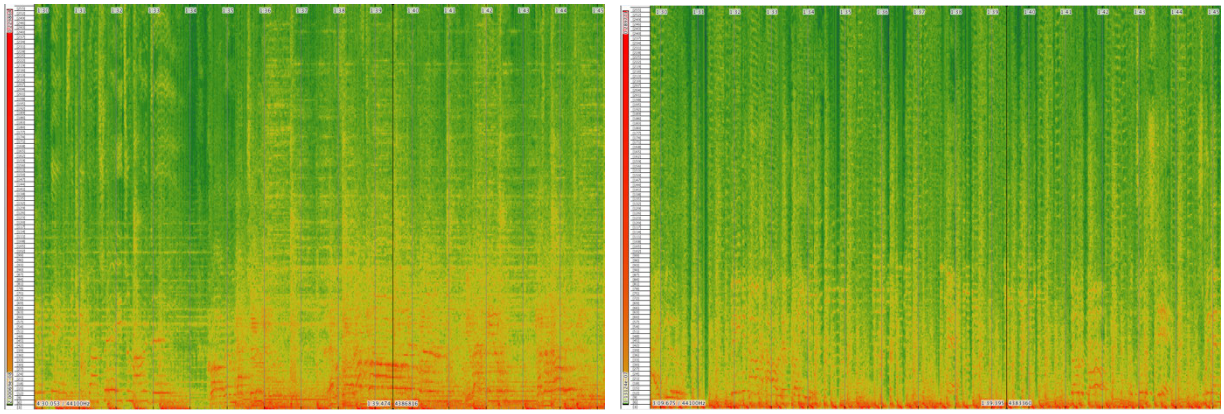

Figure 2.3 Spectral Flatness comparison between The Arctic Monkeys’ ‘Do I Wanna Know’ 1:30-1:45 (left) and The Black Keys’ ‘Howlin’ For You’ 1:30-1:45 (right).

Libxtract Crest (C)

Related to spectral flatness is crest, and the way that it is calculated is “by the ratio of the maximum value within the [frequency] band to the arithmetic mean of the energy spectrum value” (Peeters, 2004, p. 20). As another low-level feature based on the spectrum of a track, relating crest to a musical function is of less value than understanding that it is a way of differentiating and comparing tracks for the purpose of novel grouping that can be considered in a deeper musicological analysis.

Echonest API Tempo (T)

Tempo as derived from an algorithmic analysis is fairly self-explanatory and is a low-level feature. Here are a couple of examples to determine accuracy: Phoenix's 'Entertainment' returned a tempo of 75bpm, which is accurate (although it could easily be interpreted as 150bpm). Saint Motel's 'My Type' returned a tempo of 118bpm, which is also accurate.

High-Level Features

The high-level Echonest API features that I am considering are referred to as "Acoustic Attributes" (Jehan, 2011). These are said to be "modelled through learning" and are generally presented as a single floating-point number ranging from 0.0 to 1.0, (the exception in this set of features is Key) (Jehan, 2011). Some have more information on what perceptual feature they are trying to represent than others, but we can safely state that machine listening and learning has been used to model the way that these algorithms analyse tracks. They are built on extrapolations of largely unknown method from low-level acoustic features to represent somewhat subjective perceptual features. As such the resulting output, while accurate to what it is told to analyse, could be contentious and certainly is not as advanced as the average human listener. However, the value of objective points of reference, takes differences of perception between human listeners out of the equation and allows the focus of this project to remain not on the accuracy of the analyses, but on how they can influence my habitus.

Echonest API Energy (E)

Energy is a measure from 0.0 to 1.0 and "Represents a perceptual measure of intensity and activity. Typically, energetic tracks feel fast, loud, and noisy. For example, death metal has high energy, while a Bach prelude scores low on the scale. Perceptual features contributing

to this attribute include dynamic range, perceived loudness, timbre, onset rate, and general entropy" (Jehan, 2011).[4]

Considering the effectiveness of this feature, an example of a lower energy track is Muse's 'Madness', which returned an energy result of 0.417. For a large portion of the song it remains static dynamically and instrumentally, with unobtrusive electronic drums and synthesizers. This accords with my reception of the track as quite low energy. On the other end of the scale, Papa Roach's 'Burn' is a heavier and guitar-driven track with energetic drums and this is reflected in a high energy rating of 0.981.

Echonest API Liveness (L)

"Detects the presence of an audience in the recording. Higher liveness values represent an increased probability that the track was performed live. A value above 0.8 provides strong likelihood that the track is live" (Jehan, 2011).

While my dataset is not specifically looking at live tracks, I think it is interesting to consider the data related to how "live" a track sounds. For example, Soundgarden's 'Live to Rise' returned the highest live score in this dataset at 0.888 but is quite clearly not a live recording. Whether this is a result of how the algorithm hears the instrumentation or is some kind of error I am not sure. However the recording I analysed for 'Trainwreck 1979' by Death from above 1979 is actually a live version (I did not realise until I was some way into my analyses that this was the case) and returned a high liveness score of 0.67 suggesting that the parameters can be accurate in some instances. 208 of the tracks ranked below 0.5 meaning

[4] Accessible at https://web.archive.org/web/20150112031805/http://developer.echonest.com/acoustic-attributes.html

that there is a low likelihood of those tracks being live (which they are not). My reason for the inclusion of the liveness feature is that despite some questions of accuracy, I find that the way that the tool analyses tracks is unique (as shown by the correlation test) and will help to group songs in an interesting way.

Echonest API Speechiness (SP)

Speechiness "detects the presence of spoken words in a track. The more exclusively speech-like the recording (e.g. talk show, audio book, poetry), the closer to 1.0 the attribute value. Values above 0.66 describe tracks that are probably made entirely of spoken words. Values between 0.33 and 0.66 describe tracks that may contain both music and speech, either in sections or layered, including such cases as rap music. Values below 0.33 most likely represent music and other non-speech-like tracks" (Jehan, 2011). Echonest's algorithm for speechiness was designed to filter out speech-based recordings when one wants to listen to music (Lamere, 2011).

While none of the dataset had a convincing score for likelihood of being speech (none of them are,) the alternative charts include tracks with rap as well as shouted style vocal deliveries, so speechiness as a feature is relevant. As an example, the Macklemore & Ryan Lewis (feat. Wanz) track 'Thrift Shop' returned a relatively high speechiness value of 0.293 and as the vocal style is mostly rap. Conversely Incubus' 'Promises, Promises' returned a low speechiness value of 0.025 and the vocal style is much more melodic singing.

Echonest API Acousticness (A)

Acousticness "Represents the likelihood a recording was created by solely acoustic means such as voice and acoustic instruments as opposed to electronically such as with synthesized,

amplified or effected instruments. Tracks with low acousticness include electric guitars, distortion, synthesizers, auto-tuned vocals, and drum machines, whereas songs with orchestral instruments, acoustic guitars, unaltered voice, and natural drum kits will have acousticness values closer to 1.0" (Jehan, 2011).

As an example Metric's 'Youth Without Youth' returned a low Acousticness result of 0.000101 which suggests that the track is dominated by non-acoustic sounds, and upon listening this is accurate with heavy effect-use on the "acoustic" instruments; drums (which sound like sampled acoustic drums) have filtering, distortion and compression applied, and the electric guitar is distorted. The rest of the instrumentation is built on non-acoustic synthesizers and samples. The Lumineers' 'Ho Hey' returned a high Acousticness result of 0.794 which accurately picks up on the fact that this track is arranged with all acoustic instrumentation and vocals, with much more restrained effects and processing applied.

Echonest API Danceability (D)

"Danceability describes how suitable a track is for dancing based on a combination of musical elements including tempo, rhythm stability, beat strength, and overall regularity. A value of 0.0 is least danceable and 1.0 is most danceable" (Sundram, 2010). For example The Joy Formidable's 'Whirring' returned a danceability factor of 0.203 suggesting that its tempo and beat strength are not congruous to dancing, possibly due to unstable meter throughout the track. It starts out in 4/4 grouped in three bars with some emphasis on all twelve beats but at 0:27 the third bar of four is dropped to a bar of two, changing the twelve to ten. On the other end, the Daft Punk (feat. Pharrell Williams & Nile Rodgers) track 'Get Lucky', which sits firmly within the EDM genre, returned a danceability result of 0.81 and maintains a consistent 4/4 meter at 116bpm, a very danceable tempo.

Echonest API Key (K)

Key, like tempo appears to be fairly self-explanatory, with a result of 0 being C, 1 being C# through to 11 being B. In my testing it is somewhat accurate, but not consistent enough for use beyond making some broad observations about the greater dataset. I have included it in my feature analysis as it provides another somewhat unique angle for the machine listening analysis to group tracks in a way that standard human-based listening may not (Jehan, 2011).

Taking into account that I will not have the scope to provide a breakdown of the key of each track in the dataset, this tool allows me to apply some broader statistical, comparative analysis using (albeit a less accurate) approximation of the key. This allows me to easily do large scale comparisons such as between Danceability and Key to see if any interesting patterns emerge.

Echonest API Valence (V)

Valence as defined by Echonest refers to "Whether a song is likely to make someone feel happy (positive valence) or sad (negative valence)" (Echonest, 2013). It is represented as "a measure from 0.0 to 1.0 describing the musical positiveness conveyed by a track" (Jehan, 2011).

The accuracy of this is questionable as it clearly does not take lyrics into account, and as such any level of irony or satire is lost. A good example of this is Foster the People's 'Pumped Up Kicks' which returns a valence of 0.963 suggesting a very positive valence. Clearly the sound of the track is somewhat warm and positive as perceived by the features behind Echonest's measure of valence, however paired with lyrics such as "All the other kids with the pumped

up kicks, you better run, better run, outrun my gun" it takes on a much more sinister undertone. On the other hand, Social Distortion's 'Machine Gun Blues' returned a valence of 0.120 which is representative of a negative valence and this is reflected in the track's lyrical content and is clearly an example of what the valence feature finds to be a "negative" sound. Lost irony aside, being able to determine a track's feeling based on its spectral attributes is an interesting point from which to compare the effect of other attributes such as Acousticness or Danceability on Valence.

I will be using these tools in both a comparative statistical analysis approach whereby I will break down the dataset based on comparisons of the different features looking for trends and interesting correlations that could be used as influencing features, and to group tracks in interesting ways for the purpose of augmenting my listening process. This practise of grouping tracks based on their similarity and difference will provide a fresh perspective from which to listen for influencing features within the dataset allowing the MIR analysis to guide the musicological analysis.

Musicological Analysis Method

Introduction

Moore's work in the early 1990s displays a dissatisfaction with the way that popular music styles had been discussed from a musicological perspective, suggesting that the problem to that point had been the secondary placement of aesthetic behind traditional structural, form-based analyses. As well as this, sociological analyses were used to give value to "simple" musical forms rather than acknowledging that the sound in and of itself had value (Moore, 2001, p. 10). His proposition is that the "sound" of popular music should be the primary consideration because "*until we cognise the sounds*, until we have created an internal representation on the basis of their assimilation, *we have no musical entity to care about*, or to which to give value" (2001, p. 17, emphasis in original). While his work provides many of the tools with which I can begin to break down the dataset recordings in more depth, there have been several valuable additions to the field of popular musicology that improve on the language and understanding of some of the elements not covered in Moore's extensive method. In particular Encarnacao's (2013) consideration of lo-fi recording approaches, and how album structure and aesthetic choices contribute meaning to a recording; and Bennett's (2018) discussion of the undeniable, and often under-appreciated creative contributions of producers and recording engineers to the sound of records within the studio environment, are of importance to my method of analysing popular music styles where the recorded track is the accepted medium of reference (Warner, 2016, p. 133).

Considering the analysis of a work of popular music, I would suggest that there are four key elements that contribute to what we hear in the final recording; the song or composition, the arrangement, the performance and the production (not to be conflated with an album

producer in the historical context). This draws somewhat from Warner, who outlines these as "[t]he realization of the recording… the performances of the singers and musicians, and the musical composition and/or arrangement" (Warner, 2016, pp. 136-137). For the purpose of introducing influencing features at the various stages of music creation throughout this project I will adjust his model separating the *song/composition* and *arrangement* elements from one into two distinct categories which will go along with the "realization" that I place under the banner of *production*, and the *performances* making for four areas of focus in my analyses. I am making this distinction as it is important for clarity when it comes to discussing the various elements of a track, and what influences have played a part in each area.

In developing my method, this four-part understanding of the track provides a variety of directions from which to approach analysis with creative output in mind and in the section to follow I will outline my methodology and the logic behind it. My interest lies not in the connotations of a track's meaning, but in the practical components that go into making a track sound the way it does. Consideration of anything beyond the physical sounds of, and processes of creating the tracks would go beyond the scope of this project. With that in mind, one should expect a lot of overlap between the elements. However, each component is relevant to consider in the analysis of

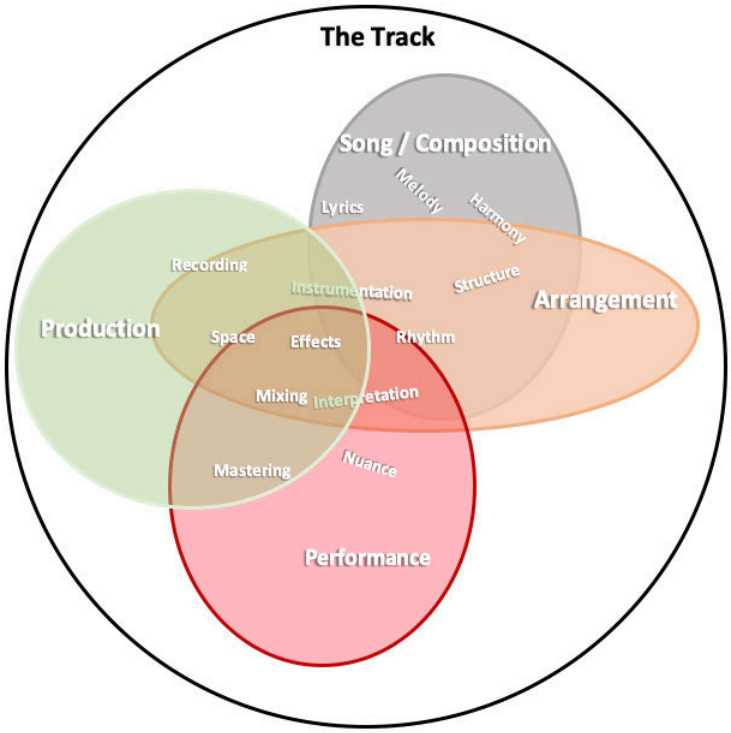

Figure 2.4 The Components of a Track

each recording. Irrespective of whether the person engineering the track also played instruments, or whether the arrangement was developed through improvisatory performances, the resulting work that we hear is what will provide elements that I can use as influence. As shown in figure 2.4, the overlap between these four main elements is quite considerable: harmony and rhythm are part of both the song and the arrangement, mixing while mainly a "production" process is also performative and contributes to the arrangement. Each of these elements has distinguishing features that I will discuss, and as a whole they provide the basis for my musicological analysis approach.

The Song / Composition

The song is the composition from which a track (or various iterations of tracks) is produced and consists of the melody, lyrics and basic harmony as you might see on a lead sheet. It provides the foundation for the arrangement, performance and production phases of track development, and is also considered the element of music covered by U.S. copyright law (Santiago, 2017).

For the purpose of this project, analysis of the lyrical and melodic content of each composition will have minimal directly applicable value. The decision not to include melody and lyrics in my analysis of this dataset, or in reflection on my own work is grounded in the project's concurrent research-led practice and practice-led research model. This played a significant role in how I chose to structure the project, so the ability to work on both creative output and research-based output at the same time was appealing. While developing my analysis strategies, I also started writing songs. This continued through the development of method, and the actual analysis of the dataset, so that by the time that I had completed my analyses and found influencing ideas to begin applying, I had a set of songs written, ready for stylistic,

performative, and production based tools to bring the melodies and lyrics into a context. The outcome of this was that having completed the combined analysis I could explore the different ways that the influencing features could subvert my creative choices prior to going into the studio, completing arrangements and producing the final tracks. This approach was factored into the way that I developed my method, and the tools chosen and analyses undertaken reflect more of a focus on the arrangement, performance and production elements of music creation.

The spectral analysis tools do take melody into account by way of analysing changing frequency content. However, the way I use this data is in a broader, more condensed approach, focusing on the tracks as they relate to each other rather than the nitty-gritty details of each spectrum. I will include some discussion about my songwriting process, as part of reflecting upon the larger creative process, but as noted earlier the expansion of my creative practice is focussed on arrangement and production rather than the writing of lyrics and melody.

That being said, expansion of my habitus *harmonically* does fall within the remit of the project. I will follow traditional analysis methods that look at the notes being played and sung, how those notes build chords, and what harmonic patterns they follow. I will use Roman numerals to identify the tonic or root note of a track as I (major) or i (minor), and modal analysis. Songs are often based on cadences looking for a sense of returning home in the harmony (for example a IV-I or V-I cadence). This method is shown in greater detail in a myriad of musicological writing and goes far beyond the scope of the broader analyses that I am conducting and is comprehensively outlined by Moore (2012, pp. 69-75).

My songwriting, particularly in the early stages tends to be harmonically simple, focused on developing the melody and lyrics before adding in harmonic interest, so within the scope of this project I was able to affect one component of my songwriting process by finding stimulating harmonic features in the dataset.

The Arrangement

The second major component in a recorded track is that of arrangement. Arrangement as I am defining it refers specifically to the elements of *structure*, *rhythm* and *instrumentation*. Moore's analysis of some of the variations on Leonard Cohen's 'Hallelujah' shows how a single composition can be creatively interpreted in a myriad of ways (Moore, 2018). Jeff Buckley's arrangement adds a guitar solo section and has an extended ending in a subversion of the original structure, while Bono's interpretation completely changes the iconic chord pattern, the rhythm, and even the melody (Moore, 2018, pp. 101-102). Instrumentation varies from Buckley's solo self-accompaniment on electric guitar and John Cale accompanying himself on piano to Bono's sampled jazz-style beat. What this shows is that the way that a song is arranged on a given recording is an integral part of how we hear that specific track. Therefore, the analysis of the elements that are part of the arrangement provides opportunity to gather influencing features for my own creative process.

My method for determining the structure of each track was based upon recognition of lyrical, harmonic and melodic patterns. For the vast majority of tracks this structure follows a verse, chorus pattern, with various other elements including pre-choruses, bridges, refrains and instrumental sections. What becomes evident through this breaking down of each track's structure is those that deviate from norms. While many follow those verse/chorus/bridge

structures, some such as Twenty-One Pilots' 'House of Gold', follow a simpler a/b format while others utilise instrumental breakdown sections (in place of a bridge with lyrics) such as heard in Fitz and the Tantrums' 'The Walker.'

I define structural sections based on Moore's definitions determined largely by harmonic content (Moore, 2012, pp. 82-85). The first section in a song is often a ***verse*** "which will have different lyrics each time it appears and can last up to 1 minute containing from 8-32 bars depending on style" (2012, 82). Often following or continuing on from the verse is a ***pre-chorus*** whose function is to "Increase the sense of tension and momentum, to be released at the start of the chorus" (2012, 83). It will often contain lyrics and its own melody distinct from the verse and chorus. The ***chorus*** lyrics, melody and harmony generally repeat on each occurrence and contain the main hook or memorable part of the song. As Moore quotes Jocelyn Neal's argument, "the 'rhetorical function of reflection … supported by musical intensification and harmonic closure' is definitional of a chorus" (2012, 83). ***Refrains*** are most often (although there are exceptions) found instead of a chorus and are often in the form of a repeated melodic and lyrical phrase at the end of a verse playing the part of the main melodic hook. An example of this would be 'Yesterday' by The Beatles where each verse ends in some variation of "Oh, I believe in yesterday." The ***bridge*** of a song generally only occurs once and is often distinguished harmonically from the chorus with a change of chords, melody or rhythm. What Moore terms "Introductions" "Tags" "Breaks" and "Playouts" I categorise under ***instrumentals*** as in the case of popular, song-form music, these sections usually have no lyrics. They generally reference one of the other song sections harmonically and/or melodically which I will acknowledge and indicate, although there are occasions where an

instrumental is distinct from all the other sections, and when this occurs it is made clear in my analyses that the instrumental section is a unique entity in the song's structure.

Instrumentation, in terms of my analysis, not only covers the actual instruments involved in the track, but also the function that they play in the arrangement. Moore names these functional layers, as the "explicit beat layer… functional bass layer … melodic layer … and harmonic filler layer" (2012, pp. 20-21). However, I would argue that for my purposes to consider the functional bass layer as distinct from the rest of the harmonic content would be an overcomplication where for the most part, the songs in this dataset have fairly cohesive harmonic structures where the bass does not function independently of the harmonic filler layer.

My adaptation of these layers for the sake of simplicity focuses on three main areas: ***Rhythm***, where the "explicit beat" elements such as drums and percussion tie in with the more harmonic, but often very rhythmic bass guitar and acoustic guitar elements; ***Melody***, the main melodic content that generally sits on top of and interacts with the rest of the harmonic content; and ***Harmony,*** which is traditionally defined as the notes that make up the chords within a composition, and includes any instruments that function in a way of adding to the overall harmonic structure of the recording. Examples of instruments that often sit in the harmonic layer include rhythm guitar, piano, synthesizer, and bass guitar. However, most instruments (aside from live drums) will play a tonal role in building the harmony. Lead vocals are an obvious example of the melody layer, though lead guitars, synthesizers, and any instrument that plays a clear melodic part or hook make up the melody layer. As a way of

clearly narrowing down the function of each particular instrument, harmony in this case is seen as being in contrast with melody, even though it also functions as a part of the melody.

The Performance

The third component is performance. Performative elements are influenced by stylistic choices while also being heavily dependent on the performer. I would argue that as well as musicians and vocalists, producers and mixers also undertake performative elements in their role in putting together a track, feeding into the overlap between these elements. The key features of performance that I will look at are *interpretation* and *nuance.* How a musician chooses to interpret a song's arrangement, and the character with which they perform it (Arns et. al., 2015, p. 206) are open to observation and could provide creative stimulation with regard to exploring my own performance techniques and approaches. Arns et al.'s analysis of Janelle Monae's 'Tightrope' where "various choices in the methods of production can be interpreted as eliciting stylistic references" (ib id. p.197) shows how referring to other tracks with similar production elements can be used to understand the context of a track's performance and the development of a creative work clearly inspired by a field by reverse-engineering said field.

Moore's discussion of "the voice" (2012, pp. 102-106) covers performance interpretation, specifically discussing ideas of *register* (whether the singer sings in a low, normal or high range), and the *cavity* that the singer's voice appears to resonate (meaning is it a nasal sound, or a chest or head sound) (2012, 102). Other vocal performance elements include the approach to *rhythm* (is the singer on the beat, behind it or in front of it) and *pitch* (is the singer intentionally flat, sharp or 'in tune') (2012, p. 103). These ideas, addressing how a musician performs rhythmically and timbrally, are applicable to all instrumental performances, and

Braae's work shows how asking the right questions of each instrument and/or musician can provide valuable information on how the performance impacts the creative outcome (Braae, 2014, pp. 62-63). While Braae's approach is focused on a single set of performers (the four members of the band Queen), this method would not be as valuable in the context of a set of recordings by a large number of artists. However the language regarding performance methods such as vocal timbral quality (ibid, pp. 120-140) and the interaction between overlayed guitar parts (ibid, p. 145) is sufficiently detailed to serve as a reference point for my own analyses. Breaking down interpretation and nuance in the data set's technologically mediated performances will provide ideas on how to approach performance in my own work.

The mixing and production of a track will have their own aspects of performance, specifically choices made about what vocal takes to use, the application of tuning on vocals to tighten the pitch of a performance, quantization on instruments to tighten the rhythm of a performance, and the use of effects to change the original performance sound captured (Von Appen, 2015, p. 40), (Warner, 2016, p. 137). All contribute to how we hear the final 'performance'. As is made clear by Warner (2016, pp. 134-135) and Toynbee (2000, pp. 69-93), while the historical goal of recording was to accurately represent a performance, the development of recording technologies as a form of arrangement means that in popular music recordings from the late 1960s onward, what we hear is a result of compiling many performances into the singular piece that we hear, rather an accurate representation of a performance.

The Production

This brings us to our fourth component, production. When it comes to "realizing" (Warner, 2016) a track, the song, the arrangement, and the performance must be mediated through

technological processes to “record” them. As Warner notes, “these recording processes and manipulations can exert a considerable influence on the other elements of composition, arrangement and performance” (Warner, 2016, p. 137).

While the role of a producer fits many boxes from creative direction, to getting the best out of an artist, to actually recording and delivering an album (Burgess, 2013) my use of the term is best understood from Burgess’ “Artist Producer” role where the producer is also the performing artist and oversees the many different aspects of record production (2013, p. 9). For the purpose of this project, it will be assumed that production refers to the creative choices mediated by technology used to record and assemble the final tracks (Renzo & Collins, 2017). This is now most commonly done through computer-based mixing and signal processing and in my case, this means using the industry standard DAW, Pro Tools. Von Appen’s analysis of Ke$sha’s “Tik Tok”, while a fictitious narrative, shows how a producer works in a pop setting, essentially building the track from scratch, composing, recording, editing and writing many of the elements (Von Appen, 2015).

With music being an aural experience, listening is the key component to the way that we experience it, and various elements of production go into designing the sound that we hear. As Encarnacao makes clear in setting up his analysis approach in *Punk Aesthetics and New Folk*, “the sound of recordings has not been adequately taken into consideration in academic studies” (2013, p. 7). His reasoning is that more of a focus should be put on the sounds and timbres of the music rather than the weight of analysis being on the harmonic content, and this rings true for my own method.

Samantha Bennett's research into the recording and production process provides a much-needed approach to understanding how certain attributes in a recording are achieved from a practical standpoint. While Warner, Moore and Encarnacao have included timbral and spatial elements in their analyses, Bennett discusses the role that the record producer and/or audio engineer play in selecting methods for capturing sound, as well as what effects and post-production are added to the original recordings to create the work that we hear in a final track (2018, p. 3). In her "Tech-Processual" method the elements discussed include the choice of microphones, mixing consoles and any other technology employed in addition to the recording space, the use of compression and saturation, the use of sampling and various audio effects to alter the sound of the original recording, as well as a practice-based perspective on reverberation and spatial constructs (Bennett, 2018). Her approach goes some of the way towards filling the technology gap (Warner, 2016) focusing first on the people and place involved in the recording (Bennett, 2018, p. 135), followed by discussion of the technologies and processes used in producing said recording, knowledge obtained both from interviews, and considered listening and recognition of "sonically discernible" elements (Bennett, 2018, p. 136). While this method's goal is to garner meaning from those "Tech-Processual" elements within a track, something that has long been missing from pop musicology, my application of Bennett's language and methods is generally from the perspective of gathering practical ideas to expand my field as a practitioner. Her work also provides insight into my reflection on the mixing and mastering process. Von Appen's narrative uses terminology common among producers in the age where the studio is no longer limited to the spaces required in times past (Von Appen, 2015). This descriptive discussion about building tracks within a DAW, finding synth sounds, and effects such as Autotune goes a long way to bringing the language of pop production into the world of

musicology. Consideration of these practical elements is vital to my own research and I believe that understanding the "Tech-Processual" methods behind individual recordings' timbres, sounds and spaces will give me another way to apply what I hear to what I create.

The concept of *space* is one that has garnered some discussion and analysis, specifically with Moore's development of the soundbox as a visual representation of auditory space, layering and musical function (2012, p. 31). The soundbox is a four-dimensional representation of the spatial qualities of a stereo recording. The first dimension is *time*, considering at what point in time in the track an instrument appears. The second is *placement* in the stereo field, represented as being on a continuum from left to right. The third dimension is *distance*, which represents whether an instrument or sound seems close or further away, more forward or back in the mix as a result of the use of reverberation and/or higher or lower perceived volume and is represented as such in the soundbox as depth. The final dimension, represented vertically, is *frequency*, whether an instrument's pitch is lower (such as a bass or kick drum) higher (such as cymbals or a lead guitar) or more in the middle (keyboards, guitars, vocals and everything else).

As a quick example of how I would apply a soundbox analysis descriptively rather than visually, consider The Killers' 'Mr Brightside'; the first twelve seconds of the track place an electric guitar in the left speaker, a filtered drum kit (with the high frequencies cut) in the right speaker and vocals pushing through the centre (with some backing vocals pushing left and right a little). At 0:13 a bass guitar joins in the lower centre, followed by a cymbal and guitar feedback swell (starting further back in distance but growing gradually more prominent) heard from both sides until the full unfiltered drums drop into the centre at 0:18,

joined by a doubled electric guitar on the right. All of this happens within the first 20 seconds of the track, an example of how the stereo field and mix can be used dynamically, and not just with static placement of instruments. Analysing what this constricted-to-open production gesture means could be taken very simply with the first lyrics “I’m coming out of my cage and I’ve been doing just fine”, with the entry of those lyrics following the opening up of the sound, emphasising the feeling of coming out from a level of sonic restriction.

While using the terms *left*, *right* and *centre* to designate mix placement in the two-dimensional space, when discussing distance and prominence in the mix (front to back and bottom to top of the soundbox) I will use *background*, *midground* and *foreground*. Background denotes an element not sonically prominent, possibly with reverb burying the sound in the mix or a low volume and/or subtle timbre meaning that it is not immediately evident in the mix. An example of a background element might be a keyboard-based pad instrument which is low in volume, lacking in higher, more prominent frequency content and has some reverberation applied to give it a sense of distance. Midground is where an instrument is comfortably audible but not the dominant textural layer of the track. Referring back to the instrumentation and layers in the arrangement portion of the analysis, the midground often situates harmonic, melodic and rhythmic elements. The foregound is the most prominent layer/s, the easiest to hear. It usually contains the lead vocal and any other lead melodic instrumentation such as guitars and synthesisers with lead lines and prominent higher frequency content, the elements that will first catch your ear.

While Moore’s soundbox focuses on a way of dealing with analysis of the timbral and spatial elements of production, Zagorski-Thomas takes it a step further discussing the “staging” of a

performance based on its spatial qualities (Zagorski-Thomas, 2010). For example, rock records from the mid to late 1960s and 1970s were often produced to represent the stadium listening experience, with emphasis on recreating the *"large scale communal experience… of a big noise in a big space"* for listeners in their bedroom (2010, pp. 256-257). These spatial qualities are the result of either the sound being recorded in a specific space, or more commonly the application of "time-based signal processing" (Bennett, 2016) where using strategies developed from echo rooms, and spring and plate reverb setups, we now have both analogue and digital samples of those physical, temporal signal-processing methods. These digital samples allow for spatial manipulation of any instrument on any track simultaneously or across the whole track (Bennett, 2016, p. 10).

Looking at our 'Mr Brightside' example, the guitar has a subtle reverb applied as you can hear the ends and beginnings of notes blend into one another, while the filtered drums are quite "dry" or lacking in reverb or noticeable space (Bennett, 2016, p. 6). The filtered vocal is also dry, and this contributes to the constricted, separated feel to the start of the track. When the unfiltered drums swell up there is a much more noticeable "space" that they are situated in, emphasised both by the space in the stereo field and the reverb applied particularly to the snare. The same goes for the vocal which has a short (length of time that the audio is extended) plate reverb which can be particularly heard emphasised on the sibilance of "asleep" at 0:20 and "smoke" at 0:23. The "staging" of a vocal, drums or any instruments in a space contributes a great deal to how we perceive and interpret the track and artist, therefore as an influencing feature, time-based signal processing and the different ways in which it is applied is a major consideration.

Recording refers to the way in which the sound is captured. How a track sounds with relation to recording is mainly influenced by choices of location (as differentiated from the constructed "space" of a recording) and equipment. Without interviewing the people who recorded each track (which goes beyond the bounds of this research) there is no real way of determining the specific rooms or spaces chosen to record in. However in some recordings we may hear artefacts of a natural room sound (whether or not it is added as an effect) and this information can be used as a creative stimulant. Zagorski-Thomas' analysis of the Kings of Leon's 'Sex On Fire' shows that not only do actual spaces, but also microphone placement, volume, frequency and dynamic range contribute to our perception of space, distance, and ambience in tracks (2015, pp. 120-124). Similarly, the equipment used is something that could only be determined by extensive interviews (as Bennett's research is founded upon) (2017), but reasonable assessments can be made on whether a sound was generated from an "acoustic" source (with a microphone) or sampled (either sampling a recording, or utilising a software instrument) through practised listening.

Production and recording *effects* refer to compression, distortion / saturation, filtering and modulation applied to individual tracks (performances or sampled material) to change their timbre. Distortion introduces saturation to a signal to make it distort; this adds frequency content that alters the timbre of the given signal. Distortion as an effect is commonly used on electric guitars and vocals (not to be confused with vocal distortion as a performance technique although the outcome can be similar). However as with most effects, distortion can and is used on many instruments and is an important aspect of describing the sound that we are hearing.

Filtering boosts or reduces a particular portion of the frequency spectrum on a signal to change its timbral quality. Particularly in electronic dance music styles, filtering is used to build energy. For example a synthesizer sound with all the low frequencies cut out could gradually have those low frequencies reintroduced to increase the energy of the synth over time. Another common application is on vocals to make a certain section stand out by removing the clarity in the high frequencies or warmth in the lower frequencies. Foster the People's 'Pumped up Kicks' has an example of this from 0:33 to 1:03, differentiating the verse vocals from the chorus. The verse has filtered vocals giving a sense of emptiness or hollowness to go along with sinister lyric. This filter is then opened up in the chorus, allowing the full spectrum (aside from any corrective equalisation) of the vocal performance through. This particular application of the effect contributes to a sense of lo-fi in the recording (even though the rest of the instrumentation and track is hi-fi).

Modulation includes effects such as delay, where a sound is repeated at a specified time after the original occurrence. It also includes chorus, vibrato and tremolo, where the pitch of the audio is "modulated". An example of this can be heard in the first two seconds of the Arctic Monkeys' "R U Mine?" where the guitar panned right has a tremolo or vibrato effect applied giving its pitch a shaky quality.

Somewhat related to modulation is the use of effects such as Autotune, and Melodyne which adjust the pitch of vocals taking them closer to the centre of the pitch allowing for "imperfect" vocal performances to be "corrected" but also allowing for manipulation of said vocals to create interesting timbral qualities (Von Appen, 2015). Where such tools have been used can be hard to determine as they can be used in a transparent way (not having much effect on

the timbre of the performance). However, there are instances where they are used to creative effect, such as fun.'s "Some Nights" at 3:11-3:28, where the tuning program switches between notes in a way that sounds unnatural or synthetic.

Mixing as it relates to production refers to the process after the different elements that make up the track have been recorded, sampled and put together where each element undergoes equalisation and compression as well as stereo placement to bring everything together. This process begins in the production phase but is often (including in this project) finished off by a specialist mixer and makes a big contribution to the way we hear a finished track. Any discussion of the way that different elements sit within a mix, while also being a part of the spatial discussion, comes down to the physical act of mixing.

Bennett's understanding of the techniques used by producers and mixers (2017) is applied in my analyses through audition of what is heard to distinguish a range of features that affect the timbral qualities of the produced sound. The nuance and practicality in the language that Bennett employs provides a foundation for my analyses, grounding the project firmly in the creative processes applied as a result of the analysis. It is one thing to hear music; it is another to create, and to create from the influence of my chosen field requires an understanding of the practice behind creating sound.

Combining this consideration of production with the more conventional music analysis elements of harmony, structure and rhythm the final outcome should be a set of influencing features that I can apply to *Stay Still | Please Hear*, with the result being an album influenced by the augmented listening process. While these practical analysis tools provide me with language for describing how what I hear in the dataset is created, the methods I have outlined

were not designed from the perspective of the creative practitioner. Moore's (1993) deconstruction of the primary (melody, harmony and structure) versus secondary (timbral, performative and spatial) elements of a track takes some of those key elements that contribute to how we hear a song and take meaning from it and bring them rightfully into the spotlight, but what it does not do (nor is it trying to) is take into account the choices that the practitioner makes in developing that sound. While analysis-led practice approaches with regard to music making have been explored in recent times (Regan, 2019), I believe that my contribution to this emerging field of research adds new knowledge. I have yet to see an exploration of the space of creativity in Toynbee's (2000, 40) field / habitus / possibles intersection where a practitioner has had the impetus to expound upon their creative choices driven by an augmentation of their interaction with said field. My experimental combined methodology encourages investigation into how influence functions from the perspective of a practitioner aware of their creative process, and intentionally directing the expansion of their habitus.

Chapter 3: Analysis

Introduction

This chapter will look at the process of analysis-through-development of methodology as well as the more in-depth analyses conducted from the "finalised" method. I will show how using my cyclic framework I was able to interweave tools from MIR and popular musicology as a way of uncovering influencing features for use in the writing, recording and production of *Stay Still | Please Hear.* The format of this chapter will be semi-chronological showing how I approached the dataset and began making observations about it based on the different layers of metadata and extracted data to build on the dataset along the way. These observations served as a starting point from which to consider how I would position myself musically with regard to the dataset and my habitus and how it might expand my field of "possibles" in the creative process. From that starting point, I go on to conduct deeper analyses of the tracks themselves and formulate a set of influencing features to utilise in the creative process detailed in chapter four.

Constructing the Database

To begin with I started collating metadata on the tracks and building a database of information to conduct statistical analyses on. This metadata was gathered from a variety of sources and covered both objective and subjective information about the tracks providing a starting point to begin experimenting with a range of methods as a way of both getting acquainted with the dataset and building toward the final methodology.

In terms of objective metadata, information such as track titles and artist were collected from Spotify. Having created a playlist of the 218 songs, this information was imported into a spreadsheet and formed the framework of the database. To this I added release year information gathered from the *Billboard* charts website. While the tracks came from five

years of charts, they actually represented seven years of release with some tracks from 2009 and 2010 being included in the 2011 year-end chart.

I then added geographic information from the artist profiles on the *Billboard* website. The larger-scale geographic areas represented are the United States of America, Australia and New Zealand, Europe, the United Kingdom, Canada, and South Africa. From there I further broke down the information into specific countries and regions (in the case of the largest representative in the dataset, the USA). I included this basic objective information as a point of context from which I could refer to the dataset from a foundational level, as well as a way of determining what role the year of release and location of the artist had in the trends that presented through the analyses.

From that point I began to include more subjective, but potentially more meaningful data that related to musical features, and this information is where the analytical process really began to take shape. The first step in this process was to add genre and style tags to each of the tracks. I use the term genre to indicate the broader categories that these tracks fall under such as Rock, Indie, and EDM[5], and style to refer to more specific sub-genres within those genres, such as indie-pop, or folk-rock. These tags were gathered from the Wikipedia pages of each single in 2016. Being publicly curated, these 80 distinct stylistic tags provide a collective folksonomy (Gruber, 2007) of the styles across the dataset. Each track has between two and four style tags and they vary from broader genre classifications such as rock, indie, folk and EDM, to more obscure and specific styles including Baroque Pop, Kwaito, Outlaw Country, and Reggae Fusion. To be clear, when conducting analyses with these style tags, as

[5] EDM stands for Electronic Dance Music.

each track has more than one tag, they could appear more than once in the style-tag analyses. For example, the song 'Little Talks' by Of Monsters and Men would appear in results for queries containing rock, indie pop and indie folk.

With such varied genre descriptors, I found it of creative value to focus on feature-based differences between tracks rather than discussing the intricacies of each track's genre. Because of this, broader stylistic trends play more of a part in my analyses than genre specific elements. Every track will have a variety of genre and stylistic elements that it draws influence from, and these "references" (Arns et. al 2015) create a context in which to understand the track. However, as far as this large-scale augmented listening experiment for creative influence is concerned, the tracks in the dataset will be the stylistic references. Therefore, when I discuss style and generic elements, it will be in the context of potential influencing features and observing trends and ideas across the dataset rather than discourse on meaning within a track's stylistic context.

With just these three main variables (year of release, location, and style and genre) a myriad of interesting observations began to present themselves. By applying simple Excel tools and a basic understanding of statistical analysis I started to break down and compare the different data-points. Early observation of this data showed an overwhelming majority (in fact two-thirds) of songs in this chart come from the USA, with 40% of those US based songs coming from California, representing 27% of the overall dataset. This lines up with the fact that *Billboard* is a US based chart. The next highest region of origin is the United Kingdom with 41 tracks at 19% of the total dataset followed by much smaller inclusions from other geographical areas. The most commonly observed style/genre tags were Alt-Rock with 36%

of tracks represented, Indie Rock with 17%, Indie Pop with 17%, Folk with 14% and Electronic Rock with 9%. This early assessment of the data before even looking at the audio already began to provide insight as the variables were compared with each other.

For example, when looking at style tags and comparing them to year, you can see that folk, following the success of Mumford & Sons' three songs charting in 2010, grew to represent a more substantial portion of the chart with multiple artists in 2012 before the sound developed into the folktronica and folk rock that we see in 2014-2015 (see Table 3.1).

YEAR	#TRACKS BY YEAR	#FOLK TAGS BY YEAR	% TRACKS TAGGED FOLK
2009	1	0	0
2010	14	3	21%
2011	41	0	0%
2012	33	8	24%
2013	50	3	6%
2014	48	5	10%
2015	28	5	18%

Table 3.1 Folk Songs by Year shows the number of songs with folk tags relative to the total songs in the database broken down by year.

I also observed a decrease in the prevalence of heavier rock style tracks including Grunge, Hard Rock and Punk when comparing the period from 2010-12 to 2013-2015 (see Table 3.2).

	#SONGS BY YEAR	HARD ROCK	GRUNGE	MELODIC HARDCORE	NU METAL	METALCORE	PUNK
	2010	1	0	0	0	1	1
	2011	4	7	2	1	0	7
	2012	1	1	0	0	0	2
TOTALS	**88**	**6**	**8**	**2**	**1**	**1**	**10**
PERCENT	2010-2012	7%	9%	2%	1%	1%	11%
	2013	0	0	0	0	0	2
	2014	5	0	1	0	0	3
	2015	0	0	0	0	0	2
TOTALS	**126**	**5**	**0**	**1**	**0**	**0**	**7**
PERCENT	2013-2015	4%	0%	1%	0%	0%	6%

Table 3.2 Genre By Year TOTALS shows the total number of songs represented by various heavier rock style tags with PERCENT below those numbers showing % of tracks represented in the first half of the dataset by year, 2010-2012 versus 2013-2015.

These initial observations about the dataset provided a platform from which to begin to develop the methods of breaking it down for deeper musicological analysis.

Statistical Analysis

In conducting a statistical analysis of the Echonest data-points as well as the previously included style-tags, year, and location data, looking both at the effectiveness of the algorithms in retrieving accurate representative data, and what trends could be observed through that data some more interesting information began to reveal itself. My goal in doing this was both to gather influencing features that I could take into the creative process, and to develop my understanding of the greater dataset based on the data I had collated. This understanding of where the dataset sits in relation to my own habitus will allow me to consider the "possibles" within this extended with regard to stylistic variation. My first example found that 25% of tracks with Grunge and 18% of Hard Rock tracks had a valence between 0 and 0.2 (indicated by the red bar in Figure 3.1) compared to a dataset average of 6% of tracks represented in the 0 - 0.2 bracket suggesting a negative feeling associated with those genres. On the other hand, 40% of Funk, 42% of Garage Rock, and 36% of Psychedelic tagged songs had higher than the average 0.6 - 0.8 valence range representation of 24% (indicated by the blue bar) indicating a more positive feeling in songs tagged with those styles.

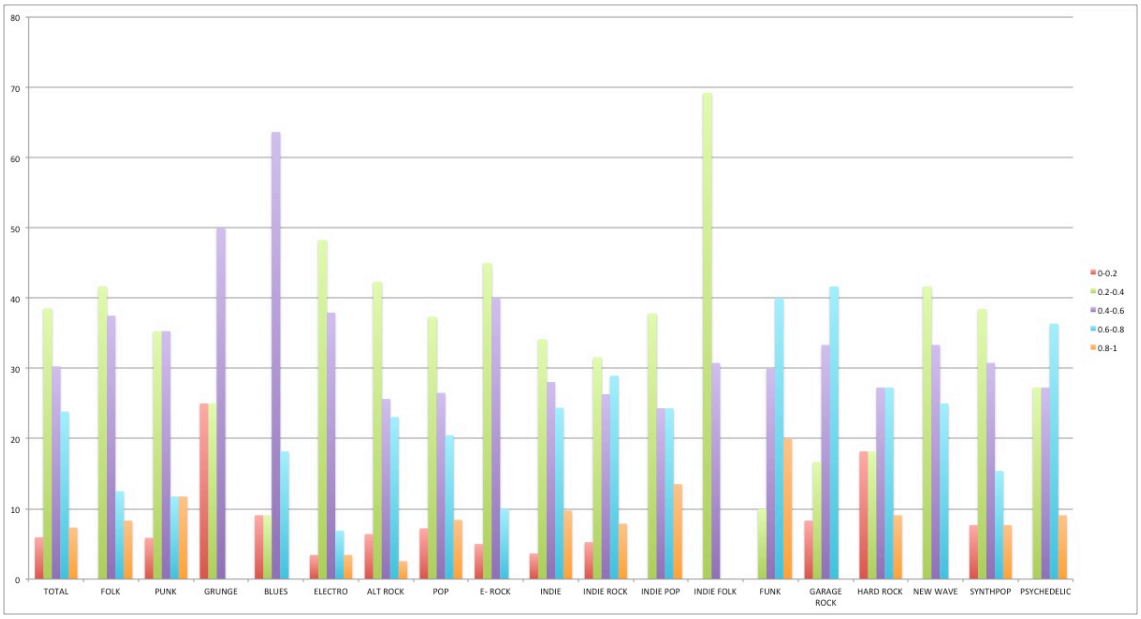

Figure 3.1 Valence by genre as analysed by Echonest: Vertical axis is the % of tracks within the genre represented within each range of valence. The horizontal axis is the genre-tags represented. Each of the coloured columns represents the percentage of songs within that genre occurring in each range of the returned valence figure. 0-0.2 is red, 0.2-0.4 is green, 0.4-0.6 is purple, 0.6 to 0.8 is blue, and 0.8-1 is orange.

As noted earlier, a track could have more than one tag and that would mean that it could appear more than once in these analyses. In figure 3.2, applying this approach to the Echonest data we can see the rise of a high Acousticness rating (as shown by the purple line) coincide with the rise of folk in 2012, confirming the trend seen in the style-tag analysis of the dataset. The median result for the dataset was 0.013, while the average was 0.065 which is why the values are grouped as they are to account for the non-linear way which this feature appears to scale up.

As far as confirming observations about stylistic trends is concerned, this portion of the method provided an understanding of the types of tracks represented, and how those trends change over time, which is a valuable starting point for making deeper observations about the dataset from which I can begin to understand my own habitus and consider ways of engaging with this field.

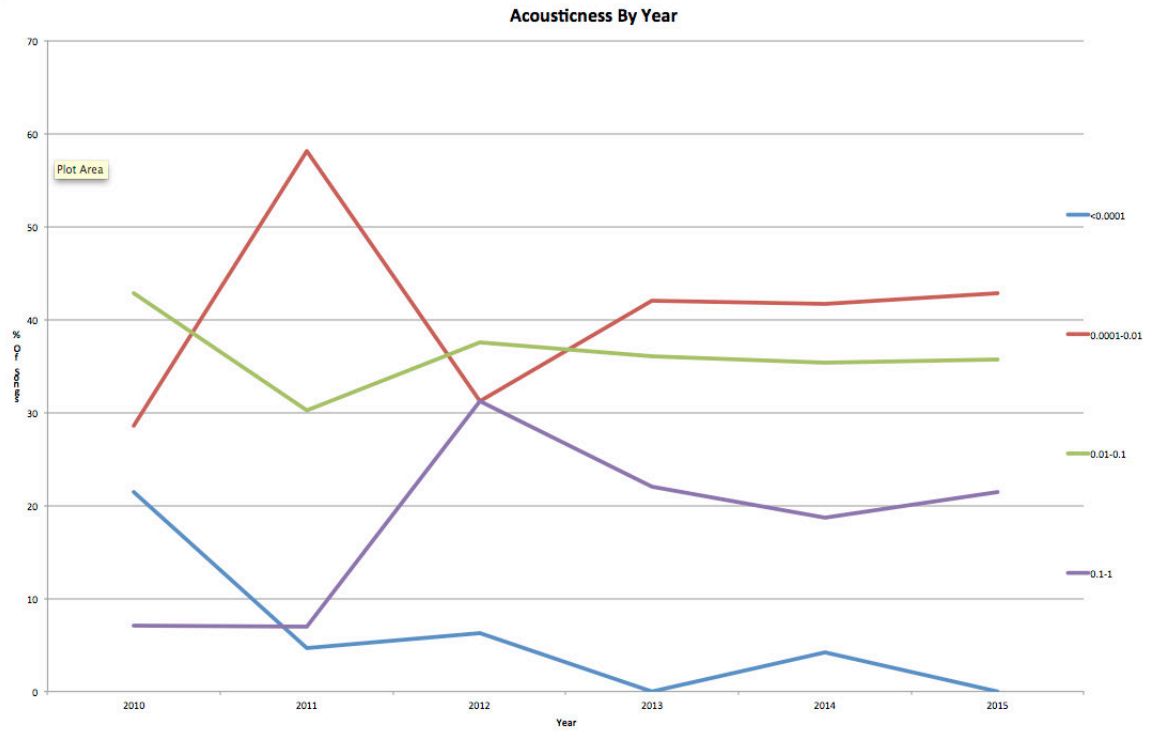

Figure 3.2 Acousticness by Year as analysed by Echonest: The vertical axis represents the % of tracks, the horizontal axis represents the years. Each coloured line represents a range within the acousticness feature between 0 and 1. The blue line is <0.0001, red line 0.0001-0.01, green line 0.01-0.1 and purple line 0.1-1

The next step I took was to group tracks (consider them together based on some similarity of features) in Excel based on being "outliers". An outlier in this instance was a track that was a set number of standard deviations away from the mean of certain features (Windsor, 2004, pp. 212-213). For example in this method's group three, both Daft Punk's 'Get Lucky' and Passion Pit's 'Carried Away' were more than 1.75 standard deviations away from the dataset mean for both Danceability and Positive Valence. While this was something of a convoluted method for grouping, and I ultimately settled on an entirely different approach, I conducted some early musicological analyses on these groups to see if there were any influencing features that I could take from them. Group one, which contained AWOLNATION's 'Sail', Milky Chance's 'Stolen Dance' and Gotye's 'Somebody That I Used to Know' were outliers based on Acousticness and Danceability. They showed acoustic instrumentation undergoing a more production or sample-based treatment, as well as the use of record-player crackle to emphasise the sample feel. In the aforementioned group three, retrospective influence from

the 1980s was a prominent production element of both tracks. These two ideas, acoustic instrumentation treated from a sample-based perspective, and a 1980s "retro" feel, I took through to my final list of influencing features for *Stay Still| Please Hear.* This is an example in my project where I started researching in a particular direction while developing my method, but ultimately decided to take another path. Because my framework is inclusive of ideas gathered in that process, those features are still of value to the practical component.

Clustering

Having reached my statistical analysis limits in Excel, I set about designing a system in the data analysis programming language, R, with which to conduct a comprehensive cluster grouping analysis (Chambers, 2008). This program, when given a set of instructions and a database containing the information to analyse, generates what is called a Hierarchical Cluster Dendrogram which is similar to a family tree. This tree demonstrates the closeness, or similarity of each of the tracks in question to each other based on the data given. This is done by placing each track into a distance matrix, with each feature being an additional dimension within which a track can be close to, or distant from another track.

As shown in the figure 3.3 (full examples are included in the appendix), by running an analysis using fourteen datapoints, a distance matrix is set up with a fourteen dimensional space where all 218 tracks have a datapoint in each dimension, and the closeness of each track's individual datapoints to every other track's datapoints is calculated before outputting a Cluster Dendrogram that represents the similarity of each track based on the chosen datapoints. In this partial dendrogram I clustered the tracks based on all Libxtract and Echonest features. I have highlighted tracks in various colours showing the proximity of songs by the same artist. This shows a level of grouping which you would expect to see from songs

created by the same artist. If you look at Mumford & Sons in the purple, you can see that tracks from their first two albums in 2010 and 2012 ('Lover Of The Light', 'I Will Wait', 'Little Lion Man' and 'Roll Away Your Stone') group closely to each other, while tracks from their third album ('The Wolf' and 'Believe') where they changed their sound from a folk style to more of an indie rock sound, group further from those, but still (relative to the entire dendrogram) close to each other. Tracks that are adjacent to each other under the same branches are more similar than those spread apart on the vertical axis, while the distance between tracks in that cluster is represented by the length of the horizontal branch lines that join them to a common vertical line.

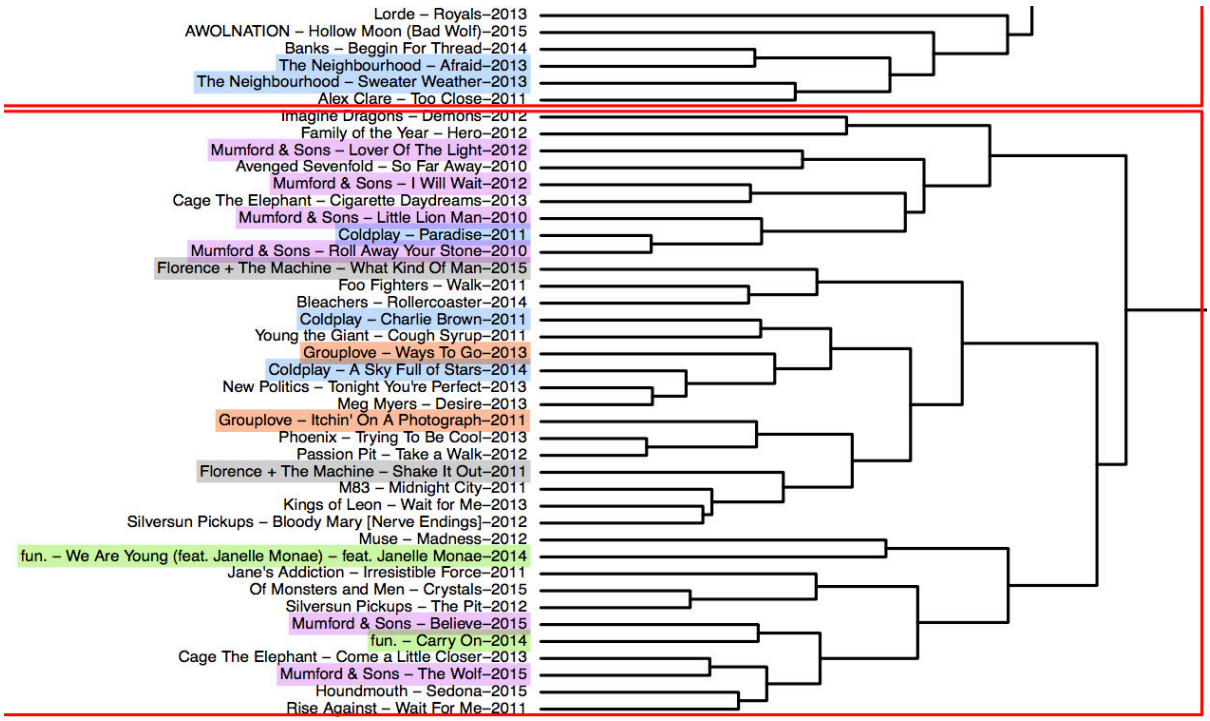

Figure 3.3 Artist Similarity Partial Dendrogram shows the track name artist and year on the left with each of the horizontal "branches" showing distance to the joining vertical branch. The colours are used to illustrate tracks by the same artist and their closeness to other tracks by the same artist. Full dendrogram with all tracks and horizontal axis in appendix - group 10.

The purpose of this form of analysis in my project is to break down the tracks into objective groups, based not on subjective style or genre groupings, but by looking specifically at the acoustic features and related measures. With an objective selection process these groups

would allow for a quasi-phenomenological listening process, augmenting and guiding my focus through fresh groupings of tracks that would not have arisen any other way.

As my methodology includes the use of traditional musicological methods as well as findings from MIR, I decided it was necessary to reduce the larger dataset to one manageable for the process of individual and group, feature-based analyses. Using a musicological perspective to determine what interesting points were brought out by the grouping method, as well as the key defining features of each group and track, this second stage of the process is where the larger number of influencing ideas were captured gleaning concrete, functional ideas from the more abstract MIR concepts.

My goal was to select ten groups of three or four tracks, that within their respective groups would represent the temporal, locative, and stylistic diversity of the dataset while providing a solid basis for my augmented listening process. To do this I chose two types of groups; the first is those that clustered at the greatest distance from the other groups with the idea being that those groups represent tracks that have more "extreme" results of the features considered as they cluster further away from the other tracks. The second type is those that clustered with the most vertical lines, suggesting a closer similarity to more of the tracks. This was to capture tracks that represent the "middle-of-the-road" of the dataset, the tracks that are most representative of the whole.

With my MIR grouping method in place, I performed about 140 individual cluster analyses using various combinations of two to four features, or larger seven to fourteen feature analyses looking for:

A) Tracks that group quickly based on the given features, using a smaller feature set of between two and four datapoints and shown by tracks that branch off earlier than the rest of the tracks. These represent the "extreme" groups of the selected features

B) Tracks that group with more vertical lines based on the given features, using a larger set of seven to fourteen features. These are the "middle-of-the-road" tracks from the dataset.

In addition to the above criteria for selecting the groups from the output cluster analyses, I chose to focus on those groups that did not have repeat tracks (between different dendrograms), and to minimise repetition of artists in an attempt to best represent the diversity of the dataset.

The ten groups that I chose to look at in more depth in more musicologically focused analyses are as follows: (the group headings link to the Appendix page with the cluster dendrogram that was used to select the group).

Two - four feature groups

1: Spectral Inharmonicity - Spectral Centroid - Key[6]

Green Day – 'Oh Love'	2012
Coldplay – 'Every Teardrop Is a Waterfall'	2011
Panic! At The Disco – 'Hallelujah'	2015
Florence + The Machine – 'Ship To Wreck'	2015

2: Liveness – Acousticness - Valence

Gotye – 'Somebody That I Used To Know'	2012
Twenty One Pilots – 'House Of Gold'	2013
Milky Chance – 'Stolen Dance'	2014

[6] Click on each group heading to see the relevant dendogram in the Appendix.

alt−J – ‘Left Hand Free’	2014

3: Spectral Inharmonicity - Energy - Liveness

Imagine Dragons – ‘Radioactive’	2012
The Naked And Famous – ‘Young Blood’	2010
Death From Above 1979 – ‘Trainwreck 1979’	2014
AWOLNATION – ‘Kill Your Heroes’	2013

4: Spectral Kurtosis – Spectral Centroid - Speechiness

Vampire Weekend – ‘Diane Young’	2013
Neon Trees – ‘1983’	2010
J Roddy Walston And The Business – ‘Heavy Bells’	2014
Macklemore & Ryan Lewis – ‘Thrift Shop’ − feat. Wanz	2012

5: Flatness – Tempo - Key

Death Cab for Cutie – ‘You are a Tourist’	2011
Sublime With Rome – ‘Panic’	2011
My Chemical Romance – ‘SING’	2014

6: Crest – Tempo - Valence

The Airborne Toxic Event – ‘Changing’	2011
The Strokes – ‘Under Cover of Darkness’	2011
Phantogram – ‘Fall in Love’	2014
Cage The Elephant – ‘Aberdeen’	2011

7: Smoothness – Danceability - Valence

Cage The Elephant – ‘Cigarette Daydreams’	2013
The Lumineers – ‘Stubborn Love’	2012
Mumford & Sons – ‘I Will Wait’	2012
Hozier – ‘Take Me to Church’	2015

Seven – fourteen feature groups

8: Echonest Features:

The Offspring – ‘Days Go By’	2015

blink−182 – ‘Up All Night’	2011
Bleachers – ‘’Rollercoaster’	2014
WALK THE MOON – ‘Anna Sun’	2013

9: LibXtract Features:

Fitz and The Tantrums – ‘The Walker ‘	2013
Thirty Seconds to Mars – ‘City of Angels’	2013
The Black Keys – ‘Tighten Up’	2010

10: All features:

Grouplove – ‘Tongue Tied’	2011
Imagine Dragons – ‘Shots’	2015
Andrew McMahon in the Wilderness – ‘Cecilia and the Satellite’	2014

Comparing the larger dataset to new groups

With ten groups of three to four tracks, from a total dataset of 218 songs from 123 artists, the 37 songs selected comprise 17% of the dataset and represent 35 of the artists which is a 28% artist representation. I believe that the diverse range of artists represented in the groups allows for a broad variety of influencing features to potentially be uncovered in the musicological analysis stage. When taking into account the 24 artists with three or more songs represented in the dataset, twelve of those artists are represented in groups. Of the eight artists who have five or more songs in the dataset, five are represented in groups, suggesting that a good portion of the artists who had consistent charting songs in this period are represented in these groups.

When assessing the effectiveness of this process as a method for selecting representative tracks from a dataset, the fact that none of the groups have repeat artists, and that across the spectrum of groups there are only two artists repeated, suggests that there is a diversity in the selections, which in the context of expanding my habitus is positive. In addition to this,

the contrasting “extreme” and “middle-of-the-road” approaches to grouping should present a set of tracks that is both of a reasonable number for in-depth listening, and representative of the features used to group them. This achieves the goal of MIR-directed musicological listening and gives a crossover point for combining the MIR and musicological tools.

Release date statistics

The percentage of songs represented by year (as compared to the total number of songs for each year in the dataset) is as shown in table 3.5:

YEAR	# TRACKS IN GROUPS	# TRACKS IN DATASET	GROUP REPRESENTATION	DATASET REPRESENTATION
2010	3	14	21%	6%
2011	8	43	19%	20%
2012	6	34	18%	16%
2013	7	50	14%	23%
2014	8	48	17%	22%
2015	5	28	18%	13%

Table 3.3 Dataset Release Date Group Representation from left to right, Column A is the year of track release, Column B the number of tracks represented in the groups, Column C the total number of tracks in the dataset, Column D the percentage of tracks from each year represented in the groups and Column E the percentage of tracks from each year represented in the full dataset..

This shows generally a 14-19% representation of the songs from each year with the exception being 2010 at 21% as a result of a low total number of songs released in that year due to this study looking at songs charting from 2011-2015. This suggests that these groups represent the range of time in the dataset with some accuracy.

Genre Statistics

Comparing the genre and style tags associated with the tracks, you can see that apart from a couple of exceptions, the percentages of the majority of tags are pretty similar, once again indicating that this was an effective method of breaking down the songs to analyse a representation of the larger group. Table 3.4 shows some of the key genres and

GENRE	% IN GROUPS	% TOTAL DATASET
ALT ROCK	32%	35%
ELECTRONIC ROCK	11%	9%
FOLK	13%	14%
INDIE POP	19%	17%
INDIE ROCK	19%	15%
NEW WAVE	8%	6%
POWER POP	11%	4%
SYNTH POP	8%	6%

Table 2.4 Dataset Genre Representation

styles before and after being broken down into groups. Table 3.5 shows the full genre / style breakdown across the dataset.

STYLE TAG	TOTAL IN GROUPS	% OF GROUPED TRACKS	TOTAL IN DATASET	% OF TRACKS
ALT ROCK	12	32%	78	36%
AFROBEAT	0	0%	1	0%
ALT DANCE	2	5%	7	3%
ALT HIP-HOP	1	3%	4	2%
ALT METAL	0	0%	3	1%
ALT POP	0	0%	1	0%
ART POP	0	0%	1	0%
ART ROCK	0	0%	2	1%
BAROQUE POP	0	0%	2	1%
BIG BEAT	0	0%	1	0%
BLUEGRASS	1	3%	5	2%
BLUES	3	8%	11	5%
BLUES ROCK	1	3%	6	3%
DANCE PUNK	1	3%	2	1%
DANCE ROCK	2	5%	5	2%
DARK WAVE	0	0%	1	0%
DISCO	0	0%	5	2%
DREAM POP	0	0%	5	2%
DUBSTEP	0	0%	1	0%
ELECTROHOP	0	0%	1	0%
ELECTRONIC ROCK	4	11%	20	9%
ELECTRONICA	1	3%	3	1%
ELECTROPOP	0	0%	5	2%
EXPERIMENTAL ROCK	0	0%	1	0%
FOLK	5	14%	31	14%
FOLK PUNK	0	0%	1	0%
FOLK ROCK	2	5%	11	5%
FOLKTRONICA	1	3%	3	1%
FUNK	0	0%	10	5%
FUNK ROCK	0	0%	8	4%
GARAGE ROCK	3	8%	12	6%
GLAM ROCK	0	0%	1	0%
GOSPEL	0	0%	2	1%
GOTHIC POP	0	0%	1	0%
GRUNGE	0	0%	8	4%
HARD ROCK	1	3%	11	5%
HEARTLAND ROCK	0	0%	1	0%
HIPSTER HOP	1	3%	1	0%
HOUSE	0	0%	1	0%
INDIE FOLK	2	5%	13	6%
INDIE POP	7	19%	37	17%
INDIE ROCK	7	19%	38	17%
INDIETRONICA	0	0%	3	1%
INDUSTRIAL ROCK	0	0%	1	0%

KWAITO	0	0%	2	1%
MELODIC HARDCORE	0	0%	3	1%
METALCORE	0	0%	1	0%
NEO SOUL	1	3%	2	1%
NEW WAVE	3	8%	12	6%
NOISE PUNK	1	3%	1	0%
NU METAL	0	0%	1	0%
NU-DISCO	0	0%	2	1%
OUTLAW COUNTRY	0	0%	1	0%
PIANO ROCK	0	0%	1	0%
POP PUNK	2	5%	5	2%
POP RAP	1	3%	1	0%
POP ROCK	2	5%	15	7%
POST-GRUNGE	0	0%	6	3%
POWER BALLAD	0	0%	1	0%
POWER POP	4	11%	9	4%
PSYCHEDELIC FOLK	1	3%	1	0%
PSYCHEDELIC POP	0	0%	3	1%
PSYCHEDELIC ROCK	1	3%	8	4%
PUNK BLUES	1	3%	2	1%
PUNK ROCK	0	0%	8	4%
R&B	0	0%	5	2%
RAP ROCK	0	0%	4	2%
REGGAE	0	0%	3	1%
REGGAE FUSION	0	0%	1	0%
REGGAE ROCK	0	0%	1	0%
ROOTS	1	3%	3	1%
SHOEGAZING	0	0%	3	1%
SKA	1	3%	2	1%
SKA PUNK	1	3%	1	0%
SOFT ROCK	1	3%	2	1%
SOUL	2	5%	6	3%
SOUTHERN ROCK	1	3%	5	2%
STONER ROCK	0	0%	2	1%
SYNTHPOP	3	8%	13	6%
SYNTHROCK	0	0%	1	0%
TRIP-HOP	0	0%	2	1%

Table 3.5 % of each genre represented in the greater dataset by the groups. Column A is the Genre tag, Column B is the number of tracks represented in groups, Column C is the % of tracks represented in groups. Column D is the number of tracks in the full dataset with each genre tag, Column F is the % of tracks represented in the full dataset.

Location statistics

Based on the location that the artist performing the song originates from, the resulting groups mostly reflect the larger dataset as shown in table 3.6. The main differences are a slightly

lower representation from European countries (3% versus 6%) and the United Kingdom (14% versus 19%) and a slightly higher representation from the USA (76% versus 67%).

LOCATION	# TRACKS IN GROUPS	% TOTAL GROUPS	LOCATION DATASET	#TRACKS IN DATASET	% TOTAL
ANZ	2	5%	**ANZ**	12	6%
AUSTRALIA	1	3%	AUSTRALIA	9	4%
NEW ZEALAND	1	3%	NEW ZEALAND	3	1%
CANADA	1	3%	**CANADA**	4	2%
EUROPE	1	3%	**EUROPE**	12	6%
DENMARK	0	0%	DENMARK	2	1%
FRANCE	0	0%	FRANCE	4	2%
GERMANY	1	3%	GERMANY	1	0%
ICELAND	0	0%	ICELAND	3	1%
SWEDEN	0	0%	SWEDEN	2	1%
SOUTH AFRICA	0	0%	**SOUTH AFRICA**	3	1%
UNITED KINGDOM	5	14%	**UNITED KINGDOM**	41	19%
USA	28	76%	**USA**	146	67%

Table 3.6 Dataset Location Representation the number of tracks per geographical region represented in the full dataset and the smaller grouped set. Column A is the Location, Column B the number of grouped tracks, Column C is the % of the total represented. Column D is Location, Column E is the number of tracks in the greater dataset and Column F is the % represented in the full dataset.

In summary, this method of using music information retrieval strategies, from a statistical analysis perspective, to break down the dataset into smaller groups of tracks that still represent the overall content of the greater dataset was, in my opinion, an effective approach. Specifically, it preserved key aspects of the diversity of the whole dataset, while still enunciating groups of related songs.

With ten groups and 37 tracks I was ready to apply a more rigorous combined analysis, considering the MIR features through a musicological lens applying deeper listening techniques to the dataset. This method, detailed in chapter two, led me to conducting the following group and track analyses.

Group Analysis Summary

The ten group analyses present a myriad of ideas. In some of the groups there were obvious similarities between the tracks, while others had more subtle relationships. The importance of these analyses is in what features I chose to use as points of influence in the development of *Stay Still | Please Hear*. As such rather than simply sharing the analyses, I will summarise the influencing features gathered through that process. The first part of this summary will focus on seven of the ten groups, one, two, three, five, eight nine and ten, discussing which ideas came to the foreground of my attention based on their groupings in this augmented listening process. The second part of the summary will show the deeper analyses I did that focused on both the group *and* individual track characteristics of groups four, six and seven.

It is important to note that in these broader group analyses, my focus was on features that were present across the whole, or most of the group. I was open to the idea of any of the afore-discussed musicological features presenting themselves, but upon completion of the group analyses it was evident that there were not many similarities of structure that were of interest. In the deeper, individual track analyses that immediately follow these group analyses, structure is considered more, however within these groups the focus leaned more toward harmonic, instrumentation, and production influencing features.

The tracks in group one, based on spectral inharmonicity and spectral centroid, had a distinct emphasis on complex higher frequencies with the spectral centroid mean being higher than in 88% of tracks in the dataset. This manifested itself in the use of cymbals and reverb in ‘Ship to Wreck’, complex synthesizers and ambient reverb in ‘Every Teardrop is a Waterfall’, cymbal-heavy drums, distorted guitar and organs in both ‘Oh Love’ and ‘Hallelujah’. These similarities in high-frequency energy are an example of how tracks that are quite different

stylistically can group together. Each of the songs in this group emphasise some form of IV-I (in the case of 'Ship to Wreck' it is a iv-i) cadence which in the case of 'Hallelujah' emphasises the clear religious references, and in the case of 'Oh Love' brings a feeling of folk to Green Day's punk sensibilities. Perhaps this is coincidence - I struggle to see how these spectral features could be related to specific cadences – but this is certainly a point of interest, and I believe strengthens the argument for listening to these tracks in novel augmented constructs.

Group two's tracks clustered on liveness, valence and acousticness and are distinctively "organic" in feeling. While elements of 'Somebody That I Used to Know' and 'Stolen Dance' are likely sampled, the instrumentation across the examples in this group is decidedly acoustic with guitars, ukuleles, vocals, analogue keyboards, strings and percussion among the arrangement choices made across the group. 'Left Hand Free' is something of an outlier, having more distorted electric guitar than the rest of the selections. There does not appear to be overt Autotune on the vocals, (though I am sure that in some of the tracks subtle tuning is utilised) and the only other audible effects beyond the obligatory reverb/delay and compression is the use of filtering in 'Stolen Dance' to switch from a lo-fi to hi-fi feeling to create contrast between sections, and the modulation on the keyboards in 'Somebody That I Used to Know'. In addition to this focus on acoustic instrumentation clearly picked up on by the acousticness feature, and possibly the liveness feature also, three of the tracks start with a i-VII or I-bVII which suggests harmony that stays close to the tonic, potentially relating back to the similarity in valence.

Spectral inharmonicity, energy and liveness were the qualifiers for group three and the interesting feature that revealed itself in the group analysis was a swing feel using triplets in

the kickdrum and swung 8th delays present in ‘Radioactive’, ‘Young Blood’ and ‘Kill Your Heroes’. The fourth track in the group, ‘Trainwreck 1979’ is a live recording, and this suggests to me that some instability in the rhythm may have been a factor in grouping these tracks. Each of the tracks also utilises elements of distortion – sawtooth synthesizers in ‘Young Blood’ and ‘Kill Your Heroes’, and distorted guitar and vocals in ‘Trainwreck 1979’ and ‘Radioactive’. This relates to sonically full tracks and connects to both spectral inharmonicity and energy grouping them together.

Group five’s tracks, grouped by flatness, tempo and key, are diverse stylistically although all guitar-driven, band-oriented tracks. Of interest is the fact that all three utilise a triplet feel, ‘You are a Tourist’ and ‘Panic’ with the high-hats, and ‘Sing’ with the kick drum. Also of note is the fact that both ‘Panic’ and ‘Sing’ employ a modulation between the verse and chorus sections. These concepts could be related back to tempo (for the triplets) and key (for the modulation) but it would surprise me if it were that straightforward given the simplicity of those features. While some of the groups provide more interesting results, it would be unrealistic in such an experimental method to expect that from all groups.

One of the groups that did not show a clear connection between the tracks is group eight, which is based on all the Echonest features. While two of the tracks (‘Days Go By’ and ‘Up All Night’) employ classic rock instrumentation, sound and style, ‘Anna Sun’ and ‘Rollercoaster’ utilise synths and pads alongside guitars and drums. This contrast of approaches could be an interesting influencing feature in the context of textural change within a track.

Group 9 clustered based on all the libxtract spectral parameters. While there is stylistic diversity there are some interesting correlations between these three tracks. Both ‘The

Walker' and 'Tighten Up' use whistling to deliver melodic content, which is not common in the dataset. In addition to that, 'The Walker' and 'City of Angels' both use a four-on-the-floor drum pattern to drive the tracks forward. This pattern continues across to group ten where 'Tongue Tied', 'Shots' and 'Cecilia and the Satellite' all function within a similar tempo range (+/-15BPM). They all use double-tracked vocals, and choir or layered vocals. Considering that group ten is based on both the Echonest and Libxtract features it is interesting to see such similarities when considering such a broad range of features. It could be suggested that these tracks are typical of the broader dataset representing the "middle-of-the-road" for this dataset's sound.

Deeper group and individual song analyses

In the next stage of the process I selected an even smaller sample of songs from the ten groups to analyse them in more depth, with the intent of finding more interesting ideas to add to the list of features to be creatively applied. These deeper analyses are a more specific look at individual approaches to the arrangement and production features that situate each of these tracks within their stylistic field. Groups four, six and seven were selected as those I thought would contain the most relevant ideas for developing a cohesive recording project, based on the findings of the larger ten group analysis.

Group four, grouped by Spectral Kurtosis, Spectral Centroid, and Speechiness contains the tracks 'Diane Young' by Vampire Weekend, '1983' by Neon Trees, 'Heavy Bells' by J Roddy Walston and the Business, and 'Thrift Shop' by Macklemore & Ryan Lewis feat. Wanz. Timbral diversity in the vocals plays a large part in what makes each track tick. 'Diane Young', 'Heavy Bells' and to a lesser extent '1983' have quite distorted lead vocals. 'Thrift Shop' switches between rapped and sung sections. This timbral variation is achieved using vocal technique

in the case of ‘Heavy Bells’, filters and delay in ‘Diane Young’ and by changing vocalists in ‘Thrift Shop’. ‘Diane Young’ utilises Autotune for effect at about 1:50 as well as phasing and filter sweeping; ‘1983’ uses more traditional vocal techniques for timbral variation such as vibrato, mouth shape and dynamic range; ‘Heavy Bells’ has a doubled and raw vocal performance with regular sharp and flat notes giving a somewhat “live” sound to the recording.

The second area of interest in group four comes in the range of approaches to production, instrumentation and arrangement. ‘1983’, and ‘Heavy Bells’ are guitar driven in the harmonic layer, but with very different production styles from each other. ‘1983’ takes the form of a polished, modern pop/rock track: power chords, distorted guitar-driven, with a synthesizer underneath. A tight drum kit and bass complement the polish of the rest of the track. In contrast ‘Heavy Bells’ achieves a messy, almost live-sounding garage band feel with heavy guitars, and compressed, crunchy drums that inhabit a very evident sonic space. I suspect that the way the drums were mixed or recorded was with an emphasis on room microphones, rather than individual microphones for each drum. The vocals are very distorted in places, partly as vocal technique, but also very likely peaking at the microphone preamps (Bennett, 2018, p. 152). The cacophony of raw noise in the choruses sits in contrast with the other tracks in this group from a production standpoint. ‘Diane Young’ maintains a rock feel while the harmonic layer is mostly driven by sampled horns. The rest of the instrumentation includes vocals and drums as well as some live guitars and piano. The approaches to drums within this track alternate between a compressed garage feel kit (Bennett, 2018, p. 162), a produced sample kit, and a tambourine/clap, blending live-feel instrumentation with sampled elements creating timbral diversity between sections. ‘Thrift Shop’ is completely sample-driven and is

situated in in the hip-hop genre as opposed to the rock-oriented styles of the other three tracks in the group with its sampled electronic drum sounds, other sampled instrumentation and rap vocals. The amount of space in the production is evident with compressed and sampled instruments sitting in very clearly defined positions in the wide mix, panned doubled vocals and moving high frequency risers[7] and samples pushing the boundaries of the stereo field. Taking some stylistic cues in terms of influencing features from this analysis, it is interesting to compare the approaches to the rhythm / beat layer across the tracks, and the impact that that had on how I interpret each track's style / genre. The treatment of the polished rock kit of '1983', the raw alt-indie compressed garage kit of 'Heavy Bells', the electronic samples of 'Thrift Shop' and the mash-up of a compressed, live-sounding kit and samples in 'Diane Young' all played a role in situating each track within their style. These considerations are clear influencing features that I will apply in producing my tracks.

Crest, Tempo and Valence are the MIR features that brought the tracks in group six together. 'Changing' by The Airborne Toxic Event, 'Under Cover of Darkness' by The Strokes, 'Aberdeen' by Cage the Elephant and Phantogram's 'Fall in Love' as a group are quite stylistically diverse, but each of them utilises a contrasting approach to space within the mix due to both physical spatial choices and after-the-performance manipulation of the recordings and it is these spatial elements that I chose to focus on.

The sense of space in 'Changing', particularly in the verses, is due to relatively sparse instrumentation with the vocals, drums and bass carrying the track. Overall vocal and drum

[7] "A riser is a sound that is gradually increasing in volume, pitch or another modulation parameter." (Holmgren, 2018)

reverb creates an unobtrusive room within which the performance occurs, while a bigger room reverb on the lead guitar adds a sense of distance sitting further back in the "soundbox" (Moore, 2012). The synth in the intro and bridge both have more of an ambient sound opening up the track space-wise as well as creating a point of difference from the mostly guitar driven harmony.

'Under Cover of Darkness' is set in a dry space and the main factor that contributes to this is the little to no reverb on the vocal and guitars, with most of the "room" sound provided by the drums. The space opens up as the drums take up more of the high frequency spectrum with the cymbals. As well as this, heavier distortion in the choruses, and the addition of backing vocal harmonies widens the perceived soundbox. In this case, the panning of instruments gives space in the left to right axis, while the depth of the track remains shallow with its limited use of reverb. Lead guitars are panned hard left and right until the instrumental bridge where the lead guitar (which has the only noticeable reverb) is in the centre. Vocals are clustered around the centre along with the bass guitar while the kick and snare are centred with toms and cymbals panned.

'Fall in Love' is set in a large ambient space, with medium-large chamber reverbs on the synths, strings, vocals, and samples, while hard panning of synths, hi-hats and backing vocals also contribute to the ambient space. The sense of space and height with the female vocal and synthesizers' bright, higher frequencies lends to the idea of falling or floating mirrored in the lyrics. Ping-pong delay is used in the drums, particularly in the bridge, contributing to the ambiguity of the space.

‘Aberdeen’ utilises heavy reverb on guitar and vocals to create a large space. It also utilises panning of lead guitars to allow clarity in the middle for the vocal. The bass carries harmony and melody in the verses with guitars playing harmonic notes as well as controlled feedback. The doubled vocal feels like a slap-back delay.

Also of interest, is the fact that all of the tracks in group six utilise a minor iii chord from a major key perspective. ‘Changing’ is based around a I vi iii V progression through the verses and choruses while the bridge is ii vi V I iii ii vi V. ‘Under Cover of Darkness’ has a I iii vi IV and I iii IV ii IV ii I in the verses as well as a ii iii ii I in the bridge. ‘Fall in Love’ has a iii IV V ii verse and a ii iii chorus with an unstable harmony that only feels at home in the instrumental where it sits on a static I chord, and in the bridge where a iii vi IV I vi iii IV I progression incorporates that grounded tonic. ‘Aberdeen’ is built on I iii IV and I iii vi IV progressions in the chorus and refrain sections. The less common nature of the minor three chord is what made this observation within group six interesting. It could be related to the valence feature, however I think it is more likely coincidental, showing again how the subversion of listening context can foreground musical features in unusual ways.

Group six epitomises the variety represented in the dataset with respect to spatial constructs, evidenced by ambience, dryness, and spatial representation due to panning and reverberation in the mix. As a palette of creative sparks to take into producing my tracks, these influencing features set a platform for my approach to space within *Stay Still | Please Hear.*

Group seven is the result of the MIR features Smoothness, Danceability, and Valence. ‘Stubborn Love’ by The Lumineers, ‘I Will Wait’ by Mumford & Sons, ‘Take me to Church’ by

Hozier and 'Cigarette Daydreams' by Cage the Elephant are all built for the most part on "real" instruments, with acoustic instruments driving much of 'Stubborn Love', 'I Will Wait', and 'Cigarette Daydreams'.

'Stubborn Love' and 'Cigarette Daydreams' both explore a familiar, hall or campfire-style, lo-fi recording space, using sounds that we know well: the acoustic guitar, piano, and strings that we associate with authentic folk music. The reverb and recording space are evident enough to place the performers in an almost distinct location in our minds. The lo-fi elements, which in the case of 'Cigarette Daydreams' is a "noisy" recording (with lots of background noise in the verses giving it a comparatively lower quality sound) and in 'Stubborn Love' is the loose nature of the performance including noise, make them feel quite intimate.

While 'Stubborn Love' maintains a lo-fi ambience alongside its folk, communal singing aesthetic, 'Cigarette Daydreams' moves away to a more polished sound, while incorporating strings and electric guitars which emphasise the nostalgia in the lyrics ("if we could find a reason, a reason to change, looking for the answers"). The track, is "looking for the answer" as the lyrics suggest, searching for a true connection with a stripped back singer-songwriter style morphing into a more modern indie-rock ballad; the duality of staging between the verse/pre-chorus and chorus/instrumental bridge sections is representative of the indecisiveness in the lyrics "close your eyes, so afraid, hide behind that baby face". This is emphasised in the chorus out of the bridge which takes on the lo-fi singer-songwriter style for the first half developing into a full ballad in the second half.

'Take me to Church' makes unapologetically clear its references to organised religion, and the spatial aesthetic explored is declared in the title. The use of long reverbs on everything from

the piano, to vocals, to guitars, to drums, creates a space that feels and sounds like an empty, dark, old church or cathedral. The IV-I cadences, while subverted in the verses as a minor iv-I, suggest the plagal, amen cadence, and in fact, the lead vocal sings “amen”. The overt religious references are represented in a passionate vocal performance, with a gospel choir backing up with ooh’s. This layering of backing vocals, used almost as an organ, lends a very human, emotive quality to the track.

‘I Will Wait’ explores a thick, almost orchestral arrangement of folk/bluegrass instrumentation. Brass, strings, thick vocal harmonies and banjo melodies leave little space until the bridge where everything drops out leaving a delayed, detuned piano for the declaration “I’ll be bold as well as strong and use my head alongside my heart so take my flesh, and fix my eyes, a tethered mind free from the lies”. Having rested in the pulled back section, brass is layered in and the lead vocal jumps up an octave as the chorus takes the song to a new climax in a way that is unexpected given how strongly it starts.

While I did conduct in-depth structural analyses of the groups, at that level I was unable to find any distinct influencing features to take into the creative process. However at the level of individual songs there were two interesting if not particularly unusual elements that I considered as influences. The first feature is tracks that begin with the vocal, forgoing a formal introduction. Vampire Weekend’s ‘Diane Young’, Hozier’s ‘Take Me to Church’, and WALK THE MOON’s ‘Anna Sun’ all utilise this approach. ‘Diane Young’s’ vocal comes in just before the percussion based instrumentation joins it, ‘Take Me to Church’ has a quaver of the first piano chord before the vocal enters and ‘Anna Sun’ has a slightly longer pad swell on the tonic chord which has no sense of time or movement until the vocal starts. The second

structural element that I found to be of interest was tracks that used instrumental bridges. These were The Strokes' 'Under Cover of Darkness' the bridge of which comes in the form of a guitar solo over a previously unheard progression that leads back into the pre-chorus, Cage the Elephant's 'Aberdeen' which has a guitar solo over somewhat static harmony before returning to an instrumental refrain, and 'Cigarette Daydreams' which applies the previously introduced refrain over a new harmonic progression.

Each of these tracks played a role in influencing the production process while I was developing my album, and in the next chapter I will provide detail on the influencing factors I chose to use.

Ultimately the creation of music is the bringing together of many different components, sounds, and effects to create something identifiable as a distinct work. As such, attempting to box any one idea or feature into one part of the creation process is somewhat futile and counterproductive. Referring back to the four main components of a track, song-writing, arrangement, performance and production are not always distinct parts of the process. For example, changes to the song's melody or lyrics may happen while it's being performed, or during the mixing stage a call might be made to change some of the rhythmic elements to better suit the overall feel. What is important in this project is having those different ideas available to be applied throughout the process of creation. The following is a list of some of the ideas that came through in the analysis process, broadly broken down into the elements of the track where I feel they are most likely to be applied. In the next chapter I will discuss my creative process, exploring some of these ideas, and showing how the application of ideas found through my analysis approach influenced what I created.

List of Features inspired by the development and application of methodology

Broad stylistic concepts

- The trend of folk
- Transition from heavier, guitar-based/rock band styles to electronic styles
- Retrospective influence; the influence of a particular time period and style in creating a track, for example disco from the 1980s.

The Song:

- **Harmony**
  - Unorthodox chord progressions
  - Use of minor iii chord in major key context
  - Verse - Chorus modulation

The Arrangement:

- **Structure**
  - Duality of space and style; contrasts between sections achieved through changes in ambience, density, and/or stylistic elements
  - No Introduction / instrumental section before vocals enter
  - Instrumental Bridge
- **Rhythm**
  - Four on the floor – Kick drum on all 4 beats
  - Triplet feels
- **Instrumentation**
  - Drum kit vs. sampled / electronic kit vs. percussion
  - Communal or layered backing vocals / Backing vocals used as an instrument
  - Sparse vs. Lush / full instrumentation
  - “Classic” versus “Modern” rock styles represented in the use of drier, distorted guitars versus more polished driven guitars and synthesizers.

The Performance:

- **Vocal**
    - Vibrato and dynamic range
    - Doubled lead vocal
    - Expressive vocal performance
- **Instrumental**
    - Messy versus tight performance style

The Production:

- **Effects**
    - Acoustic instrumentation undergoing a sample-based treatment
    - The use of record player crackle to emphasise the sample feel.
    - Tight production versus noisy or messy production within a single recording
    - Compression and distortion elements
    - Filter sweeping
    - Lo-fi (or filtering / effects that achieve a lo-fi feel)
    - Autotune for effect
- **Space**
    - Clearly defined sonic space
        - The use of a range of reverbs, or lack thereof, to define the depth of a space
        - The use of panning to widen and fill the soundfield
- **Mixing**
    - Enhanced high frequencies in the mix
    - Heavy reverberation and delay

Chapter 4: Creative Reflection

Introduction

Recording an album is something I had not undertaken prior to this research project, so my creative process had a lot of room for development. The stages of that creative process, from the writing of songs (something that I have been doing for over ten years), to the arrangement of those songs (something I have experimented with for the past seven-to-eight years) to the recording and production of tracks which I have also dabbled in, provide a variety of places where that process can be intentionally interrupted and influenced by the methodology I have developed.

My intention in applying this methodology is to utilise influence in a creative way that is not imitation but allows for development as an artist; an application of fresh ideas to my usual way of doing things. Harking back to Bourdieu's (1993) framework of an artist's habitus and field as discussed by Toynbee (Toynbee, 2000, p. 40), movement within or away from the artist's habitus is where artists explore their creative boundaries. Having developed my habitus through years of studying, listening to, writing and performing certain styles of music, producing *Stay Still| Please Hear* has allowed me to explore some of the less likely "possibles" through the augmented listening method. With the MIR groupings selecting which tracks I would analyse and compare to each other, the "possibles" that might not immediately be apparent to me otherwise could come to the forefront. This is not to say that I limited the impact my habitus could have on the outcome (I do not think that is the aim of this project). However, the subversion of my process allowed an injection of creative possibilities on the outer edges of my practice.

Having sketched out the picture with the basic harmony and melody, producing each track adds colour by applying stylistic features, effects, and instrumentation. The layers of the

creative process in turning a song into a finished recording are multi-faceted and intricate, with space for directed exploration. While analysis of the completed work cannot always separate components of a track easily, as they clearly all interact with each other, for the purpose of reflection on my creative process, some distinction between the areas will be used to clearly illustrate specific points of influence.

Regarding the goal of creative influence, I believe that this has been achieved with varying levels of success across my tracks. By playing with both specific ideas such as the use of choir-like backing vocals as an instrument, and the broader strokes of genre or style, each recording reveals evidence of varying levels of conscious influence from findings of the dataset analyses. At significant moments throughout the arrangement, recording, performance, production, and mixing of the album, ideas from the dataset have been used to inform the creative decisions made. I believe that I have applied these features in way that has developed my tracks into something that they could not have been otherwise.

Creative Influence – The Song

As noted in Chapter 2, the simultaneous pursuit of theoretical and creative strands of the research means that findings from the dataset were applied to arrangement and production, rather than the writing of melodies and lyrics. I will provide here some detail behind my initial process of writing the songs to give a sense of how my creative process has been subverted. Harmony is one area where I used influencing features from the dataset to impact my compositions, and I will detail those points of influence at the end of this section. In the interest of reflecting on my process and showing the development of these tracks from start to finish, I will also outline my creative process in writing the songs for *Stay Still | Please Hear.*

My approach to songwriting has been that of a singer-songwriter, with acoustic guitar and vocal central to my process. All of the songs were written by sitting down with a guitar and developing a harmonic or melodic idea, often in tandem with lyrics. ‘Stay’ started with the 11/8 (3 + 3 + 3 + 2) plucked guitar progression over which I wrote the vocal melody and lyrics. As with many popular music styles, for me melody and harmony are generally understood aurally rather than notated, particularly in the writing stage, where I rely more on musical intuition based on my habitus (McIntyre, 2008) than on a deep understanding of music theory. ‘Stay’, ‘Seeds’, ‘Bold-Faced Lie’, ‘Another Point of View’, ‘Through the Night’, ‘Daisy Chains’, ‘First Sight’, ‘Implications’ and ‘Here’s to Hoping’ were all written by improvising a guitar riff or chord progression and finding a melody to interact with that. The alternative starting point I used for ‘Other Side’ and ‘New Door’ was to develop a melody along with lyrics independent of a physical instrument and add the harmony afterwards. When writing vocal melodies, most of the songs started with a chorus or hook idea. When considering the interactions between melody and harmony in these songs in hindsight, I notice that I often centre my melodies around notes that create tension and release such as the major 7 over the tonic chord in the verse of ‘Other Side’, or the major third where a minor third might be expected in the chorus of ‘Daisy Chains’.

Lyrically I wrote most of the songs from personal experience with the goal of trying to capture a somewhat universal understanding of an emotion or situation that I was trying to process. While the lyrics do take on specific meaning as I understand more why they were being written from a personal perspective, and what they implied, much of the meaning is intended to be ambiguous and open to personal interpretation. ‘Bold-Faced Lie’, ‘Other Side’ and ‘New

Door' however, were written as explorations of a more fictional idea or story which I used as an alternate method for inspiring lyrics.

I have come to recognise that some influences for lyrical ideas came from (either consciously or subconsciously) songs that I was aware of but are not part of the dataset. The chorus of 'Seeds' "What if I change my mind…" could be seen as influenced by The Foo Fighters 'Pretender' chorus lyric "What if I say I'm not like the others", something I realised after recording and production was complete on the song. This is interesting considering the songs are similar in terms of production, instrumentation and energy. The second influence, which I was more aware of at the time, is the chorus from 'Other Side' "This is not a fight, it's a riot…" which was influenced by Fall Out Boy's 'This Ain't A Scene, It's An Arms Race' of which the influencing lyric is the title. While these were not specifically influenced by the dataset, in the context of expanding my field of "possibles" it was neither achievable or desirable given the long-term nature of developing my habitus to restrict the creative process to newly acquired ideas. Acknowledging influences from outside of the chosen dataset gives a clearer picture of my habitus and therefore an understanding of where I am pushing the boundaries of my field.

While later considering the arrangements of my tracks (in an overlap of songwriting), I spent time finalising the structure and chord progressions of each song. Reflection on my writing process revealed that I had several go-to chord progressions that would perform specific functions. For example, many of my early song arrangements used a IV I V vi bridge as a building tool (this was left unchanged in some tracks and can be heard in 'Daisy Chains'). This led me to subverting those initial harmonic choices with what I thought were interesting

progressions from the ten-group dataset. Without copying unusual progressions, taking a trial and error approach I would take a harmonic idea such as a major V chord used in the minor key as found in Fitz and the Tantrums 'The Walker' at 2:11 and integrate it into my arrangement to add tension and interest to the track. This particular example was applied to the chorus of 'New Door' which was originally written with a vi IV I V major key progression leading out into the key change. By playing with the major III (which is the major V borrowed from the minor key) I came up with a (III) IV I III vi V IV I III which I found to be far more effective at building tension and creating interest.

'Bold-Faced Lie' was influenced by the #v passing chord in the chorus of My Chemical Romance's 'Sing'. In 'Sing' the chord adds tension between chorus sections, and I use it in much the same way in 'Bold-Faced Lie' adding tension at the end of the chorus leading into the "Stand up to the shakedown" second chorus section.

In 'Implications' the major II and III chords in the chorus are borrowed from the IV and V chords in the minor progression from Macklemore and Ryan Lewis (Feat. Wanz)'s 'Thrift Shop'. Originally my chorus chord progression was a much simpler IV I V vi progression, but with the injection of those chords from outside the Ionian scale the initial spark of idea from 'Thrift Shop' led me on a tangent to this more complex progression which I believe has more interesting interactions with the melody and adds some much needed tension and release to the track.

IV I II IV vi III V II^6 IV I III vi V IV I V

Creative Influence – The Arrangement

The arrangement of my tracks was a process that took place all the way through to getting the mixes finalised with the mix engineer, at which point I made structural changes to

'Implications'. This demonstrates that the creation of music, particularly in its recorded form, is often not a linear process. As detailed in the method chapter, my definition of arrangement is focused on instrumentation, structure and rhythm. The act of arranging occurs at many stages in a track's development so organising my thoughts in this way does not conflate to a chronological understanding of how each track was realised. However, it does allow me to focus on specific elements with clarity about where influence has occurred throughout the process.

Many of the instrumentation choices made on this album were directly impacted by the dataset with stylistic trends observed through the MIR analyses feeding into the detailed musicological analyses where I considered what part specific instrumentation played in those trends. These observations include the transition from heavier, distorted, guitar-based genres such as grunge and punk into synth-based genres such as synthpop and electronic rock over the period represented by the dataset. The second major trend that I observed was that of folk influenced styles and how that developed from a raw feel with Mumford & Sons' (2010, 2012) and The Lumineers' (2012) earlier tracks to the later folk influenced electronica of Avicii (2013) and Coleman Hell (2015).

Prior to tracking the album in the studio, I laid out a plan for the instrumentation I would use on each track. Considering the influence of a stylistically diverse dataset I wanted the final tracks to be representative of that, so I focused on a specific approach for each song. Of importance regarding instrumentation was whether to use live drums, sampled or electronic drums, or percussion, as these rhythmic foundations are one of the major points of differentiation between the styles represented in the dataset. With that beat layer starting

point, decisions around whether to use acoustic or electric guitars, acoustic or sampled pianos, bass guitar, sampled strings and horns, synthesizers, keyboards and pads could be made.

'Seeds' and 'Bold-Faced Lie' are both stylistically influenced by heavier alt-rock tracks with distorted electric guitar layers, bass guitar and live drums forming the foundation of the sound. The bass guitar riff of 'Daisy Chains', influenced by the verses of Cage the Elephant's 'Aberdeen', drives a similar alt-rock feel in a slower track with electric guitars more focused on melody than filling out the harmony as in 'Seeds' and 'Bold-Faced Lie'. This is joined by live drums, an organ and ambient pad, giving a sense of space and filling out the track. While the treatment of the guitars and drums in 'Seeds' pushes more towards hard-rock style tracks such as Switchfoot's 'Dark Horses' and Rise Against's 'I Don't Want To Be Here Anymore', a less polished, less spacious treatment of guitar and drums in 'Bold-Faced Lie' is more akin to the garage-rock, indie-rock feel of The Strokes' 'Under Cover of Darkness'.

I approached the instrumentation for 'Stay', 'Other Side' and 'Another Point of View' from an indie-pop perspective, incorporating sampled, electronic drums alongside more traditional instrumentation such as electric guitar, acoustic guitar, (sampled) cello and strings. One key instrumentation influence was the use of backing vocals as an instrument by Hozier in 'Take Me to Church' and Phantogram in 'Fall in Love'. This influence can be heard in both 'Stay' and 'Another Point of View' where I layered vocals and saturated them in reverb, creating an organ-like "instrument" that has a sense of breath and vulnerability consistent with the feel that I wanted to convey through those tracks.

'New Door' and 'Through the Night' use traditional drum sounds, but rather than being recorded live, these are sample-based. 'New Door' engages with a soft-rock ballad feel, employing acoustic guitar, a detuned piano, sampled strings and bass along with the vocals. 'Through the Night' employs classic square and sawtooth synth sounds that interact with the electric guitar lines exploring elements of the electronic side of music, while staying in more of an indie/pop realm.

'First Sight' and 'Here's to Hoping' apply folk instrumentation starting with percussion: kick, shaker and tambourine alongside acoustic guitar, piano, sampled strings, double bass and sampled horns. 'First Sight' draws from The Lumineers' 'Stubborn Love' as a folk influence, intending to capture something of a communal music-making feeling (even though in this case there is only one performer) emphasised by the backing vocals. 'Here's to Hoping' takes its folk cues from Mumford and Sons' 'I Will Wait' which has a more polished and full sound with thick vocal harmonies, and integrates horn and string samples alongside the percussion and double bass to go with the ubiquitous folk/bluegrass "down down up down up" acoustic guitar strumming shown in figure 4.1.

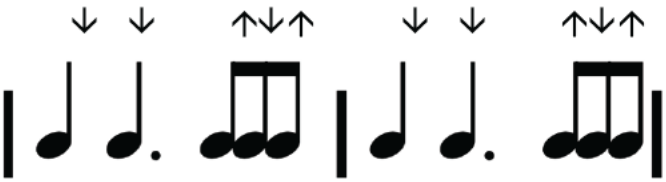

Figure 4.1 Folk Strumming Pattern

Structurally, I took the technique of bringing the vocal into the track without a progression-based "intro" section and applied it in different ways to 'Through the Night', 'Implications' and 'Here's to Hoping'. In 'Through the Night' the way that the vocal and synth starts on the first beat of the track is almost jarring in its immediacy, and this is enhanced by the space as

the sound drops away after the first line before swelling again into the second phrase. 'Implications' has two beats of the bass guitar, organ and acoustic guitar playing the first chord before the layered vocals come in with the first verse. 'Here's to Hoping's' vocal starts on a dotted crotchet pickup beat with the instrumentation joining on the first beat of the first full bar.

The second structural influence was the idea of an instrumental bridge. For both 'Bold-Faced Lie' and 'Through the Night' the early iterations of the songs had lyric-based bridges written. However, I was unhappy with them lyrically and melodically, and rather than write a new bridge, I decided instead to drop the lyrics and melody altogether and do an instrumental bridge. In both cases I did repeat the last line of the chorus as something of a refrain / vocal riff, but these sections function as bridges. And while not fully instrumental, similar to 'Cigarette Daydream's' "do do doo's" in that instrumental bridge / refrain, an already introduced lyrical idea is used in a new context to clearly differentiate the sections.

Creative Influence – The Performance

Performance is the area where individual expression and interpretation of the composition takes place through each performer on the track. Each (human) performance of a piece of music is going to be unique with the possibility of two performances ever being exactly the same extremely low. The context of a performance contributes to the performance, and the locative / time element also applies to recorded music, albeit in a more convoluted sense than that of a singular live performance (Toynbee, 2000, p. 91). This does not mean however that one performance cannot be influenced by another, rather that there is a level of uniqueness in every performance.

‘Daisy Chains’ is a track in which I approached my vocal performance from the influence of J Roddy Walston and the Business’ ‘Heavy Bells’. My goal was to capture an element of the passion shown through vocal distortion, where the vocalist was almost yelling at points in the track giving a very raw sense of emotional connection. While my vocal is much cleaner than the vocal in ‘Heavy Bells’, the final chorus was the point on the album where I pushed my voice the most.

When performing the guitar parts for ‘Bold-Faced Lie’ my focus was less on a tight, rhythmic and tonally perfect performance and more on capturing a feel of almost jarring rawness (as far as pop production is concerned). This was in contrast to tighter, fuller guitar performances in ‘Seeds’ and as mentioned in the section on instrumentation, was influenced by The Strokes’ ‘Under Cover of Darkness’.

While I performed most of the instruments and vocals on the album, I did not play drums on ‘Seeds’, ‘Bold-Faced Lie’, ‘Daisy Chains’ and ‘Implications’. Instead they were performed by Jess Ciampa under my creative direction. I gave him a rough idea of the beat that I wanted for each track, and he took creative licence within his habitus to capture an interpretation of what I was suggesting. There were sections (such as the half time feel in ‘Seeds’) where I was quite clear on the feel I wanted, and then other sections (such as the cymbal improvisation at the end of the first verse of ‘Daisy Chains’) where I did not give much direction and instead allowed Jess to go with his own interpretation of the part.

As with every element of the track, performance also occurs through production and mixing choices such as whether or not to tune a note or allow it to stay sharp or flat. Contemporary processes of recording and production allow for an infinite number of iterations and

alterations to performance takes. This means that the original takes could be unrecognisable in the final result, and the actions taken to achieve that result are their own kind of performance which will be explicated in the next section.

Creative influence – The Production

The process of production, or the recording and processing of audio through technological mediums to create a record (Burgess, 2013), provided a variety of influencing features to direct my creativity. Two of the main elements that I explored in this stage were placement within the stereo mix using panning, reverberation and volume to bring musical elements into more or less prominent positions within the soundbox (Moore, 2012) and techniques and effects applied through the mixing and production process to affect the timbre of each musical element as well as the tracks as a whole (Bennett, 2018).

A large component of the sound of a track is dependent on where it was (or appears to have been) recorded. An ambient track such as Coldplay's "A Sky Full of Stars" utilises lush reverberation to place the listener in a large, distant, ambiguous location. On the other end of the spectrum a track like The Strokes' 'Under Cover of Darkness' includes minimal reverberation and delay and sets the listener much closer to the performer sonically. Most tracks will sit somewhere in between, either cultivating a specific space, such as a large hall in The Lumineers' 'Stubborn Love' or a small garage such as 'Heavy Bells' by J Roddy Walston & the Business, or a more ambiguous, ambient setting.

This setting of a track's sonic space is achieved utilising reverberation and delay as well as techniques applied through the recording process to make use of the physical space's timbral characteristics. In application, some of my tracks utilise the recording process, room selection

and mic spacing to create a sense of a literal physical space. All of them, to some extent, apply reverberation to instruments and vocals to set each element in a sonic location within the soundbox, and to create cohesion between the different elements.

My goal was a final work where the tracks, employing a range of stylistic elements, and drawing from a range of influences, work together to create both diversity and unity. This is achieved by having some consistency of space, not to limit creative expression, but by using elements throughout the album that link the tracks. The main consistency in approach was in the recording and production of the lead vocal and acoustic guitar. The vocal was recorded in one space, with two microphones, a Neumann TLM102 and an AKG c414 to give some slight timbral variation depending on what each track called for, while the acoustic guitar was also recorded in one space and utilised the same three microphone setup in each of the tracks recorded.

'Stay', 'Another Point of View', 'Other Side' and 'Through the Night' are set in large, ambient spaces, emphasised by lush reverberation, the use of ambient pads and the use of delays to give a sense of ambiguity and to draw the listener into a big imagined space. 'Another Point of View' in particular creates contrasts between sparse and lush sections with harmonised background vocals and other instrumentation used to expand and build sections. The track starts with minimal low frequency content until the cello enters in the second verse. Points of reference for this approach include Hozier's 'Take Me to Church', Phantogram's 'Fall in Love', and Coldplay's 'Every Teardrop is a Waterfall'. The rest of the tracks are set in more clearly defined spaces, with various approaches to setting the auditory scene. Within its modern rock context, 'Seeds' can be heard as being performed in a large venue, with the

reverb on the snare particularly contributing to this impression, although the vocal delay works as an intentional effect rather than contributing to the sense of space. “Here’s to Hoping” has a tighter sound, with much of the space being emphasised by the sampled kick. This is contrasted with ‘First Sight’ which although having similar instrumentation is set in a much more airy/spacious ambience. This is emphasised by the plucked acoustic guitar, as opposed to the strumming in ‘Here’s to Hoping’.

Various effects were used throughout the production process, but one of the major influences was the idea of lo-fi where a track, or elements of the track are perceived to be of a low or lower audio quality, relative to the rest of the recording or album. Encarnacao suggests, that the concept of lo-fi, where recordings are perceived to have a lower standard of recording quality, can come from either a case of necessity (musicians being unable to afford the costs of high-quality recording) or an intentional aesthetic approach to imply a sense of authenticity as in the commercial release of Bob Dylan’s *Basement Tapes* (Encarnacao, 2013, pp. 133-137). Today, with the minimal expense required to produce high-quality home recordings, I believe that for the most part musicians applying a lo-fi aesthetic do so as a creative choice.

A clear example of this in my practice can be heard coming out of the bridge of ‘Other Side’ where the lead vocal line “A sign of life will drown all fear” is put through a filter which bypasses the high frequencies, taking away the clarity of the vocal. Another example of a lo-fi feel is heard at the start of ‘New Door’ where the simple instrumentation (lead vocal and acoustic guitar) feels almost like a home recording due to placement close to the centre of the stereo field. Once the strings and the rest of the instrumentation comes in at the chorus,

the soundbox is spread out wide. This was influenced specifically by the duality of space in Cage the Elephant's 'Cigarette Daydreams'.

Other effects applied include a sample-like treatment of the electric guitar in 'Other Side' where I played a guitar riff and looped it, applying a vinyl effect to give it a sense of being sampled. This kind of acoustic/electric sampling treatment is used in Gotye's 'Somebody That You Used to Know' and Milky Chance's 'Stolen Dance'. The use of vocal tuning, adding an unnatural quality to the vocal, can be heard in the breakdown of fun.'s 'Some Nights' and which I applied at a couple of points in 'Stay' particularly as an emphasis on the lyrics "When hypocrisy becomes a trend". Vocal tuning is also particularly evident in the backing vocals for 'Implications' giving them a somewhat unnatural, and I think almost unnerving quality which is also emphasised by the organ.

Mixing

While I made the initial selection of performances and some basic effects, the mixing was passed on to Anton Hagop (engineer for Powderfinger's *Vulture Street* and engineer and mixer on Brooke Fraser's *What to do with Daylight)*, who brought all the components together and made them work. I "produced" each track to a certain level, using indicative effects including reverbs and delays, and shared these rough initial mixes with Anton. In the following, I'll share some verbatim conversations to show how the producer/mixer relationship worked in this situation. When sending him the raw files for mixing his direction regarding these effects was:

A: “I require the tracks dry, but noticed you have used a lot of fx in your mixes which I quite like. For any part with an effect that is distinctive or important please provide a wet version as well as the dry. I may recreate what you've done if it can be improved a little, sometimes I use the wet track if it has a certain vibe.

So just leave all fx on and print a stereo track for that one vocal, guitar or whatever. Don't go crazy, anything with basic delay/reverb etc can be left dry - it's just the fancy stuff.”

Anton’s intent to preserve and enhance my creative and tonal vision, by manipulating the audio to create a polished and professional sounding end-product, helped me to achieve the sound I desired but lacked the ability to mix on my own. I gave Anton a set of reference tracks from the dataset for each track to give him a picture of the field that I was working from. My reason for this is that I wanted to “influence” Anton, and to maintain some level of control over the creative direction that the tracks took, by further suggesting the “possibles” that I had captured in my part of the production process. The reference tracks that I gave him were as follows:

Stay: ‘Fall in Love’ – Phantogram, ‘Take me to Church’ – Hozier

Seeds: ‘Aberdeen’ – Cage the Elephant, ‘Dark Horses’ – Switchfoot, ‘I Don’t Wanna be Here Anymore’ – Rise Against

Bold-Faced Lie: ‘Under Cover of Darkness’ – The Strokes

New Door: ‘Cigarette Daydreams’ – Cage the Elephant, ‘Promises, Promises’ - Incubus

Another Point of View: ‘Take me to Church’ – Hozier, ‘Renegades’ – X Ambassadors

Other Side: ‘Stolen Dance’ – Milky Chance, ‘Magic’ – Coldplay, ‘Somebody that I Used to Know’ - Gotye

Through the Night: ‘Afraid’ – The Neighbourhood, ‘Fall in Love’- Phantogram

Daisy Chains: 'You are a Tourist' – Death Cab for Cutie, 'Aberdeen' – Cage the Elephant

First Sight: 'Stubborn Love' – The Lumineers, 'Ho Hey' – The Lumineers

Implications: 'Hold Back the River' – James Bay

Here's to Hoping: 'I Will Wait' - Mumford & Sons, 'House of Gold' - Twenty One Pilots**,** 'Little Talks' – Of Monsters and Men

Across *Stay Still | Please Hear,* some of the creative steps Anton took included re-amping[8] the guitars in 'Seeds' and 'Bold-Faced Lie', as well as adding the chorus effect on the guitar heard in the post-bridge chorus of 'Seeds'. He also took some liberty with the drums in 'Seeds' tweaking them to be more aggressive and energetic, even changing the beat in the last chorus by sampling the separate recorded elements of the drum kit. For the most part, the rest of the tracks stayed relatively true to what I gave him, with his input being balancing the instruments, equalising frequencies, adding reverb, and applying compression and saturation to enhance the harmonic and temporal content in a way that brought the tracks to life. Here are some examples of the type of back and forth that we had whileworking toward achieving my aesthetic vision.

> Seeds:
>
> J: I'd like a touch more vocal delay on "tonight" @ 0:56 "time" @1:34 "tonight" @ 1:59 "tonight" @ 3:19. It doesn't need to be dramatic, I'd just like it to be a little more evident at those points.
>
> A: Done. I didn't go too crazy as it can get cheesy.

[8] Re-amping is a process where the recorded signal of an electric guitar is routed back through a chosen amplifier and re-recorded to capture that amplifier's character.

Another Point of View:

J: I'd like to hear it with a bit more reverb on the main BV's, possibly more high end to really shimmer/sparkle.

A: Done.

Other Side:

J: Out of the bridge the line "a sign of life will drown all fear" I'd like the vocal to be more filtered just to make it stand out a bit more.

A: Done.

Through the Night:

J: I'd love the lead guitar/s to punch through a bit more specifically from the instrumental into the key change

A: Done

With regard to the effectiveness of utilising reference tracks in this way, I believe that with the starting point of my rough mixes, and the direction indicated by the reference tracks, Anton was able to intuitively (from his habitus) capture the elements that I wanted to bring out in each track. I was able to maintain the production elements that I found important to demonstrate my application of influence while, allowing his expertise to enhance the production standards.

Mastering

The mastering of *Stay Still | Please Hear* was undertaken by Mitchell Hart, the audio engineer, technician and studio operations manager for the School of Humanities and Communication Arts at Western Sydney University. While the overall impact of mastering on the final

outcome is much less obvious than that of mixing, it is vital nonetheless. In this case I did not give direction and allowed Mitchell to use his experience and ear to bring an extra layer of energy to the already well-mixed tracks. The tightening up of the low end, adding punchiness, hyping (adding of energy to) the high end and warming of the tracks overall was the final touch needed to make the album ready for release. Both the mixing and mastering communication were done entirely online with comparison and feedback on my end being sent via email and any stems or mixes required being sent via cloud storage.

Album Title and Artwork

The title and artwork for this album are intended to be representative of the concept and creative and lyrical journey. The title is taken from the first track 'Stay' which has four verses. The first words of each verse Stay, Still, Please, and Hear come together to form the album title. The significance is that together, these verses represent the album's lyrical journey. "Stay, my heart is just too fragile", moves to a recognition of the challenge "Still, face the uncertain failure" to a plea for support with "Please, don't turn your back on us" before coming to "Hear, I will open up again". While these themes are obviously broad, and their meanings are open for interpretation, the narrative arc of the tracks' lyrics as well as their sound, goes through these changes of mindset and focus from the protagonist's perspective.

The artwork depicts the protagonist approaching a tunnel representing the journey to be undertaken. The immediate path in front is visible, as is something at the end which represents being able to see what is directly ahead of us, as well as some conception of what the future could look like. However the path through is black, characterising the unknown of what could happen along the way. The visual aesthetic was intended to be a contrast between

the industrial elements of graffiti, concrete and rust of the storm drains with the green "natural" plant life visible in the foreground (present) and on the other side of the tunnel (future).

Overall, creating *Stay Still | Please Hear* was a process of interplay between my habitus and the field focusing on the point of influence through "possibles". This was mediated through the features absorbed from the dataset from the sometimes directed, sometimes arbitrary MIR approach, and the in-depth, but broad, searching musicological approach, expanding my practice in a way unique to this project. The framework of research-led practice allowed me to explore the different elements required to develop my tracks with assistance on the aesthetic creative choices that needed to be made along the way. The diversity in the tracks' stylistic choices is a reflection of the dataset's diversity, while the homogeneity through the album is a result of the consistency of my vocals, melodies and lyrics.

Chapter 5: Evaluation and Conclusion

One of the major constraints of this project was the goal of creating an album. The decision to produce an album, rather than a series of single, independent tracks, was made early in the research project, and was a guiding framework for the way that the analysis process was conducted. With the aim of developing something that worked creatively as a whole and took the listener on an album-length journey within a "pop" context, the boundaries stylistically had to be somewhat narrow. By this I mean that within the creative process there was a focus on making sure that the songs were lyrically and musically accessible and had some consistency. This had both advantages and disadvantages and in evaluating the effectiveness of the listening process on creativity, these should be taken into consideration.

One of the advantages was that throughout the process, ideas were able to permeate in a variety of ways in different songs, creating continuity. An example of this is the stylistic journey that the album takes, with some of the early tracks (such as 'Seeds' and 'Bold-Faced Lie') having a guitar-driven rock feel, while tracks in the middle of the album (such as 'Another Point of View', and 'Other Side') explore more sample-based electronic styles. 'Through the Night' and 'Daisy Chains' touch on ideas of retro influence, with classic 80s and 90s synths and guitar tones reimagined, while 'First Sight' and 'Here's to Hoping' at the end of the album explore stylistic influence from the folk portion of the influencing dataset. These stylistic directions were prominent in the dataset, have been the overarching themes through the album, and were a driving factor in my investigation of the production process.

A second advantage of the album approach was the ability to apply influencing features in different ways depending on how I felt they would best impact the given track. For example, observing a number of approaches regarding the use of space in tracks meant that I could try

various methods with each track to see how they fit in with, and directed the music-making process. Having many ideas available and working on a variety of applications for those ideas meant that I was able to use the ideas as influencers rather than rules. If I had been working on a track by track, single basis I would potentially have felt more restricted, or locked into using a particular idea that I may have had trouble applying in an effective way.

Of the disadvantages to this approach, one prominent difficulty is that of time. Trends in styles and sounds develop and evolve quickly, not only from year to year as is shown in the time-genre based analyses in this project, but continuously (Moore, 2012, p. 8). So, by the time it came to apply the influencing features from the 2011-2015 alternative charts to my project, it was well into 2017-18 and some could argue that this left the project (if its goal was creating "current" pop music) already out of date. However, as the initial goal was not to create a commercially successful album (as nice as that might be), I believe the idea of generating creative ideas by analysing a set of songs is still a worthy research directive. In future research I believe that a condensed application of this method could be used to generate ideas for the development of any genre or style of music with very topical or current reference when desired. With that in mind there is certainly scope for further development and application of the ideas covered in this project.

As far as the broader utility of my research-led practice project is concerned, another person looking at the same dataset, using the same tools, through the lens of their own musical experience and background (their own habitus) would likely come up with completely different observations to the ones that I have detailed. This is partly because of the stylistic diversity of the dataset. While this broad brush-stroke approach has been useful as a way of

developing the method behind gathering the influencing features, allowing for very blatant variations in the data to direct the focus of the analyses, it would be interesting to see the effectiveness of the approach when applied to a more homogenous group of songs. I think that the resulting ideas could be more limited, and more specific to the dataset analysed, and perhaps any creative output would more closely resemble the influence group upon which it was based. On the other hand, the simplicity with which I applied the MIR tools meant that within each track there is certainly more diversity of information that could be gathered within each spectral feature. The same could be said for the musicological analysis, there are more layers of complexity that could be considered within each track, however a more fine-grained approach might be more effective across a smaller sample size. Whether that would be seen as a more effective application of the method is debatable. What I do know is that this process of developing the techniques and settling on the tools that make up the methodology was aided by the diversity in a larger dataset, which made it easy to explore a variety of broader analysis approaches, and to define the range of elements that were chosen as influences.

With regards to the success of my research, I believe that the large-scale, varied analysis approaches used throughout this project gave me a great amount of confidence in developing an aesthetic for each track as a part of the album. From the creation of demos through to the final tracks, the features and ideas drawn from listening to the music in the dataset augmented by the MIR process influenced the production of each of my tracks in a way that both stretched my stylistic boundaries and developed my range of creative options as an artist.

The function of the MIR analyses was to provide focus on both high and low level features in the dataset, and though an argument could be made that the output content should reinforce those features, this may have resulted in the inhibition of the sparking of creative ideas in the production process. A creative response to the given stimuli should, for the purpose of creating something unique, develop these sparks through my lens with the focus being on showing engagement with the field of works from my habitus. Therefore, I did not believe it to be of value to include comparative MIR analyses of the final tracks as the response need not inhabit the same qualities or MIR parameters as those being analysed. This is especially true in the case of the low-level features, where trying to replicate spectral patterns would place too heavy a focus on specific styles of mixing and mastering. Subsequently, the features derived from the augmented listening process afforded by the novel MIR grouping method are, by design, somewhat detached from the MIR process, and whilst I engaged in some speculation regarding why such features presented in the chosen groups, the focus remains on how the generated ideas influenced my practice.

The trajectory of this project has led to it being something of a proof of concept, investigating how directed analysis can impact the creative process. The exploratory development of the method played a large part in the research, such that it generated more possibilities for exploration and expansion than could feasibly have been applied in the given timeframe. If I were to undertake this research again, starting with my analysis technique, I would spend more time exploring a broad range of approaches to songwriting, as well as taking more extreme stylistic steps away from my habitus. The infinite dataset possibilities available means that by applying my approach to any number of recording-based genres, they could be used as creative stimulus for future creations. These stimuli could be applied in the earlier

stages of songwriting, making more consideration of the lyrical content using methods, such as those used by O'Regan in her study of the Beach Boys (O'Regan, 2014, pp. 224-263), in a theme-based analysis of the chosen dataset. I could also make use of linear spectral analysis algorithms to apply comparative melodic analysis giving a separate data point to find inspiration in the realm of songwriting. It might also be rewarding to look more deeply into a dataset with some peculiarities regarding structure as an influence in that area.

This journey has seen the application of both Music Information Retrieval and musicological methods to augment the listening processes that influence the creation of finished recordings. It allowed for a level of control over those influencing factors, as well as providing a platform for building a sound, or aesthetic for the album. This conscious and directed form of creative development enhanced my skills in arrangement, production, performance and mixing, developing my habitus throughout the project. By engaging with styles and genres that I was not well versed in I have been able to expand my habitus by engaging with a field of possible creative choices. Through exploring digital and traditional popular music analysis methods, I was able to develop a combined methodology that as a form of creative influence, was effective. As a method for the development of my artistry, this project has been a success. As a method for the generation of creative ideas relevant to the production of an album, the analysis process facilitated a fresh and novel approach to influence. With a more streamlined approach, I believe that this methodology could be further explored as a method for the development of an artist. With regard to the field of digital musicology, I believe that this research shows a variety of ways that MIR analyses and data can be integrated into popular musicology analysis methods, to give a better understanding of stylistic trends, and that

spectral, acoustic data generated using MIR tools can be used to better understand tracks and sets of tracks musicologically.

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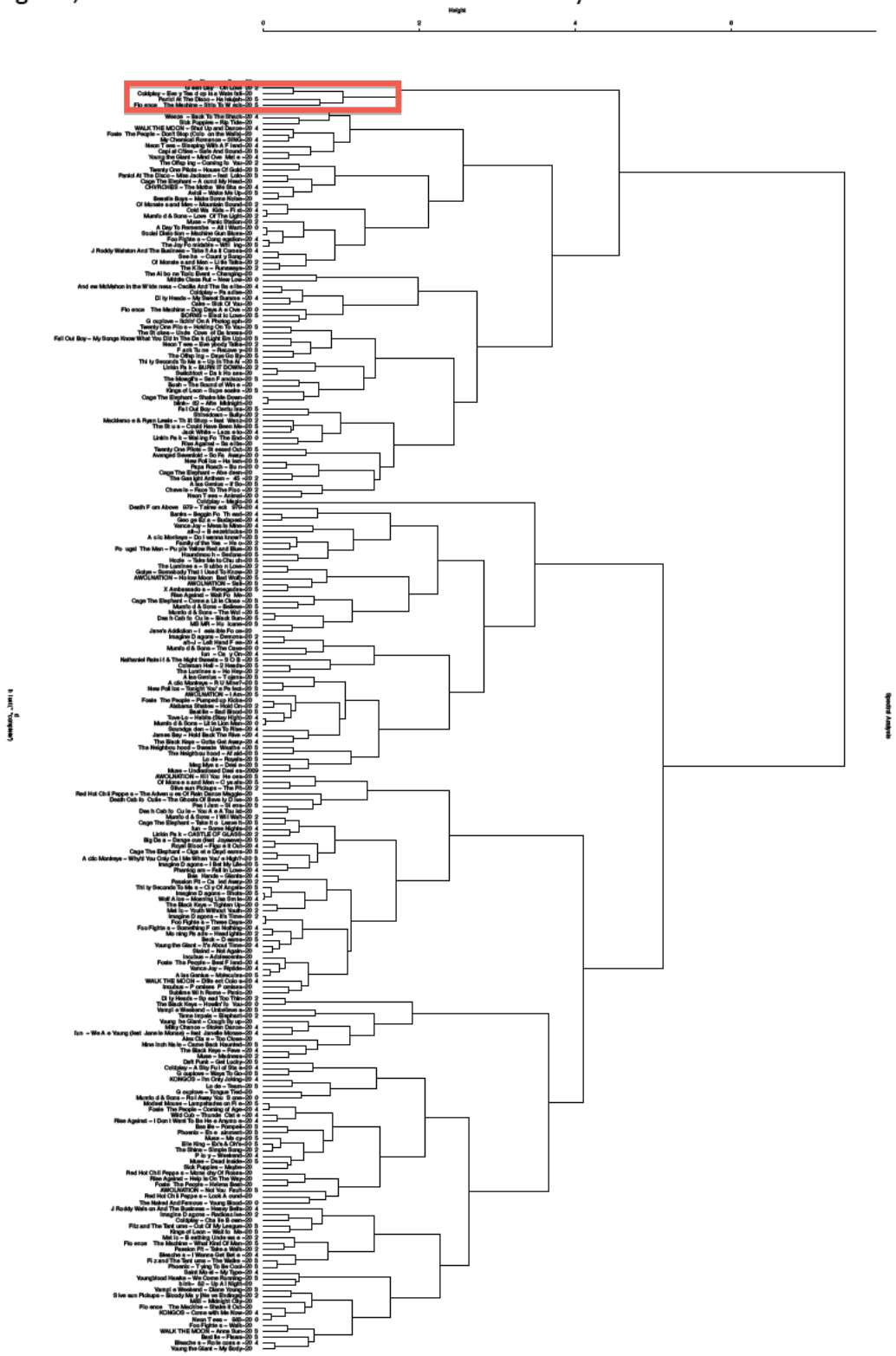
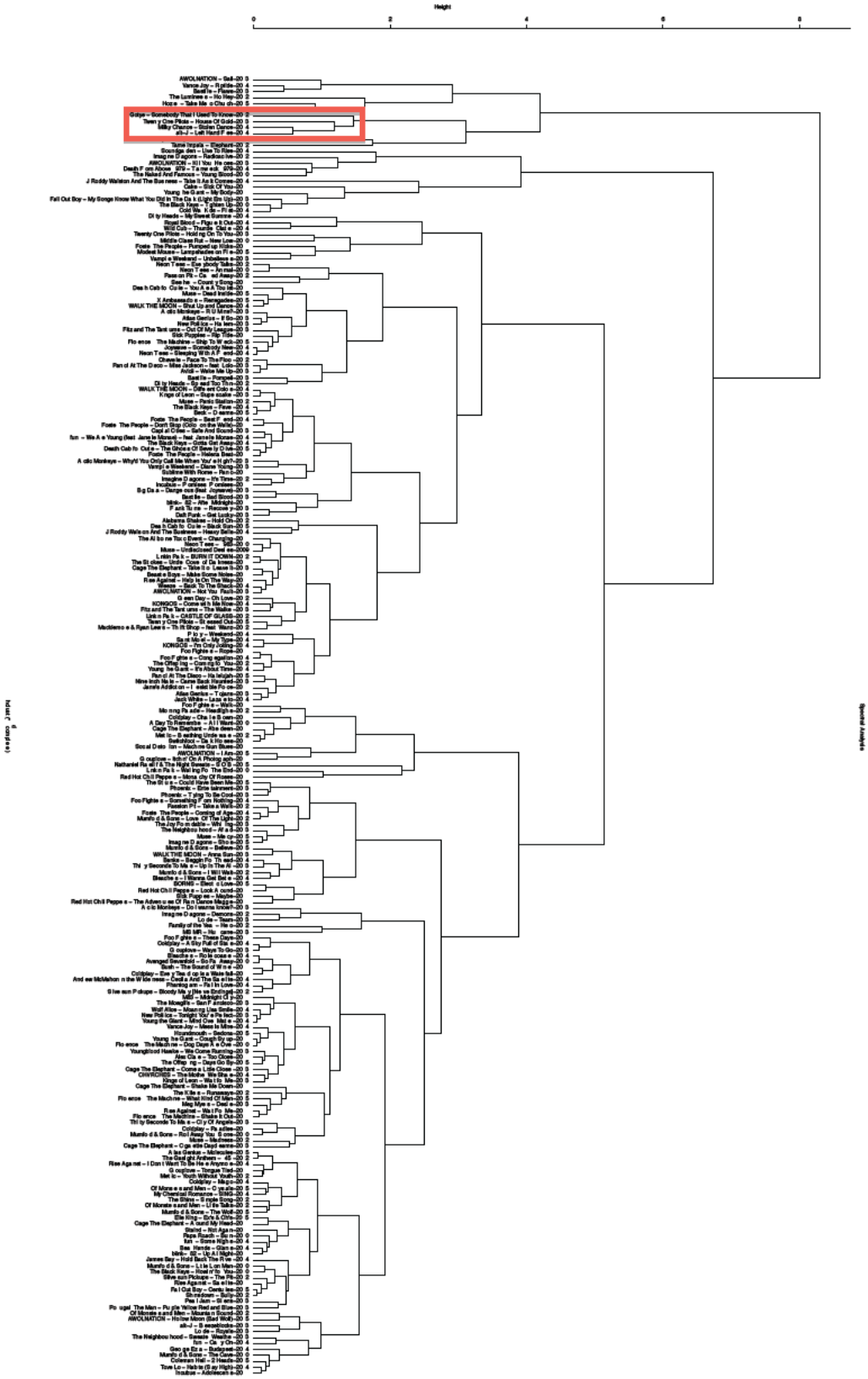
Appendix

Group 1: Spectral Inharmonicity, Spectral Centroid & Key

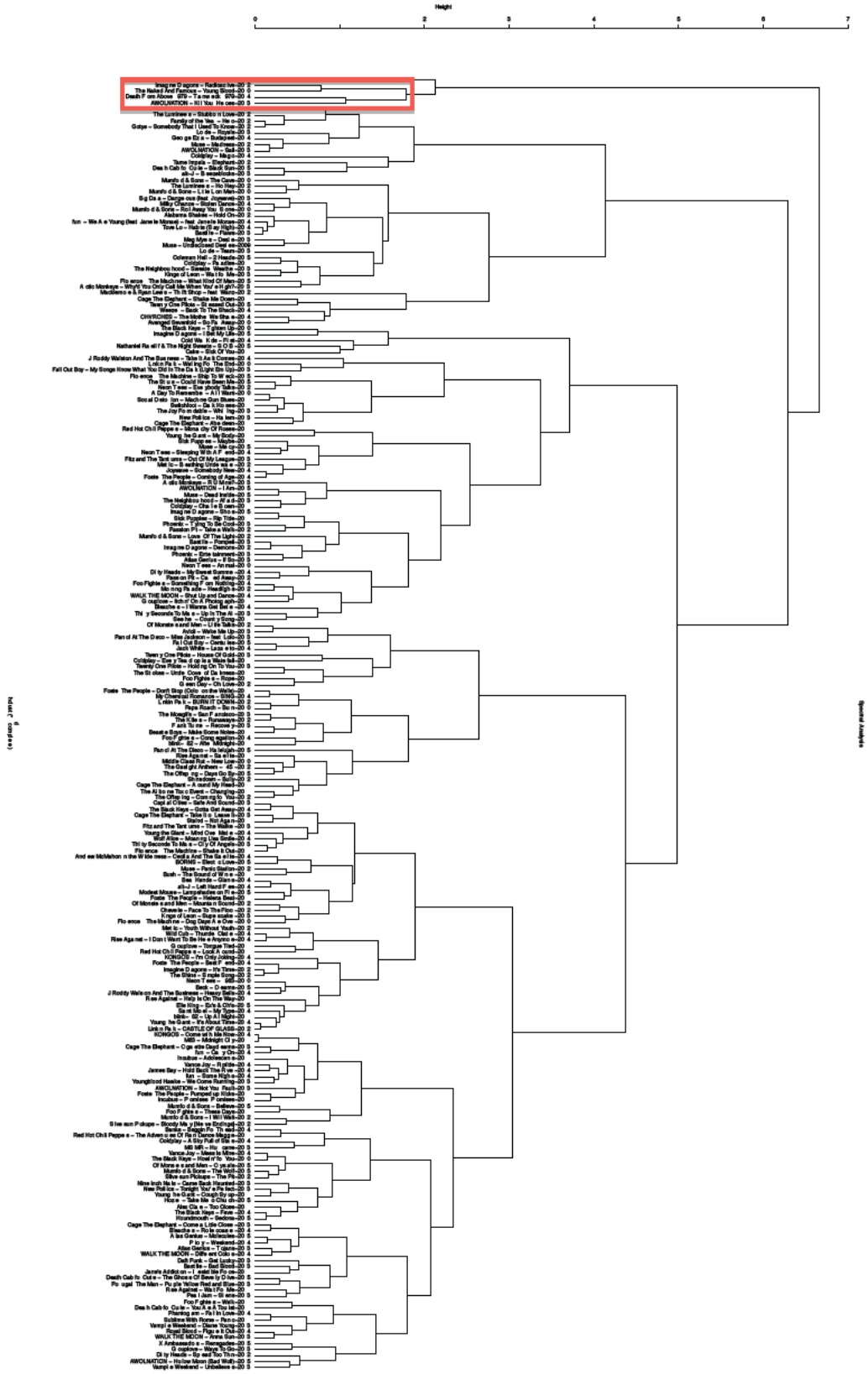
In each of these dendrograms, the red box indicates the group that was selected from the dendrogram, while the horizontal axis indicates how many branches the tracks took to group.



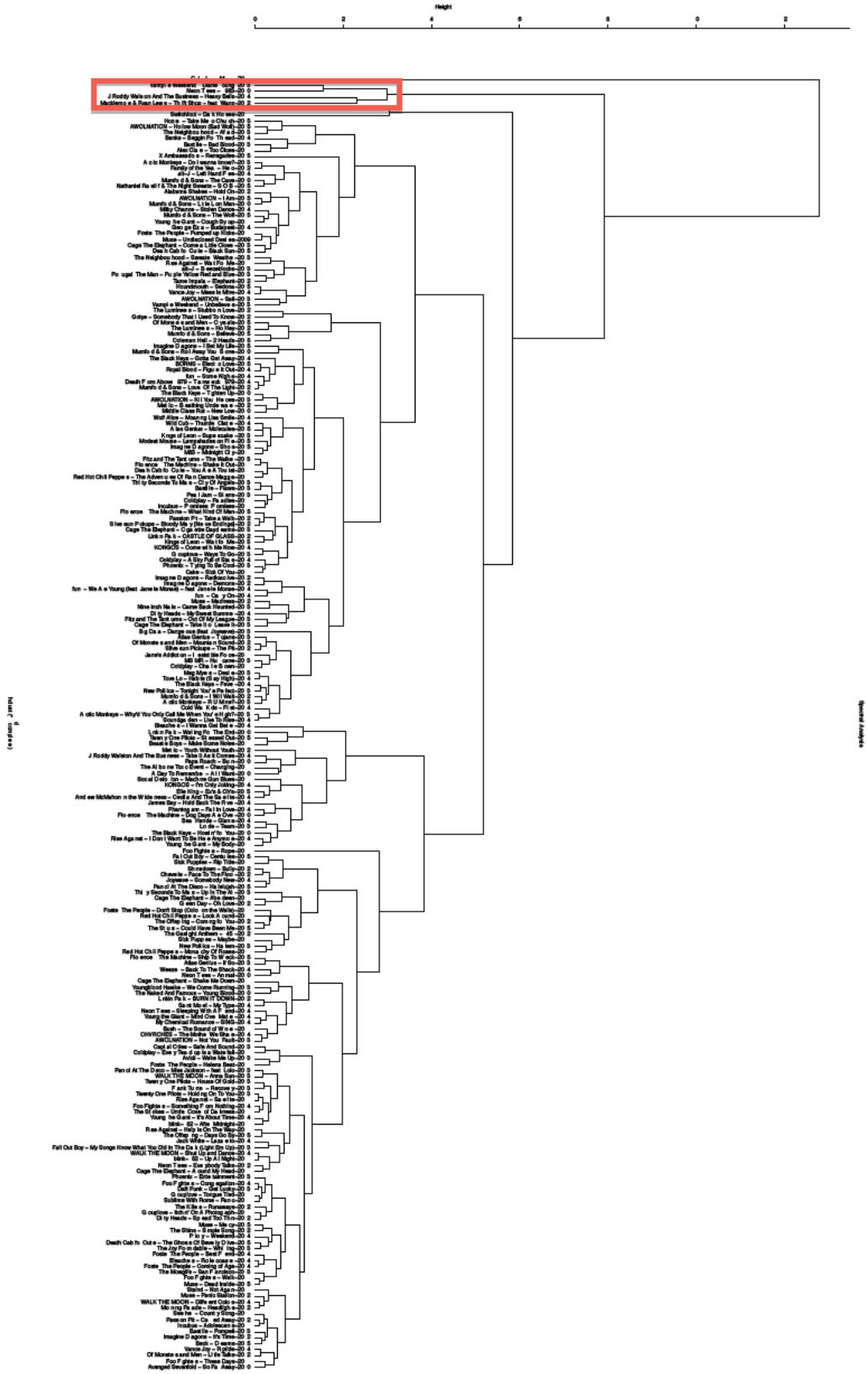
Group 2: Liveness, Acousticness & Valence



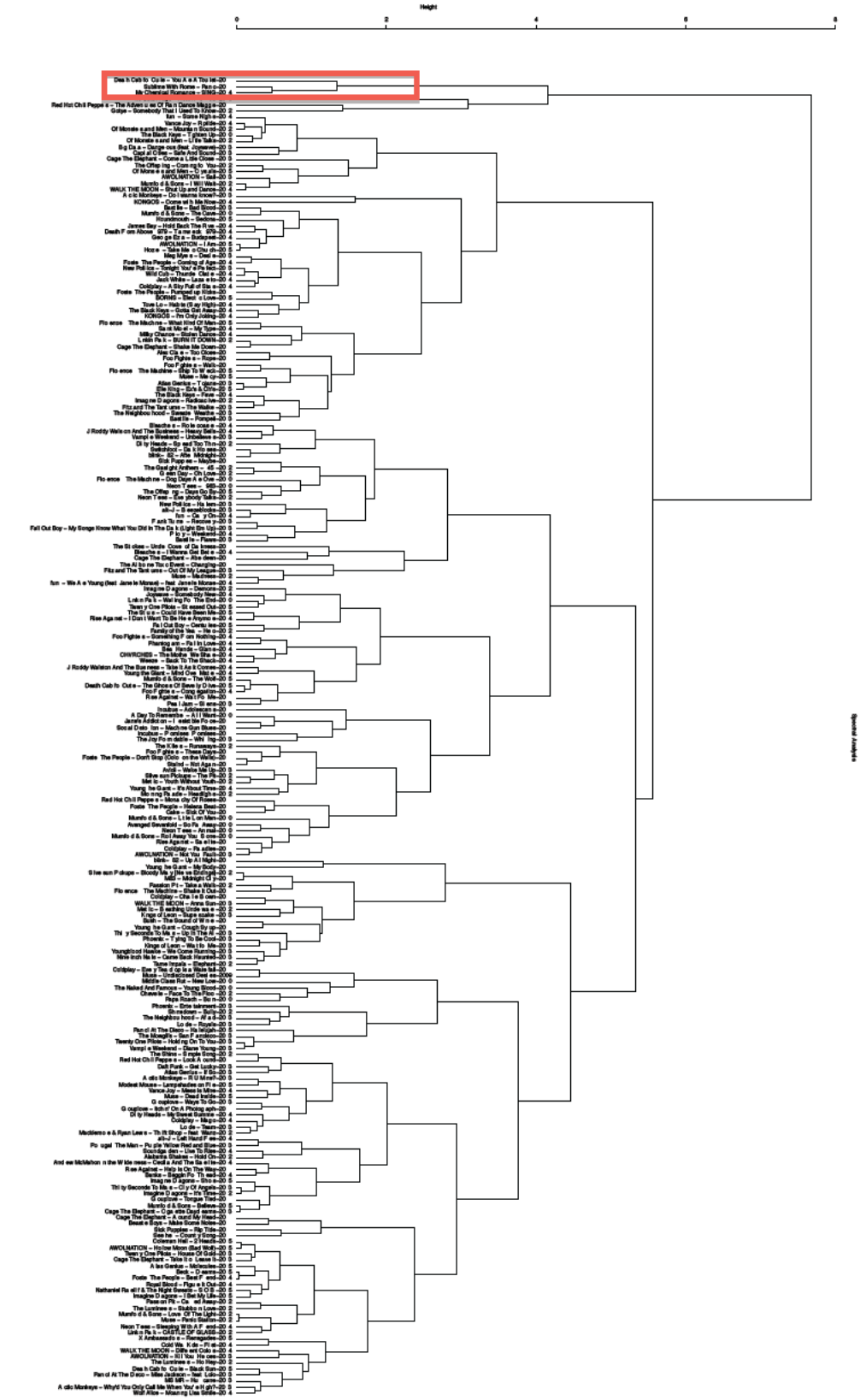
Group 3: Spectral Inharmonicity, Energy & Liveness



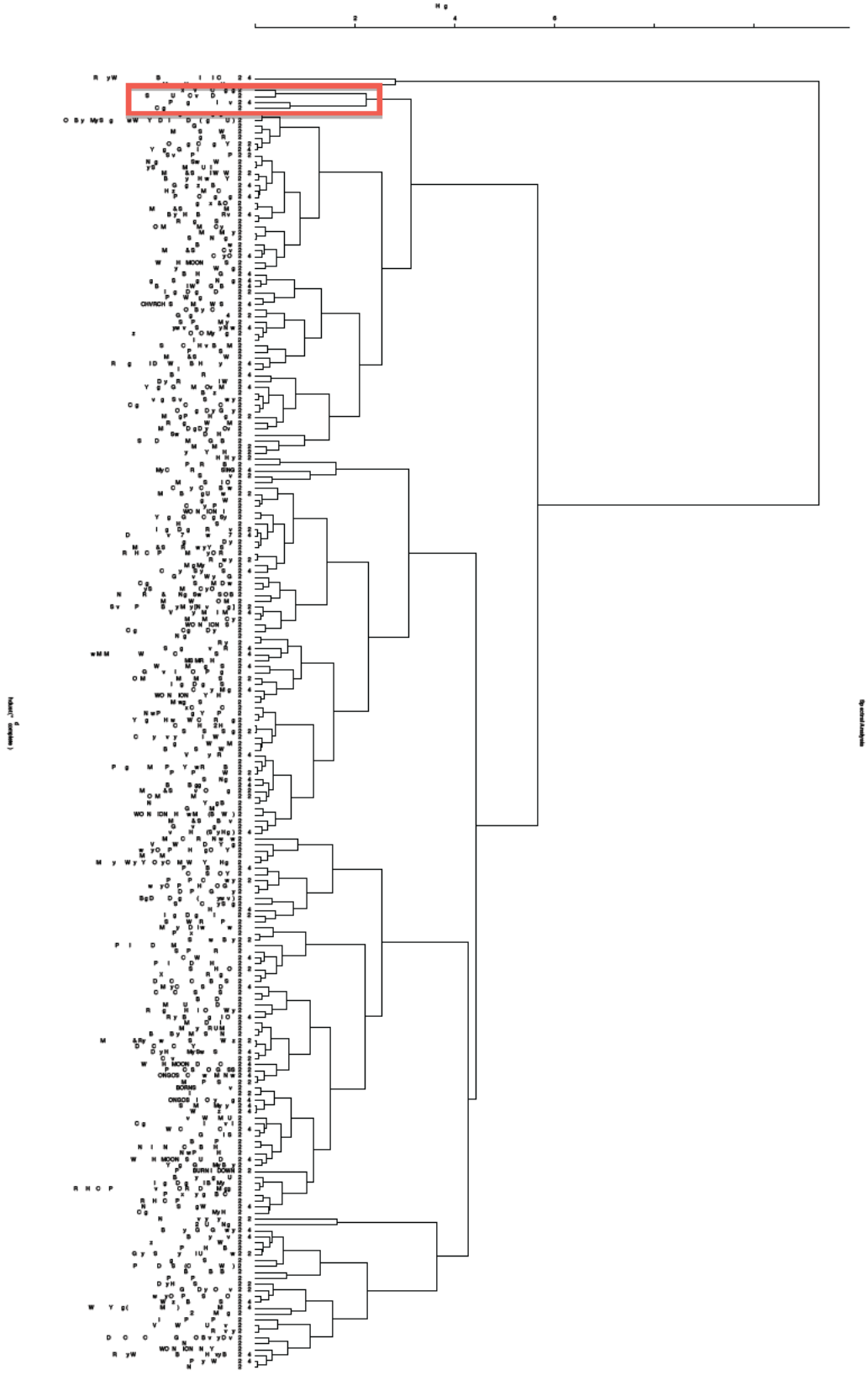
Group 4: Spectral Kurtosis, Spectral Centroid & Speechiness



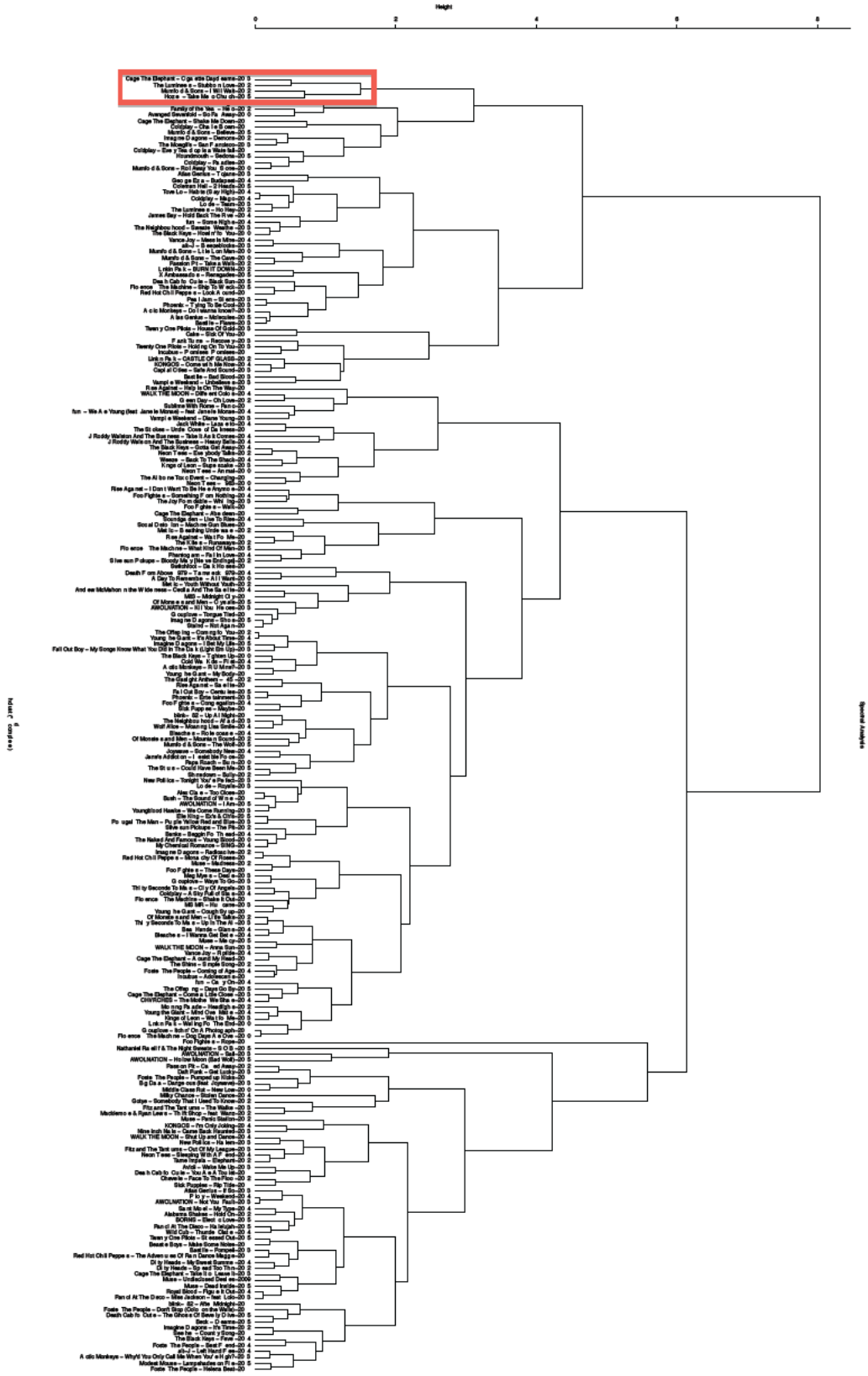
Group 5: Flatness, Tempo & Key



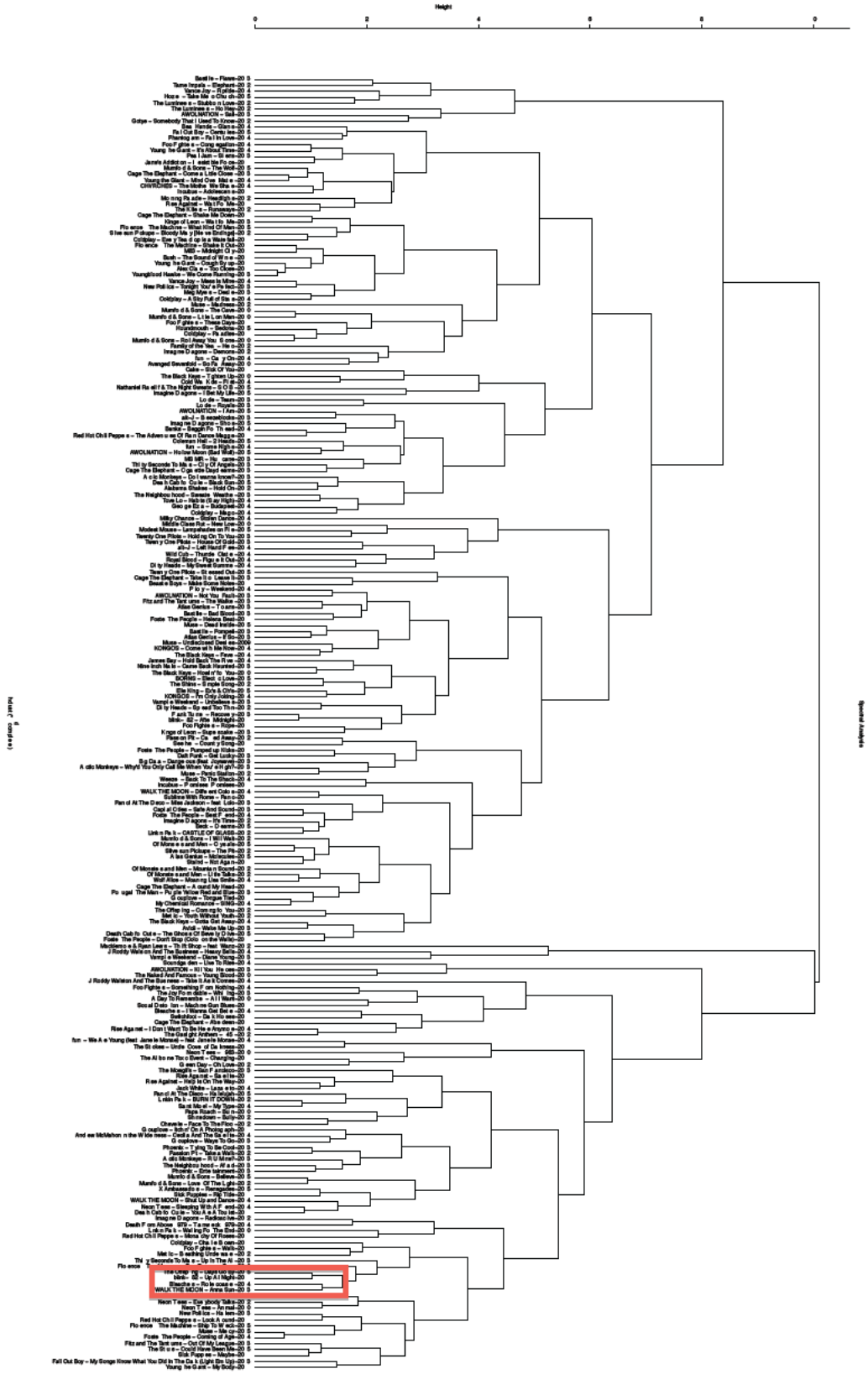
Group 6: Crest, Tempo & Valence



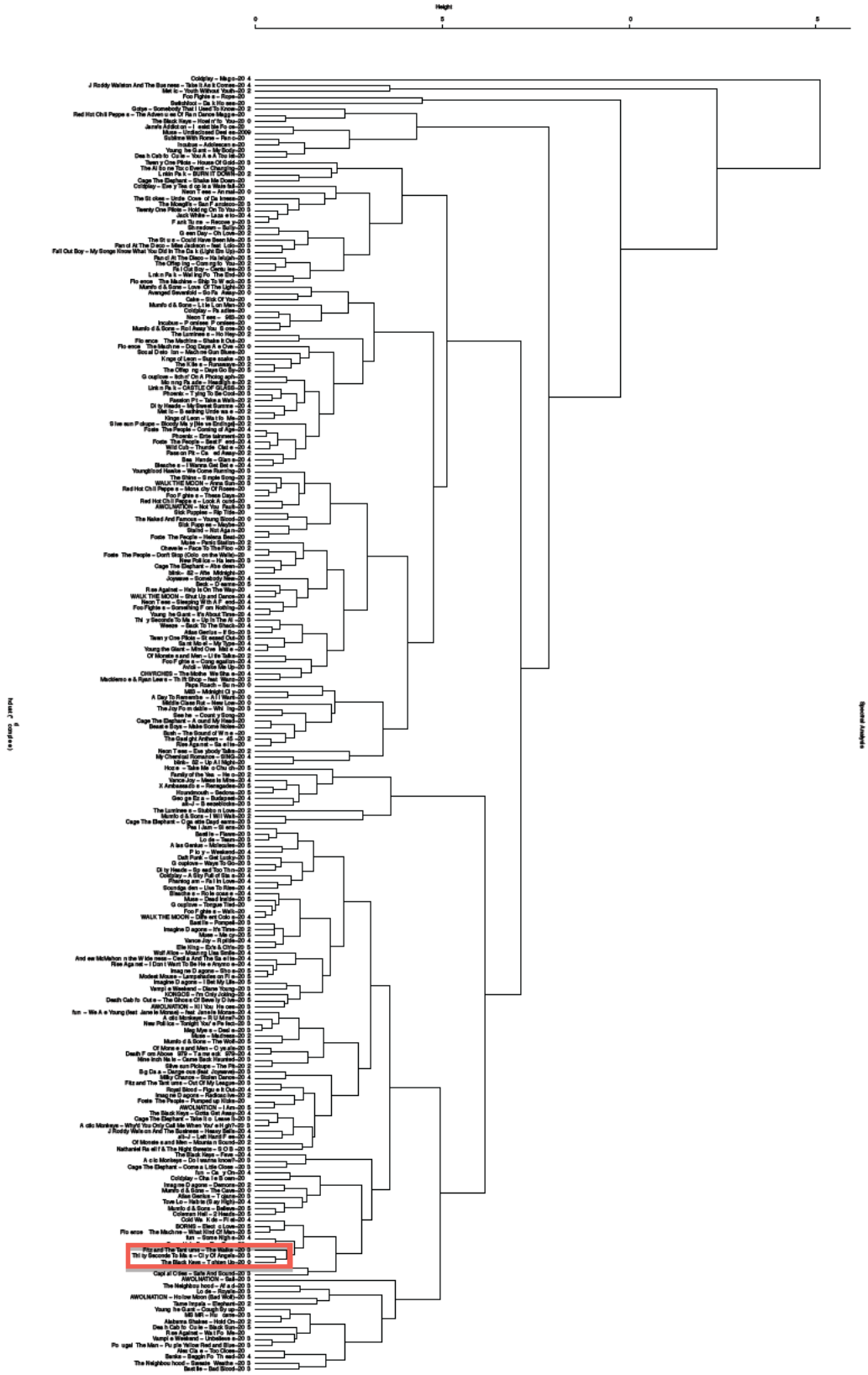
Group 7: Smoothness, Danceability & Valence



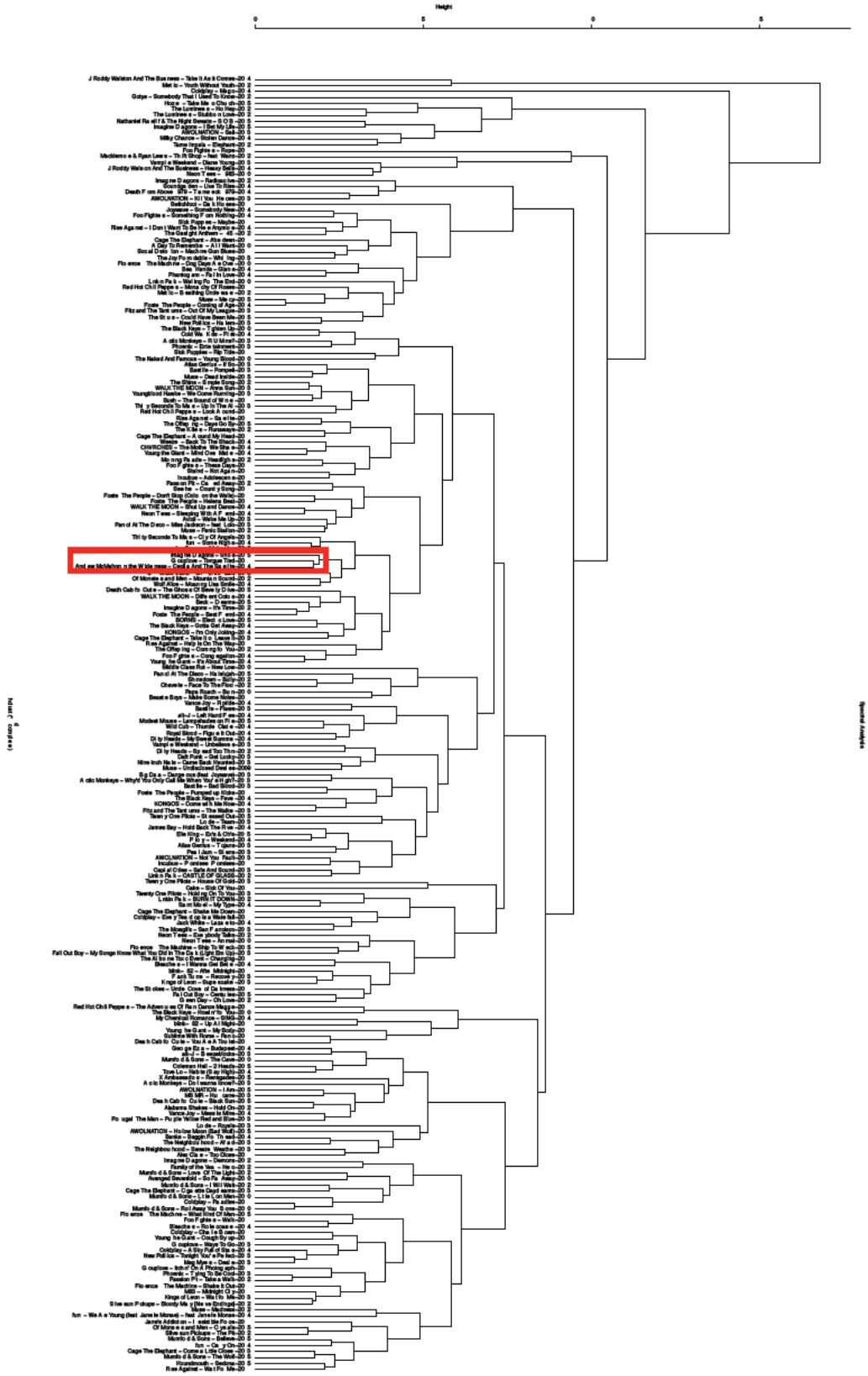
Group 8: Echonest Features



Group 9: Libxtract Features



Group 10: All Features



List of Dataset Tracks

Clicking on the artist or track name will take you to a Spotify link of the track

A Day To Remember – All I Want	2010
Alabama Shakes – Hold On	2012
Alex Clare – Too Close	2011
alt-J – Breezeblocks	2013
alt-J – Left Hand Free	2014
Andrew McMahon in the Wilderness – Cecilia And The Satellite	2014
Arctic Monkeys – Do I Wanna Know?	2013
Arctic Monkeys – R U Mine?	2013
Arctic Monkeys – Why'd You Only Call Me When You're High?	2013
Atlas Genius – If So	2013
Atlas Genius – Molecules	2015
Atlas Genius – Trojans	2013
Avenged Sevenfold – So Far Away	2010
Avicii – Wake Me Up	2013
AWOLNATION – Hollow Moon (Bad Wolf)	2015
AWOLNATION – I Am	2015
AWOLNATION – Kill Your Heroes	2013
AWOLNATION – Not Your Fault	2013
AWOLNATION – Sail	2013
Banks – Beggin For Thread	2014
Bastille – Bad Blood	2013
Bastille – Flaws	2013
Bastille – Pompeii	2013
Bear Hands – Giants	2014
Beastie Boys – Make Some Noise	2011
Beck – Dreams	2015
Big Data – Dangerous (feat. Joywave)	2013
Bleachers – I Wanna Get Better	2014
Bleachers – Rollercoaster	2014
blink-182 – After Midnight	2011
blink-182 – Up All Night	2011
BØRNS – Electric Love	2015
Bush – The Sound of Winter	2011
Cage The Elephant – Aberdeen	2011
Cage The Elephant – Around My Head	2011
Cage The Elephant – Cigarette Daydreams	2013
Cage The Elephant – Come a Little Closer	2013
Cage The Elephant – Shake Me Down	2011

Cage The Elephant – Take It or Leave It	2013
Cake – Sick Of You	2011
Capital Cities – Safe And Sound	2013
Chevelle – Face To The Floor	2012
CHVRCHES – The Mother We Share	2014
Cold War Kids – First	2014
Coldplay – A Sky Full of Stars	2014
Coldplay – Charlie Brown	2011
Coldplay – Every Teardrop Is a Waterfall	2011
Coldplay – Magic	2014
Coldplay – Paradise	2011
Coleman Hell – 2 Heads	2015
Daft Punk – Get Lucky	2013
Death Cab for Cutie – Black Sun	2015
Death Cab for Cutie – The Ghosts Of Beverly Drive	2015
Death Cab for Cutie – You Are A Tourist	2011
Death From Above 1979 – Trainwreck 1979	2014
Dirty Heads – My Sweet Summer	2014
Dirty Heads – Spread Too Thin	2012
Elle King – Ex's & Oh's	2015
Fall Out Boy – Centuries	2015
Fall Out Boy – My Songs Know What You Did In The Dark (Light Em Up)	2013
Family of the Year – Hero	2012
Fitz and The Tantrums – Out Of My League	2013
Fitz and The Tantrums – The Walker	2013
Florence + The Machine – Dog Days Are Over	2010
Florence + The Machine – Shake It Out	2011
Florence + The Machine – Ship To Wreck	2015
Florence + The Machine – What Kind Of Man	2015
Foo Fighters – Congregation	2014
Foo Fighters – Rope	2011
Foo Fighters – Something From Nothing	2014
Foo Fighters – These Days	2011
Foo Fighters – Walk	2011
Foster The People – Best Friend	2014
Foster The People – Coming of Age	2014
Foster The People – Don't Stop (Color on the Walls)	2011
Foster The People – Helena Beat	2011
Foster The People – Pumped up Kicks	2011
Frank Turner – Recovery	2013
fun. – Carry On	2014
fun. – Some Nights	2014

fun. – We Are Young (feat. Janelle Monáe)	2014
George Ezra – Budapest	2014
Gotye – Somebody That I Used To Know	2012
Green Day – Oh Love	2012
Grouplove – Itchin' On A Photograph	2011
Grouplove – Tongue Tied	2011
Grouplove – Ways To Go	2013
Houndmouth – Sedona	2015
Hozier – Take Me to Church	2015
Imagine Dragons – Demons	2012
Imagine Dragons – I Bet My Life	2015
Imagine Dragons – It's Time	2012
Imagine Dragons – Radioactive	2012
Imagine Dragons – Shots	2015
Incubus – Adolescents	2011
Incubus – Promises, Promises	2011
J Roddy Walston And The Business – Heavy Bells	2014
J Roddy Walston And The Business – Take It As It Comes	2014
Jack White – Lazaretto	2014
James Bay – Hold Back The River	2014
Jane's Addiction – Irresistible Force	2011
Joywave – Somebody New	2014
Kings of Leon – Supersoaker	2013
Kings of Leon – Wait for Me	2013
KONGOS – Come with Me Now	2014
KONGOS – I'm Only Joking	2014
Linkin Park – BURN IT DOWN	2012
Linkin Park – CASTLE OF GLASS	2012
Linkin Park – Waiting For The End	2010
Lorde – Royals	2013
Lorde – Team	2013
M83 – Midnight City	2011
Macklemore & Ryan Lewis – Thrift Shop - feat. Wanz	2012
Meg Myers – Desire	2013
Metric – Breathing Underwater	2012
Metric – Youth Without Youth	2012
Middle Class Rut – New Low	2010
Milky Chance – Stolen Dance	2014
Modest Mouse – Lampshades on Fire	2015
Morning Parade – Headlights	2012
MS MR – Hurricane	2013
Mumford & Sons – Believe	2015
Mumford & Sons – I Will Wait	2012

Mumford & Sons – Little Lion Man	2010
Mumford & Sons – Lover Of The Light	2012
Mumford & Sons – Roll Away Your Stone	2010
Mumford & Sons – The Cave	2010
Mumford & Sons – The Wolf	2015
Muse – Dead Inside	2015
Muse – Madness	2012
Muse – Mercy	2015
Muse – Panic Station	2012
Muse – Undisclosed Desires	2009
My Chemical Romance – SING	2014
Nathaniel Rateliff & The Night Sweats – S.O.B.	2015
Neon Trees – 1983	2010
Neon Trees – Animal	2010
Neon Trees – Everybody Talks	2012
Neon Trees – Sleeping With A Friend	2014
New Politics – Harlem	2013
New Politics – Tonight You're Perfect	2013
Nine Inch Nails – Came Back Haunted	2013
Of Monsters and Men – Crystals	2015
Of Monsters and Men – Little Talks	2012
Of Monsters and Men – Mountain Sound	2012
Panic! At The Disco – Hallelujah	2015
Panic! At The Disco – Miss Jackson - feat. Lolo	2013
Papa Roach – Burn	2010
Passion Pit – Carried Away	2012
Passion Pit – Take a Walk	2012
Pearl Jam – Sirens	2013
Phantogram – Fall In Love	2014
Phoenix – Entertainment	2013
Phoenix – Trying To Be Cool	2013
Portugal. The Man – Purple Yellow Red and Blue	2013
Priory – Weekend	2014
Red Hot Chili Peppers – Look Around	2011
Red Hot Chili Peppers – Monarchy Of Roses	2011
Red Hot Chili Peppers – The Adventures Of Rain Dance Maggie	2011
Rise Against – Help Is On The Way	2011
Rise Against – I Don’t Want To Be Here Anymore	2014
Rise Against – Satellite	2011
Rise Against – Wait For Me	2011
Royal Blood – Figure It Out	2014
Saint Motel – My Type	2014
Seether – Country Song	2011

Shinedown – Bully	2012
Sick Puppies – Maybe	2011
Sick Puppies – Rip Tide	2011
Silversun Pickups – Bloody Mary [Nerve Endings]	2012
Silversun Pickups – The Pit	2012
Social Distortion – Machine Gun Blues	2011
Soundgarden – Live To Rise	2014
Staind – Not Again	2011
Sublime With Rome – Panic	2011
Switchfoot – Dark Horses	2011
Tame Impala – Elephant	2012
The Airborne Toxic Event – Changing	2011
The Black Keys – Fever	2014
The Black Keys – Gotta Get Away	2014
The Black Keys – Howlin' for You	2010
The Black Keys – Tighten Up	2010
The Gaslight Anthem – "45"	2012
The Joy Formidable – Whirring	2013
The Killers – Runaways	2012
The Lumineers – Ho Hey	2012
The Lumineers – Stubborn Love	2012
The Mowgli's – San Francisco	2013
The Naked And Famous – Young Blood	2010
The Neighbourhood – Afraid	2013
The Neighbourhood – Sweater Weather	2013
The Offspring – Coming for You	2012
The Offspring – Days Go By	2015
The Shins – Simple Song	2012
The Strokes – Under Cover of Darkness	2011
The Struts – Could Have Been Me	2015
Thirty Seconds To Mars – City Of Angels	2013
Thirty Seconds To Mars – Up In The Air	2013
Tove Lo – Habits (Stay High)	2014
Twenty One Pilots – Holding On To You	2013
Twenty One Pilots – House Of Gold	2013
Twenty One Pilots – Stressed Out	2015
Vampire Weekend – Diane Young	2013
Vampire Weekend – Unbelievers	2013
Vance Joy – Mess Is Mine	2014
Vance Joy – Riptide	2014
WALK THE MOON – Anna Sun	2013
WALK THE MOON – Different Colors	2014
WALK THE MOON – Shut Up and Dance	2014

Weezer – Back To The Shack	2014
Wild Cub – Thunder Clatter	2014
Wolf Alice – Moaning Lisa Smile	2014
X Ambassadors – Renegades	2015
Young the Giant – Cough Syrup	2011
Young the Giant – It's About Time	2014
Young the Giant – Mind Over Matter	2014
Young the Giant – My Body	2011
Youngblood Hawke – We Come Running	2013

Stay Still | Please Hear Lyrics

Stay

Verse 1:

Stay

My heart is just too fragile

My mind is lost in circles

Our place of strength is gone

Verse 2:

Still

Face the uncertain failure

Atrophy becomes a threat

In this broken simulator

Verse 3:

Please

Don't turn your back on us

In your word I count the cost

Of unreasoned reasonings

Verse 4:

Here

I will open up again

When hypocrisy becomes a trend

A faith shaken is not stirred

Seeds

Verse 1:

A broken heart on the map

As I'm running though the facts

Soap and water won't relax

My wretched soul my hands attack

As I wander through time

As my wonder climbs

Chorus:

What if I change my mind a thousand

Times and just keep on my path

What if my life becomes a show of

Shattered dreams and failed plans

Will you hold me tonight

Will you stay by my side

Verse 2:

Sick of failing, I won't pretend

Darkness fighting to descend

Open eyes, won't see the light

Seeds of doubt become foresight

As I wander through time

Still my wonder climbs

Chorus:

Bridge:

I thought I was fine

I found a love in spite of me

A new kind of identity

You gave your time to me

Let go of my crimes

When I was crying out to change my

paradigm

Bold-Faced Lie

Verse 1:

A deviation a change

A demonstration of what's to come

A generation remains

A symptom of a loaded gun

As fear and entropy rage

A sickness not defined by health

As they say turn the page

Our story dictated by wealth

Chorus:

A bold-faced lie from a running man

Don't he know that we've got him beat

A smooth-talking con with a different plan

Don't he know that we've got him beat

Verse 2:

You say that it's not the same

My lonely friend has found some fun

Your egotistic remains

My instinct fights but the battle's won

As fear and entropy rage

A sickness I define as wealth

As they say turn the page

A story read by those with health

Why did we sell our health for

Chorus:

A bold-faced lie from a running man

Don't he know that we've got him beat

A smooth-talking con with a different plan

Don't he know that we've got him beat

Stand up to the shakedown

Stand up to the shakedown

Interlude:

Don't you know that we've got him beat

Don't you know that we've got him beat

New Door

Verse 1:

When the fight has gone on way too long

And your broken heart is on the run

When your faith in truth is shaky at best

And you can't find hope in anyone

Try once more

Still unsure

Chorus:

If you're tired of the concessions

Conscience is in session

Holding you for ransom

Open up a new door

Tell them that you're worth more

Tell them that your heart's sore

Tell them that you're gonna

Open up a new door

Open up a new door

Verse 2:

In your eyes that sparkle

Has come and gone

When there's nothing to rely upon

When the ones you trusted

Have let you down

And your cares are nowhere to be found

Try once more

Still unsure

Chorus x2:

Bridge:

Don't let go, don't let go now

Don't let go, don't let go now

Don't let go, just hold on now

Don't let go, just hold on now

If you're tired of the concessions

Holding you for ransom

Chorus x3:

Another Point of View

Verse 1:

Existence unexplored

Potential unsure

A future unimagined

Life not yet spoken for

Verse 2:

I can't see you with my eye's mind

But my mind eyes off another point of view

As if you would be the one that I can never know

When all I want to see is you

Verse 3:

I know it's what you've dreamed of

But the dream just has to break at every scene

I ask you just to trust him, trust in trust alone

But I don't know if I can

Chorus:

Why would you give me something

Just to take it back

Why does my head feel nothing

While my heart's unpacked

Other Side

Verse 1:

Another hill to climb

Can't find an alibi

Moral condition of

A generation of free lives

As you walked out the door

I'd never heard that phrase before

I know it wasn't me

But what we couldn't see was the enemy

Chorus:

This is not a fight

It's a riot and our souls are getting heavy

From a conscience reignited

Seems we're out of time

All the broken pieces breaking peace of

mind

As we mine to the other side

Verse 2:

Tunneling down the line

A consequence of changing stride

A city burning wild

With extra credits for their crimes

As we walked out the door

I've never said that phrase before

As we step up to breathe

Now all that we can see is the enemy

Chorus:

Bridge:

Clear, nothing, clear, nothing's clear

Clear, nothing, clear, nothing's clear

I'm sure there is something here

Clear, nothing, clear, nothing's clear

Clear, nothing, clear, something's here

A sign of life will drown the fear

Chorus:

Bridge:

Through the Night

Verse 1:

Scars now appear, Blemishes and fears

We're fighting so much, yet still so in love

Pre-Chorus 1:

I can't see through the tears

Clouded vision fools our ears

What we hear is

A contradiction of what we've seen

What we've heard steals our nearness

We were fearless

Chorus:

Forever fighting evil hiding

In the darkest places

Leaving lonely faces

Verse 2:

Now's the time

Don't say no let's get it right

Mutual sigh

As we strain to feel the light

Pre-Chorus 2:

Walk through the night, hold me tight,

open eyes

It's waiting just beyond our sight

Hands held we know, though we go,

beyond hope

Love is our guide, thorn in our side

Chorus:

Forever fighting evil hiding

In the darkest places

Leaving lonely faces

Well you and I we

Touch the sky swinging

Through blissful thinking

No thought of sinking

No thought of sinking

No thought of sinking

Daisy Chains

Verse 1:

I came as I am

I brought with me everything

In my torn & shattered hands

Pieces of what's left of me

Verse 2:

Two hearts opened wide

One mind reaching out to see

Imagining inside

A future in our destiny

Chorus:

Don't, don't let go

I'm holding on

I promised that I won't

Won't give up

When all seems lost

I'll pay the cost

Verse 3:

You've seen what I've been through

And the tremble I feel in your hands

Says you're there too

How can we make a clean start

When all of our dreams have broken apart

Chorus:

Bridge:

I'm here for the long haul

Not gonna be the short fall

The weak link in our daisy chain of

happiness

Just look me in the eyes now

As I pray that maybe somehow

Our chain of fragile flowers turns into gold

Chorus x2:

First Sight

Verse 1:

In your eyes I'm safe and warm

Adventure calls beneath the storm

Where the wind will blow us next who knows

But a whispered dream will keep us close

Chorus:

I've been waiting for the right time

Waiting for the right time to tell you

I need you more than ever before

Verse 1:

Chorus:

I've been waiting for the right time

Waiting for the right time to tell you

I need you more than ever before

I've been waiting for the right time

Waiting for the right time to tell you

I need you more than ever before

Bridge:

I hear the fear in every heartbeat

repeating the part

Where the frontier became so sincere

Where to start with a million pieces of desire left no choice

Here part with creation till it comes to life in a fresh night

The best kind of right

Where the dark must submit to the light

And the first sight of your newly opened eyes

Will take every wrong and make it good

Freedom no longer misunderstood

Chorus x2:

Implications

Verse 1:

Your eyes they speak to me

Telling me about the future that they see

Your heartbeat changing speed

You've drawn a line in the sand

But we're both, on your side

Chorus:

What if my direction was rearranged

My dreams replaced with

Some of your open-mindedness

Would I see a change in my exchanges

What if my position remains unchanged

Verse 2:

The writing's on the wall

Our destiny seems set in stone, are we

bound to fall?

Your breath is calling me

Have we regressed to implications of

humanity

Chorus:

Bridge:

Open eyes to a new horizon

Failed attempts at a bigger life while

Broken promises and chosen lies

Leave reckless hearts in a bitter fight

Chorus:

Here’s to Hoping

Verse 1:

Another broken memory sits

Behind the glass of a window frame

And the picture from the time before

The scene where you felt my pain

An open book of crazy thoughts

Where antagonists all sound the same

But the story never ended

We just gave up when it seemed too late

Verse 2:

Now roll the credits on a life

Where the struggle overcame the name

An epilogue where the resolution

Waits for the second page

We found more reason in the rhythm of a

Rhyme our feet can’t move in chains

A most unsatisfying ending

Chorus:

Wo-o-o-o-oah

Wo-o-o-o-oah

Wo-o-o-o-oah

Here's to hoping

Verse 3:

The final strokes on the canvas

Where the colour overrules the blame

Volatility aside our actor

Braces for the final stage

Brushing hostility away our expectation

Finally falls in line

There's so much more time

Chorus:

Verse 1:

Chorus: