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FROM BEATS TO TRENDS: A VARIABLE-BASED STUDY OF SPOTIFY'S TOP 100

ZEREN Başar¹, ARAPGİRLİOĞLU Hasan²

ABSTRACT

This study analyzes current music trends by examining songs featured in Spotify's Global Top 100 weekly charts throughout 2021 using a data-driven approach. Descriptive data analysis was employed to identify and examine musical characteristics associated with patterns of chart presence and chart longevity on digital music platforms. The research data consist of 5,200 chart entries corresponding to 602 unique songs obtained from the weekly Global Top 100 charts published between January 1, 2021, and January 1, 2022. The analysis focuses on key musical variables such as genre, tonality, tempo (BPM), and song duration. Genre and song duration data were obtained from publicly available song metadata, while tonality and tempo analyses were conducted using Logic Pro X version 10.6. The findings show that Pop, Hip-Hop, and Reggaeton were the most prominent genres in the charts, accounting for a substantial proportion of total chart entries. In addition, certain musical characteristics such as minor tonalities, specific tempo ranges, and song durations appeared to be associated with greater chart longevity. By focusing on musical parameters, the study provides a descriptive perspective on popularity patterns in digital music charts and may offer useful insights for music production and music education.

Keywords: Music, Spotify, digital music platforms, music charts, musical trends.

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RİTİMLERDEN TRENDLERE: SPOTİFY TOP 100 LİSTESİNİN VERİ TABANLI İNCELEMESİ

ÖZ

Bu çalışma 2021 yılı boyunca Spotify Global Top 100 haftalık listelerinde yer alan şarkıları veri temelli bir yaklaşımla inceleyerek güncel müzik trendlerini analiz etmektedir. Çalışmada dijital müzik platformlarında listeye giriş ve listede kalıcılıkla ilişkili müziksel özellikleri belirlemek ve incelemek amacıyla betimsel veri analizi yöntemi kullanılmıştır. Araştırma verileri 1 Ocak 2021 ile 1 Ocak 2022 tarihleri arasında yayımlanan haftalık Global Top 100 listelerinden elde edilen ve 602 farklı şarkıya karşılık gelen toplam 5.200 liste girişinden oluşmaktadır. Analiz kapsamında janr, tonalite, tempo (BPM) ve şarkı süresi gibi temel müziksel değişkenler ele alınmıştır. Janr ve şarkı süre bilgileri şarkıların künye verilerinden elde edilirken, tonalite ve tempo analizleri Logic Pro X 10.6 yazılımı kullanılarak gerçekleştirilmiştir. Bulgular Pop, Hip-Hop ve Reggaeton janrlarının listelerde en belirgin türler olarak öne çıktığını ve toplam liste girişlerinin büyük bir bölümünü oluşturduğunu göstermektedir. Bunun yanı sıra minör tonaliteler, belirli tempo aralıkları ve şarkı süreleri gibi bazı müziksel özelliklerin listede daha uzun süre yer alma eğilimiyle ilişkili görüldüğü söylenebilir. Bu çalışma müziksel parametreleri önceliklendirerek dijital müzik listelerindeki popülerlik dinamiklerine veri temelli bir perspektif sunmakta ve müzik üretimi ile müzik eğitimi alanlarına yönelik pratik çıkarımlar önermektedir.

Anahtar Kelimeler: Müzik, Spotify, dijital müzik platformları, müzik listeleri, müzikal trendler.

INTRODUCTION

The rapid rise of digital music platforms has fundamentally transformed the ways in which music is distributed, discovered, and consumed. Streaming services now play a central role in shaping listening habits by providing immediate access to different catalogues of music and organizing content through charts, playlists, and algorithmic recommendation systems. Within this environment, digital platforms have become increasingly influential in shaping which songs gain visibility and how they circulate in contemporary popular music culture.

Among these platforms, Spotify occupies a particularly prominent position due to its global reach and its strong influence on everyday listening practices. Spotify's weekly chart systems, especially the Global Top 100 provide a valuable record of songs that achieve broad international exposure and maintain visibility within a highly competitive streaming environment. For this reason, such charts are important as cultural and industrial reference points. They reflect prevailing listening tendencies, influence promotional strategies and contribute to the shaping of musical production practices in the digital era.

Existing literature includes a range of studies examining the influence of top music charts on listening habits and music consumption. Sim ve Park (2022) associated song discovery with chart rankings and reported that songs appearing in the Top 100 influenced consumer choices to a measurable extent. Other scholars such as Kim (2007) and Aguiar (2018), have explored algorithmic approaches to chart ranking as well as the differences between human curated and algorithmically generated playlists. Aguiar and Waldfogel (2021) further examined biases in playlist composition, drawing attention to disadvantages faced by independent labels and female producers. In parallel, studies by Bhattacharjee (2007), Verboord (2018), and Im (2018) addressed chart trends in relation to gender, linguistic influence and artist prominence, while Schedl and Bauer (2017) argued that mainstream songs, particularly those featured in top charts are likely to

shape users listening habits. Although this body of research is substantial, it has largely concentrated on algorithmic, economic, and socio-cultural dimensions of chart performance. By contrast, musical variables of charting songs have received comparatively limited attention. Even in studies that consider broader contextual factors, such as Pettijohn and Sacco (2009) linked Billboard song preferences to socio-economic conditions, the primary focus remains on external determinants rather than on musical parameters such as genre, tonality, tempo, or song duration. This suggests a need for more focused research on the musical characteristics that appear in globally successful songs within digital streaming charts.

This study addresses that gap by examining the songs featured in Spotify's Global Top 100 weekly charts throughout 2021. Using a descriptive and variable-based approach, it analyzes selected musical parameters to identify patterns among charting songs. The study focuses specifically on genre, tonality, tempo, song duration, and evaluates how these variables appear in relation to chart presence and chart longevity. Rather than making causal claims, the article aims to provide a data-driven description of musical tendencies visible in one year of Spotify's global chart activity.

The study contributes to the literature in three main ways. First, it strengthens research on digital music culture by focusing directly on musical variables within a streaming chart framework. Second, it offers an analytical perspective that may be useful for music producers, composers, and industry professionals interested in current patterns of chart visibility. Third, it provides a contemporary reference point for music education by connecting chart based listening data with musical analysis. In this sense, the article seeks to contribute to a more focused understanding of how musical features appear within globally circulating popular music on digital platforms.

Aim

The aim of this study is to identify contemporary musical trends by analyzing the songs that appeared on Spotify's Global Top 100 weekly charts throughout 2021 in terms of selected musical variables. Specifically, the study seeks to examine how genre, tonality, tempo, and song duration relate to chart presence and longevity on digital music platforms. By employing a quantitative and variable based approach, research aims to reveal recurring musical patterns that characterize popular songs within a global streaming context.

Significance

This study carries significance in three main dimensions:

- Academic – it contributes to the fields of musicology and digital music studies by providing a data-driven examination of how musical variables relate to popularity and chart longevity within streaming-based music charts, addressing a gap in the existing literature that predominantly focuses on socioeconomic or algorithmic factors.
- Industry – it offers practical insights for composers, producers, and music industry professionals by identifying musical characteristics associated with sustained chart success, thereby supporting informed decision making in popular music production.
- Educational – it provides an analytical framework that can be utilized in music education and production curricula to better understand current trends in popular music, bridging theoretical analysis with real-world digital music practices.

Problem Statement

Digital music charts published by streaming platforms play a central role in shaping contemporary listening habits and music production practices. Despite their influence, there is limited empirical research addressing which musical characteristics are commonly associated with chart success and

longevity. Existing studies largely emphasize recommendation algorithms, market dynamics, or listener behavior while the role of musical variables remains underexplored. Therefore, the central problem of this study is to determine which musical features are shared by songs that enter and remain on Spotify's Global Top 100 charts.

Assumptions

This study is based on several underlying assumptions:

- Spotify's Global Top 100 charts accurately reflect global music consumption trends on digital platforms.
- Musical variables such as genre, tonality, tempo, and song duration are relevant factors influencing chart presence and longevity.
- Tonal and tempo analyses conducted using Logic Pro X yield reliable and consistent results.
- The weekly chart data published by Spotify are accurate and methodologically consistent.

Limitations

This study acknowledges several limitations:

- Songs featured on Spotify's Global Top 100 weekly charts only,
- The time period between January 1, 2021, and January 1, 2022,
- A defined set of musical variables, namely genre, tonality, tempo, and song duration.

The study does not account for listener demographics, recommendation algorithms, promotional strategies, or socioeconomic factors. Consequently, the findings should be interpreted within the contextual boundaries of the selected platform and time frame.

Theoretical Framework

Before the rise of today's technology, music was mainly accessible through live performances or attendance at music events. Originally, printed sheet music dominated the market, serving as both the primary method of music transmission and a main source of income for artists. The evolution of music streaming platforms and technological advancements have significantly changed how we access music.

In 1877, Edison's groundbreaking invention the phonograph, revolutionized music reproduction. It utilized a strip of foil wrapped around a rotating metal cylinder to capture sound. This innovation paved the way for Berliner's gramophone, which adopted flat disks for sound recording. The gramophone's discs were cheaper and easier to produce than Edison's cylinders, heralding the era of mass production in sound recording. By 1894, a phonograph player cost about 40 dollars and by 1906, standard record prices had plummeted to 36 cents (Geralt, 1955: 35). These reduced costs democratized access to music technology. Initially, the gramophone's poor sound quality meant it didn't rival sheet music. However, Hakanen (1998) argues that as its quality improved, gramophone recordings began to undercut sheet music sales.

The inventions of the phonograph and gramophone set the stage for radio broadcasting of music recordings. Although radio technology existed since the early 20th century, music broadcasts took some time to emerge. As Crowley and Heyer (2015) highlight, the exact beginning of music radio is debated, but music was reportedly broadcast between 1912 and 1917 by a college station in San Jose. Radio changed music consumption habits. Wood (2009) contends that while bands once played the same arrangements for years, radio's vast reach forced musicians to innovate constantly. Hakanen (1998) further suggests that radio's influence on listener preferences surpassed even that of the phonograph.

The rise of radio, coupled with the burgeoning popularity of the gramophone, signaled imminent transformations in the music industry. By the early 1930s, the significance of sheet music sales had waned considerably (Park, J. G. 2021: 2). In response to diminishing returns from sheet music, broadcasters expanded their playlists, playing a wider variety of tracks. One motivation behind this increased production was the prospect of greater advertising revenue. However, this surge in music production presented challenges, particularly in selecting music for airplay and sales. Hajdu (2015) notes that this proliferation resulted in inventory management issues for record stores.

In 1940, the American entertainment magazine *Billboard* began publishing a weekly "Music Popularity Chart", which showcased the nation's top-selling records. Intended as a tool for industry insiders, the chart has had significant cultural implications. Hajdu (2015) posits that the chart represents a democratic measure of aesthetic judgment, with record sales reflecting individual tastes;

"The *Billboard* music chart claims to evaluate "popularity" through the measurement of sales. Its fundamental principle asserts that buying a record is an exercise of aesthetic will, an expression of personal taste. It says, 'I liked this song, I paid for it, and here is the proof in this list.' The hit parade on the radio serves to reinforce the proposition that purchasing a record is a claim of individual judgment, a democratic act. So, it's the record buyers who make songs hits; the privilege of making hits belongs to them. The charts merely document these results." (Hajdu, 2015: 8).

By the 1950s artists began appearing on multiple charts, which traditionally represented distinct genres. Lynch (2017) notes that the industry's genre classifications were disrupted when Chuck Berry's "Maybellene" charted in Country and Western, R&B, and Pop categories. This highlights the subjective nature of charts, and their potential mismatch with genuine listening habits. Sanmarti (2007) further critiques the industry's racial categorizations, arguing that charts can't truly capture diverse musical tastes.

By the 1990s, efforts had begun to ensure that chart information included more accurate sales data. However, a more effective examination of sales in music stores required the support of technology, when the Nielsen Soundscan program started collecting sales data from all music stores, assumptions about what people listened to changed. According to Sim and Park (2022) study of listening habits in the 90s, while America's radio stations tended to privilege classic rock, the best-selling albums of the early 1990s were mostly Country and Hip-Hop records.

The tools used to calculate chart rankings have been in constant flux. *Billboard* magazine has the longest-running series of top charts evaluating different genres and styles of music and therefore sets a standard for comparison. However, over the last two decades, *Billboard* has failed to keep up with evolving listening technologies. For example, listening data from Pandora (internet radio service) was not added to the *Billboard* charts until January 2017 (Staff and Dunn, 2017).

The evolution of audio technologies over the years encountered some problems in the 1980s due to the size of audio files and important steps were taken to accelerate technological development. The foundations of this change in listening technologies were developed by the German K. Brandenburg in 1987 (Sterne, 2012). Full-resolution digital audio files require a data stream of approximately 10 MB per minute to deliver CD-quality sound. 10MB/minute, which may seem insignificant today is far above the period capabilities of digitally transmitted data. As a solution to this problem, Brandenburg developed the MP3 format, which aims to compress audio files by 12 to 1 without compromising quality (Brandenburg, 2000). A 60 MB song can be compressed into a 5 MB file, and albums have been reduced from 500 - 600 MB to around 40 - 50 MB.

This reduction in file sizes was an important turning point for the sharing and copying of music. Another factor leading the change was the widespread use of the internet. While the internet has

made music more accessible to the listener, it has also become a tool for independent musicians to reach a global audience without the help and support of a major record label. The acceleration of the internet has made it easier for the end user to access music without a physical means of transportation.

Shawn Fanning, John Fanning and Sean Parker saw the shrinking size of audio files and the proliferation of the internet as an opportunity and developed the Napster program. Napster is a simple and free program that uses P2P, a network protocol for sharing data between two or more clients. According to Raymond Ku (2002), with the introduction of Napster, new albums were leaked for free to the listeners before they were sold and the music industry of the time suffered huge losses. The small size of MP3 files further popularized P2P sharing among people and Napster became the ultimate destination for free online music. According to Menn (2003), the application reached 80 million subscribers in a short period of time but was shut down after lawsuits by record labels and artists. Despite the closure of the application in 2001, Knopper (2009) argues that the wave of pirated music created by Napster pioneered the changes that the music industry would experience from the early 2000's onwards.

The surge in pirated music consumption resulted in significant revenue losses for the music industry, prompting the search for strategies to counteract piracy (Ku, 2002). In response Apple - then not a central player in the music business integrated a novel feature into iTunes for its devices in 2001. Steve Jobs unveiled this as the iTunes Music Store during an Apple event in 2003. At its inception, the platform hosted a modest 1,000 tracks. However, it introduced a paradigm shift by allowing listeners to digitally purchase individual songs rather than necessitating the acquisition of an entire album for a single desired track. Reflecting on this development, then CEO of Bertelsmann Music Group (BMG) remarked:

“Steve Jobs told us, 'There are two things you need to accept: Every song is 99 cents, and all songs should be sold as singles.' We went home and gulped because this was very hard for the music industry to accept. For us, when songs really became popular, the price should have been determined at what we thought was the right price, instead of \$1.” (Pham, 2013:23).

Jobs made deals with five major record labels to sell their content through iTunes, which combined with its companion product iPod, made iTunes an absolute success. It sold one million songs in its first week and not only became the best online music retailer but also replaced Walmart and Best Buy as the best music retailers (Sequeira, 2003). In a short period of time, it shifted the industry from high-priced CDs to cheap singles. Current data shows that although streaming services have now overtaken digital song sales, the iTunes Store is still the platform with the highest song sales in 2022 (Forde, 2022).

Streaming delivers content directly to devices without the need to download files from the internet. The dawn of music streaming services began with the launch of Spotify by Daniel Ek and Martin Lorentzon. Founded in Stockholm in 2006, Spotify was established with the recognition that many consumers were not interested in purchasing specific albums or songs. The platform offers access to an extensive music library for \$9.99 per month or for free with ads, ensuring its availability to a broad audience. Parker (2021) highlights the platform's role in helping many independent musicians achieve mainstream success. As noted by Forbes magazine in 2021, Spotify led the streaming services industry, boasting 31% of all users (Forde, 2022).

METHOD

This study adopts a quantitative research design based on descriptive data analysis to examine musical characteristics associated with chart presence and chart longevity on digital music platforms. The description of the data obtained provides the basic characteristics of the sample determined within the scope of the study and presents statistical information related to individual variables without altering the existing dataset, thereby enabling the data to be interpreted in an understandable way (Güçlü, 2020). Descriptive data analysis may also be understood as the objective presentation and interpretation of existing data (Kemp, 2018: 3). In line with this framework, the present study identifies and describes recurring patterns in the musical features of songs appearing in Spotify's Global Top 100 weekly charts.

Data Collection Techniques

The research focuses on songs featured in Spotify's Global Top 100 weekly charts over a one-year period. The dataset covers the charts published between January 1, 2021 and January 1, 2022. It was retrieved in February 2022 from the Kwordb (Kwordb, 2022) world chart archive, which provides publicly accessible weekly chart records for Spotify. In total, 52 weekly charts were examined, each consisting of 100 ranked entries resulting in a dataset of 5200 chart entries corresponding to 602 unique songs.

Repeated appearances of the same song across different weekly charts were preserved when calculating total chart entries, but they were consolidated in unique song analyses. This distinction made it possible to evaluate the dataset in terms of total chart presence and individual songs.

Variables and Operational Definitions

Musical variables including genre, tonality, tempo, and song duration were selected based on their relevance to popular music composition and their frequent use in musicological and analytical studies. The study aims to describe patterns and distributions that characterize charting songs within a global streaming context.

In this study, chart longevity is defined as the total number of weekly Global Top 100 charts in which a given song appeared during the observation period. For interpretive comparison, longevity was considered in two ways. First, whether a song remained on the chart for more than one week, and second, whether it remained on the chart for more than 10 weeks.

To facilitate descriptive comparison, tempo values were grouped into four analytical categories. 65–85 BPM, 86–105 BPM, 106–127 BPM, and 128 BPM and above. These thresholds were established as practical analytical bands intended to make the distribution of charting songs more interpretable within a descriptive framework. Rather than representing rigid music theoretical categories, these BPM groups were used to distinguish relatively slow, moderate, moderately fast, and fast tempo ranges in a way that would support comparison across genres and chart longevity patterns.

Song durations were likewise classified into analytical groups to identify how charting songs cluster around commonly recurring length ranges in the streaming era. In line with the structure used in the findings section, six duration groups were employed. 0:00–2:30, 2:31–3:00, 3:01–3:30, 3:31–4:00, 4:01–4:30, and exceeding 4:30. This grouping strategy was designed to provide a more readable descriptive comparison of shorter, mid-length, and longer songs while allowing finer differentiation within three to four minute range, where a substantial portion of charting songs appears to cluster. The duration categories therefore function as analytical intervals for descriptive interpretation rather than as fixed theoretical classes.

Data Analysis

Genre classifications were derived from publicly available artist and song related information compiled from Wikipedia and cross-checked with Spotify’s metadata where applicable tonality and tempo (BPM) values were determined through audio analysis conducted using Logic Pro X version 10.6. Each track was imported into the software environment, where tonal center and tempo were identified using a combination of automated analysis tools and manual verification performed by the researcher.

All collected data were organized, categorized, and analyzed using Microsoft Excel. The findings were presented through descriptive statistics, tables, and graphical representations to facilitate comparative interpretation across genres and variables.

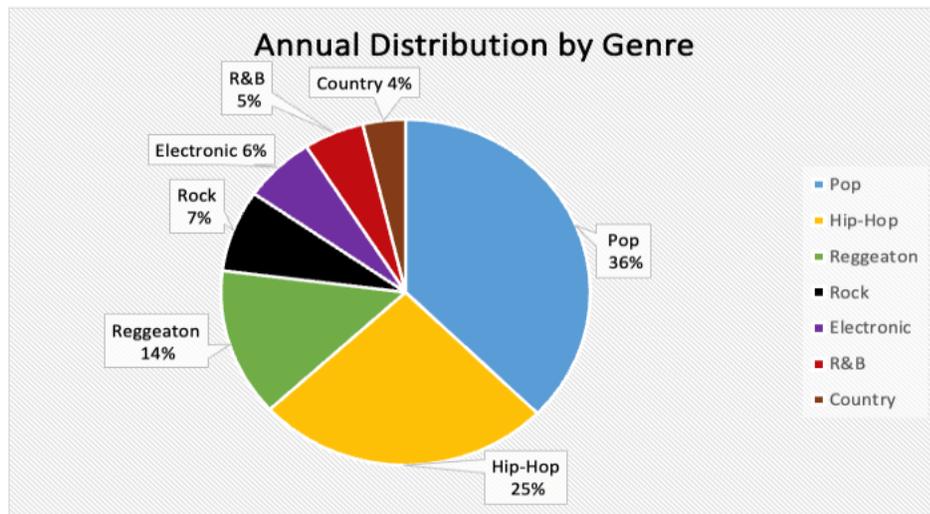
Reliability and Verification

To enhance coding reliability, all variables were cross-checked before the final analysis stage. Tonality and tempo values obtained through Logic Pro X were manually verified by the researcher, and repeated chart entries were reviewed carefully to ensure consistent distinction between total chart appearances and unique songs. Since the coding and verification process was conducted by a single researcher, no inter coder reliability coefficient was calculated. However, manual rechecking was used to improve internal consistency in classification and data handling.

FINDINGS

Genre Analysis

An analysis of the 2021 data from the weekly Spotify Top 100 charts reveals the annual distribution of songs by genre presented in Graph 1.



Graph 1. Distribution of Spotify Top 100 charts in 2021 by Genre.

From the data, 602 songs that entered the Top 100 charts in 2021 spanned between seven distinct genres. Notably, 75% of these songs fell into three primary genres. They are Pop, Hip-Hop, and Reggaeton. A detailed breakdown of song counts by genre is provided in (Table 1).

	Pop	Hip-Hop	Reggaeton	Rock	Electronic	R&B	Country
Total Number of Songs	1	2	3	4	5	6	7

Stayed only 1 week on the list	2	1	5	4	7	6	3
10 weeks or more on the list	1	3	5	4	2	4	6

Table 1. Comparison of genres in terms of various variables.

Table 1 shows that some genres appeared frequently in the top 100, yet many of their songs remained on the chart for only a short period. For instance, 178 songs in 2021 charted for just one week. Interestingly, Hip-Hop which holds the second spot in terms of sheer quantity in the Top 100, also tops the list of genres whose songs remained for a mere week. This may indicate shorter chart persistence for many Hip-Hop tracks in this dataset. Pop and Country follow in second and third places respectively. Rock secured the fourth place with 13 songs, while Reggaeton came in fifth with nine entries.

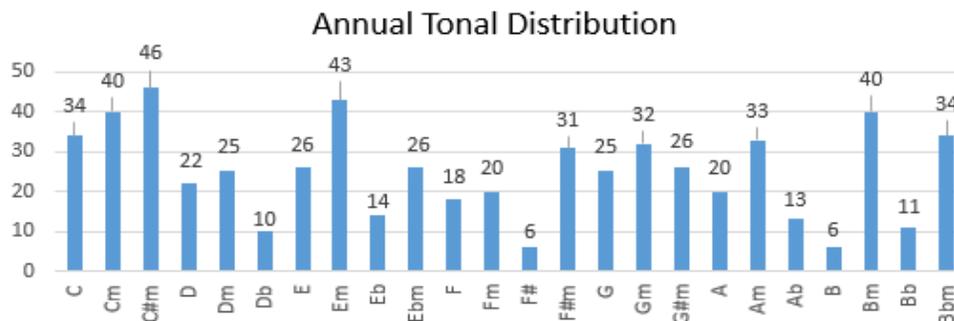
In contrast, when considering songs that have maintained a presence on the charts for 10 weeks or more, 90 songs achieved this distinction. Pop appeared as the most persistent genre with 34 songs (38%), having such longevity. Electronic music followed at 18% with Hip-Hop at 13%. R&B and Rock both shared the fourth spot with 11%, while Reggaeton and Country occupied the fifth and sixth positions with 9% and 0% respectively.

Pop ranked first both in total song count and in the number of songs that remained on the chart for 10 weeks or more. Although Hip-Hop songs were prevalent, their typical chart duration was brief. Remarkably, Reggaeton ranking third in overall song counts but fifth in one-week chart stays, displayed a contrasting trend when considering songs charting for over 10 weeks.

Rock music displayed consistency, taking the fourth place across all categories and portraying a balanced position among the seven genres. Electronic music, while not in the top three by quantity, had a commendable 75% of its total entries stay on the charts for over 10 weeks, suggesting that Electronic songs showed a comparatively high proportion of long-charting entries. Similarly, R&B maintained a consistent position across different metrics but outperformed in songs charting for more than 10 weeks. Conversely, Country music, with the least entries emerged as the genre with the shortest average chart durations.

Tonal Trends

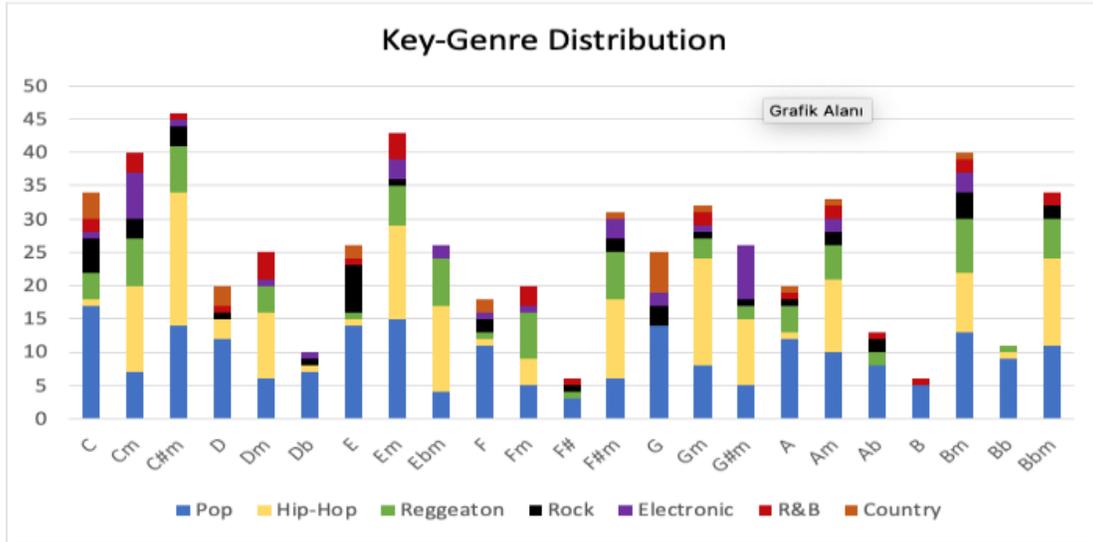
From the data gleaned from Spotify's weekly Top 100 charts in 2021, a tonal distribution of 602 songs is detailed in Graph 2.



Graph 2. Annual tonal distribution of Top 100 charts.

Analyzing the tonal distribution reveals C#m as the predominant key, representing 46 of the charted songs. Following C#m, Em secures the second spot while Cm and Bm share third place. Conversely, the least favored keys were F# and B.

A deeper dive into the key distribution across the seven genres that dominated the 2021 Top 100 is visualized in Graph 3.

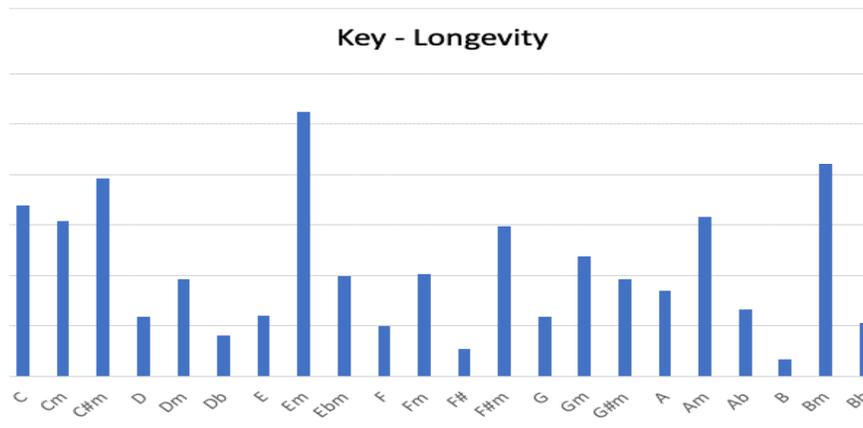


Graph 3. Key-Genre Distribution.

From this graph, C#m emerges as a versatile key. Breaking down its genre distribution, 41.3% belonged to Hip-Hop, followed by Pop at 30.4%, Reggaeton at 15.2% and smaller fractions for Rock, Electronic and R&B. Bm, the second most popular key showed significant representation in Pop (30%), Hip-Hop (22.5%) and Reggaeton (20%).

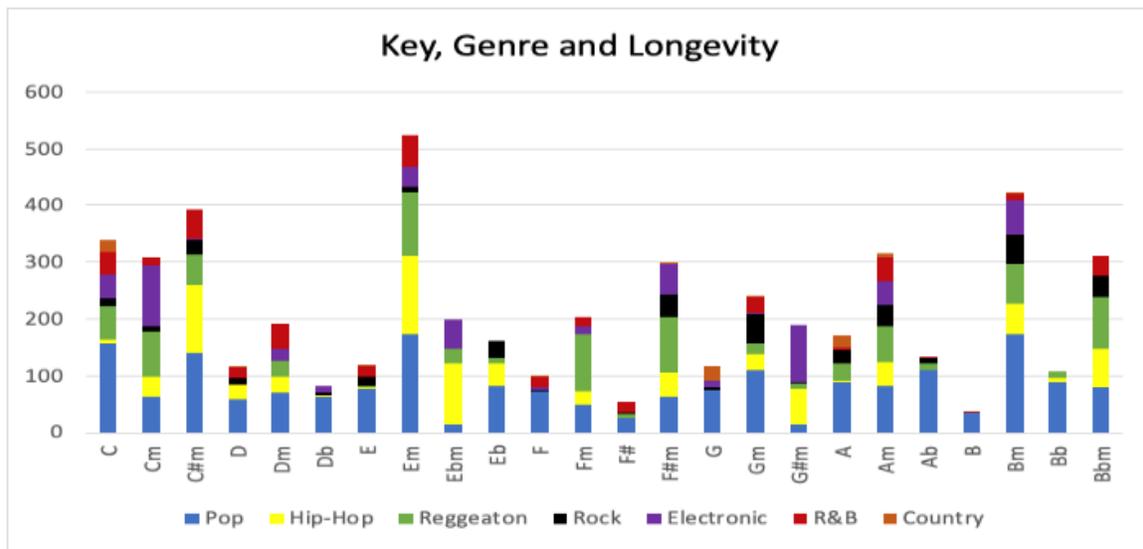
While Pop, Reggaeton and R&B exhibited a diversified key usage, Hip-Hop prominently favored C#m. Rock leaned heavily on E and C, possibly influenced by holiday-themed songs prevalent around Christmas and New Year. For the Electronic genre, Cm and G#m made up 45% of its charted tracks. The Country genre, in contrast, predominantly featured the G key with 30% of its tracks in this tonality.

An interesting pattern emerges when analyzing key preferences against song longevity on the chart as detailed in Graph 4;



Graph 4. Comparison of keys with their longevity (more than 10 weeks) on the list.

This comparison shows a change in tonal distribution when long-charting songs are considered separately. While C#m dominates in overall chart entries, songs in Em seem to have a longer chart lifespan. In contrast, Bm moves up to second place in terms of longevity.



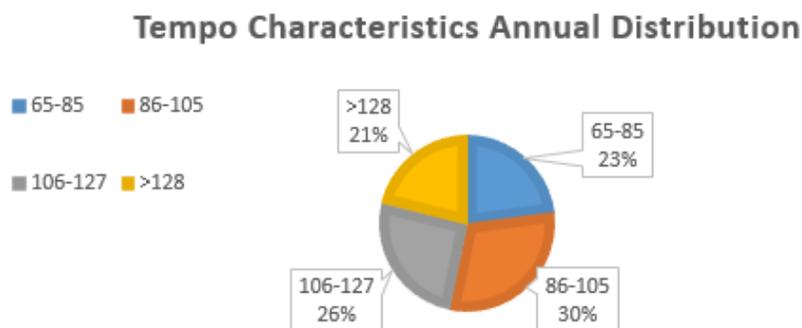
Graph 5. Analysis of tonal distribution in terms of genre and longevity on the list.

Dissecting the interplay between tonality, genre, and chart longevity (as seen in Graph 5) reveals some distinct patterns. In the Pop genre Em, Bm, and C dominate songs with extended chart durations, diverging from the general tonal distribution trend. This suggests that while initial chart entry doesn't strongly favor any key, certain tonalities appeared more frequently among long-charting songs.

In the Hip-Hop realm, Em again reigns supreme in terms of chart duration, sharing the spotlight with C#m and Ebm. Together, these three keys comprise 43.3% of long-charting Hip-Hop songs. Reggaeton also exhibits a preference for Em for its long-staying tracks. However, while Fm ranked second in this genre, it contradicted the general trend, suggesting that Fm was more visible among long-charting Reggaeton songs in this dataset.

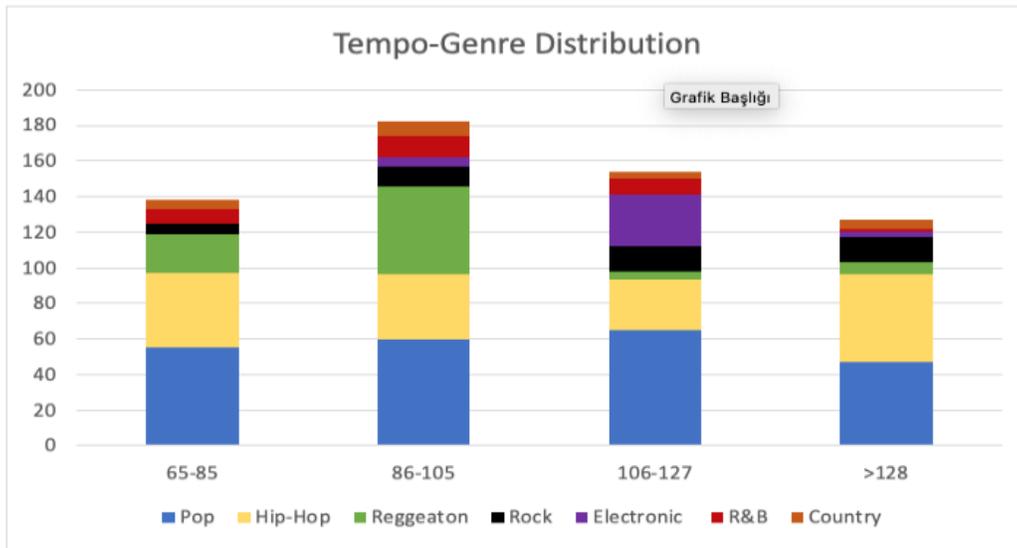
Tempo Preferences and Chart Stamina

From the data sourced from Spotify's 2021 weekly Top 100 charts, the annual distribution of tempo characteristics quantified as beats per minute (bpm) was categorized into four primary groups. This distribution is visualized in Graph 6.



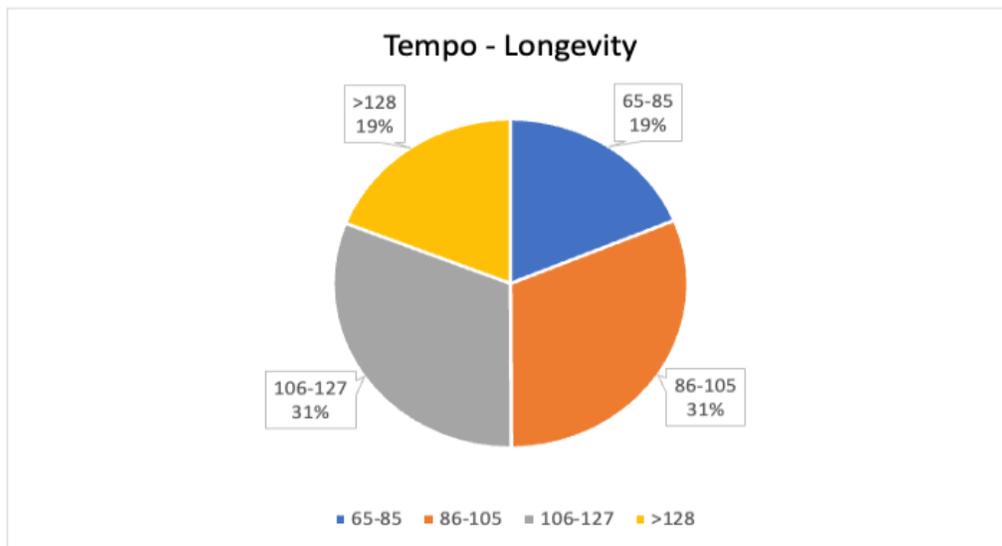
Graph 6. Annual distribution of tempo characteristics.

The analysis of the tempo distribution indicates a relatively even spread across the tempo groups for the 602 charted songs in 2021. Specifically, songs with tempos between 86-105 bpm took the lead at 30%, followed closely by 106-127 bpm at 26%, 65-85 bpm at 23% and songs exceeding 128 bpm at 21%. When the distribution of tempo groups by genre is analyzed, the findings in Graph 7 are obtained.



Graph 7. Distribution of tempo groups in relation to genres.

A deeper tempo-genre analysis represented in Graph 7 suggests an interesting pattern. No particular tempo dominance was observed in Pop, Hip-Hop, Rock, R&B, and Country. Reggaeton stands out with a strong preference for tempos between 86-105 bpm, accounting for 59% of its chart entries. Electronic music, on the other hand, sees 39% of its tracks fall within the 106-127 bpm bracket.



Graph 8. Tempo and longevity on the list.

Graph 8 delves into the correlation between song tempos and their longevity on the charts. This comparison shows a similar tendency. Songs in the 86-105 bpm and 106-127 bpm groups not only dominate in number but also tend to stay on the charts longer than songs from other tempo groups.

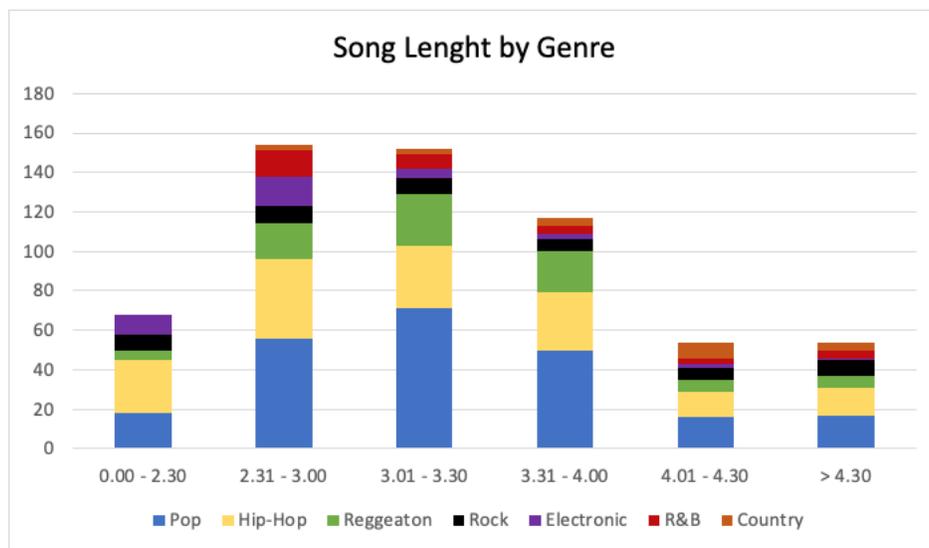
When focusing on songs that sustained their chart positions for ten or more weeks in 2021, a shift in tempo distribution can be observed. The 106-127 bpm group, while being the second most frequent overall topped the charts in terms of song longevity with a 41.56% representation. Pop and Rock were the driving genres behind this trend. The leading tempo group 86-105 bpm drops to second place for songs with extended chart presence. The >128 bpm group climbs in ranking for longer-charting songs with Electronic and Hip-Hop genres significantly represented.

It is noteworthy that while Electronic songs predominantly charted in the 106-127 bpm range, those that remained on the charts for ten weeks or more leaned towards the >128 bpm tempo. Hip-Hop displayed a similar trend, shifting its focus to the >128 bpm range for songs that enjoyed a longer presence on the charts.

R&B songs that lingered for ten or more weeks predominantly fell within the 65-85 bpm bracket. Some specific tempo gaps were observed; both Hip-Hop and Rock had no representation in the 65-85 bpm range for longevity of songs. Electronic was absent in both the 65-85 bpm and 86-105 bpm groups, R&B lacked presence in the 106-127 bpm and >128 bpm categories, both Pop and Reggaeton saw no songs above 128 bpm sustaining for ten or more weeks.

Duration Dynamics

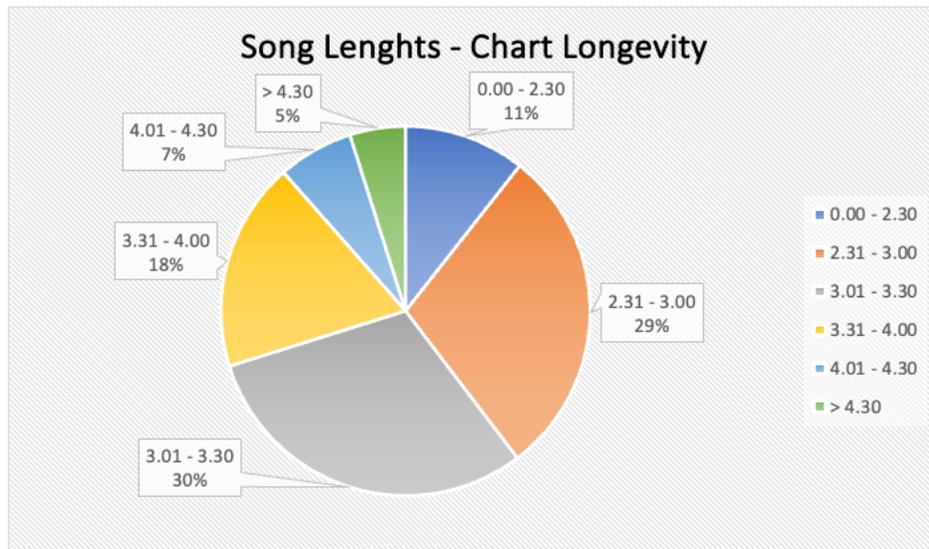
Upon analyzing the weekly Spotify Top 100 charts from 2021, the yearly distribution of the 602 charting songs based on song lengths reveals six distinct length groups, as illustrated in Graph 9.



Graph 9. Song length and Genre.

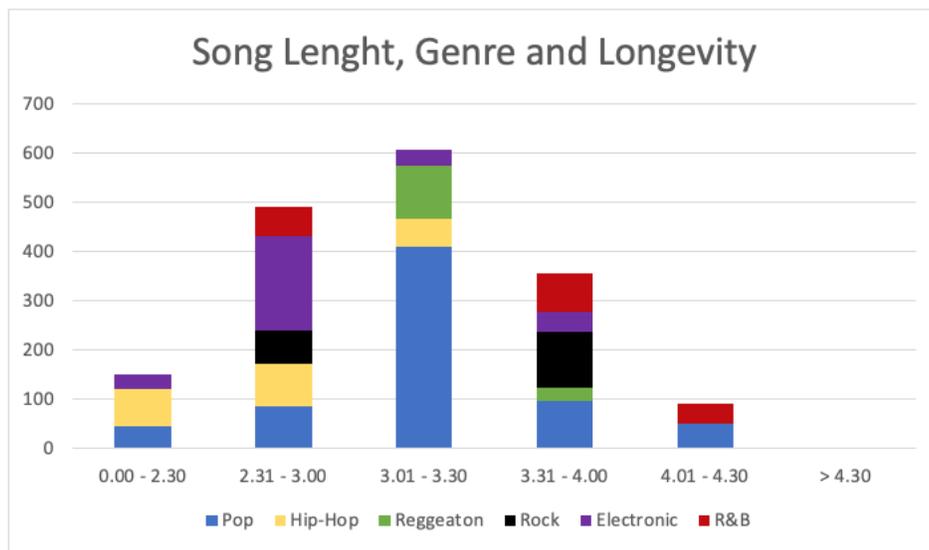
Delving into the interrelation between song length and genre, 0:00 - 2:30 category leans towards Hip-Hop, yet no genre predominantly features songs from this bracket. Notably, R&B lacks representation in this group. Hip-Hop, Rock, Electronic and R&B strongly favor the 2:31 - 3:00 bracket. Pop and Reggaeton stand out in the 3:01 - 3:30 category, while the subsequent 3:31 - 4:00 bracket, albeit led by Pop, doesn't dominate in any genre. Both Pop and Hip-Hop shine in the 4:01 - 4:30 range with Country songs most commonly found here. The longest songs, those exceeding 4:30 are again shared by Pop and Hip-Hop.

In essence, the genres and their preferred song lengths are: Hip-Hop, Rock, Electronic and R&B in the 2:31 - 3:00 bracket; Pop and Reggaeton in the 3:01 - 3:30 and Country in the 4:01 - 4:30 bracket.



Graph 10. Song length and longevity on the list.

When assessing the correlation between song lengths and their chart longevity, Graph 10 shows a notable pattern. Although songs in the 2:31 - 3:00 range lead in overall numbers, those in the 3:01 - 3:30 category outlast them on the charts. Notably, the rates for both groups surpass those of the 4:01 - 4:30 and > 4:30 categories.



Graph 11. Song length, genre and longevity.

Expanding on this in Graph 11, songs from the 3:01 - 3:30 range appear more prominently in long-charting songs with Pop contributing 59.44% and Reggaeton an even higher 80.29% of songs lasting 10 weeks or more. It's worth noting that neither Rock nor R&B had songs in this range that charted for over 10 weeks. Surprisingly, no song exceeding 4:30 in length sustained a long chart presence, suggesting that songs exceeding 4:30 were less common among long-charting tracks in this dataset.

CONCLUSIONS

This study examined the songs featured in Spotify's Global Top 100 weekly charts throughout 2021 by focusing on four musical variables, including genre, tonality, tempo, and song duration. Based on a descriptive analysis of 52 weeks of 5200 chart entries corresponding to 602 unique songs, the study aimed to identify recurring musical tendencies in globally circulating songs on a major digital music platform. Rather than explaining chart performance through recommendation systems, promotional strategies or broader socio-economic factors, the study concentrates on the musical properties of the songs themselves and evaluated how these properties appeared in relation to chart presence and chart longevity. In this respect, the article contributes to an area of digital music research that has received comparatively less attention than algorithmic, industrial or behavioral approaches.

The findings indicate that the annual distribution of songs in Spotify's Global Top 100 was concentrated strongly around three genres, which are Pop, Hip-Hop and Reggaeton. These genres accounted for the majority of chart entries and therefore emerged as the most visible musical categories in the dataset. At the same time, visibility and persistence did not operate in identical ways across genres. Pop ranked first both in the total number of songs and in the number of songs that remained on the chart for 10 weeks or more, suggesting a relatively stable presence across the observation period. Hip-Hop, although highly represented in total chart entries, also showed a notable concentration among songs that remained on the chart for only one week, which may indicate shorter chart persistence for many Hip-Hop tracks in this dataset. Reggaeton, while represented by fewer songs than Pop and Hip-Hop, displayed a comparatively more durable chart profile when long-charting songs were considered separately. Electronic and R&B, although smaller in total number, also showed comparatively strong proportions in the group of songs that remained on the chart for 10 weeks or more.

The tonal findings suggest that minor tonalities were more prominent than major tonalities in the overall dataset. Keys such as C#m, Em, Cm and Bm appeared frequently in the annual distribution, while some tonal patterns became more visible when chart longevity was considered separately. In particular, the comparison between general chart presence and longer chart duration suggests that some tonalities appeared more frequently among long-charting songs than in the overall annual distribution. A similar pattern emerged in tempo analysis. Although the overall spread across the four tempo groups was relatively balanced, the 86-105 BPM and 106-127 BPM ranges were especially prominent. When songs that remained on the chart for 10 weeks or more were examined, the 106-127 BPM category became even more visible, suggesting that mid-tempo and moderately fast songs occupied an important position among longer-charting tracks. Duration analysis also revealed a clustered rather than random distribution. Songs in the 2:31-3:00 and 3:01-3:30 ranges were the most common overall, while songs in the 3:01-3:30 range appeared particularly prominent among long-charting songs. By contrast, songs exceeding 4:30 were less common among tracks with extended chart presence.

Overall, the findings indicate that songs achieving global visibility in Spotify's 2021 weekly charts tended to cluster around certain recurring musical characteristics rather than displaying a fully random distribution. This does not mean that chart success can be reduced to genre, tonality, tempo, or duration alone. However, it does indicate that some musical tendencies appeared more regularly than others within the dataset and that these tendencies may be relevant for understanding how popular music circulates in the streaming era. From this perspective, the study provides a descriptive reference point for musicology, digital music studies, music production and music

education by showing how chart-oriented songs may be examined through directly observable musical variables.

At the same time, the findings should be interpreted within the limits of the study design. The dataset is restricted to Spotify's Global Top 100 weekly charts and to the period between January 1, 2021 and January 1, 2022. In addition, the analysis is limited to selected musical variables and is based on descriptive rather than inferential statistical analysis. For this reason, the study does not claim causal relationships between musical variables and chart performance. Future research may expand this framework by comparing multiple years, including other streaming platforms, examining additional musical variables or combining descriptive musical analysis with inferential statistical methods. Such studies may help clarify whether the patterns observed here are specific to the selected period and platform or whether they reflect broader tendencies in contemporary digital popular music.

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GENİŞLETİLMİŞ ÖZET

Dijital müzik platformlarının yaygınlaşması müziğin üretim, dolaşım ve tüketim biçimlerini önemli ölçüde dönüştürmüştür. Özellikle streaming tabanlı sistemler şarkıların daha görünür hâle gelmesini ve müzikal eğilimlerin öne çıkmasını da etkileyen yapılar oluşturmuştur. Bu bağlamda Spotify, küresel erişimi, çalma listesi ekosistemi ve haftalık liste sistemleriyle güncel müzik kültürünün şekillenmesinde belirleyici platformlardan biri hâline gelmiştir. Spotify Global Top 100 listeleri ise belirli dönemlerde şarkıların ve janrların görünürlüğünü incelemek açısından işlevsel bir veri alanı sunmaktadır.

Dijital müzik platformları üzerine yapılan çalışmalarda çoğunlukla algoritmik öneri sistemleri, dinleyici davranışı, çalma listesi yapıları ve pazar dinamikleri üzerinde durulmaktadır. Buna karşılık listelerde yer alan şarkıların doğrudan müziksel özelliklerine odaklanan çalışmalar sınırlı görünmektedir. Özellikle janr, tonalite, tempo ve şarkı süresi gibi değişkenlerin küresel ölçekte dolaşıma giren popüler şarkılar bağlamındaki dağılımını ortaya koyan araştırmaların sayısı görece azdır. Bu çalışma, söz konusu boşluktan hareketle Spotify'nın 2021 yılı boyunca yayınlanan Global Top 100 haftalık listelerinde yer alan şarkıları müziksel değişkenler üzerinden incelemeyi amaçlamaktadır. Böylece çalışma dijital müzik listelerindeki görünürlüğü doğrudan müziksel parametreler üzerinden değerlendirmeye açmaktadır.

Araştırma nicel ve betimsel bir tasarım çerçevesinde yürütülmüştür. Veri seti 1 Ocak 2021 ile 1 Ocak 2022 tarihleri arasında yayınlanan 52 haftalık Spotify Global Top 100 listesinden elde edilmiştir. Veriler Şubat 2022'de Kworb arşivi üzerinden derlenmiş ve toplam 5.200 liste girişine ulaşılmıştır. Bu girişler içinde sürekli olarak tekrar eden 602 tekil şarkı belirlenmiştir. Aynı şarkının farklı haftalarda tekrar listede yer alması toplam görünürlük hesabında korunmuş, ancak tekil şarkı analizlerinde bu tekrarlar birleştirilmiştir. Çalışmada janr, tonalite, tempo ve şarkı süresi temel değişkenler olarak ele alınmıştır. Janr bilgisi erişime açık metadata üzerinden, tonalite ve tempo değerleri ise Logic Pro X 10.6 kullanılarak elde edilmiş ve araştırmacı tarafından manuel olarak

yeniden kontrol edilmiştir. Şarkı süresi ve tempo verileri ise betimsel karşılaştırmayı kolaylaştırmak amacıyla belirli analitik aralıklara ayrılmıştır. Bu yönüyle çalışma küresel streaming listelerinde görülen dinleyici tercihlerini tanımlamayı hedeflemektedir.

Elde edilen bulgular, 2021 yılı boyunca Spotify Global Top 100 listelerinde en belirgin görünürlüğe sahip janrların Pop, Hip-Hop ve Reggaeton olduğunu göstermektedir. Toplam liste girişlerinin büyük bölümü bu üç жанr etrafında kümelenmiştir. Ancak toplam görünürlük ile listede kalıcılık her жанr için aynı biçimde işlememektedir. Pop, toplam şarkı sayısında ve 10 hafta ve üzeri listede kalan şarkılar içinde en güçlü görünürlüğe sahip жанr olarak öne çıkmaktadır. Hip-Hop listelerde yoğun biçimde temsil edilmekle birlikte, yalnızca bir hafta listede kalan şarkılar arasında da güçlü biçimde yer almaktadır. Bu durum Hip-Hop'un yüksek listeye giriş sıklığına rağmen bazı örneklerde daha kısa liste ömrüyle ilişkili olabileceğini düşündürmektedir. Reggaeton ise toplam sayısal görünürlüğü Pop ve Hip-Hop'tan daha sınırlı olmasına rağmen, uzun süre listede kalan şarkılar söz konusu olduğunda dengeli ve kalıcı bir profil sergilemektedir. Benzer biçimde Electronic ve R&B de toplam sayı bakımından daha küçük gruplar olmalarına karşın, 10 hafta ve üzeri listede kalan şarkılar arasında dikkat çekici oranlara ulaşmaktadır.

Tonalite bulguları minör tonalitelerin genel dağılım içinde majör tonalitelere göre daha baskın görüldüğünü ortaya koymaktadır. Özellikle C#m, Em, Cm ve Bm gibi tonaliteler yıl genelinde öne çıkan tonal merkezler arasında yer almaktadır. Ancak listeye giriş yapan şarkı sayısı ile listede uzun süre kalma arasında tonal açıdan tam bir örtüşme bulunmamaktadır. Uzun süre listede kalan şarkılar ayrı olarak incelendiğinde bazı tonalitelerin daha görünür hâle geldiği gözlemlenmektedir. Bu durum, tonal tercihlerin sadece listeye girişle değil, belirli ölçüde listede kalıcılıkla da birlikte düşünülmesi gerektiğini göstermektedir. Tempo açısından bakıldığında ise dört ana tempo aralığı arasında bütünüyle tek yönlü bir dağılım yerine görece dengeli bir yapı bulunduğu görülmektedir. Bununla birlikte 86–105 BPM ve 106–127 BPM aralıkları toplam dağılımda ve uzun süre listede kalan şarkılar içinde daha belirgin görünmektedir. Özellikle 10 hafta ve üzeri listede kalan şarkılarda 106–127 BPM aralığının daha görünür olması, orta ve orta-hızlı tempo aralıklarının uzun liste ömrüyle birlikte daha sık ortaya çıktığına işaret etmektedir.

Şarkı süresi bakımından elde edilen veriler, dağılımın belirli süre kümeleri etrafında yoğunlaştığını göstermektedir. En sık görülen süre aralıkları 2:31–3:00 ile 3:01–3:30 aralıklarıdır. Özellikle 3:01–3:30 aralığındaki şarkıların uzun süre listede kalan örnekler arasında daha görünür olması dikkat çekicidir. Buna karşılık 4:30'un üzerindeki şarkıların uzun süre listede kalan parçalar arasında daha sınırlı olduğu görülmektedir. Bu bulgu, dijital platformlarda dolaşıma giren popüler şarkıların belirli süre normlarına eğilim gösterebildiğini düşündürmektedir. Bununla birlikte, bu durumun tek başına açıklayıcı bir neden olarak görülmemesi gerekir, çünkü liste performansı çalışmada doğrudan incelenmeyen başka etkenlere de bağlı olabilir.

Çalışmanın genel değerlendirmesi Spotify'nın 2021 yılı Global Top 100 haftalık listelerinde yer alan şarkıların tamamen rastlantısal bir müziksel dağılım sergilemediğini, belirli жанr, tonalite, tempo ve süreler etrafında kümelenildiğini göstermektedir. Bu sonuç, popülerliğin betimsel düzeyde bazı müziksel eğilimlerle birlikte ele alınabileceğini düşündürmektedir. Bununla birlikte araştırma müziksel değişkenlerle liste başarısı arasında nedensel bir ilişki kurma iddiasında değildir. Çalışmanın kapsamı tek bir platform, tek bir yıllık dönem ve sınırlı sayıda değişken ile sınırlandırılmıştır. Bu nedenle bulguların seçilen bağlamın sınırları içinde değerlendirilmesi gerekir. Gelecekte yapılacak araştırmaların farklı yılları karşılaştırması, başka dijital platformları veri setine katması ve betimsel çözümlemeyi çıkarımsal istatistiksel yöntemlerle birleştirmesi burada gözlenen örüntülerin daha geniş ölçekte sınanmasına katkı sağlayabilir. Bu yönüyle çalışma, dijital müzik kültürünün müziksel boyutunu görünür kılmaya dönük betimleyici bir başlangıç noktası sunmaktadır.