The Science of Singing Along: A Quantitative Field Study on Sing-along Behavior in the North of England

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The study investigates contextual and musical factors that incite audiences in Western music entertainment venues to sing along to pop songs. Thirty nights of field research were carried out in five entertainment venues across northern England. The percentage of people singing along was recorded for each of the 1,054 "song events," serving as the dependent variable. In addition, musical analysis was carried out on the songs of a subset of 332 song events. Nine contextual factors as well as 32 musical features of the songs were considered as different categories of explanatory variables. Regression trees and a random forest analysis were employed to model the empirical data statistically. Results indicate that contextual factors can account for 40% of the variability in sing-along behavior, while adding musical factors into the model – in particular those relating to vocal performance – was able to explain about another 25% of the variance. Results are discussed with respect to theoretical approaches on neo-tribal behavior.

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Singing along to a recorded or live performance is a fairly common form of music making. It does not require any music training and is performed by a single individual (e.g., singing along to the radio) or in a group – for example, as part of music entertainment events such as a concert or a club night. Singing along to popular music in club environments is a fairly widespread behavior in Western entertainment culture and can be surprisingly intense. It is not uncommon that at times, revelers will join in with such enthusiasm, abandon, and vigor that they conjure up scenes allied with notions of "tribal" or indigenous societies; scenes that some argue to be obsolete in contemporary Western society (Blacking, 1973; Small, 1998).

In order to obtain a comprehensive understanding of sing-along behavior in a modern Western society, it is necessary to look at the phenomenon from different perspectives and relate it to literature from distinct areas of academic study. Thus, we will briefly contextualize our study within related research from evolutionary music psychology, cultural studies, and popular music research that touch on different aspects of sing-along behavior.

Several people have argued that in its evolutionary origins, music may have developed in humans as an aid for social bonding and cohesion, and synchronizing group mood (e.g., Dunbar, 1996; Huron, 2003; for an opposing view see Gould & Vrba, 1982; Pinker, 1997). Singing together in a synchronized manner might have also developed as an aid for male hominids to attract female mates even prior to the development of language (Merker, 2000). In analogy to these theories on the origins of music, music can serve as a powerful aid of social bonding, marker of identity, and sexual attraction in current Western society (Bennett, 2001; Cross, 2003; DeNora, 2000; Gregory, 1997; Huron, 2003; Jackson, 2004; Malbon, 1999; Small, 1998; Zillmann & Gan, 1997). Bonding socially, expressing identity, and attracting a mate are all factors that potentially motivate audiences to sing along to music in a leisure context.

In addition, the positive effects that singing can afford for the individual in general are potential motivations for audiences to sing along with music. Singing in groups reportedly improves emotional well-being, including releasing stress, improving mood, and promoting relaxation (Bailey & Davidson, 2005; Clift & Hancox, 2001; Clift et al., 2010; Kreutz, Bongard, Rohrmann, Hodapp, & Grebe, 2004; Unwin, Kenny, & Davis, 2002). Similarly, making music in groups may trigger the release of oxytocin into the forebrain, a hormone that is related to feelings of pleasure (Freeman, 2000).

Singing along is sometimes referred to in ethnomusicological studies of pubs and clubs, where it can facilitate

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social bonding, afford positive social interaction through a cooperative group activity, relate to general reveling, and allow individuals to communicate engagement with the context (Bennett, 1997; Björnberg & Stockfelt, 1996; Finnegan, 2007; Jackson, 2004). Singing along can also help create a familiar atmosphere in venues where traditions such as singing along are established and maintained by a group of regulars (Bennett, 1997).

In nightclubs, singing is often combined with dancing, and watching and being seen are key pleasures in this context (Pini, 2001; Thornton, 1996). They are spaces where ecstatic moments can be accessed and revelers can experience "playful vitality" – "a celebration of the energy and euphoria that can be generated through being together, playing together and experiencing 'others' together" (Malbon, 1999, p. 164). Jackson's (2004) anthropological perspective on the world of clubbing views dancing at clubs as a challenge to the mainstream approach to the body, "…unleashing the Dionysian body from the Apollonian constraints imposed upon it in the everyday" (p. 15). Music in this context is a uniting force as well as "a form of sonic adrenaline that consistently re-energises the night" and seduces people into "a state of frenzy" (p. 25, 34). This state of frenzy can be both personal, an "individual experience of deep immersion into the beat," and social, "created through the emotional power of music, which binds people empathetically to one another" (p. 34). As Jackson observes, part of this frenzy is "…people singing along; givin' it everything they've got, all wallowing in the passionate embrace of the music" (p. 27).

The *symbiotic* relationship between music and its reception makes the crowd's reception of a song as important as its audible presence. Part of this *reception-creation* is singing along and this is very much connected to the music's bodily reception-creation in dance, movement, and facial expressions. This process may be viewed as a "musical gesture" – "an expression of a profound engagement with music" and "an expression of a fundamental connection that exists between music and movement" (Leman & Godøy, 2010, p. 3). Singing can play a role in both the *arousal* and *synchronization* of audience members, both of which are considered evolutionary functions of music and dance as social events (Noorden, 2010, p. 155).

In this sense, group sing-along behavior is akin to the cultural phenomena that have been discussed under the "neo-tribes" paradigm (Maffesoli, 1988; Malbon, 1999). By joining its participants in a relatively unison activity, singing along facilitates the formation of temporary neo-tribes in leisure contexts, where mostly strangers are brought together socially to form a tribe, and then are instantaneously released from the tribe once the event is over. Members of the neo-tribe play the roles to fulfill that neo-tribe's function – to have fun, to party. As "strangers become fellow pleasure seekers," visible signs of one's desire to party and enjoy the night must be carried on the "surface of the flesh" (Jackson, 2004, p. 90). Singing along to music allows revelers to express this desire, thus bonding them with their fellow pleasure seekers to form a temporary neo-tribe for the duration of the night.

It is important to remember that the sing-along behavior we observed in this study did not emerge from a cultural void, but from a society that has a precursory cultural history of informal singing. In eighteenth-century England, singing along was reported at Georgian catch or Comus clubs where "a group of enthusiasts would gather round a table to drink and sing, under the leadership of a burly chairman" (Senelick, 1971, p. 379). Singing along was also reported to have taken place at the early form of the pantomime (Senelick, 1971). Records from the nineteenth-century report informal public singing flourishing at public houses, song-and-supper rooms, parlor and saloon bars, tavern concert rooms, and free-and-easies (Lawrence, 1915). Also at this time, working men's clubs emerged in the industrial North of England where the varied entertainment had an emphasis on "singing, both by individuals and by the company as a whole" (Hoggart, 1957, p. 153). The music hall thrived in Victorian times, where audiences were well-known to join in with songs during performances and in particular during the choruses, which were catchy and easy to learn.

With the arrival of reproduction technologies, the twentieth-century brought major shifts in music consumption patterns. Home record players and radios made listening to music at home, instead of at the public concert, increasingly popular. As Marshall (1997) maintains, "in the privatized world of consumption, the listener, by purchasing a record, could sense his or her personal possession of the song and performer" (p. 154). So singing into a hairbrush in your bedroom mirror was born, as well as the development of personal listening devices. This shift, occurring in conjunction with the professionalization of the singer, perhaps did much to suppress amateur singing. By domesticating the listening of music and placing singing into the realm of the celebrity specialist, singing to some extent has become a behavior one can imitate in private but not engage in freely in public. There is an often proclaimed fear of singing in public (Richards & Durrant, 2003; Whidden, 2008), particularly solo singing, which remains in the realm of situations of isolation (e.g., singing in the shower or the car) for most of the population.

One exception is karaoke, a phenomenon that began in Japan in the 1970s and, in the following decades, did much to stimulate solo singing in public across the world. The popularity of karaoke in the UK may have links to the working-class communities of northern England, Scotland, and Wales, where "patterns of public, amateur singing have been historically the strongest" (Kelly, 1998, p. 99). Research into karaoke offers insights into public singing (Mitsui & Hosokawa, 1998; Welch & Murao, 1994; Wong, 1994), though obvious differences separate karaoke from groups singing along, including the amplification of a voice or small group of voices separated from the crowd (though karaoke evenings in the UK can become communal sing-along events, Kelly, 1993), the absence of a pre-recorded vocal line, and a premeditated, organized approach to the act of singing.

In Asian-American communities, Wong (1994) argues that "karaoke is one of many examples of how people reclaimed the mass media and make it their own again… one way that people ensure performative possibility and their own active participation in this process" (p. 163). Although less intensely a performance than karaoke, singing along in groups allows the group to reclaim songs for themselves and use them for their own purposes (e.g., reveling). However, through joining in with the existing version they are acknowledging the existing vocal line – the leader whom they follow (however faithfully). While "karaoke takes the notions of live and canned and messes them up, rendering them ambiguous" (Wong, 1994, p. 164), groups that sing along clearly recognize the "canned" music and coexist with it, creating new versions that include the main singer in the mix in varying degrees of subordination, depending on the context in which it is received (e.g., the volume of the pre-existing music, how many others are singing) and on individual and collective interpretations.

Singing in groups in Britain today is more developed than solo singing, occurring regularly at music festivals, popular music concerts, school, church, the Christmas pantomime, and sporting events. Events exclusively designed for singing along in groups have gained popularity recently, such as "Sing-Along Messiah" evenings or events for singing along with popular musicals, such as Sing-a-long-a Production's *The Sound of Music*. More survey-type research on the extent of music-making in the general population, such as the work conducted by Finnegan (2007), is needed to be able to ascertain how much public group singing actually occurs in the UK.

Singing along at popular music concerts and festivals is probably most akin to the kind of singing along to popular music that occurs in the pubs and nightclubs this study examines. Audiences at festivals and concerts can experience a social bond with others and feel connected to the performers by engaging with live music (Packer & Ballantyne, 2011; Pitts, 2005). Singing along en masse could also be described as "neo-tribal" in these contexts, where a "new social reality" can be constructed for the duration of the event. The quality of this temporary social bond that can occur with other members is expressed by a music festival audience member interviewed by Packer and Ballantyne (2011): "If they're into the same act that you're into, if you're singing along and they're singing along…you've got nothing else in common at any other time, you know what I mean? You've got a connection at that time" (p. 171).

There may be differences between contexts, however, in how audiences interact with each other and the music. Singing along is perhaps a less intimate encounter in festivals and concerts, as the audience gaze is directed to a large central stage, rather than the internal gaze of the dance floor or pub seating area. In addition, audiences at concerts and festivals are often attending as "fans" of the band or artist that they are watching. They are bonded beyond the event through this common "fandom," in a less temporary way than nightlife audiences (though nightlife audiences may share more general musical tastes).

Singing along in a pub or nightclub is therefore somewhat unique when compared to other public singing contexts in the UK: it occurs with a degree of spontaneity (as opposed to organized sing-along events, for example); it is a sing along (rather than singing led by participants, as at football games, for example); and the songs potentially originate from a wider repertoire (as opposed to those belonging to a particular religion, fan culture, or sports team).

Despite the extensive theoretical and sociological literature on urban or neo-tribe behavior, there has been very little research focusing on sing-along behavior in developed societies, or on "singalongability," i.e., the musical qualities that might motivate an individual to sing along to a particular song (Pawley, 2009). Stefani's (1987) theoretical exploration of what makes melodies "singable" comes close to addressing singalongability, though what makes a melody singable and singalongable are arguably different things. The musical qualities that Stefani considers make melodies singable include ranges limited to about an octave, conjunct motion, periodic durations of breath, and syllabic setting of text. These qualities plausibly present less of a technical vocal challenge to an amateur singer, making songs with such qualities more singable, and perhaps more singalongable. However, Stefani's ideas are not grounded in empirical research, nor do they deal with aspects relevant

to a sing-along situation, such as the lead singer's vocal performance.

Similarly, Burns (1987) used a music-analytic approach to elucidate the features involved in the formation of musical hooks, i.e., simple recurring musical patterns that are important for recognition and shape the identity of a song. Like Stefani (1987), Burns does not ground his selection of hooks in empirical data nor does he evaluate the effectiveness of the music features he describes with regard to the perception of hooks.

In contrast, Dockwray's (2005) musicological work on rock anthems is partially grounded in empirical data. Starting from data from several surveys on songs that are commonly agreed to be rock anthems, Dockwray identifies a number of melodic features that are common to prototypical rock anthems such as relatively short phrases in the chorus, relatively little rhythmic variability and an adherence to the beat level, descending melodic contours, as well as mainly simple intervallic movements. She concludes that rock anthems combine many musical features that implicitly tell the participants "when and how to sing" and make them thus very singalongable. She also draws parallels to church anthems and national anthems that serve the same functional role of motivating and facilitating a maximal portion of the audience to sing along.

The present study is the first investigation tackling the question of singalongability empirically and thus closing a gap in the existing literature. We also elucidate the contextual conditions under which singing along occurs as part of music entertainment in a modern Western society. In particular we ask what musical attributes inspire audiences to sing along to one song more than another? What other, extra-musical factors might influence audiences to join in, such as the time of night a song is heard? In other words, this study addresses how singing along is affected by the context in which music is heard, as well as what musical qualities make a song singalongable.

Method

DESIGN

An observational study design was used that is known in ethnographical research as a "participant observer" approach. In this paradigm the researcher views human interaction "from the perspective of people who are insiders or members of particular situations and settings," ultimately generating "practical and theoretical truths about human life grounded in the realities of daily existence" (Jorgensen, 1989, p. 13). Thirty nights of field research in five entertainment venues were carried out over a period of nine months, between November 2006 and July 2007, with six nights of research at each of the venues (see details of venues in Appendix A). An average of 20 hours of research were carried out at each venue. The unit of observation is the song event, i.e., a song played at a particular point in time on a particular night in a particular venue.[1] There were 1,054 song events in total that had complete datasets for the ten contextual variables (see below). Six hundred and thirty six different songs were observed in these 1,054 song events. For a subset of 332 song events comprising 115 different songs, analysis of 32 musical feature variables was carried out. Note that this design includes the repetition of the same songs as part of different song events (e.g., on a different night and in the same or a different venue), as well as repeated observations over the course of one night in the same venue. The dependent variable in this study was the relative number (i.e., the percentage) of people singing along for each song event.

PARTICIPANTS

Participants were guests of five entertainment venues in northern England with estimated ages ranging from 18 to 60. Venues were located in Kendal, York, Leeds, and Manchester. The venues, which varied in size, location, function, audience, and musical styles played, were deliberately selected to gather data from a heterogeneous sample since we aimed to understand sing-along behavior at a more general level rather than being limited to only one context. The venues ranged from a small pub to a large nightclub, with capacities of between 70 to 800 people. One of the venues housed exclusively "live" performances, while the other four employed DJs.[2] Details on the five venues can be found in Appendix A.

The research was carried out "under cover" and the observed participants were not made aware of the research carried out on the night in order to avoid influencing their reveling and normal sing-along behavior.

MATERIALS

In this observational study, materials and stimuli were given by the environment and merely recorded by the researcher. At no point did the researcher interact with or manipulate the contextual or musical factors.

[1] Qualitative data was also collected as part of this research, results of which are not reported in this article. The qualitative aspects of the study included a typology of sing-along behavior, ranging from "jaw-clenching" (singing unenthusiastically with one's jaw clenched) to "tribal" (a large group of people singing and dancing enthusiastically), as well as interviews with DJs and performers employed at the venues where research was carried out (Pawley, 2009).

[2] Aspects of vocal performance for live vocalists presented a challenge in analysis as they perform the song differently (to varying degrees) from the original recording. The original recording was used for the musical analysis, assuming that audiences were familiar with the original version.

Two types of variables were considered in an effort to explain sing-along behavior in this study: contextual variables and musical variables. For the purpose of this study contextual variables were defined as all observable variables that could have a potential impact on sing-along behavior in the venue and that are not related to musical structure. Ten contextual variables were used: venue; size of venue (small, medium or large); function of the venue (pub/bar or nightclub); age range of audience (age ranges of 18–24, 18–40, 18–50, 30–60); day of the week (weekday vs. weekend); "liveness" (song played live vs. from a recording); relative position of song in the set of songs played on the night (ranging from 0 to 1 and dividing this range into $n-1$ equal steps where n where is the total number of songs played on a particular night); highest UK chart position achieved by song; number of weeks of song in charts; and date of song release. Data for more variables, such as genre of song and volume level, were also collected but then not used in the analysis because in retrospect it turned out that the data source or measurement procedure could not be trusted. Other potentially important variables, such as alcohol consumption or demographics of the audience (e.g., the gender ratio in the venue for each song event), were considered but turned out to be difficult or impossible to collect.

Thirty-two musical variables were defined for the modeling of sing-along behavior. These focused on characteristics of the singing style or the singer and the background vocals, the structural characteristics of the "vocal hook,"[3] characteristics of the lyrics, and the overall structural organization of the tune. Variables focusing on the vocal part were selected as they were thought to be the part of the song to which people most likely sang along. The definition and selection of variables was based on previous analytic and theoretical literature on singing in popular music and ethnomusicology (Lomax, 1968; Murphey, 1989; Stefani, 1987), though choosing which variables to analyze was somewhat speculative, as no previous dedicated study of singalongability had been carried out. Other aspects of the vocal line (e.g., melodic shape) and other types of variables (e.g., instrumentation, instrumental riffs, tempo, genre) not used in analysis may in fact play substantial roles in singalongability. Time limitations, coding difficulty, and the necessity of having a healthy ratio of variables to instances prevented the exploration of further variables in this study. A complete list of musical variables can be found in Appendix B.

[3] The "vocal hook" phrase was given more attention, mainly because during field research it was observed to be more heavily sung along to than other sections of the song. Determining a song's vocal hook was judged by qualities of structural repetition, "memorability," and "catchiness" (Burns, 1987; Middleton, 1990, p. 139; Peterik, Austin, & Bickford, 2002, p. 326). Also aiding identification, a singalongable vocal hook is generally thought to be found in the chorus (Kachulis, 2005).

Due to the complexity of most musical variables, especially the ones related to singing performance, a purely computer-based analysis neither from a symbolic representation nor from the audio signal was feasible without losing a great deal of real-world perceptual validity. Instead, all musical variables were hand-coded by an expert musicologist who was also a professional singer and singing teacher in popular music. Due to the constraints of the manual labor involved, only a selection of 115 songs covering 332 song events were analyzed for all musical 32 variables.[4]

PROCEDURE

For each of the 30 nights, the main researcher and a research assistant placed themselves in the entertainment venue from the beginning to the end of the music set. For each song event, counts (or estimates when exact counts were not possible) of the number of people singing along over the course of each song played and a total number of people in the visible area of the venue were covertly recorded onto a dictaphone.[5] Other information, such as the section of the song with the maximal sing-along behavior, comments on the audience behavior, and the title and artist of the song (or, if unknown, a few seconds of the song itself for later identification), was also recorded.

Results

DESCRIPTIVE RESULTS

The size of the audience ranged between 3 to 100 for the 1,054 song events with a median of 60 and mean of 55.28 ($SD = 29.49$) people in the audience. For the subset of 332 songs events for which all musical variables were

[4] Musical analysis was completed on songs that were allocated to top and bottom tiers that were created using the percentages of people singing along, with the top tier consisting of songs with which 66% or more of people sang along and the bottom tier consisting of songs with which between 1–5% of people sang along. A roughly equal number of songs were therefore allocated the top and bottom tiers so as to have a representative selection of songs.

[5] The sing-along estimates sometimes posed difficulties, particularly in large groups, as it was hard to keep track of multiple people singing along at a particular moment in time and who did or did not sing over the course of the song. The easiest solution in this circumstance was to make an estimate at the moment when the most number of people were singing along (often in the chorus, but not always). This involved quickly glancing around at people's faces and noting how many of them were singing. The number counts were usually *estimates* (unless there were a small number of people). Efforts were made by the main researcher to stay consistent over the course of the study, which, along with research assistant verifications, gives these estimations a good degree of reliability and validity. A research assistant was always present to verify numbers, though only one estimate per song event was recorded.

present, the size of the audience had a minimum of 5 and a maximum of 100 with a median of 80 and mean of 68.3 (SD = 25.72), indicating that the smaller set might be regarded a representative subsample of the full sample in terms of the size of the audience.

The percentage of people singing along was also quite variable across the 1,054 events ranging from 0% to 100% with a mean of 26.97% (SD = 25.48%) and a median of 20% (interquartile range: 35.42%). Descriptive statistics for the subset of 332 song events that were used for the musical analysis suggest a higher variability (range: 0 to 97.78%, interquartile range: 49.78) and a higher central tendency (mean 43.86%, median: 43.3%) than in the full data set due to the stratified sampling strategy used. Figure 1 shows graphically that the distribution of sing-along percentages of the full data set was skewed towards the low end of the percentage scale or, phrased differently, *not* to sing along to a song was a much more common behavior than to sing along.

With respect to the five different venues and the position of the song on the play list of each night of research, Figure 2 demonstrates a great variability in the "dynamics of the night" across the five different venues. Venues clearly differ in how much their audiences are prone to sing along overall but for most venues a clear trend for more people to sing along towards the end of the night was discernable.

There was great variability in the average percentages of people singing along to individual songs, and for most songs only a very low percentage of people sang along (median: 13.88%). There was also great variability in the percentages of people singing along when compared across songs (SD = 21.08%) and only a few songs had consistently high percentages of the audience singing along over several occasions. The only song that made 100% of the audience sing along was *Imagine* by John Lennon, but this song was played on only one occasion.

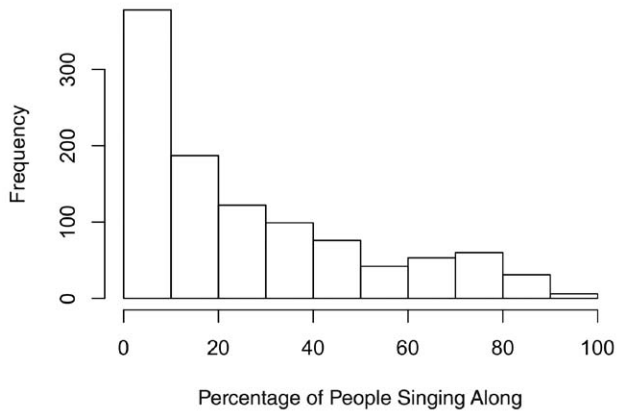

FIGURE 1. Histogram of percentages of people singing along across song events. *Frequency* (*y*-axis) refers to the frequency of song events.

For compiling a "top ten list" of sing-along hits that repeatedly made a large percentage of the audience sing along, we limit ourselves to songs that have featured in more than one song event. Table 1 shows the "hit list" of the songs with the highest average percentages of people singing along. Not surprisingly, this list of the most singalongable songs shows a certain overlap with the list of most commonly agreed rock anthems that Dockwray (2005) obtained through questionnaires.

While this hit list – a mixture of classics and seasonal hits – might be of interest to DJs, the media, and the music industry, we will resist the temptation to speculate about the reasons why individual songs result in such high sing-along numbers. Instead, we take a scientific approach and investigate the question of which common features help to explain the sing-along percentages as observed across all the song events for which we have musical data.

PREDICTIVE MODELING OF SING-ALONG BEHAVIOR

The purpose of this analysis is to model and therefore explain what contextual factors and musical characteristics motivate revelers to sing along in a specific situation and to a specific song. The empirical investigation of this question is exploratory and has no predecessors in the literature. This led us to consider a relatively large set of potential predictor variables

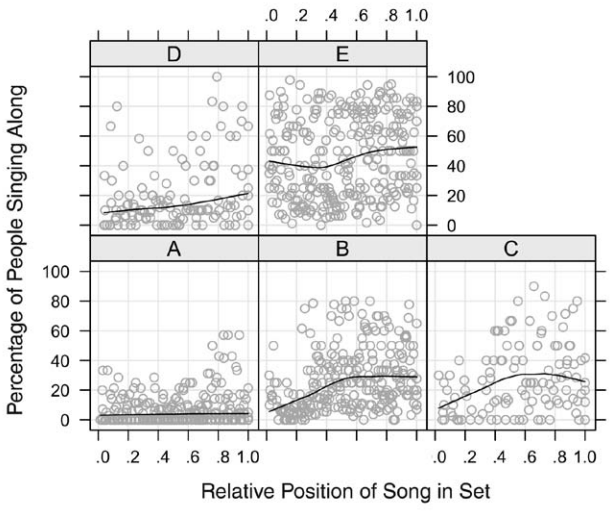

FIGURE 2. Percentage of people singing along in a relative time span across all six nights at each venue (Venue A: small, "working-class" pub, York; venue B: gay bar and nightclub, Leeds; venue C: student nightclub, York; venue D: small rock bar, Manchester; venue E: large nightclub, Kendal). A robust locally-weighted regression curve for each scatterplot (function lowess()from the R software environment, based on Cleveland, 1979) indicates the central tendency across the course of the night for the six nights of research in each venue.

TABLE 1. "Top Ten" Sing-Along Songs Occurring Twice or More.

Song	Average % of people singing along	Average no. in audience when song was played	No. of song events featuring song
We are the Champions (Queen)	85.91	85	4
Y.M.C.A. (Village People)	85	75	2
Fat Lip (Sum41)	81.58	80	3
The Final Countdown (Europe)	78.89	70	2
Monster (The Automatic)	78.72	70	4
Ruby (Kaiser Chiefs)	78.52	68	3
I'm Always Here (Jimi Jameson)	77.18	83	7
Brown Eyed Girl (Van Morrison)	76.85	87	3
Teenage Dirtbag (Wheatus)	75.7	68	5
Livin' on a Prayer (Bon Jovi)	75.36	87	7

where for most, the relationship with the dependent variable (percentage of audience singing along to song event) is unknown.

There are a number of statistical techniques that could potentially be used to model a dependent variable from a large set of predictors. These include binomial (logistic) regression with variable subset selection, shrinkage regression methods such as Ridge regression (Hoerl & Kennard, 1970) and the LASSO technique (Tibshirani, 1996), or partial least squares regression (Wold, 1975) to exploit any existing correlational structure between predictors. In a previous analysis of this dataset (Pawley, 2009) we used principal component analysis to reduce the dimensionality of the space of predictor variables followed by a binomial regression model with subset selection which produced reasonable results. However, reconsidering the structure of the data and the type of model we wanted to specify we choose a different class of statistical techniques for the analyses reported below, namely regression trees and a random forest as the corresponding ensemble method. Tree-based statistical methods have a long history in artificial intelligence and data mining as well as multidimensional statistics.[6] Statistical tree models differ in a number of ways from linear regression models and we exploited their properties for the analysis of this dataset (see Hastie, Tibshirani, & Friedman, 2009, p. 350–352, for a general comparison of tree models compared to other statistical and data mining techniques frequently used). First, tree models use a built-in variable selection mechanism and do not have problems with large sets of predictor variables. Second, tree models can very easily deal with heterogeneous sets of predictor variables, including the continuous, ordinal, categorical (with many or few categories), and binary variables we have in this dataset. Third, tree models do not assume a linear relationship between predictors and dependent variable. Finally, tree models are ideal for identifying high-order interaction effects between predictor variables, whereas in linear models interaction effects have to be specified explicitly. Tree models also lend themselves very naturally to a graphical interpretation and understanding of the data. In the case of this observational dataset, it was the heterogeneity of the variables, as well as the assumption that sing-along behavior might occur especially when certain conditions in the environment and/or in the music are met (i.e., when certain variables interact), that lead us to adopt the tree-based approach.

Generally speaking, classification and regression tree models work by recursively partitioning observations on the dependent variable into homogeneous subgroups where observations on the dependent variable have similar values (e.g., splitting our Percentage variable into low vs. high percentage values). The data are split between values of an independent variable (e.g., small vs. medium sized and large venues). At each node of the tree the independent variable that maximally increases the homogeneity of the data is selected for splitting. This process of partitioning into subgroups of the data is repeated recursively until subgroups should not be split any further either because a minimum group size criterion is reached or because there is no increase in homogeneity to be gained from a further split. The resulting tree of splits lends itself easily to a graphic display and interpretation. For this study we used a particular family of tree models called conditional inference trees that combine the rigorous theory of permutation statistics (Hothorn, Hornik, & Zeileis, 2006) with the principle of

[6] For a detailed introduction to tree methods the reader is referred to Breiman, Friedman, Stone, & Olshen (1984) and to Strobl, Malley, & Tutz (2009) for uses of tree-based methods in psychology. For an overview of their applications in music research, see Müllensiefen (2009).

recursive partitioning (Hothorn, Hornik, & Zeileis, 2008). We used the software package "party" implemented in the free software environment R.

Modeling the context of sing-along behavior. We first constructed a separate tree model with the percentage of people singing along for a given song event as the dependent variable and nine contextual variables as predictors.[7] The model is graphically represented in Figure 3.

The model makes use of six different variables and explains 40.84% of the variance in the dependent variable on a subset of 20% of the data that had been reserved for evaluation by random sampling. For each node of the tree, the *p* values indicating the significance of the split are given as well as a description of the two "children" (i.e., subgroups) of the split on the independent variable. For the terminal nodes (i.e., nodes that are not split any further) the predicted percentage of people singing along is given as well as the number of observations represented by this node.

The model can be interpreted by starting at the top of the tree, following each branch down from each node, to arrive at a final node with a prediction for the percentage of people singing along. For example, if one descends to the right from the first "Venue Size" node down the "Medium or Large Venue" branch, then descends to the left at the "Age Range" node down the "18 – 24" branch, this can be interpreted as follows: in a medium or large venue with an audience of 18 – 24 year olds, the model predicts that 45% of the people will be singing along. Technically, the logical combinations of these two conditions can be regarded as an interaction of these two predictor variables

Modeling sing-along behavior using contextual and musical variables. As an initial step we tried to construct a conditional inference tree using the 32 musical variables as input. However, this tree model only made use of three predictor variables (the use of high chest voice, the use of vocal embellishments, and the clarity of consonants) and explained only around 5% of the variance in the data, and even this small amount of variance disappeared when combined with the context tree model.

[7] We excluded "Venue" as a predictor variable because we were not interested in the effects of the specific venues in this particular study. However, we kept "Venue Function" as a predictor variable which captures the general aspects of the type of venue and should therefore allow for interesting generalisations.

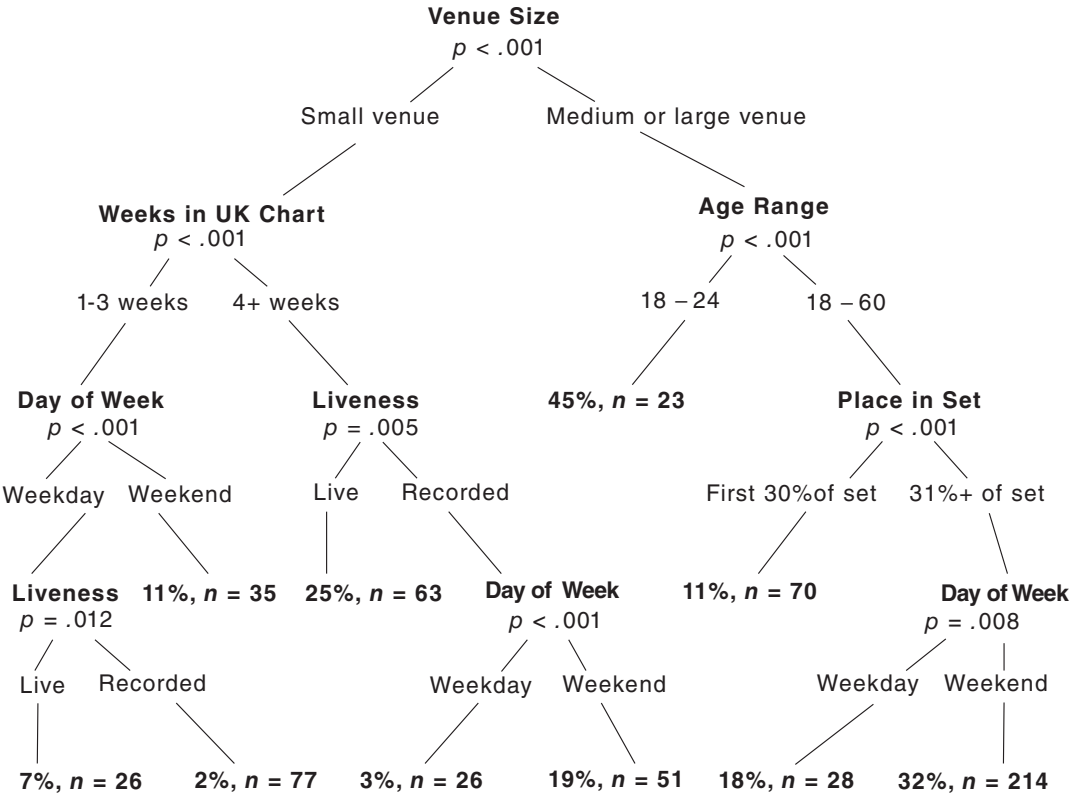

FIGURE 3. Tree model of contextual variables where *p* designates the significance value for the split based on permutation statistics; *n* designates the number of song events in the terminal nodes; and the final percentages designate the predicted percentage of people singing along under the conditions specified by the splits along that particular branch of the tree.

A single tree model, just as a single regression formula, can only reflect one specific combination of explanatory variables. However, from theoretical considerations we hypothesize that several different combinations of musical features might motivate people in an audience to sing along to a song or to a chorus. Thus, we deem a model describing just a single musical "sing-along formula" too simplistic and not appropriate, especially given the huge stylistic range of songs in the sample. We take the poor performance of the single tree model using musical variables as evidence towards this hypothesis.

As an alternative method, better suited to our problem at hand, we constructed a random forest model (see Breiman, 2001, for the initial concept of random forests and Hastie et al., 2009, for a summary chapter) based on conditional inference trees (Strobl, Malley, & Tutz, 2009). In a random forest model many trees of explanatory variables are grown independently to predict the dependent variable. For each tree only a bootstrap sample (i.e., a subset) of the available data is used and the number of explanatory variables is limited to a small subset of all predictor variables available. From the many tree models grown within a random forest, the majority vote (or average) for each data point serves as the predicted value. Random forests have been shown to have a superior prediction accuracy compared to individual tree models as well as to many other statistical predictive techniques. They are able to make use of information in "weaker" explanatory variables in complex interactions, i.e., variables that on their own have less predictive power with respect to the dependent variable. In addition, results from random forest models can often be very well generalized to new datasets because random forests do not tend to overfit on training data. The conditional random forests we used here have also been shown to deliver very reliable results even when several predictor variables are highly correlated (Strobl, Boulesteix, Kneib, Augustin, & Zeileis, 2008), giving a relatively accurate account of the importance of each predictor variable independent of other, potentially correlated, predictors. However, random forests are not easily visualized and variables are typically interpreted in terms of their relative importance taking into account all their main and interaction effects in all trees that contain that specific variable. The relative importance is given as the decrease in mean prediction accuracy of the random forest when the variable is not present in the model (or values of the variable are permuted), answering the question "how much less accurate is the model when this specific variable is left out or completely random." The relative importance score takes into account the main effect as well as all the interaction effects of the specific variable being present in the model and is therefore not easily related to the notion of a "specific part of the variance explained by a main effect" in a linear regression model.

We used the data subset of 332 song events for which values on all 32 musical variables were available. Because the focus of the study is on the musical factors that influence singalongability we combined the contextual factors and used the predictions from the contextual tree model described above as a single additional predictor variable to serve as input to the same model random forest model. With these 33 predictor variables we computed a random forest using 10,000 trees and a subset size of 10 variables for each tree. Using the built-in cross-validation mechanisms, i.e., the so-called out-of-the-bag predictions, the model explains 64.77% of the variance in the dependent variable (Percentage of People Singing Along).

Figure 4 shows the relative permutation importance of all musical variables.[8] The predictions from the tree model of contextual factors were by far the most important predictor and obtained the highest conditional importance score of 101.43, while all musical variables had importance scores in the range from roughly 0 to 7. Note that the absolute values of the variable importance score should not be interpreted, but the difference between importance scores has a meaningful interpretation.

To investigate the relative importance of contextual versus musical variables further, we computed a random forest model with only the predictions from the contextual model as predictors, which explained 39.52% of the variance in the data. This is very similar to the 40.84% of variance that the original tree model of contextual factors evaluated on a different subset of the data (see above). We then computed a random forest model using only the 32 musical variables, which was able to explain 51.91% of the variance.

Two important observations can be derived from these results. First, the high proportion of variance explained by the random forest based on only musical variables stands in clear contrast to the negligible amount of variance (~5%) explained by the tree model using the same set of predictors (see above). We take this as further evidence that singalongability cannot be explained by a single formula but that many different musical conditions can motivate people to sing along. Second, the amounts of variance explained by the model with musical variables only and the model using contextual factors only do not sum up to the amount of variance by the random forest model that combines musical variables and the predictions from the contextual model. This is presumably due to the fact that contextual and musical factors are not fully

[8] We obtained a very similar importance ranking of the musical variables when we computed a second forest with a different random seed. This can be taken as an indicator that the random forest model will generalize well to future datasets.

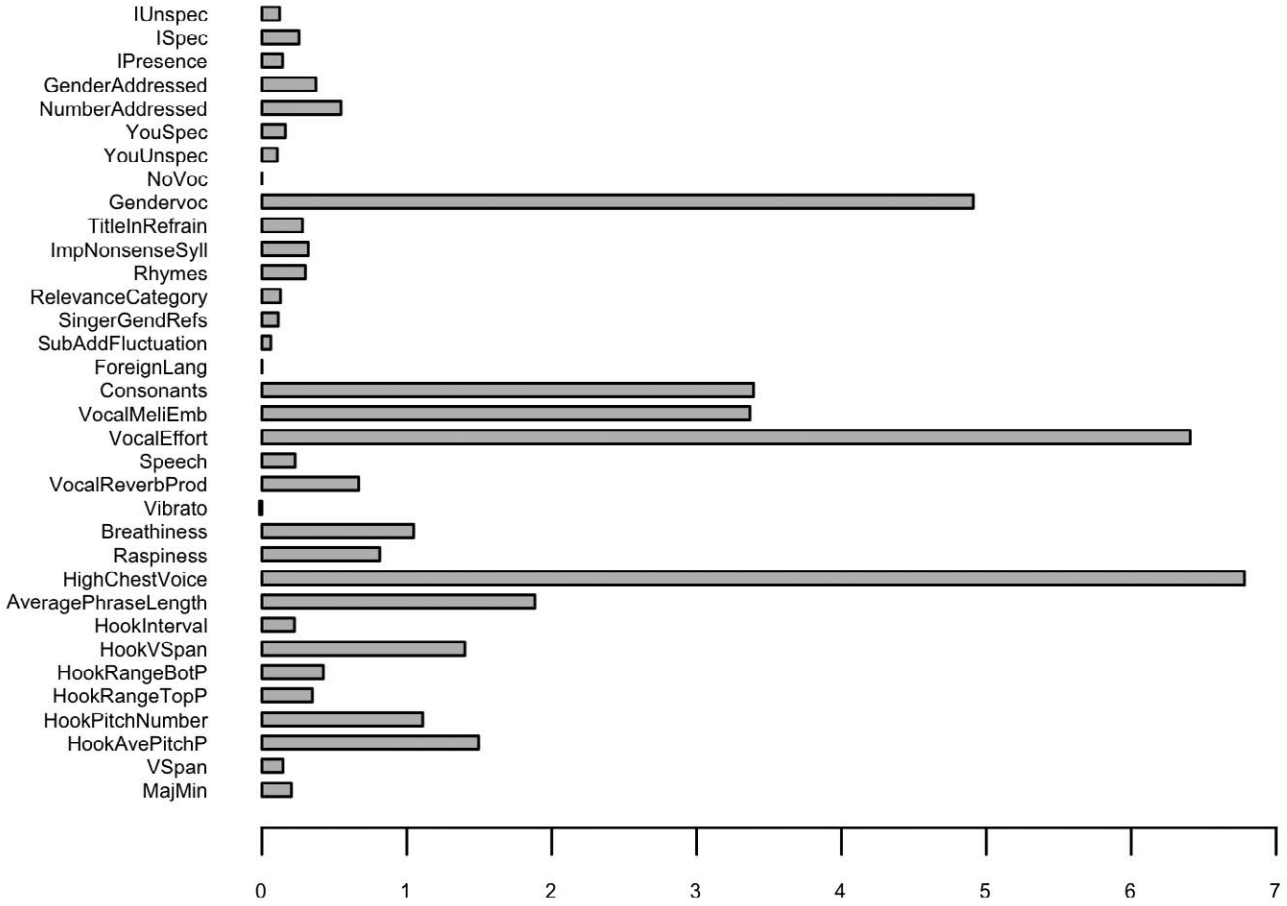

FIGURE 4. Relative permutation importance of musical variables resulting from random forest. The unit of the *x*-axis is arbitrary and absolute values should not be interpreted. However, the difference between importance values is meaningful and thus, this figure shows which variables are more or less important for explaining the dependent variable (percentage of people singing along to a song event) and how large the difference in importance is. Note that the predictions from the contextual tree model served as a predictor in the random forest model (importance score: 101.43) but have been excluded from this graph to enable a better focus on the musical variables.

independent; contextual conditions interact with what kind of songs can potentially be played.

Because the focus of the following results is on the musical variables we have excluded the contextual model from the variable importance graph (Figure 4) and description of results.

The five most important musical variables were High Chest Voice (conditional variable importance: 6.78), Vocal Effort (6.41), Gender of Vocalist (4.91), Clarity of Consonants (3.39), and Vocal Embellishments (3.37). All of these variables reflect aspects of the vocal performance.

The next important set of variables contains four musical features that all describe aspects of the compositional structure of the vocal melody: Average Phrase Length (1.88), Average Pitch of the Hook (1.5), Vocal Span of the Hook (1.4), and Number of Pitches in the Hook (1.11). Note that the difference between least important variable from the first group of variables related to vocal performance – Vocal Embellishments (3.37) – and the most important variable of compositional structure – Average Phrase Length (1.88) – is relatively large (1.49) compared to the differences between variables of compositional structure (< 0.8).

After this follows a long tail of variables of decreasing importance that relate to further aspects of the vocal performance (e.g., raspiness and breathiness of the voice), aspects of the lyrics (the number of people addressed, the use of nonsense syllables, rhymes, etc.), and more variables of compositional structure (e.g., the lowest and highest pitch of the hook).

The conditional variable importance gives an estimate for how important a particular variable was for predicting the correct score on the dependent variable across all trees of the random forest and including all main and interaction

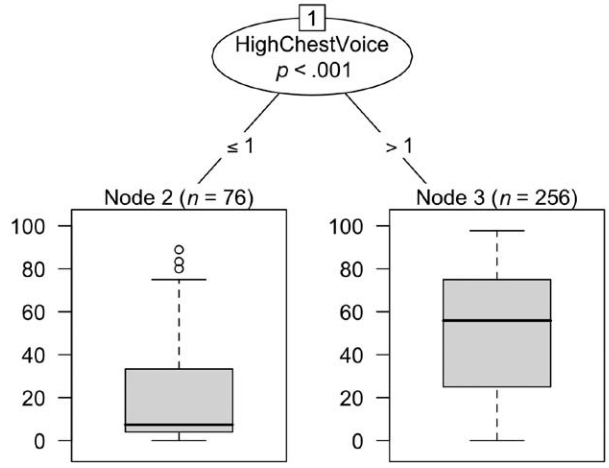

FIGURE 5. Single regression tree demonstrating the positive influence of the use of a high chest voice on the percentage of people singing along. The *y*-axis represents the dependent variable (percentage of people singing along to a particular song event). Category 0 designates no use of high chest voice; 1 designates some use of high chest voice; 2 designates considerable use of high chest voice; and 3 designates much use of high chest voice. For each node, the number of song events is given in brackets indicates how large the datasets represented in each child node. For this tree, 76 song events make only some or no use of a high chest voice while 256 song events make considerable or much use of the high chest voice.

effects. However, it does not provide an indication of whether the influence of a predictor variable on the dependent variable is negative or positive. In fact, this is difficult to ascertain across a large number of tree models that

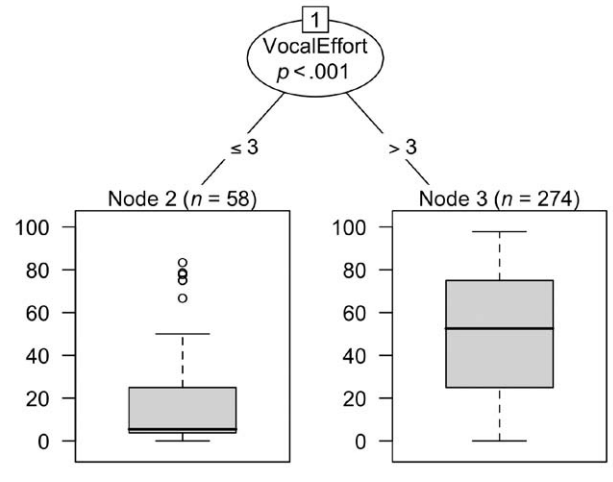

FIGURE 6. Regression tree demonstrating the positive influence of vocal effort on the percentage of people singing along. Category 1 designates very relaxed, calm, unaccented style and little evidence of vocal effort; 2 designates relaxed, calm, not very projected; 3 designates medium level of projection and effort; 4 designates fairly energized and projected; and 5 designates highly energised and projected, with forceful attacks. The *y*-axis represents the percentage of people singing along to a particular song event.

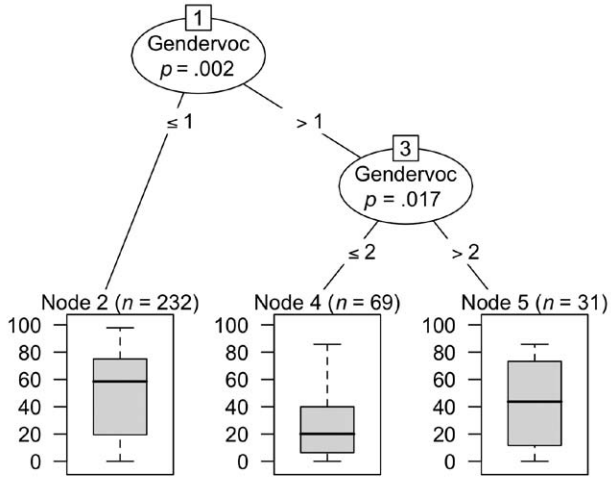

FIGURE 7. Regression tree demonstrating the positive influence of a male singer on the percentage of people singing along. Category 1 designates a male lead singer; 2 designates a female lead singer; and 3 designates a duet with male and female lead singers. The *y*-axis represents the percentage of people singing along to a particular sing event.

potentially are all different in structure. This is because it is possible that a given explanatory variable has a positive main effect on the dependent variable but as part of a complex interaction might have a negative influence for a smaller subset of data points.

Thus, in order to get an idea about the direction of the main effect of the five most important variables, we computed individual regression trees for each variable. The graphical representations of these trees are given in Figures 5 to 9.

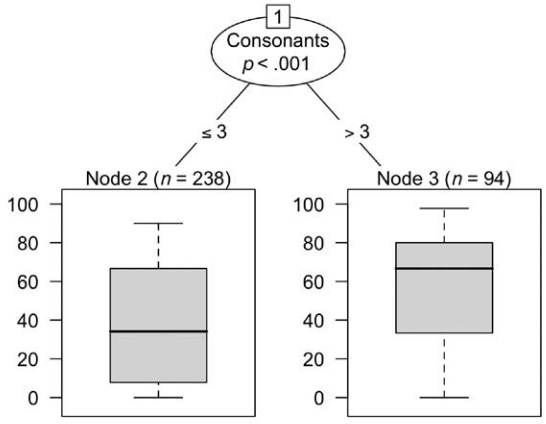

FIGURE 8. Regression tree demonstrating the positive influence of clear consonants on the percentage of people singing along. Category 1 designates very slurred pronunciation; 2 designates slurred pronunciation; 3 designates normal, clear pronunciation of consonants; 4 designates precise consonants, all discernable; 5 designates very clear, highly articulated consonants. The *y*-axis represents the percentage of people singing along to a particular sing event.

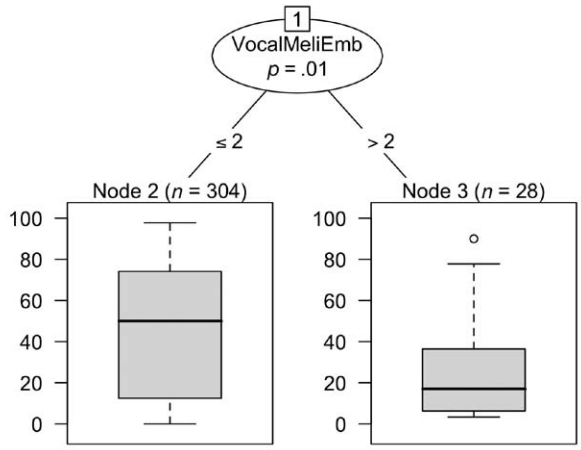

FIGURE 9. Regression tree demonstrating the negative influence of vocal melisma, embellishment, and ornamentation on the percentage of people singing along. Category 1 designates little or no use of melisma and embellishment; 2 designates some use; 3 designates considerable use; 4 designates vocal style that is mostly melismatic and embellished. The *y*-axis represents the percentage of people singing along to a particular sing event.

As Figures 5 to 9 demonstrate, more use of a high chest voice and more vocal effort by male singers on the recording in combination with clearly articulated consonants and less vocal embellishments are favorable musical features that encouraged the participants in our study to sing along.

Discussion

This study represents the first empirical research into sing-along behavior as part of Western public entertainment culture. The design of the study was mainly exploratory and considered a large number of potential factors (predictor variables) that might potentially play a role for sing-along behavior to occur. In summary, results show that a model built purely from contextual factors explains a large proportion of the variance in the dependent variable (around 40%), while adding musical factors into a complex model explains about 65% of the variance in this field observational study. The contextual factors that act positively on the number of people singing along in an entertainment context are: larger venues, a younger audience, a weekend night, songs that are played later in the set, and more popular songs (that spent at least four weeks in the UK charts).

Most of these contextual factors are connected to aspects generally associated with more intense revelry. Weekends are traditionally associated with leisure time, when more intense revelry occurs. In general, as a night progresses in entertainment venues, revelry also intensifies, particularly as people consume more alcohol, "loosen up," and leave their "everyday" lives behind (Jackson, 2004; Malbon, 1999; Pini, 2001). Inebriated clientele may sing along more, as they experience heightened arousal and less social anxiety (due at least to the belief that they have had alcohol, see Himle et al., 1999; Wilson & Abrams, 1977). Alcohol may help loosen inhibitions about singing in public and through arousal, inspire the expressive, celebratory activities of singing and dancing. This connection to inebriation was certainly supported by observations made in the field and reports from the DJs and performers that were interviewed (Pawley, 2009). Larger venues may also be connected to greater revelry, as the party can be even bigger (particularly if the venue is full).

Younger people in the UK are well-known to party more intensely than older age ranges. They are be more likely to drink heavily in pubs, bars, or clubs than older age groups, who are more likely to drink heavily at home (Goddard, 2008, p. 28). Younger people also engage more intensely in music consumption (Holbrook & Schindler, 1989; Straw, 2001; Zillmann & Gan, 1997), which plays a significant role in their identity formation (MacDonald, Miell, & Wilson, 2005). This greater engagement with music in the everyday lives of young people might explain greater levels of singing along within these contexts, since this form of participatory music reception ties in with their general habit of musicking. Singing along can be a significant expression of one's own musical taste and therefore announce and broadcast, in the act of singing along, one's newly emerging sense of identity.

The result that more popular songs inspire more singing along is a fairly intuitive finding. Songs that are more familiar to people equip them with more competence to sing along. In addition, people may enjoy singing along to songs that they prefer, though we cannot directly infer that audience members in the study better "liked" or "knew" songs that performed better in the charts. Having information on the song knowledge and taste of our participants would have helped understand the potential connection between taste, knowledge, and singing along, but this information was difficult to collect or speculate about. Songs are fluid in society and heard in many different contexts (e.g., advertisements, films, shopping centers), making correlations between specific song taste or knowledge and certain demographic characteristics of an audience, such as age, very difficult to make with confidence.

Popular songs may also be more likely to evoke a particular historical moment or era, triggering collective nostalgia. Feelings of nostalgia for one's youth can be particularly strong, and as Bennett (2001) argues, "popular music, as the sonic underpinning for each successive era in post-war youth cultural history,

arguably plays the most significant role in the nostalgic perpetuation of youthful sensibilities from the 1950s onwards" (p. 153). Singing along with a song can elicit and/or express to others this sense of nostalgia.

In addition to the contextual factors, we found several musical factors that influence sing-along behavior. However, we did not find an indication for a single or simple "sing-along formula." The results obtained from tree models and the random forest instead suggest that there is a large number of combinations of musical features that can incite (or diminish) singing along. The most important musical variables reflect aspects of the vocal performance on the recording to which revelers sing along. This is in line with a claim frequently made by theorists of popular music that "performance must be treated as central to the aesthetics of popular music" (Frith, 1996, p. 94). This assertion is corroborated by our empirical results showing that the prominent use of a high chest voice, increased vocal effort, the preponderance of a male singer on the recording, a greater clarity of consonants, and a lesser use of vocal embellishments, melismas, and other forms of vocal ornaments all help to increase sing-along behavior. While aspects of the vocal performance seem most important for inciting sing-along behavior, aspects of the compositional structure of the tune, such as the average phrase length, the average pitch level of the hook, and the vocal span of the hook rank in a follow-up group. Variables that reflect aspects of the lyrics rank among a number of less important variables from the aforementioned groups. Thus, it seems that to successfully trigger sing-along behavior in a typical entertainment situation the performance of the vocalist is of greatest importance.

Though conditions might be different for different geographical regions, cultural environments, and musical scenes, every effort was made to not overfit the model to this specific dataset. Replication studies in different parts of the UK and/or abroad, as well as in different settings where singing along is also a frequent behavior (e.g., church, sports events), are planned in hopes to replicate the general result that it is aspects of vocal performance, rather than compositional structure, that most influence sing-along behavior.

Aspects of vocal performance that were found to incite singing along are similar to qualities identified in anthems in popular music (Dockwray, 2005). Singers using a high energy, well-projected, high chest voice, with minimal melisma or embellishment, are successful in motivating revelers to sing along perhaps because their anthemic singing becomes a "call to party" – an invitation to participate in the party through singing (and potentially other forms of engagement, such as dancing). This cry might be compared to a "call to arms" or "war cry," defined as "a yell intended to rally a group of soldiers in battle" or "slogan used to rally support for a cause" (WordNet, 2010). The simple, unembellished nature of a repetitive slogan and the full-throttled yell of a battle cry are analogous to the features we found to incite singing along in a reveling situation. In both situations, music is used to motivate a group of people to act in unison. In a sing-along situation, this unites revelers in what can be interpreted as a temporary neo-tribe. By engaging with music through song and dance, revelers express their pleasure and excitement in partying, and demonstrate their desire to partake in the partying to other members of the tribe. The singer's "call to party" and audience's positive response harks back to early human tribes, where music was thought to have been used to synchronize mood and unite tribal members in celebration or battle, which probably aided early human survival (Huron, 2003).

Alternatively, it may be that this type of emphatic vocal style inspires singing along simply because people are inspired to sing by hearing singing, and emphatic vocals make it more obvious that someone is singing. An emphatic lead vocal could also just be more attention drawing, inspiring engagement with the music and vocal line, and singing along becomes an extension of this engagement.

The finding that male vocalists were more singalongable may also relate to the "war-cry" tradition. As fighting battles are traditionally male dominated, it may be that a male "call to party" is more effective from a historical perspective. There are, however, many other potential explanations, including the field observation that males were less likely to sing along to a female voice than vice-versa. In a pub or nightclub where attracting potential mates is one objective, perhaps men feel that joining in with a female singer is a threat to their masculinity. It may also be that male singers tend to sing more anthemic songs than females, as was found to be the case in popular rock anthems (Dockwray, 2005).

The finding that songs sung with clearer consonants inspire singing along is probably related to a perceptual facilitation effect. Lyrics that are sung more clearly have a greater likelihood to be understood and remembered by more people. In addition, reproducing clearly sung lyrics in a sing-along context can be considered easier than singing along to slurred lyrics with a highly idiosyncratic sound production. Thus, a singing style featuring clearly pronounced consonants might inspire confidence in the person joining in.

In conclusion, pubs and nightclubs provide a unique context to understand singing along with popular music

in public. Results suggest that the phenomenon is connected to conditions of general revelry, as well as the vocal performance of the lead singer. Revelers are called to party by an anthemic leader, which unites the audience in a temporary neo-tribe while they belt out the tune together and act in relative unison. This tradition perhaps harks back to our evolutionary roots – long may it continue!

Author Note

This research was conducted as part of the first author's dissertation at University of York, York, United Kingdom.

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Appendix A: Venue Descriptions

Field research was carried out at the following five entertainment venues:

- Venue A: a small, "working-class" pub with live cover bands performing every evening, catering to an older crowd in York.
- Venue B: a medium-sized, trendy city centre gay bar and nightclub with primarily dance and chart music in Leeds.
- Venue C: a student night at a large nightclub with chart, dance, "cheese," and indie music in York.
- Venue D: a small rock bar catering to an "indie" crowd in Manchester.
- Venue E: the largest nightclub in Kendal attracting locals of all ages and tourists with dance, chart, "cheese," and classic hits.

TABLE A1. Research Hours at Venues.

Venue	Research hours[a]	Total hours at venue
A	20:30–11:30	18 hours
B	21:30–0:00/ 21:30–2:00*	19 hours
C	22:30–2:00	21 hours
D	20:30–0:00 21:30–2:00*	23 hours
E	22:30–2:00	21 hours

[a]Venues with two times indicate different peak revelry times on weekdays and weekends.*

Appendix B: Thirty-two Musical Variables Tested

TABLE B2. Melodic and Harmonic Variables.

Variable	Coding	Range
Major or minor key	Binary	major / minor
Span of vocal melody	Semitones	5 to 27
Average vocal phrase length	Seconds	0.95 to 4.95
Average pitch of vocal hook	MIDI numbers	33 to 52
Number of different pitches in vocal hook	Integer	1 to 6
Lowest pitch in vocal hook	MIDI numbers	45 to 67
Highest pitch in vocal hook	MIDI numbers	58 to 80
Span of vocal hook	Semitones	0 to 19
Average interval of vocal hook	Semitones	0 to 6

TABLE C3. **Vocal Style Variables.**

Variable	Coding	Examples
Use of high chest voice	No high chest voice | some high chest voice | considerate high chest voice | much high chest voice.	"much high chest voice": *I'm Always Here* (Jimi Jamison); "no high chest voice": *Milkshake* (Kelis)
Presence of raspiness in voice (Lomax, 1968)	No raspiness | some raspiness | considerable raspiness | much raspiness.	"much raspiness": *Place Your Hands* (Reef); "no rapsiness": *9 to 5* (Dolly Parton)
Presence of breathiness in voice	Very pure tone | neutral | some breathiness | very breathy tone.	"very pure tone": *Reach* (S Club 7); "some breathiness": *Summer of '69* (Bryan Adams)
Presence of vibrato in voice	No or little vibrato | some vibrato | considerable vibrato | much vibrato.	"no or little vibrato": *All the Small Things* (Blink 182); "considerable vibrato": *I Wanna Dance with Somebody* (Whitney Houston)
Amount of reverb and/or production effects used on voice	Little or no effects and/or reverb | some effects/reverb at times | considerable amount of effects/reverb all of the time | much use of reverb/effects all of the time.	"little or no effects and/or reverb": *Brown-Eyed Girl* (Van Morrison); "considerable amounts of effects/reverb all of the time": *Love Don't Let Me Go (Walking Away)* (David Guetta vs The Egg)
Use of speech in vocal part	No speech | mostly sung with some speech | equal amount sung and spoken | mostly spoken | completely spoken.	"no speech": *A Little Respect* (Erasure); "completely spoken": *The Message* (Grandmaster Flash)
Amount of vocal effort/ energy/projection	Very relaxed, calm style with little evidence of effort | relaxed, calm, not much projection | medium level of projection/effort | fairly energised/projected | highly energised and projected, forceful attacks.	"highly energised and projected, forceful attacks": *We Will Rock You* (Queen); "relaxed, calm, not much projection": *Ashes to Ashes* (David Bowie)
Use of vocal melisma, embellishment and/or ornamentation	Little or no melisma/embellishment | some melisma/embellishment | considerable melisma | much melisma.	"little or no melisma/embellishment": *Hi-Ho Silver Lining* (Jeff Beck); "much melisma": *Candyman* (Christina Aguilera)
Clarity of consonants	Very slurred pronunciation | slurred pronunciation | normal, clear pronunciation | precise consonants, all discernable | very clear, highly articulated consonants.	"slurred pronunciation": *Macarena* (Los del Rio); "precise consonants, all discernable": *Monster* (The Automatic)
Gender of vocalist(s)	Male | female | male and female.	
Gender of backing vocalists	Male | female | male and female.	
Prominence of backing vocals in overall mix	Backing vocals in background | main vocals moderately more dominant than backing vocals | backing and main vocals play equal role | backing vocals dominant in foreground.	"backing vocals in background": *Bohemian Like You* (The Dandy Warhols); "backing and main vocals play equal role": *Rock This Party (Everybody Dance Now)* (Bob Sinclar & Cutee B)

TABLE D4. Lyric Variables.

Variable	Coding
Presence of words from languages other than English	No words other than English | some words from non-English language | considerable amount of words from non-English language | entire song not in English.
Presence of specified/unspecified "you" (Murphey, 1989)	Unspecified you | unspecified you but not principal referent | no use of you | specified you | specified you but not principal referent.
Presence of specified/unspecified "I" (Murphey, 1989)	Unspecified I | unspecified I but not principal referent | no use of I | specified I | specified I but not principal referent.
Presence of subject/addressee fluctuation (Murphey, 1989)	Addressing type (e.g. hey girl, you are...) | third person singular (e.g. he said…) | fluctuates between both.
Number of people addressed	1 person | group of people | combination of person/group/unspecified | unspecified.
Gender of people addressed	Male | female | male and female | unspecified gender | combination of male/female/unspecified.
References made to singer's gender	Explicit mention of singer's gender | implication of singer's gender through entioning he/she (in heterosexual relationship) | no mention of singer's gender or love interest's gender.
Relevance of song lyrics to pub/club context	More relevant lyrical themes: love (positive/neutral) | party-theme | inspirational. Less relevant themes: love (negative) | random or very specific | political/comment on society | character painting.
Presence of rhymes	Number of pairs of perfect or general rhymes. Range: 0 to 52.
Use of nonsense syllables	Number of nonsense syllables used at important points of the song. Range: 0 to 330.
Whether the title of the song is in the refrain (Tawa, 1990)	Binary