

A SURVEY ON MUSIC LISTENING AND MANAGEMENT BEHAVIOURS

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ABSTRACT

We report the results of a survey on music listening and management behaviours. The survey was conducted online with 222 participants with mostly technical backgrounds drawn from a college age population. The median size of offline music collections was found to be roughly 2540 songs (both physical media and digital files). The major findings of our survey show that elements such as familiarity of songs, how distracting they are, how much they match the listener's mood, and the desire of changing the mood within one listening session, are all affected by the activity during which music is listened to. While people want to have options for manipulating the above elements to control their experience, they prefer a minimal amount of interaction in general. Current music players lack such flexibility in their controls. Finally, online recommender systems have not gained much popularity thus far.

1. MOTIVATION

Since the advent of mp3 files and the fast spread of high bandwidth Internet connectivity, there has been an extreme increase in the number of songs listeners can have immediate access to. In the past decade, the size of personal digital music libraries has seen a similar fast growth. Moreover, subscription based on-demand streaming services like Spotify have made millions of songs readily available to their users. Many studies exist on music listening and management behaviours [2, 4, 9, 10], but with the immense speed at which technology advances, new questions frequently arise on how listeners interact with the immense amount of music available to them.

As Downie et al. [6] point out, one of the main challenges that ISMIR currently faces is encouraging the participation of potential users of Music Information Retrieval (MIR) systems. In this study we investigate the issues such users have in their day-to-day interaction with music. We first divide music interaction into two main categories: (a) music listening, and (b) management of music collections.

Music listening comprises the process of deciding what to listen to in a music listening session and the kind of

control exerted by the user on the played music. Management includes obtaining music, managing tags, creating and maintaining playlists, sorting, and so on. Music listening can be both a personal or a social experience. Here, we concentrate on personal music listening. Methods of playback range from low control methods like shuffling one's whole collection along with skipping songs, to higher control ones like having pre-compiled playlists for various occasions or even choosing songs one after another.

Although the amount of user studies on music information retrieval and browsing has been growing as of late, there is a lack of studies when it comes to understanding what factors influence a user's music listening choices in various contexts, what methods of playback are used and why, and what devices and services are more frequently used. Previous studies have focused mainly on users' information seeking behaviours [1, 7, 8], discovering new music [3], digital music library management [4, 10], use of physical or digital media [2], playlist generation behaviours [9], music listening contexts [?, 2, 5, 9], reasons for listening [?, 5], and social aspects of music consumption [9].

In this study, we focus on the act of music listening by investigating our participants' listening behaviours, and trying to understand influential factors in their choice of playback method, and the amount of control and interaction they desire. We compare some of our results regarding playback methods and playlist creation to what Vignoli [10] and Stumpf and Muscroft [9] found. We also study our participants' use of music recommendation services like Grooveshark, iTunes Genius, and Last.fm. Finally, we discuss some implications for the design of future music listening tools.

2. RELATED WORK

There is a close relation between searching (or browsing) and managing libraries, in the sense that the most frequently used cues and properties in searching and browsing can be a good basis for organizing a personal library. This is to some extent confirmed by similar observations by Bainbridge et al. [1], Lee and Downey [8], and Vignoli [10]. In the first two studies, which focus on finding music or music information, the most used properties are reported to be "performer" and "song title". Vignoli [10] asks participants about the attributes they mostly use when retrieving songs from their personal libraries, and again artist name and song title come out on top.

The study by Vignoli [10] is one of the very few that discusses issues relating to the acts of music listening as

well as collection management. Vignoli asks participants how often they use various playback methods and reports that the most favorite method is “I choose one or more albums”, while “I search for a single song” ranks second. It is notable that these two are both highly controlled experiences, compared to choosing an artist or shuffling the whole collection. Also, users liked to create playlists as opposed to using existing ones, which is also indicative of the higher level of control desired.

Regarding how these playlists are created, a recent paper by Stumpf and Muscroft [9] reports that the concepts most frequently mentioned by participants in a think-aloud playlist creation task were tempo and mood. However, the study had only 7 participants, so a generalization is difficult. In this paper, among other things, we also discuss our own results regarding these attributes and playback methods for listening to music during various activities, and look for similarities with what Vignoli, Stumpf, and Muscroft observed.

3. METHODS

Our online survey included a total of 32 questions covering both collection management (13 questions), music listening (14 questions) and demographics (5 questions). The Likert scale is the most used question format throughout the survey. Medians and modes are used for reporting the results of Likert scales, as opposed to averages.

The survey population consisted mostly of Simon Fraser University’s (Canada) Computing Science and Engineering faculty and students who were invited to take part in the survey with mailing lists. We also initiated snowball sampling by encouraging the respondents to spread the word to their friends and family. The questionnaire went through several revisions and was pilot tested with a total of 10 respondents before being sent out to participants. The results presented in this paper were gathered in two stages. The first stage, which targeted only Computing Science graduate students and faculty, had 79 participants. After the first stage, we analyzed the results for questions with low response rates and revised three of them for the second stage, which had 143 participants (Computing Science undergraduates and Engineering students). We present aggregate results for all of the 222 participants in case of identical questions, and stage 2 results for revised questions.

Our participants had an average age of 25.85 with a standard deviation of 9.02, and a median of 23. The majority of our participants (73%) were males, and 95% had a Computing Science or Engineering background.

4. RESULTS

In this section, we present an overview of the results for major questions, in both listening and management categories. Naturally, not all participants answered all the questions, so for each question, only the participants that have answered it are included in computing averages, medians, etc. Whenever we look at results of two or more questions together, we only include the subset of participants who have answered all of them.

4.1 Music Listening

Average hours of music listening per day (both active and passive): During active listening, one is listening to music for the sake of listening, not doing other activities. Passive listening happens when music is listened to during other activities to get in and out of moods, to cancel out ambient noise, to go through boring activities, and so on [5]. Average hours (per day) of active and passive listening were asked in form of ranges. For active listening, these ranges were: Less than 1 hour, 1-2, 2-4, 4-8, and more than 8 hours. In case of passive listening, since it generally happens more than active listening, the choices were changed to cover a larger range: less than 1, 1-2, 2-4, 4-6, 6-8, 8-10, 10-12, and more than 12 hours. For the 174 participants that answered these questions, the median and mode choice for number of active listening hours per day was “less than 1 hour”. Both median and mode jump to “2-4 hours” in case of passive listening.

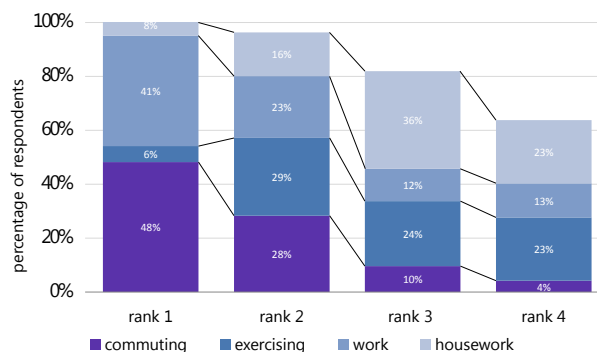


Figure 1. Activities ranked based on their portions of a participant’s overall passive listening hours (based on 178 responses).

To understand during what activities passive listening happens, we asked participants to rank 4 activities: commuting, exercising, work, and housework. These are also the top activities reported by Lamont and Webb in [?], except for exercising. This is because we considered exercising as an activity which is reliant on playlists more than the other 3 and could thus broaden our scope when we later ask about playback methods during these activities. As seen in

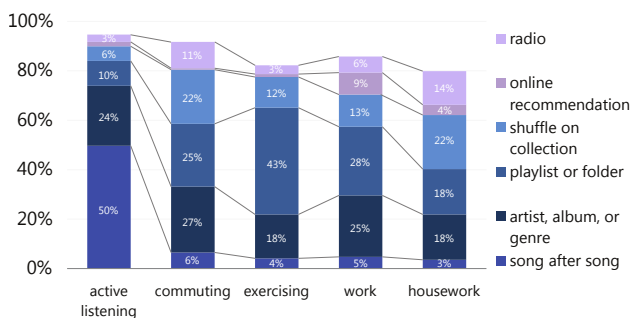


Figure 2. Preferred methods of playback for various simultaneous activities (passive listening) and active listening.

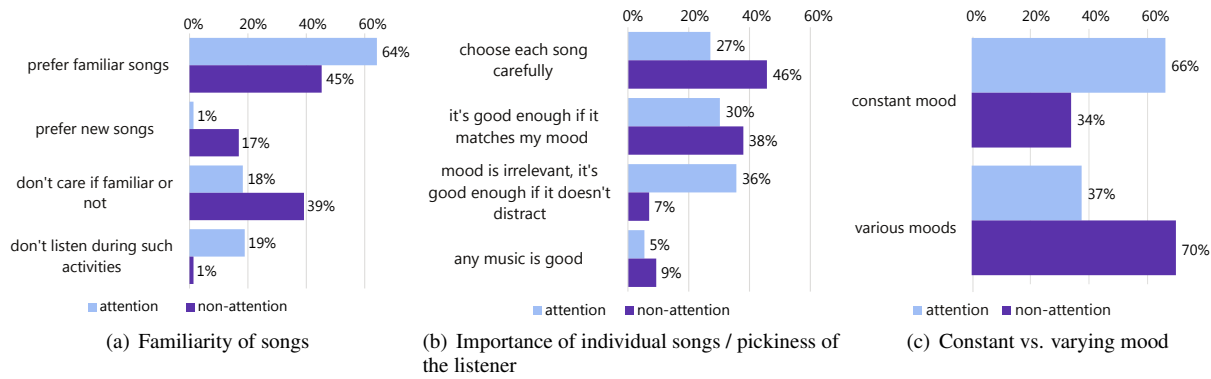


Figure 3. Results for questions regarding familiarity, importance, and mood variance of songs.

Figure 1, commuting and work take similarly large chunks of the first rank, with exercise and housework following on ranks two and three. We also provided a comment section for the corresponding question to be able to pinpoint other important activities that we might have missed. Surfing the Internet, playing video games, and during/before sleep were the three activities most often mentioned (13, 10, and 6 times, respectively). Brown et al. [2] found out that the most popular places for listening to music were the car (82% of the time), the living room (61%), and work (38%). Our results show a shift towards work. The reason can be both our population’s age and technical background and the fact that with the rapid growth of technology since 2001, nowadays much of people’s work happens on their computer which also contains a large collection of music. One distinction between the different activities comes from the amount of attention they need and the amount of control on the music a listener would want. These factors influence the chosen playback methods.

Preferred playback methods for each activity: We study the methods of playback our participants preferred for the same list of activities as before, namely commuting, exercising, work, and housework, along with active listening. For each activity, the respondent was asked to choose one of 6 playback methods. In Figure 2 we see the percentages for each activity and method out of all 169 participants who answered this question. Respondents were told not to choose any method if an activity didn’t apply to them, therefore the sum of the columns isn’t always 100%.

Choosing song after song dominates the active listening portion and this is not surprising. To figure out which method is generally preferred for passive listening, we exclude active listening results, sum the total number of times each method was chosen and divide that by the number of all the choices made by all participants. We observe that the overall preferred method is “a prepared playlist or folder of songs” with a 29% share. “Picking an artist, album, or genre” and “a shuffle on your whole collection” are second and third with 22% and 19% shares. “Radio, including online stations”, “song after song”, and “online recommendation services” end up with quite small shares of 8%, 5%, and 4%, respectively. For the same reason as above, the sum of these percentages isn’t necessarily 100. In comparison, Vignoli [10] observed that “I choose one

or more albums” was the top choice, which is in line with what we see here: an overall preference for higher control. “I search for a single song” is second there, which could be because Vignoli does not classify methods based on activities, resulting in active listening skewing the results.

Importance, familiarity, and mood of songs, and interaction tolerance: As mentioned earlier, a distinction between activities during which music is listened to can be the amount of attention the activities need. We believe that work and commuting (if it is not driving) can lie on two opposing ends of this spectrum, with work needing very high attention from the listener and commuting needing much less. As both these activities contribute heavily in our participants’ listening hours, it is crucial to have a better understanding of listening behaviours during each. We hypothesized that having to pay (or not) pay attention to the activity will affect the following 4 aspects:

- How familiar the songs are.
- How picky the listener usually is (we call this *importance* of songs)
- If a constant mood is preferred or if there need to be various moods (in one session of listening).
- What the maximum amount of desired interaction is.

Our questionnaire contained a question on each of the above for both activities that need attention (we will call these “attention activities”) and those that do not (we will call these “non-attention activities”).

Figure 3(a) shows that familiar songs are generally preferred for both attention and non-attention activities, and in case of attention activities, participants strongly preferred familiar songs with nearly 0% preferring new ones. Figure 3(b) shows that while it is important that the music during attention activities does not distract the listener, a large fraction of participants expressed a need for matching moods and choosing each song carefully, even during attention activities. This is expected for non-attention activities, but is somewhat surprising for attention ones, and indicates a general preference for high control on the music. This is in agreement with our results for playback methods discussed earlier. Figure 3(c) shows that although constant mood was the dominant choice for attention activities, still nearly 40% preferred various moods.

To target issue d (maximum amount of desired interaction), we asked participants what their maximum amount

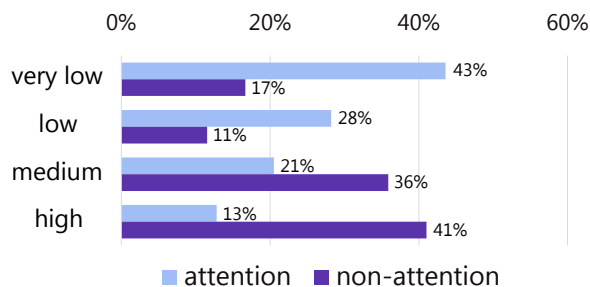


Figure 4. Results from questions on amount of interaction with music player (based on 82 responses).

of desired interaction would be if they wanted to change the mood. One metric for “amount” of interaction can be the amount of time it takes for the user to perform it. Choices included examples that gave our respondents an idea of this time. These were: (a) “very low interaction”: e.g. skipping tracks; (b) “low”: e.g. specifying your desired change in mood but not having to find any particular song; (c) “medium”: e.g. switching to another playlist; (d) “high”: e.g. finding specific songs one after another.

The question was more complex in the first stage. Due to high non-response, it was changed to the one described. The results discussed here are from the second stage.

For attention activities (see Figure 4), although a preference for lower interaction is expected, it is interesting to see that along with “very low interaction”, “low interaction” was also acceptable by a large margin. During non-attention activities, participants preferred to have higher control on the music source with the medium and high choices dominating the scene.

Use of online music services: It is clear from the above results that online recommendation services are not popular at all even among our survey population which consists mostly of college-age people with technical backgrounds. Indeed, when asked about what music services they have ever used, 33.8% (75 out of 222) said they haven’t ever used any of the provided choices (Last.fm, iTunes Genius, Grooveshark, Zune Smart DJ, Pandora, Spotify, iLike, and Musicoverly) and didn’t provide any other service in the “other” comment section. For the remaining 147 participants, Grooveshark, iTunes Genius, and Last.fm were the most prevalent choices with 46%, 45%, and 42%. 23% had used Pandora, and 7% Spotify. YouTube was the most popular “other” choice with 6 participants (3%). When asked about their favourite service, 61% of participants who answered the question said they didn’t normally use these services. The rest of the responses reflect what we have above, with Grooveshark, iTunes Genius, and Last.fm being the top three. This result, however, seems to be more dependent on the popularity of these services than conscious choice as we had only a small number of participants that had tried all or almost all services. For an in-depth analysis more than our 222 participants are needed.

4.2 Management of Music Collections

Primary sources of music (CD, mp3 player, radio, etc.): Participants were asked to choose between 5 frequency ad-

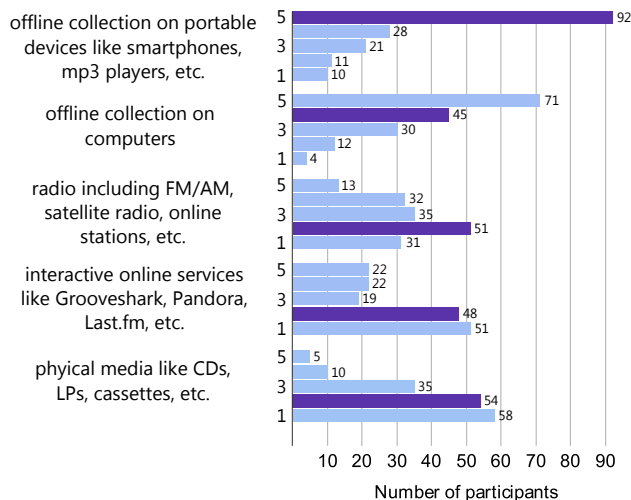


Figure 5. Popularity of music sources. Y axis: 1=Never; 2=Rarely; 3=Sometimes; 4=Often; 5=Very Often. X axis: number of participants who chose each option with the darker bars being the median choice.

verbs in a Likert scale. In Figure 5, the number of participants who chose each choice for each source is shown, with the darker bars being the median for each source. While offline collections on portable devices score the highest, we need to keep in mind that most of our participants have a technical background.

Collection statistics: Our participants had a median of 15 pieces of physical media and 2000 digital songs¹. Most participants (65%) said they were likely to correct inaccurate tags that they find in their collections. The median respondent maintained between 2 to 4 playlists.

Handling of digital collections (manually with a folder structure, or using an application like iTunes): Almost half of the respondents (83 out of 155: 53%) preferred to manually manage their music folders rather than relying on an application. Applications ended up second with 26%, and 21% said they used both. It appears that management using applications has gained much more traction since Vignoli’s study [10] in 2004, which reports that all the 7 participants used manual folders. Participants were also asked about what application they preferred for managing their libraries, with the choices offered being Windows Media Player, iTunes and “other”. In Figure 6 we see the choices made by the 144 participants who answered the question, along with the difficulties expressed with each of these applications.

Important factors for managing music collections (album, artist, genre, etc.): Participants were asked to specify how important various factors were for them in managing their collections by choosing between “Very Important”, “Important”, “Somewhat Important”, and “Not Important” for each factor. Artist, with a median of “Very Important” was the top choice here. This confirms the findings reported by Vignoli [10] and Bainbridge et al. [1]. Second were album and genre with a median of “Impor-

¹ For digital collections, participants had a choice of providing number of songs or gigabytes. In cases where gigabytes were provided, they were converted to number of songs, assuming 4 megabytes per song.

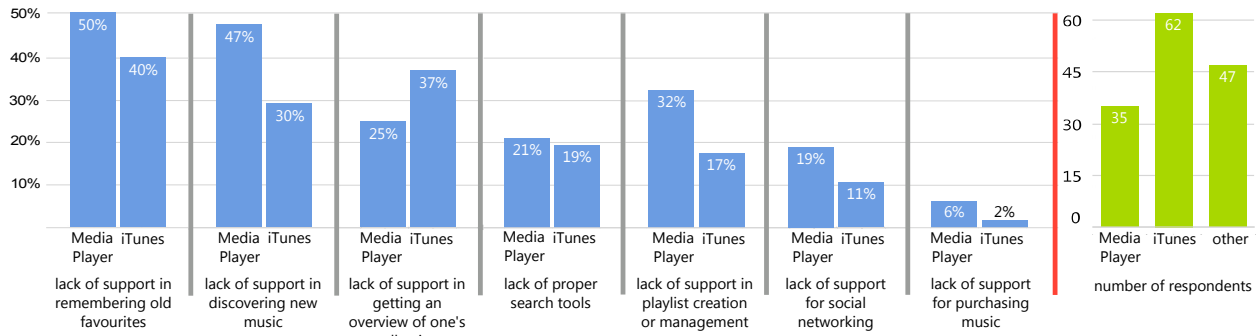


Figure 6. Applications used for library management and difficulties faced with them. Each column shows the perceived lack of support for a task among each application’s users. The right-most column shows the number of respondents who chose each application.

tant” and a mode of “Very Important”. These were also among the top factors in both the above studies, along with song title.

Important factors in creating playlists: We also asked participants who said they created and managed playlists, about important factors in doing so. Due to high non-response, this question was altered for stage 2 and only stage 2 results are reported in this paper. The format was a three-choice Likert scale for “importance” of factors. This and the question regarding factors important in managing collections were located far apart from each other in the questionnaire. We also altered the choices to not be similar to those offered in the management question, so as to prevent participants from recalling their management answers. The choices for each factor were one of “Not Important”, “Somewhat Important”, and “Very Important”. Mood came out on top with both a median and mode of “Very Important”. Genre, artist, and tempo all had a median of “Important” and a mode of “Very Important”. In case of mood, our results confirm Stumpf and Muscroft’s findings [9], but not for tempo. They reported that tempo was actually the most important factor for their participants, with mood and rhythmic quality being 2nd and 3rd. Here, tempo is only 4th.

To summarize all the results for important factors in management and playlist creation, we scale all of them to a range between 1 and 4 where 4 is the highest score possible for each factor. The results are shown in Table 1.

	playlist creation	management
mood	3.42 (1 st)	2.39
genre	3.17 (2 nd)	2.52 (3 rd)
artist	2.95 (3 rd)	3.54 (1 st)
tempo	2.80	1.90
album	2.31	2.73 (2 nd)
instruments	2.25	1.78

Table 1. Factors important in playlist creation and management of music collections. Scores are out of 4.

5. DISCUSSION

Understanding our participants’ listening behaviours starts from knowing when they listen to music. Commuting and work were the most popular activities making up our participants’ listening hours. A good music listening tool has to cater to at least the most prominent activities by supporting the playback methods that best fit them.

In Figure 2, we can see that more controlled methods like a playlist or choosing certain artists, albums, or genres are generally more popular than less controlled methods like shuffle, radio, and online recommendation services, and this is more pronounced for “work” and “exercising”. This is expected, because exercising requires very specific tempo and rhythm, and work generally needs high attention, so with a shuffle on one’s whole collection, the songs are unlikely to satisfy the needed degrees of familiarity, mood, and not being distracting.

But the question is: Are these conventional playback methods enough? According to Figure 3(c), nearly 40% of our participants expressed a desire to have **various moods even during attention activities**. To achieve this, listeners have to resort to switching playlists (assuming they even have prepared ones), applying various filters of artist, album, genre, etc. while listening, or even creating a playlist every time, not to mention choosing songs one after another. According to Figure 4, all of these require amounts of interaction more than what a person would normally want to have with the music source during attention activities. It is interesting to note that 71% of our participants were OK with very low or low interaction. Having in mind that very low interaction is essentially a shuffle on one’s collection and that shuffle is not appropriate for many activities, we see a need for novel interaction methods in the “low interaction” range.

We set out to understand what the users would want to have control over, in a Utopian music player. We hypothesized that the familiarity of the songs, their mood and how distracting they are, and if they should have similar moods or not, are among the elements that are affected by the kind of activity during which music is listened to. Judging by Figure 3 and Figure 4 we claim that our hypothesis was confirmed with all the results showing notable differences between attention and non-attention activities.

One could say that online recommendation services like Last.fm, Pandora, and Grooveshark support low interaction while also introducing the listener to new music. Our results show that these services have not really gained traction with users. Several reasons can be speculated for that, like price, sub-par interfaces, availability (different countries), accessibility (computer only or mobile too?). For instance, accessibility can be the reason why online services are used mostly during "work", which is in case of our survey population, mostly done on the computer while online. But there is also the quality of recommendations. Right now, all the noteworthy online recommendation services operate on the basis of similarity to a seed song or a user's library of favourite songs. The maximum control the listener has is skipping songs or in some services, inserting songs into the playlist (e.g. Grooveshark). The listener can have no control over what aspects of the songs are taken into account for computing the "similarity". It is evident from our results that, contrary to the idea behind playlists which are pre-compiled lists for various occasions, there seems to be an inherent impulsiveness in the choice of music. That is, at any point during a session of listening, the listener might want to steer the experience to a new direction. The elements mentioned above are only some of the aspects that should be controllable in this "steering" act. Spotify apps like Moodagent or EchoNest's steerable playlist API are promising developments in this regard.

6. CONCLUSION

The results of studying our 222 participants' music management and listening behaviours were reported and analysed. We discussed how our participants manage their music collections, during what activities they listen to music, how many hours a day they listen to music, if and how they manage playlists, what methods of playback they prefer, what their primary sources of music are, and if they use online recommendation services.

The most important attributes of songs for collection management were artist, album, and genre, which is in agreement with the findings by Vignoli [10] and Bainbridge et al. [1]. We found that mood, genre, and artist were most important for creating playlists, which partly confirms what Stumpf and Muscroft [9] found with 7 participants. They reported that tempo was actually the top choice, with mood and rhythmic quality being 2nd and third, and genre 5th. The median size of personal music collections was found to be 2540 songs. Participants listened to these collections on portable devices and computers more than any other source. This was mostly during commuting and work. Only half of the respondents said they only used manual folder structures for managing their collections rather than applications such as iTunes. This is in contrast with what Vignoli [10] reports from 2004, where all the respondents only used manual folders. The very limited popularity of online music services was surprising to us, considering our population's mostly technical backgrounds and young ages.

Overall, for passive listening (listening to music during

other activities), more controlled playback methods like prepared playlists and filters of album, artist, etc. were more popular than shuffling. We discussed these in relation to elements such as familiarity of songs, how distracting they are, how much they match the listener's mood, and if various moods are desired in a session of listening or not, and concluded that there's a need for novel interfaces with easy and efficient support for manipulating these elements dynamically and with a low amount of required interaction.

We would like to note that one issue with our current results is the heavy focus on participants with technical background. To have more reliable results, we are currently extending the survey to other population groups.

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