Social Translucence Within Shared Music Listening Sessions

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ABSTRACT

Music streaming services generally keep very detailed logs of their users' music listening habits. They need this data to power their recommendation engines. Users get presented with the results of the recommendation engine through the adaptive content presented to them, but they rarely get presented with the underlying data. Within this research, we deployed a social context display that presents users a visualization based on their historical streaming data. The aim of this display was to create a more socially translucent environment during a shared music listening session. Through multiple field deployments during small get-togethers, the effects of the social context display were tested, through both quantitative and qualitative means of validation. We found that the social translucence generally had a net positive impact on the decision making process with regard to the selection of music to play. Furthermore, due to the strong emotional connection to the content (music), a few social dynamics emerged that have not been described in previous applications of social translucence. To support future designs, we summarized these new insights.

1 INTRODUCTION

Music listening is an inherently social experience. Obvious examples are festivals and concerts, but even within the context of the home, it is quite often seen as a social occurrence. Music plays a significant role in creating a mood for parties and small get-togethers. It can be seen as a kind of glue that aims to create social connectedness by putting everybody in a similar mood. Just how music is an interplay of various instruments in harmony, it too can involve a sense of harmony amongst users. This sense of harmony, however, is hardly reflected in the music control interfaces. Historically, we mostly see a form of autocratic control [2], with a key-user being in control of the music. Lower-level users can usually only intervene socially (e.g., talking). A concrete example of this status quo in action would be the key-user having Spotify opened on their phone, connected to a Bluetooth speaker. To alleviate these pains, the industry has been moving towards a more shared control experience. In 2018, Spotify added a way to create a 'Group Session'. This feature allows users to share control of their listening sessions with others in real time. Features like this help users to collaborate on curating the music together. This is a great first step towards a more social experience, but these systems do little to create a shared awareness of all users' wants and needs.

Music streaming services are, of course, internally very aware of the user's taste in music. Services like Spotify have an internal log of all songs streamed - and even skipped - by the user. These enormous amounts of user data are needed to power the artificial intelligence-based recommendation systems in use by virtually all big content providers.

Within this research, we aim to use this data create a socially translucent shared music listening experience. Social Translucence is a model for collaboration that focuses on the principles of visibility, awareness, and shared accountability [4]. Social Translucence has mostly been applied to computer-supported cooperative work (CSCW) [4, 8]. No major research has been done on the subdomain of shared music control, however. Our research contribution therefore focuses on applying the aforementioned concepts to the domain of shared music listening. We explore how visibility, awareness, and accountability can play a role in streamlining the choosing of music for co-located groups. We therefore ask the question: Q1: "What are the effects of Social Translucency in the context of shared music listening?". These 'effects' can be subdivided into two major categories: changes to the music being played and changes in social dynamics. These categories were given their own sub questions: **SQ1:** How does Social Translucence affect the music being played? SQ2: How does Social Translucence affect the social dynamics at play during shared music control? Through a field deployment of a social context display [3], participants were presented with each other's estimated enjoyment of the music played during the listening session. To answer the first sub question, individual music affinity scores were logged throughout the music listening sessions, and participants were questioned about their sense of representation within the music. Questionnaires and semi-structured interviews were used to discover the changes in social dynamics as a result of the social context display.

2 RELATED WORK

Most interfaces and systems used in everyday life are shared. This holds especially true when we consider everybody affected by the output as a user [6]. For example, while one might choose to not be directly involved with choosing the music that plays, they are still affected by the results. Most systems are designed with individual users in mind. The systems provide little to no information on the various users' wants and needs. To combat this and make systems more collaborative, various researchers have sought to find out how one might design for awareness of the social context.

One of the first papers to lay out a guide for systems that support collaboration and communication is a paper by Erickson et al. [4] on Social Translucence. Within this research, the authors argue that digital systems can support coherent behavior by making participants and their activities visible to one another. To create such a system, one needs to consider three characteristics: visibility, awareness, and accountability. They then further describe their experiences creating social translucence within 'Babble', a communication platform for knowledge communities. They argue that Social Translucence is needed for people to be to conform to social conventions. If the system is not socially translucent, it will be hard to observe and imitate others, and to engage in peer

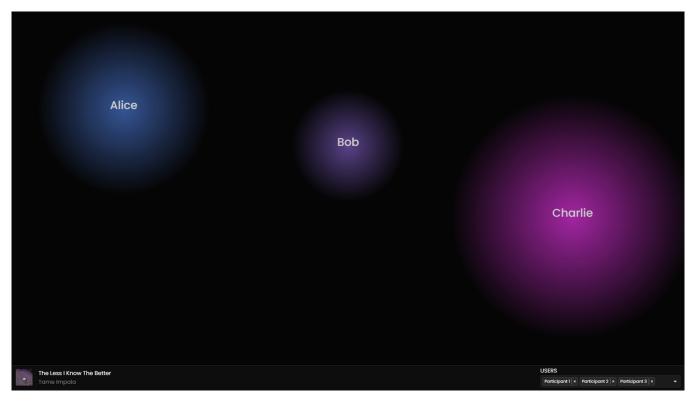


Figure 1: Screen capture of the social context display. The height is an abstraction of the user's estimated enjoyment of the current song (song affinity). The size abstractly visualizes the estimated enjoyment of the music played during the entire session (music affinity).

pressure. These kinds of communication and social dynamics are essential for effective collaboration.

Traditionally, the principles of social translucence have been mostly applied to the domain of computer supported collaborative work (CSCW)[4, 8, 9]. Within this domain, social translucence is mostly used as a way to try and make up for the lack of physical communication possibility within digital workplaces. Ding et al. [3], however, explore the role of a social context display. A social context display presents co-located users with social context to inform actions and decisions. Through their design intervention, they aim to create abstractions for understanding how to make social information more easily visible. Furthermore, they gained insight into how members manage their self- and group-representations through the display. This research has served as the fundamental basis upon which our social context display was based.

To summarize some of the findings within the research domain of Social Translucence, Niemantsverdriet et al. [6] created the DASS framework. This framework provides a detailed overview of the design consideration to make when designing for awareness. Within our research, the DASS framework was used as a guide to create the social context display.

3 DESIGN

In line with the principles of Social Translucence [4], a social context display was created that aims to provide users with visibility,

awareness, and accountability (figure 1). To effectively create such a display, one must present users with the right data, presented at the right level of abstraction [6]. For this research, an algorithm based on the participants' historical song streaming data was used to estimate individual enjoyment of the music (a short explanation of the algorithm can be found in appendix A). Through this method, enjoyment can only be estimated. No amount of historical data can provide full certainty of how the user will enjoy a song in the present. Tastes in music can change over time. Moreover, the range of emotions associated with music listening makes the enjoyment very context dependent. One might not necessarily enjoy the same songs in a group context, as compared to when they are alone for example. We will therefore use the term 'music affinity' when talking about the algorithmically estimated enjoyment of the music being played during a session. 'Song affinity' is similar in meaning, but applies to a singular song. This available insight into individual users' music affinity should give users a better sense of awareness, compared to no information at all. Since the data is only an estimation of enjoyment, it was chosen to be presented in a non-exact manner: the underlying numerical estimations of enjoyment are abstracted from the user to prevent meaningless comparisons between affinity values.

As discussed within the DASS framework [6], persistence of data is an important consideration to make within these kinds of social context displays. Since the research focuses on the music

listening session, it was considered crucial to present participants with historical data. Social Translucence is applied as a tool to make the whole music listening session more inclusive towards all users. On a per-song level, there is no need to be inclusive. Not only is this practically impossible, but the social dynamics of a get-together naturally lead to individually liked songs being played. Letting friends hear a new song you just discovered, for example. This does not mean that a representation of song affinity was completely disregarded however. Due to the emotional connection users have to the subject matter (music), it was decided also include a visual representation of song affinity. The hypothesis being that this would prove to be a more socially potent visual as compared to the music affinity. With these requirements in mind, the social context display was designed.

The display (figure 1) shows everyone each other's music affinities. Each person is abstractly visualized through their own orb. The size of the orb represents a user's music session affinity (estimated enjoyment of the music played throughout the whole session), while its vertical position represents song affinity (estimated enjoyment of the song currently playing).

4 METHODOLOGY

As previously stated, the effects of social translucence on shared music listening are categorized into two main categories: changes in the music being played and changes in the social dynamics. Within this section we shortly describe both.

4.1 Changes in Music

To investigate the effects of the social context display on individuals' music affinity, an analysis is done on how the display influences the songs chosen to be played. The hypothesis being that the display encourages a more even distribution of music affinity between users. In other words, through awareness and accountability, users are aided and incentivized, respectively, to curate a more socially inclusive listening experience. Next to a quantitative data analysis of the music affinity, users will also be questioned about their music enjoyment through questionnaires and semi-structured interviews. These questions will focus on their perceived sense of representation within the music that is played, as well as their general enjoyment of the music (since we can't be sure that better representation is causally linked to enjoyment).

4.2 Changes in Social Dynamics

It is quite common for social context displays to have significant consequences on social dynamics. Apart from the obvious changes due to increased awareness and accountability, there are some less obvious changes that could arise. The display itself can, for example, become a means of expression through which users can perform [3]. To explore these potential changes in the social dynamics, semi-structured interviews are conducted with participants. It is expected that key-users and low-level users will see different benefits to the social context display. key-users might enjoy the increased awareness since this could help them be (perceived as) better at their task of choosing music. Low-level users might see more benefits from the increased accountability. They know that the key-user knows that they are being underrepresented. For this reason, the findings

distinguish between these two categories of user. Finally, users will be asked about potential interactions they want implemented to handle the Social Translucence gained through the social context display.

4.3 Test Setup



Figure 2: The social context display deployed during one of the shared music listening sessions.

A total of three field studies were performed. These groups consisted of four, three, and three participants. Thus, a total of ten participants participated in the study. The demographics of participants can be summarized as 20-25 year old people, all of whom were already familiar with usage of music streaming services., Additionally, the researcher did one ethnographic session with friends to gain observational insight into the effect of the display on the social dynamics. These observational insights were used to guide the open-ended post-interviews with the three groups where the researcher was not present during the study. The three groups were asked to find a location were they would normally choose to listen to music. In practice, this meant that the subjects were either located in the kitchen or the living room. Participants were asked to fill in a demographic questionnaire, after which they were free to listen to music as they would normally, with the social context display being the only new addition to the environment. The groups were required to have the social context display on for at least an hour. Optionally, they could choose to continue the session for longer. At the end of the session, participants filled in the post-questionnaire. This questionnaire included UEQ-S questions [7], as well as eleven Likert scale questions with regards to the usefulness of the display as a medium to create social translucence. These questions were as

- $(1) \ \ \textit{The visualization accurately depicted my music enjoyment}.$
- (2) The visualization accurately depicted others' music enjoyment to me.
- (3) The social context display helped me be more aware of what others like to listen to.
- (4) This change in awareness is beneficial to the social dynamics.
- (5) The social context display made it easier to select songs.

- (6) The social context display helped hold the key-user(s) accountable to play music everybody likes.
- (7) The social context display kept me accountable to play music everybody likes.
- (8) The change in accountability positively impacts the social dynamics.
- (9) I felt that people were more considerate of my music taste with the social context display present.
- (10) The social context display was beneficial to my overall music listening experience.
- (11) The social context display improved the social dynamics regarding the choosing of music.

Lastly, participants were asked two open questions. First, they had to describe the biggest strength and weakness of the social context display. Secondly, they had to argue their preference for either the song affinity or the music affinity aspect of the social context display. This post-questionnaire was used by the researcher to inform what questions they should ask during the post-interview.

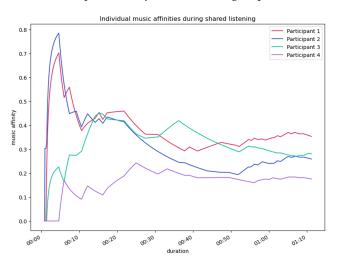


Figure 3: Individual music affinities over time for one of the sessions.

To further substantiate the post-interview, each group was presented with a graph of their individual music affinities over time (figure 3). In other words, the graph is a visual representation of the size of each person's orb at any point during the music listening session. Presented with the figure above, for example, participants deduced that they made a conscious effort 'boost' participant 4 around the 16 minute mark. The results of the post-interviews were thematically analyzed to find common themes amongst them.

5 RESULTS

In this section we describe the findings of the performed user studies. The results are separated into two main categories, quantitative and qualitative data.

5.1 Quantitative Findings

Within this section, we analyze the quantifiable results of the postquestionnaires. This includes questions about the usefulness of the social context display as a tool for generating social translucence, as well as a short analysis of the user experience questionnaire (UEQ-S) [7].

5.1.1 Social Translucence. Within the post-interview, users were asked eleven Likert scale questions with regards to the social context display. Figure 4 shows the results of the questionnaire.

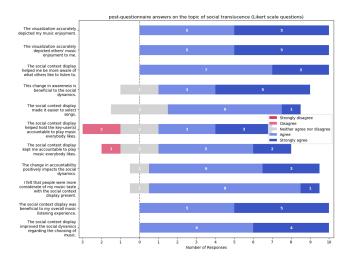


Figure 4: Overview of answers to the questions on the effects of social translucence.

The results shown above suggest that participants generally understood the value of the socially translucent system. 96 out of 110 answers are on the 'agree' side of the Likert scale. The only questions that got partially negative responses were on the topic of accountability. The participants that disagreed highlighted two main reasons as to why they disagreed. Firstly, they mention that they are such good friends with the other participants, that the social pressure to please them has disappeared. They mention that the accountability aspect might be more useful in a situation where participants are not as familiar with each other. Secondly, during their test, a Spotify group session was in use. This means that all participants are free to add music from their own device. This, in their view, completely eradicated the peer pressure to add songs for others; those participants can simply do it themselves.

5.1.2 UEQ-S. To gain insight into the user experience in a standardized way, the UEQ-S user experience questionnaire [7] was used. The results of this questionnaire among the 10 participants can be found in figure 5.

As evidenced by the results, users had mostly positive feelings towards the user experience. The answers leaning towards 'complicated' and 'confusing' were a consequence of these participants not immediately grasping the music affinity aspect of the social context display. The slow moving nature of the music affinity made it conceptually harder to grasp than the quickly updating song affinities.

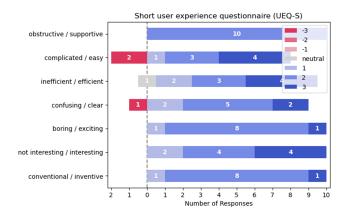


Figure 5: Overview of answers to the UEQ-S.

5.2 Qualitative Findings

The post-questionnaire ended with the following question: Which was more useful to you; the 'song affinity' (position of the orb) or the 'music affinity' (size of the orb) aspect? Which aspect would you rather (in some form) find on an actual product? Please briefly describe why. The full list of responses can be found in appendix C Interestingly, most users (9/10) consider the song affinity to be more useful to them. The directness of the song affinity feedback seems to be a big reason for why this aspect of the social context display was preferred. Some participants arguments in favor of the song affinity are as follows:

"Position of the orb, because it changed quite often. The size of the orb didn't change that much, so it was less fun to watch"

"Position of the orb was more clear and visible in how you were represented by the song. It was more easy to follow and recognize Therefore the position was for me the biggest aspect"

While in the minority, some participants do see more value in the music affinity aspect of the social context display. One participant explains their reasoning in the following way: "Size of the orb. It is easier to recognize the fact that you do not listen to one particular song that often. It is more valuable to see the overall interest of people in a group when more songs have been played. This is harder to recognize in person and this way you have evidence to show it." The song affinity being preferred by most users highlights how potent the social qualities of a social context display can be.

These open-ended questions, combined with the quantitative data, were used as a backing for the semi-structured post-interviews. Through these interviews, users were asked to elaborate upon their answers. These interviews subsequently got thematically analyzed. The common themes have been extracted out and the general insights are translated into a selection of key design decisions to consider. These insights are shortly described within the discussion.

6 DISCUSSION

In line with the previous literature, the social context display is generally deemed as an effective tool to inform participants of what is going on within the group. Research summaries such as the DASS framework by Niemantsverdriet et. al [6] provide a detailed guide

on how to design a socially translucent system. This study was positioned as a pioneering application of social translucence in the context of shared co-located music listening. While comparing this novel application to the domains where social translucence is usually applied (CSCW), we see that the strong emotional connection to the subject matter (music) changes the roles that a social context display can and should play. We argue that, within the domain of shared music listening, a correctly made social context display can not only be useful, but also be enjoyable. It is therefore of utmost importance to consider the social implications of the display. In this section we reflect upon some of the design insights gained as a result of the user studies. The following considerations could help in the creation of a socially interesting social context display. These considerations could be seen as an extension to the rules laid out in the DASS framework.

6.1 Social Translucence as a Conversation Starter

Some earlier papers do describe how a social context display becomes a noteworthy conversation starter [1, 3]. We however feel that the emotional connection that users have with music elevated the social capabilities of the display to a level not seen before in the literature. This of course makes sense, since people like to talk about things they are passionate about. What makes our case special is that the impact on the social dynamics was so strong, that it became the most potent part of the design. All the while still maintaining its functions as a socially translucent system that aids cooperation. By making the social context display enjoyable to use in social settings, it becomes less of a 'necessary evil' that is needed facilitate effective cooperation. It becomes a potent tool in the broader scope of social interaction. We therefore suggest to strongly consider the social implications of the design, since we believe that effective cooperation aspect can be significantly strengthened by making users excited to be cooperatively engaged by the design.

6.2 Presence and Absence of Data

Most often, conversations enabled by the social context display were a result of one or two participants having a high song affinity. Participants would quite often point out a high song affinity that they did not expect. Phrases like "I didn't know you listened to this song as well!" or "I for sure thought I would've streamed this song the most!" were used to start a discussion about the song in question. The opposite, however, was also true. A participant not having affinity with a certain song would also raise eyebrows. Other participants were often quick to ask about the discrepancy between what the screen shows, and their internal estimate of how much that person would like that song. Often, there actually was a satisfactory answer as to why this user did not have high affinity with the song. They would for example argue that they prefer the live version of the song, that they mostly listen to this song on a vinyl record, or that they like to watch the video clip on YouTube.

Interestingly, participants pointed out that the absence of song affinity by all members could be used as a way to quickly identify that a song was not put into the queue by anyone; the streaming service added the song automatically as a result of an empty queue.

This highlights how visualization of user affinity can be helpful to identify at a glance which actions were taken by other users. This function could be made more explicit, by showing who added a song within the user interface.

6.3 A Different Kind of Privacy

The only potential downside acknowledged by multiple users was privacy infringement. These concerns are widely discussed within social translucence research, and they are still valid within the context of shared music listening. The emotional connection to the content does however slightly change the nature of why privacy is important. Within computer supported collaborative work (CSCW), privacy must be considered since the socially translucent tools can often also be used as a surveillance system. In our case, privacy deals more with the involuntary outing of personal feelings (towards certain songs). The degree to which users are willing to share personal data is very dependent on the social context. One could imagine how high affinity with a 'guilty pleasure' song would evoke a different emotional response depending on the closeness to the other group members. This makes it quite difficult to design a version of the social context that works in all kinds of group settings. When discussing this issue with the participants, they claimed that making participation voluntary on a per session basis should suffice. We advise to consider the privacy trade-offs on a case-by-case basis.

6.4 Helping Alleviate Low Representation

Within some of the field studies, there was quite a big difference between the music affinities of various participants. When the participants were asked about this difference, they felt that the user with the lowest music affinity was fully within their right to play some songs they would like the most. One badly represented participant mentioned that he did indeed play some songs for himself as a result of seeing his lower representation on the screen. They still ultimately scored lower than the others. The reasoning seemingly being that their preferred music would lower the other affinity scores. There seemed to be a kind of utilitarian mindset: the sum of the enjoyment is more important than variance between affinity values. Furthermore, playing songs only you like will most likely have immediate negative consequences on the mood of the group. This dissuades badly represented users of playing their favorite songs. We feel that the user interface could play an important role here to alleviate some of these pains. Since we have knowledge of all users' song affinities, the interface could potentially help badly represented users by giving suggestions of what to play, all the while keeping the other group members in mind. A social context display with access to relevant user data can use adaptive content to steer the group towards fairer representation for all.

6.5 Timing and Gamification

While initially a bug and not a feature, the social context display would take about five seconds to update after a new song started playing. Unforeseen by the researchers, these five seconds provided an opportunity for participants to play a small game, where they would guess who had the highest song affinity for that particular song. Some users would softly say 'oh exciting' in anticipation of

the screen updating. These short betting games would occasionally help centralize attention back to one point. Participants would for example look up from their phone to see the update, after which they would be back to interacting with the group as a whole. While these interactions were in our case an accidental byproduct of an API rate limit, these kinds of gamified properties could be explicitly designed for. As an example, in our case, the social context display could have been adapted to say 'one user streamed this song 182 times!' before revealing the data. The timing, frequency, and and content of the prompts should all be considered through the lens of the social situation being designed for.

7 FUTURE WORKS

The results presented within this paper provide a promising start for social translucence within shared music listening. There are however a few additional tests that could be done that were outside of the scope of this study. First off, a long-term deployment would be helpful to identify to what degree the social context display suffers from the novelty effect. Barreto et al. [1] describe how their social context display saw an *orientation* phase [5] of approximately 4 weeks, after which they noted a 40% drop in user interactions. Furthermore, while the results show that users do feel more represented within the music that plays, it would be nice to further analyze if this is actually the case in practice. This was originally planned for this study, but due to the limited number of sessions (4) the idea was disregarded since its conclusions would be statistically insignificant. Lastly, we are interested to see how the findings here might be applied to something different than shared music listening, to which users still have an emotional connection. The shortness and replay-ability of music make music a great candidate for a social context display. It would be interesting to see what kind of adaptations would need to be made to apply the same principles to, for example, short-form video.

8 CONCLUSION

This research paper aimed to find out what the effects of social translucency are in the context of shared music listening. We demonstrated that a social context display is not limited to improving collaboration effectiveness. If there is an emotional connection to the underlying content, the display becomes a very potent conversation starter. By most accounts, this secondary functionality has actually proven to be more desired by participants than the first. Participants still strongly validated its functionality as a tool to create awareness and accountability. The result is a social context display that not only improves collaboration, but is also just enjoyable to use. With participants generally claiming better collaboration and an improved social situation, the application of social translucence within shared music listening shows strong potential. Therefore, the sub-questions "How does Social Translucence affect the music being played?" and "How does Social Translucence affect the social dynamics at play during shared music control?" can be answered with: positively. That being said, some key considerations (as laid out in the DASS framework, for example [6]) still need to be taken into account. To build upon these considerations, we highlighted some key insights that may be considered when creating a

socially translucent system that presents data to which users are emotionally connected.

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A SHORT EXPLANATION OF THE UNDERLYING ALGORITHM

This social context display used the participating users' historical streams of the last 365 days. The algorithm looks at the number of streams on the song to create the song affinity number. To make it slightly more fair for users who listen to less music in general, we take the total amount of streams into account when calculating the song affinity. So, 2 song streams would lead to higher affinity for someone with 10 total streams, as compared to someone with 100 total streams. Perfectly balancing these values would be a study of its own, but users generally felt properly represented by the outcome of the screen.

B ANSWERS TO OPEN QUESTIONS

B.1 Question 1

In what ways was the content of the display mostly discussed? What kind of topics would arise as a result of the display?

Everyones music taste

It was funny to see which sad music people listened to. It caused some conversations.

Particular music taste, introducing new music, talking about specifics of a song.

Different music tastes of the group participants Discussing the music genres everyone has in common or different than each other

It gave a bit of a competitive vibe when a popular song came on, because you wanted to be the highest orb.

Music taste

Shared artists, what people like most from certain artists and sharing of new genres

It was a good conversation starter to talk about the artist or similar artists in the genre. Which could then be played.

It was entertaining to see who will like the music you're playing Discussions were had about the song itself and about the quantity of streams users had.

B.2 Question 2

Which was more useful to you; the 'song affinity' (position of the orb) or the 'music affinity' (size of the orb) aspect? Which aspect would you rather (in some form) find on an actual product? Please briefly describe why.

Position of the orb, because it changed quite often. The size of the orb didn't change that much, so i was less fun to watch

Position of the orb. For both questions. Depicted results most directly Size of the orb. It is easier to recognize the fact that you don't listen to one particular song that often. It is more valuable to see the overall interest of people in a group when more songs have been played. This is harder to recognise in person and this way you have evidence to show it.

Position of the orb was more clear and visible in how you were represented by the song. It was more easy to follow and recognize Therefore the position was for me the biggest aspect

The song affinity, because it gave information about the song that was playing at the moment and was for me more usefull for chosing a next song.

Song affinity. More acute and you can change it faster

Position, the size stayed mostly the same so I did not really realise that it had a purpose. Also position, but size might be more interesting if there are larger differences.

The song affinity, but a genre or artist affinity would also be fun since you can like a certain artist or genre without listening to a specific song.

The song affinity, because the music affinity didn't change that much for me

the song affinity was more fun because the feedback is very direct. I think that the music affinity plays more of a role on a semisubconscious level when choosing new songs (e.g, choosing one the person in last place might enjoy)