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Alone Together: A Mixed-Methods Analysis of Spotify Listening During the COVID-19 Pandemic

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Abstract

What is the soundtrack to a global pandemic in the 21st Century? Music has been used to improve individual wellbeing during periods of uncertainty, discomfort and illness throughout history. Personal music consumption, in particular, has been used as a distraction, emotion regulation technique and communication tool. From 16th Century plagues to COVID-19, the method of consumption may have evolved but the instinct to turn to music has remained.

This research brings together a novel dataset collected from anonymised Spotify users via the Spotify API comprising 25,800 playlists and 2,782,025 pieces of music. The playlists were all created by users between January 1st (before any countries announced lockdown) and July 29th 2020 (date of data collection). The playlists have been identified by their titles which all contain phrases relating directly to aspects of the pandemic (lockdown, coronavirus, COVID, social distancing). The tracks and the audio features, such as key, tempo, valence, danceability, energy etc. of each track contained within each playlist have been captured, as has any descriptive metadata users added to their playlists. The article presents a weighted analysis of the tracks that were included within COVID-19-associated playlists most frequently and the musical features that were included within playlists. Within the article, a series of typical COVID-19-associated tracks and playlists are suggested from the weighted analysis and Spotify's audio features. Further to this, a thematic analysis of the descriptive metadata entered by listeners into their playlists reveals a multifaceted dataset displaying stark divides between optimistic or socially minded playlists compiled for personal and collective benefit, and heavily pessimistic, negatively-valenced descriptions of plague and worldwide disaster.

1. Introduction

The impact that the COVID-19 pandemic has had on society cannot be overstated. It has reached every nation, community and industry to varying degrees in a way that no other modern historical event has (Holmes *et al.*, 2020). The personal impact of anxiety for our own personal health, and the safety of our loved ones has had significant ramifications on the collective mental health of the population (Pfefferbaum & North, 2020). Many people find themselves facing uncertainty at the possibility of losing their job and the financial burden that accompanies that.

In addition to the universal increase in anxiety (Brooks *et al.*, 2020), the measures that have been taken to manage contagion and transmission have focused on limiting contact with others; removing routines with new working from home schedules; closing social, service and retail venues and generally removing many of the strategies typically used to mitigate negative influences on mental health. Mass home-confinement (including remain-at-home instructions, quarantine, and isolation) are unfamiliar to most of the current population and as such, people have found themselves ill-equipped to deal with confinement (Holmes *et al.*, 2020). Even the newly adopted language of the pandemic reinforces the attenuation of social interaction with terms such as 'social distancing' and 'self-isolation' becoming commonplace in English speaking countries. Criticisms of these terms and their possible repercussions for mood and mental health emerged relatively early in the pandemic (Aminnejad & Alikhani, 2020).

The music performance industry has been sent into chaos and has been one of the slowest to recover (Hanley, 2021). Many major artists have delayed their releases and the subsequent industry-mandated promotional tour (Official Charts Company, 2020). At the time of writing, live music performances may not return as we know them for many years. Therefore, we might ask: in response to the lack of social interaction, the anxiety and stressors imposed by COVID-19, and the lack of live music, have listeners sought comfort and solace in streaming?

2. Listening in 2020

In terms of accessibility, availability and frequency of time, listening to recorded music (by either the radio, physical medium or streaming) has long overshadowed live music and shows little sign of abating (e.g. International Federation of the Phonographic Industry, 2019). Since the arrival of the 'celestial jukebox' (Goldstein, 2003) and the possibilities of high speed mobile internet access, the ability for listeners to curate their listening on a track by track basis has grown exponentially (Lamere, 2015). Our relationship with listening drifts further from an ownership to usership model (Arditi, 2018), meaning our libraries of our most meaningful music are likely increasingly digital in nature. Hence, in recent years, listeners have become adept at instinctively managing, sorting, compartmentalising, compiling and filtering their music to allow for ready access to the music that is 'needed' at any particular juncture (DeNora, 1999; van Goethem, 2010; Saarikallio, 2011). Recorded music, digital libraries and instant reflexivity is becoming the norm for many listeners.

Music and wellbeing has been studied with increasing popularity in recent years, in part owing to the relatively effective health interventions listeners can make through music listening and playing (e.g. Gebhardt *et al.*, 2014; Zoteyva *et al.*, 2015; van den Tol *et al.*, 2019). Music has been shown to be used by listeners to augment aspects of their cognition, behaviour, mood, physiology and even perception of self (e.g. Juslin, 2005; Karageorghis and Terry, 2009; Salimpoor *et al.*, 2009; Elvers, 2016). It is a 'technology of the self' (DeNora, 1999) that listeners readily employ in response to stimuli. Music has been shown to have positive outcomes for mental health issues and can help ameliorate anxiety, depression and stress levels.

The weeks commencing 9th March and 16th March 2020 saw many European countries enter various forms of lockdown or restriction to attempt to stem the tide of COVID-19 (Dunford *et al.*, 2020). Movement for many people was highly restricted, with many required to stay in their homes. Social interaction in person diminished considerably. As such, many spaces where live or even recorded music would be heard were no longer accessible; venues, concert halls, discos, clubs, restaurants, shops, and even the workplace. As far as music listening is concerned, COVID-19 temporarily removed many spaces where music was not personal and digitally curated.

Under the shadow of COVID-19, many people were isolated from social interaction and their normal everyday routine. As such, it is possible that for many, music's usefulness as a tool was of paramount importance in aiding self-regulation. Current listening technologies, such as Spotify, Apple Music,

Deezer, YouTube, Tidal, or Amazon Music provided a ready methodology for listeners to access and curate a huge range of musical materials that may have allowed them to draw on music's functionality as a tool to facilitate wellbeing. However, little robust research exists that would allow us to gain an insight into the possible ways in which listening was used during the pandemic.

3. Interrogating Listening

Although the 'A.I. Spring' (Maclure, 2020) has somewhat detracted focus and enthusiasm from the promised insights 'big data' could offer, many commercial and scholarly entities allow direct access to large datasets. Spotify allows direct access to its Application Programming Interface (API) and anonymised user data (primarily data concerning listening behaviours, online behaviours and geographical data, with little identifiable biographical or demographic data available). Hundreds of scholarly research publications have interrogated Spotify's API, often with a view to developing more refined music recommendations. Identifying publications that attempt to use Spotify to identify real-world phenomena or to discern mental health impacts of global events is challenging and yields few results. Other researchers have explored other socio-cultural or socio-economic through comparable APIs (e.g. Zendle *et al.* 2020).

Spotify's API (or similar publicly available user database) allows for naturalistic or non-interventionist studies of ecologically valid behaviour. Therefore, this publication attempts to interrogate Spotify's API and make meaningful insights as to people's experiences of the pandemic. What listening material was most commonly used? How was that material framed or understood by listeners? Can we ascertain any attitudinal stances or emotional states from listeners? In essence, what can Spotify reveal about the experience of listening in lockdown?

4. Methods

To interrogate listening during lockdown, a database of specific COVID-centric playlists was required with a significant size to allow for exploration and analysis. Spotify was selected for the focus of this study as it: a) has the largest quantity of users of all music streaming services (over double that of its closest competitor) (Dredge, 2020), b) allows relatively open access to listening data, and c) limits the identification of individual users and their data. The Spotify API allows access to 12 audio features (typically factors calculated from smaller items that are not individually accessible and not published). These features are *key*, *mode*, *time signature*, *acousticness*, *danceability*, *energy*, *instrumentalness*, *liveness*, *loudness*, *speechiness*, *valence*, and *tempo*.

To collect the required data from Spotify, an application using the Spotify Web API[1] was developed, allowing a prepared list of search terms to be processed. A list of search terms related to the COVID-19 pandemic was prepared. These were *pandemic*, *quarantine*, *social distance*, *coronavirus*, *covid*, *furlough*, *lockdown*, *self-isolation*, and *flatten the curve*, in various tenses and formats to allow for the greatest quantity of data to be captured (owing to the API's search limitations). These English language terms clearly limit the applicability of the findings, but a broader multilingual study was not possible at the time of writing. The search query from the Spotify Web API was used, with the 'type' associated with the search limited to playlists only. By doing this, each result returned represents a single playlist in the Spotify database in the format dictated by the object model used by Spotify[2]. As part of the search query, a desired number of results must be included. This limit is capped at 2,000 by Spotify, thus when performing all searches, this upper limit was used in all cases to acquire the widest range of data possible. It should be noted that while the upper limit was used in all cases, it does not guarantee that a

[1] See https://developer.spotify.com/documentation/web-api/.

[2] See https://developer.spotify.com/documentation/web-api/reference/object-model.

corresponding number of results will be returned in line with actual content of the database which may contain less than 2000 results for a search.

Once the search query returns the associated playlists, these were then filtered on the content within to ensure that the data within relates to the period of time being examined. This study used the date of the 1st of January 2020 and rejected any playlists which showed any activity before this date. Playlists do not contain the date of their creation so an examination of the tracks within the playlist was used. Each track includes the date it was added to the playlist, allowing rejection of the entire playlist if activity was found before this date. The data was gathered on the 29th of July. The playlists which passed the date filter were then examined in more detail and their content collected from the API and recorded for further analysis. The stored content includes identifiers for the playlist, both an ID and a URI, the name and description of the playlist, when its first track was added (used as a pseudo creation date) and the number of followers the playlist has at time of examination. The tracks within the playlist were also recorded with identifiers and information about both their creation and audio features saved for examination.

Once the features of the tracks were captured, weighted measures of centrality were performed on the audio features using a statistical analysis package (SPSS). The weighted measures were calculated to account for repeated tracks which may have appeared many times in the dataset. An automated sentiment analysis was performed on playlist descriptions. In addition to this, correlational analyses were conducted in order to facilitate comparisons between musical features and the sentiment analysis of the playlists' titles and descriptions. As the data for the audio feature analysis was not normally distributed and the need to be robust to outliers, Spearman's correlation was selected.

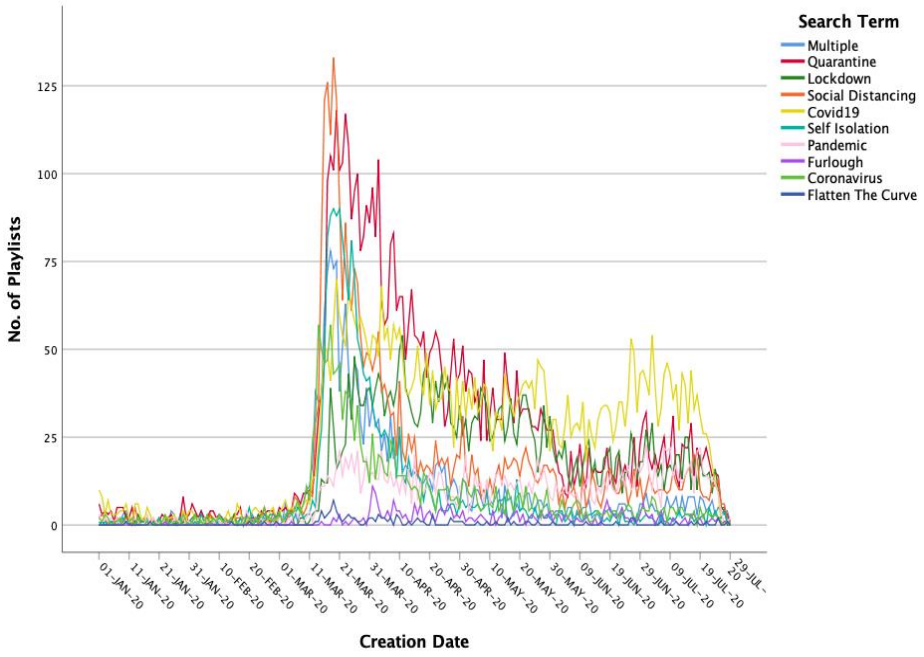
5. Findings

The data collection process resulted in the identification and collection of 25,800 playlists, their contents, any user text descriptions added to playlists, and additional metadata about the playlists (including the date at which the first track was added, a pseudo-measurement of playlist creation date).

"Quarantine"-related search terms yielded the most frequently used terms in playlist titles (6,678 playlist titles). The least frequently used terms were "Flatten The Curve"-related terms with only 153 playlists titles referencing the concept. However, the 2,000 search term limit imposed by Spotify's API does restrict interpretation of some terms (particularly "Coronavirus" for which only the term itself could be searched and yielding the maximum amount of results). 2,040 playlist titles used several of the search terms simultaneously. Approximately on the 15th of March, playlists created with the searched terms peak in frequency, with the peak sustaining for some terms for between 1-2 weeks (see Figure 1). Some terms were found to peak suddenly and quickly diminish in frequency (most notably "Social Distancing" which sees an almost immediate attenuation). Towards the end of the data capture period several terms such as "Self-Isolation" and "Coronavirus" drop to very low levels of creation. However, the "Covid" search term appears to have maintained a more consistent frequency of playlist creation with a small but noticeable rise in June and July.

Within the 25,800 playlists obtained in the data capture process are 2,782,808 tracks. Upon closer inspection 783 of these items were found to be podcasts (usually containing COVID-related advice and best practice). Given that these are not musical and do not possess standardised audio feature measures (they are written in a format that would skew any numeric processes significantly) the podcasts were removed from all further analysis resulting in a dataset of 2,782,025 items. However, as these tracks are pulled from thousands of playlists created by thousands of different users, a second dataset of 'unique tracks' and their frequency was created. In this data there are 698,460 unique pieces of music that have been included in COVID-centric playlists. The frequency of tracks contained within each playlist displays considerable variability ranging from 1–8,691. As such, the mean tracks per playlist was found to be 108 (M = 108, SD = 189). The median was found to be 64 track per playlist.

Figure 1. Search terms in playlists by creation date



6,032 playlists were identified that contain user-input descriptions. Descriptions are limited by Spotify's interface to 300 characters, hence descriptions are necessarily brief. Spotify suggests listeners should 'Give [their] playlist a catchy description'. A thematic analysis was conducted on these descriptions. This analysis was a cycle of inductive 'explicit coding' followed by several cycles of 'latent coding', as described by Braun and Clarke (2017; 2019). The data was understandably dense, and 34 themes were identified. The most prevalent and relevant to this publication are explored below. Approximately 5-7% of the dataset is in a foreign language (most frequently Spanish) or scrambled text owing to the use of non-European text characters. The description text was analysed for sentiment using RapidMiner's *Text Vectorization* module. An automated cross-validated approach; the model classified 22.07% of descriptions as 'negative' (i.e. containing a quantity of negatively defined terms, words, phrases etc.). Over half of the dataset being categorised as expressing 'neutral' sentiment (3,385 playlists, 58.49%) (i.e. not expressing any particular valenced language). The remaining 19.42% were defined as 'positive'. Whilst these analyses are impacted by structural and algorithmic bias (e.g. IEEE P7003), they can be considered a fairly crude but potentially indicative instrument for some initial exploratory work.

6. Discussion

Several different exploratory analyses were conducted drawing on a range of methods and techniques. These differing approaches are grouped in the following discussion by the various 'units' that comprise the experience of a typical listening session on Spotify i.e. tracks, playlists, and descriptions; all treated as distinct entities here.

6.1 Track Analysis

Spotify's API allows access to high-level factorised audio features for each piece of music listed. For each of the 2.78 million tracks, the 12 audio features (*key, mode, time signature, acousticness, danceability, energy, instrumentalness, liveness, loudness, speechiness, valence, tempo*) were obtained. Weighted measures of centrality were performed on the audio features. No one piece of music within the

dataset matched 11[3] median measures of centrality in a multivariate analysis. However, by applying jitter to the measures, Donna Summer's 1979 version of *Last Dance* was found to be the track that best matched the multivariate median, being within 1% tolerance of 10 feature measures (*key* was not matched here, being a full tone lower). Given the lyrical content of *Last Dance*, it is tempting to read this finding as a melancholic or fatalist outlook on the pandemic on the part of listeners; one final hedonistic moment before tragedy strikes. However, the track was only included in 21 playlists in the data. In reality, the song merely represents a median point for the data and divulges very little about the attitudes and habits of listeners.

Rather than addressing the data through the lens of centrality, a frequency analysis of the popularity of songs within the dataset reveals an alternative perspective. The most frequently included track on a playlist was The Weeknd's *Blinding Lights*, accounting for 5,377 playlist inclusions (Table 1) out of a possible 25,800 playlists (20.83%). Using the metric of inclusion in playlists as a proxy for popularity, this could be argued to be the most popular track as it occurs in over a 5th of all playlists analysed.

Table 1. Most frequently playlisted tracks

Rank	Artist	Title	Count	Release Date
1	The Weeknd	Blinding Lights	5,377	29/12/19
2	DaBaby	ROCKSTAR (feat. Roddy Ricch)	4,107	24/04/20
3	SAINt JHN	Roses - Imanbek Remix	4,021	18/09/19
4	Harry Styles	Watermelon Sugar	3,416	15/05/20
5	Drake	Toosie Slide	3,297	03/04/20
6	Dua Lipa	Don't Start Now	3,128	31/10/19
7	Powfu	death bed (coffee for your head) (feat. beabadoobee)	2,903	08/02/20
8	BENEE	Supalonely	2,794	06/12/19
9	Lady Gaga	Rain On Me (with Ariana Grande)	2,656	22/05/20
10	Surfaces	Sunday Best	2,515	06/01/19
11	Dua Lipa	Break My Heart	2,501	25/03/20
12	Lil Mosey	Blueberry Faygo	2,478	07/02/20
13	Roddy Ricch	The Box	2,382	10/01/20
14	Doja Cat	Say So	2,375	23/01/20
15	THE SCOTTS	THE SCOTTS	2,191	24/04/20
16	Surf Mesa	ily (i love you baby) (feat. Emilee)	2,052	26/11/19
17	Justin Bieber	Intentions	2,051	07/02/20
18	Megan Thee Stallion	Savage Remix (feat. Beyoncé)	2,036	29/04/20
19	Jack Harlow	WHATS POPPIN	1,953	21/01/20
20	Ariana Grande	Stuck with U (with Justin Bieber)	1,943	08/03/20

The popularity of *Blinding Lights*, and the other tracks listed in Table 1 demonstrate listening behaviours that are surprising during the pandemic. Regulatory theory suggests that, in times of stress or crisis, listeners may employ music to comfort, soothe, or discharge negative emotions (Van den Tol and Edwards, 2013; Groarke and Hogan, 2016; Van den Tol, Edwards and Heflick, 2016; Baltazar *et al.*, 2019). Furthermore, the music selected by listeners in these situations is typically music that is well known to them (i.e. lacking novelty) and has a valence relative to their current states (either the same to allow for rumination or different to allow for emotional regulation to that valence). However, the tracks

[3] *Loudness* is excluded from further analysis and tested owing to mastering variations over time i.e. 'the loudness wars' (see Devine, 2013), and Spotify's normalisation processing making it a redundant measure in many listening scenarios.

found to be most popular during the pandemic do not appear to offer a particular valence or regulation goal: in actuality, they are simply new releases or occupy the charts during lockdown. Given that the playlists captured for analysis all contain keywords specifically referencing the pandemic, the popularity of the charts within these playlists appears at odds with both the goals stated in many playlists and a great deal of the music and wellbeing literature; listeners preferring highly specific and personal music choices to function as comforting or coping stimuli (Greasley and Lamont, 2006; Levitin, 2007; Sloboda, Lamont and Greasley, 2012).

The list of most popular tracks here is entirely constructed from tracks that were highly rated in the popular music charts and lists provided by the various measurement organisations and algorithms (both within and beyond Spotify). All but one of the tracks identified within this playlist were released either during the pandemic or approximately less than 6 months before the 15th of March 2020 and they all peaked in chart position from the start of 2020 onwards. It would appear that, rather than engaging with highly personal or individualistic musics during lockdown, many listeners elected to continue pre-COVID listening patterns that place the locus of interest in novelty. Clearly, it would be foolhardy to suggest that listeners in this data only listen to contemporary pop charts, but it does provide evidence that listeners were maintaining some normal habits (such as engaging with new chart releases) even during the pandemic and local/national lockdowns. The resilience of continued chart-following listening is certainly noteworthy.

Further to this, and even more surprising, is the possible influence that the social media platform TikTok has had on the most frequently playlisted tracks. More than half of the tracks listed in Table 1 have popular dance steps, viral videos or other memes associated with them on the platform. Irrespective of the specific source of popularity we should not discount this as it evidences social media usage during lockdown (see Basch *et al.*, 2020; Ostrovsky & Chen, 2020). We should also consider this as not only representative of the behaviour of listeners, but also emblematic of current promotional strategies employed by the music industry.

However, in real terms, this only accounts for a small fraction of the listening that has occurred during the pandemic. The multivariate median, frequency, and popularity would appear to reinforce the status quo of normal listening; a listening mode concerned with charts and novelty, and not a cohort-wide shift in listening. However, this is also inferred rather than evidenced outright owing to the lack of any data that would provide a ready comparison. Such comparison would necessitate another historical dataset from a similarly significant global event – this does not exist. As such, this perspective on the data limits how we might interpret listening and possible wellbeing impacts of listening during lockdown beyond suggesting that chart interest continued unabated.

6.2 Playlist Analysis

The analysis of playlists revealed several surprising findings. Whilst there is certainly evidence of listeners directly referencing and responding to COVID-19 in their playlists, the consumption and content habits of listeners appears to be less impacted by COVID-19 than one might initially predict (as suggested previously). The following analysis offers an alternative approach to popularity; the playlists that follow express the most frequently occurring exclusive track in the first 20 possible positions of all 25,800 playlists. This frequency analysis of the position of tracks within playlists reveals the same story of barely interrupted standard consumption concerned primarily with charts and contemporary hits rather than listening otherwise influenced by the pandemic. As such, this playlist (Table 2) could be considered a somewhat 'average' playlist whose title and/or description pertains to the pandemic.

There is considerable crossover with the most popular tracks identified in Table 1, with 14 of the most popular 20 tracks appearing here, and the remaining 6 all being present within the 100 most popular tracks. However, were novelty and the various influences supposed above removed i.e. new releases,

chart popularity, social media, virality etc., would a more meaningful picture of listening engagement come to the fore? To explore this question, all tracks released from 2019 onwards were filtered from the data (owing to the 6th Jan 2019 being the earliest popular track: Surfaces' *Sunday Best*) and then the same methodology was applied to recalculating the 'average playlist'. Removing the influence of the charts that were contemporaneous with COVID-19 from the analysis reveals a starkly different picture of listening during the pandemic; one filled with puns, irony, dark humour, and tinged with the current wave of nostalgia that pervades popular culture.

Table 2. Most frequently playlisted track in position (exclusive)

#	Artist	Title	Count In Position	Release Date
1	The Weeknd	Blinding Lights	165	29/12/19
2	SAINt JHN, Imanbek	Roses - Imanbek Remix	99	18/09/19
3	Dua Lipa	Don't Start Now	64	31/10/19
4	BENEE, Gus Dapperton	Supalonely	57	06/12/19
5	Doja Cat	Say So	49	24/01/20
6	Drake	Toosie Slide	44	03/04/20
7	DaBaby, Roddy Ricch	ROCKSTAR (feat. Roddy Ricch)	42	24/04/20
8	Tones And I	Dance Monkey	39	10/05/19
9	Powfu, beabadoobee	death bed (coffee for your head)	36	08/02/20
10	Surfaces	Sunday Best	34	06/01/19
11	Dua Lipa	Break My Heart	38	25/03/20
12	Harry Styles	Adore You	39	06/12/19
13	Doja Cat	Boss Bitch	32	23/01/20
14	Harry Styles	Watermelon Sugar	42	15/05/20
15	Post Malone	Circles	34	31/08/19
16	Lil Mosey	Blueberry Faygo	31	07/02/20
17	The Weeknd	In Your Eyes	28	24/03/20
18	Surf Mesa, Emilee	ily (i love you baby) (feat. Emilee)	26	26/11/19
19	Maroon 5	Memories	25	20/09/19
20	Lady Gaga, Ariana Grande	Rain On Me (with Ariana Grande)	23	22/05/20

With these influences removed the most popular track in the data was The Police's *Don't Stand So Close To Me*; included in 1,251 playlists (Table 3). Further to this, a picture of a much more diverse listening experience comes to the fore. In this non-chart version of the 'average playlist' tracks present a broad date range spanning 50 years (1968-2018). The age range of these tracks is not surprising (given the birth of commercial pop arguably occurred in the 1960s), yet many of the tracks listed appear to have been selected to refer directly to the pandemic.

However, far more noteworthy is the implied humour of many of these tracks. Listeners appear to be constructing some playlists that are directly referencing the pandemic in a jocular or sardonic manner. Some tracks reference the requirements for social distancing (*Don't Stand So Close To Me* and *U Can't Touch This*), whereas some appear to play on the isolation of lockdown and the desire for human contact or interaction (*Dancing With Myself*, *Dancing On My Own*, *I Wanna Dance With Somebody*, *I Think We're Alone Now*, *Ghost Town*). A thread of much darker humour can be found in the tracks that concern breathing (*Harder To Breathe* and *Every Breath You Take*) referencing the respiratory symptoms and complications of COVID-19. Other tracks generally play on the themes around the pandemic: *It's The End Of The World As We Know It*, commenting on the severity of the situation and *Toxic* in reference to the virus itself. However, despite the cynical or bleak sentiments displayed in many of these tracks, there are some that display more hopeful or positive outlooks. Both *Stayin' Alive* and *I'm Still Standing* express a more defiant tone with narratives of survival and overcoming adversity.

Table 3. Most frequently playlisted non-chart track in position (exclusive)

#	Artist	Title	Count In Position	Release Date
1	The Police	Don't Stand So Close To Me	145	19/09/80
2	R.E.M.	It's The End Of The World As We Know It	74	16/11/87
3	Bee Gees	Stayin' Alive	37	13/12/77
4	MC Hammer	U Can't Touch This	35	13/01/90
5	Britney Spears	Toxic	23	13/01/03
6	Elton John	I'm Still Standing	13	03/02/83
7	The Killers	Mr. Brightside	16	29/09/03
8	Toto	Africa	9	10/05/82
	Gen X	Dancing with Myself		03/10/80
	Maroon 5	Harder To Breathe		07/02[4]
9	Robyn	Dancing On My Own	12	20/04/10
10	Tiffany	I Think We're Alone Now	11	08/87
11	Whitney Houston	I Wanna Dance with Somebody	10	02/05/87
12	The Police	Every Breath You Take	11	20/05/83
13	Otis Redding	(Sitting' On) The Dock Of The Bay	9	08/01/68
	The Specials	Ghost Town		12/06/81
	Pixies	Where Is My Mind?		21/03/88
14	Journey	Don't Stop Believin'	9	10/81
15	Earth, Wind and Fire	September	10	18/11/78
16	Gotye	Somebody I Used To Know	11	05/07/11
17	1975	It's Not Living (If It's Not With You)	9	18/10/18
	MGMT	Kids		13/10/08
18	Foster The People	Pumped Up Kicks	9	14/09/10
19	Fleetwood Mac	Dreams - 2004 Remaster	9	24/03/77
	The Beatles	Here Comes The Sun - Remastered 2009		26/09/69
20	Bon Jovi	Livin' On A Prayer	11	31/10/86

The other tracks that intersperse the non-chart 'average playlist' appear to display a different sentiment altogether. Rather than directly referencing the pandemic, these tracks appear to be prime examples of the current wave of nostalgia that pervades popular culture (Reynolds, 2011, refers to the phenomenon as 'retromania' in his discussion of popular music culture). These tracks are typically some of the most popular older tracks available on Spotify, some achieving over nearly a billion plays[5] (*Mr Brightside*, *Africa*, *Don't Stop Believin'* etc.). The popularity of these tracks within the non-chart 'average playlist' may well be entirely distinct from the pandemic and may merely be evidence of the enduring popularity of these tracks.

6.3 Description Themes

In the various cycles of thematic analysis, 34 themes were identified in the descriptions created by listeners. Although all of these themes present interesting perspectives on listeners' experiences of lockdown listening, it would be unfeasible to give each of these themes exposition here. Rather, six of the most prevalent and pertinent themes (those concerning mental health and wellbeing) are discussed. Within the following discussions, each theme includes direct quotations of some playlist descriptions.

[4] No date for three releases was available; only months and years.
[5] According to Spotify's own in-app data.

However, where any identifiable data was included this has been censored. No spelling or grammar has been altered.

1. *Mental Health*
   There is a significant quantity of playlist descriptions that reference mental health and the possible interactions between that and the pandemic. Typically, the references fall into two main categories; the first of which delves into negative mental health conditions or states (depression, anxiety, stress), and the second as an attempt at orientation towards more positive mental states. These references showcase a pessimistic or even sometimes hopeless perspective of the creators' mental health such as a playlist: '4 da homies in self isolation, this is mainly yearning and covid-19 induced depression' or the simple statement 'hello I am depressed and in quarantine'. Indeed, it appears that users are very much aware of their mental health and often link that activity directly to playlist creation and listening: 'Guess what, you thought that your crippling depression and anxiety was bad before lockdown. Ha, now you have mental breakdowns everyday in your car and are now in a state of psychosis, lets now add in drug induced music playlist that will really knock your feminist socks off.'.

   Although certain examples (such as some of those above) or 'stressy, depressy and social distancing' are not without their dark humour, it does not necessitate that all playlists that appear to be concerned with mental health should be taken lightly. Some users appear to offer starkly serious description data within their playlists: 'i may not show it but my mental health has declined considerably since going into lockdown'. In many playlists that fall within this theme there is a tendency towards openness and honesty as it relates to mental health conditions.

   The second category of mental health themed descriptions tend towards a much more positive attitudinal stance. Playlists purport to aid listeners in dealing with their depression or offering a temporary mood booster: 'happy songs because lockdown is a tad depressing' or 'Good tunes for depressing times.'. However, others go further, suggesting that music can be treated as a treatment for mental health conditions: 'In case of mental health emergency' and 'COVID ANXIETY SUPPRESSANT'. These statements are certainly supported by significant work in music psychology and music therapy (see Krause and North, 2014 for an overview of key research).

2. *Making and Helping*
   One of the most consistent fragments of terminology used within the description data was that of users creating playlists to "help" others in some way. Commonly, users state that they have constructed a playlist 'to help make your lockdown more enjoyable'. This construct varies between a handful of different expressions, with playlists helping to 'Make lockdown more bearable', 'helping you enjoy yourself' or to 'help get you thru the pandemic!!1!'. What is perhaps most notable here is that users appear to consider their playlists useful tools for their friends and followers to regulate mood or arousal levels during the pandemic. They are presented as gifts or restoratives that are passed from the original creator out into the world (see London, 2014): 'If the self-isolation and social distancing are getting you down or making you feel stressed, music can be an amazing release. I made this playlist of downtempo, ambient bits and pieces, I hope it helps.'

   Also, the messages or descriptions included within the playlists in this theme are often personalised for particular listeners or a set of listeners. They are made with the intention that they convey messages of hope or support to others, rather than actually operating as support to their initial creator. In a similar manner to traditional cassette mixtapes that were presented as tokens of love or friendship, many *Making and Helping* playlists appear aimed at transmitting specific personal messages to another person. Within the data there are some particularly poignant and personal examples fitting this theme: '[name], this playlist contains messages from

your friends and family. I'm sorry your half marathon was canceled but we are all SO proud of you for sticking with it anyways. You inspire us all! Here is what the most important people in your life have to share with you on this special day. We love you.'. Another anonymous example includes 'An assortment of things I've been listening to lately, just as a reminder that I love you my dear self-isolated friend.'. The playlists for broader groups and the individualised ones both operate as gifts or totems passed from one to another and appear in the data as fairly sincere and supportive.

3. *Prayers*

There is a distinct contingent of playlists and users that have created playlists with an overt religious tone to them. Arguably, these can be parsed into groups. Firstly, one group appears to have compiled worship music under the banner of the pandemic, suggesting that the tracks contained with the playlists have a particular resonance or poignancy pertaining to the COVID-19 pandemic. In their descriptions users suggest that they are 'hoping songs of prayer, praise and worship will encourage and uplift you' or that 'we pray these songs will minister to you in these questionable times'. Other playlists are less clearly defined with examples simply stating 'Praise and Prayer 2020' and 'Prayers' although the musical content of the playlist remains staunchly religious. Furthermore, there are examples that employ strongly religious language but do not expressly include the word 'prayer' such as 'God is good, and He is in control. That's why we choose faith over fear, and Christ over Covid' and 'Songs to encourage and inspire you that our loving God is still in control and we can trust Him for our every need even with the Coronavirus threatening.'. Arguably, these are expressions of faith for some listeners and demonstrates the tendency of individuals to turn to religion in times of strife or challenge (e.g. Ai *et al.*, 2005).

The second group tends to compile non-religious songs around a narrative of interventionist prayer. The tone of these playlist descriptions tend toward the often-maligned 'thoughts and prayers' phraseology employed in public relations contexts (Thunström & Noy, 2019). Playlists describe their function as 'Fighting and praying for those who are ill or gone' or as a call to action: 'Let's all pray to end COVID-19'. Others provide alternative (possible glibber) descriptions: 'Your 2020 self isolating, ordering in, and praying for the sick playlist'. Irrespective of the nature of orientation to religion the playlist creators have, it appears that there is a tacit acknowledgement of music's ability to facilitate prayer or spiritual activity.

4. *Complaining*

A considerable quantity of the descriptions captured in the study were notable for their tendency to complain or bemoan the pandemic. These descriptions are particularly focused on the self (whereas playlists in other themes tend to be socially minded or at the very least concerned with societal welfare). Although the *Mental Health* theme discussed previously also tends towards the self, the descriptions tended towards a broader contextualisation of one's own issues in relation to the global perspective of a pandemic. Conversely, in this theme there tends to be less insight and context included in descriptions, with playlist creators tending towards defeatism and self-pity. Indeed, some users even used such terminology in their descriptions: 'self isolation and self pity'. Others list their feelings or their experiences of lockdown or isolation: 'for the sad extrovert who cant be around people :(', 'im just sad lonely and lockdown has no effect on me because ive never been able to fit in any where i vent to my rabbit so i dont typically recommend listening to this playlist' and a playlist that contains 'Music to reflect the moods of being in lockdown - frustration, regret, relaxation, 'naturisation', community, sadness, fear, boredom'.

Interestingly, few playlist creators complain about the societal and global ramifications of the pandemic such as the global loss of life or the impact on financial markets etc. In actuality, the most common complaint in the data is that of boredom: 'jams for when youre quarantined without chocolate and bored out of your mind', 'am bored someone get me out' and 'i'm really

fucking bored. it feels like it's been a week already'. These statements of boredom are often framed in terms of time or duration around lockdown and/or isolation. Several playlist descriptions simply ask, 'how much longer?' or complain about the length of time that users have been required to socially isolate themselves. The playlists that fall within this wider theme often do not promise or suppose that the playlist will do anything except perhaps mirror their own mood states, and as such operate in the alternative position to the *Making and Helping* theme playlists.

5. *Defiance*

Amongst many of the themes and phrases in the dataset that tend towards negativity or depression, there are playlist descriptions where a very different voice can be identified. Rather than bemoaning the current situation, many users construct playlists that are described with much more defiant phrases. One user suggested 'It's time to show the world just how united we actually are... through one of the most simple of things that connects us all...The love of music. Play it. Play it loud.', and another stated 'isolation does not have to mean desolation! we are strong and can persevere!'. As with other more positively framed themes (such as the *Making and Helping* theme), these playlists operate as gifts or offerings to spur on their friends or followers. However, rather than suggesting that the music can expressly "help" others feel better, the descriptions appear to suggest that music itself allows listeners to feel empowered and can behave as a reminder or cue for self-belief. An apt example of this can be found in this description: 'Songs to uplift you, empower you, make you want to dance, run but mostly importantly remind you that you GOT THIS during quarantine.'

In addition to the empowering messages that promote positive outlooks or provide personal encouragement to other listeners, there is a thread of more overtly aggressive descriptions within the dataset. Although still encouraging to a degree, and certainly defiant, the descriptions present a more forcefully combative tone with more violent terminology used against a personified version of the pandemic. A prime example of these defiant and aggressive messages would be: 'Shove it in CoViD-19's face that you're still enjoying the magic of music.'. Furthermore, there are several less articulate descriptions that simply attack or insult the pandemic i.e. 'Fuck Covid' and 'fuck off covid'.

6. *Alone But United*

One particularly broad theme within the data concerns social obligation and an understanding of collective action as an important strategy to curb the spread of the pandemic. Although less prevalent than some other themes, it represents a distinct strand within the descriptions. The language used in the playlist descriptions is partially reminiscent of governmental and political rhetoric used during the most severe public restrictions of lockdown etc. Playlist descriptions include 'Let's stay together, happy together and fight against this Virus!', 'We are all in this together! #BeSafe #BeStrong' and 'Bruh this is not how 2020 was supposed to go BUT WE STILL IN THIS SHIT TOGETHER'. In these descriptions the language of "togetherness" used in many public announcements and awareness campaigns is clear, and could arguably be suggested as proof that such messages were at least in some part heeded. However, the language was also somewhat shifted or questioned in part by some users: 'in a time of not social distance but physical distance. let these melodies wash over you and feel united x'. In this example, a playlist creator clearly takes issue with the notion of social distance as a concept, suggesting that social interaction can continue but under physically distanced conditions. The theme generally sees a positive and somewhat defiant perspective of the situation but does so in a manner that presents rather as a call to action and to encourage acquiescence to anti-COVID measures.

6.4 Sentiment Analysis

An additional question was posed of the data: does the sentiment expressed in the description in any way correlate or predict the musical contents of the playlist? The sentiment analysis output was correlated with the mean audio features of each playlist. The results in Table 4 show that playlists with more acoustic, instrumental and high tempo tracks were positively correlated with more positively titled playlists. Playlists with negative titles or descriptions contained tracks which were rated as more danceable and louder.

Table 4. Correlation of audio features to sentiment rating

			Sentiment Value
Spearman's rho	Key	Correlation Coefficient	0.003
		p	0.832
	Mode (Maj/min)	Correlation Coefficient	0.024
		p	0.065
	Time Signature	Correlation Coefficient	-0.02
		p	0.129
	Acousticness	Correlation Coefficient	.031*
		p	0.02
	Danceability	Correlation Coefficient	-.056**
		p	<0.01
	Energy	Correlation Coefficient	-0.023
		p	0.087
	Instrumentalness	Correlation Coefficient	.064**
		p	<0.01
	Liveness	Correlation Coefficient	-0.019
		p	0.144
	Loudness	Correlation Coefficient	-.070**
		p	<0.01
	Speechiness	Correlation Coefficient	-.047**
		p	<0.01
	Valence	Correlation Coefficient	-0.011
		p	0.421
	Tempo	Correlation Coefficient	.038**
		p	0.004
	** Correlation is significant at the 0.01 level (2-tailed).		
	* Correlation is significant at the 0.05 level (2-tailed).		

This would infer that people who were using music to enhance or achieve a more positive mood during the period of interest, were selecting music which would typically be considered calming and upbeat, based on the musical features (Schubert, 2004). Conversely, Spotify users who were feeling more negative, or at least creating playlists with more negative labels, included tracks which were more physically stimulating, perhaps as a method of distraction (Randall et al.) or to allow for some form of escapism or venting to occur. Interestingly, there is no correlation between the valence of the tracks in the playlists and the sentiment expressed in their titles. This could reflect the complexity and diversity of the experience of the pandemic, and people's responses to it. Alternatively, the automated sentiment analysis and overall "noisiness" of the text data may represent confounding variables that have obfuscated possible relationships.

7. Conclusion

From the questions posed and evidence collected in this study it is possible to form an image of how some listeners have elected to listen during lockdown and the pandemic more generally. The analysis has shown that interest in the charts continued uninterrupted for many, and others preferred to delve into dark humour and COVID-related jokes. It has also suggested that listeners are, for the most part, attempting to engage with the world in a positive manner through their playlisting behaviours. Whilst some users do display discontent, there are many users who voice defiant or helpful sentiments, using Spotify and playlists to reach out to support others. Others use playlists as a soothing influence to aid with mental health issues and share these playlists when they are needed.

The exploratory approach taken in this study has evidenced it is possible to make substantial, although somewhat broad inferences about listener behaviour and attitudes through engagement with publicly available data. It also provides a ready dataset for comparative analysis if further lockdowns or restrictions are (re)introduced in future, allowing contrast between views and listening choices.

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