Personality Traits Predict Music Taxonomy Preferences

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Abstract
Music streaming services increasingly incorporate additional music taxonomies (i.e., mood, activity, and genre) to provide users different ways to browse through music collections. However, these additional taxonomies can distract the user from reaching their music goal, and influence choice satisfaction. We conducted an online user study with an application called "Tune-A-Find," where we measured participants' music taxonomy choice (mood, activity, and genre). Among 297 participants, we found that the chosen taxonomy is related to personality traits. We found that openness to experience increased the choice for browsing music by mood, while conscientiousness increased the choice for browsing music by activity. In addition, those high in neuroticism were most likely to browse for music by activity or genre. Our findings can support music streaming services to further personalize user interfaces. By knowing the user's personality, the user interface can adapt to the user's preferred way of music browsing.

Author Keywords
Personality; Music; Recommender systems; Taxonomy.

ACM Classification Keywords
H.5.2. [User Interfaces]: User-centered design.

Personality & user preferences
Different studies have shown relationships between personality and user preferences. In the music domain Rentfrow and Gosling have investigated the relationship between personality traits and genre preferences. E.g., one of their findings show that extraversion is related to preferences for country, pop, religious, and soundtrack music [16]. In this study we take a broader perspective, and focus on the frequently used taxonomies by music streaming services to order their music collections. We show with our results that the relationship between personality and music is not limited to music preferences, but can be extended to music browsing strategies.

Introduction

With large amounts of music available online, music information retrieval (MIR) plays an important role in navigating through music. Much research has been done on classifying music (assigning textual labels to characterize music) in order for systems to manage music collections and help users find music that they want to listen to (for an overview see [6]). Music streaming services use music classification to organize music in predefined taxonomies for their users to browse through. While "genre" is the most widely used taxonomy, other ways of organizing music have emerged. Popular music streaming services, such as: 8tracks, AccuRadio, Songza, Spotify, [1] incorporate additional taxonomies such as mood or activity to better serve different music browsing needs of its users. These additional taxonomies are in line with findings of how people use music in their lives [12].

While ample research has focused on choice satisfaction with an item, chosen from a set of similar items (e.g., [1]), others have shown that the creation of choice satisfaction already starts at the taxonomy level [10]. Research has demonstrated that additional taxonomies can distract, even when they are not considered relevant for the search of an item [15]. Distraction can raise the search effort because of competing attention [11], and complicate the search for an item [2]. Choosing and making trade-offs between taxonomies becomes challenging when they possess unique or complementary features that are not directly comparable [7]. In the end, it can decrease consumers' preference strength for, and satisfaction with the eventually picked item [10].

The genre, mood, and activity taxonomy used by music streaming services include features that are not directly comparable; they all provide different perspectives to browse for music. Displaying them simultaneously can complicate music browsing, and eventually diminish users' satisfaction with the chosen music and/or the system. Therefore, it is important to understand taxonomy preferences on an individual level. If the system can adapt the interface according to individual preferences by anticipating on taxonomies that may distract, it can contribute to increased user satisfaction. E.g., by emphasizing the user's preferred taxonomy and pushing others to the back, or not showing them at all.

Prior psychology studies have shown that personality is an enduring factor that influences user's behavior, interest, and taste (e.g., [16]; more details in left bar). This started an emerging interest in building personality-based recommender systems (e.g., [18]; more details in next page's left bar). With this work, we contribute to this emerging field by showing that users' music browsing strategy is related to personality traits. For this we use the music browsing taxonomies (mood, activity, and genre) frequently used by music streaming services. Our results can be used to further improve personality-based systems. By knowing the relationship between personality and music taxonomies, we could exploit personality information in order to personalize the user interface and counteract on distracting taxonomies.

This leads us to the following research question:

RQ: *How do personality traits predict taxonomy (mood, activity, genre) preferences in music streaming services?*

We conducted an online user study where we asked participants to interact with a music application. Among 297 participants we found that personality traits are a

[1] http://www.8tracks.com, http://www.accuradio.com, http://www.songza.com, http://www.spotify.com

Personality-based recommender systems
Information about the relationship between personality traits and user preferences have been given interest to improve recommender systems. Tkalcic et al. for example, proposed a method to overcome the cold-start problem by including personality information to enhance the neighborhood measure [18]. Moreover, Hu and Pu found that personality-based recommender systems are more effective in increasing users' loyalty towards the system and decreasing cognitive effort compared to systems without personality information [9].

predictor of taxonomy preferences. We found in line with our hypotheses, that those scoring *high* on *openness to experience* chose *mood*, those scoring *high* on *conscientiousness* or *neuroticism* chose *activity*, and those scoring *high* on *neuroticism* chose *genre*.

How taxonomy preferences can be predicted

Our thesis is that taxonomy preferences can be inferred from personality traits. Personality is considered an enduring factor that influences behavior, interest, and taste. Therefore, knowing one's personality can help to infer their preferences (e.g., music genre preferences [16]). Different models have been created to categorize personality, where the five-factor model (FFM) is one of the most well known and widely used. The FFM consists of five general dimensions that describe personality: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism [13].

In this study, we hypothesize that these dimensions, except for agreeableness, can help us predict users' music taxonomy preference. The agreeableness dimension is related to helpfulness, trusting, and sympathetic [3]. These are factors that we believe are not relevant for predicting taxonomy preferences in this study, and therefore agreeableness will not be further discussed. The dimensions relevant to our hypotheses are discussed below.

Openness to experience
The openness to experience dimension refers to characteristics such as: active imagination, willingness to consider new ideas, divergent thinking, and intellectual curiosity. Those who score high on this scale tend to be unconventional and independent [3]. High openness to experience has also shown to be related to the openness of feelings. It has shown to relate to aesthetic emotions, as well as to greater awareness, clarity, and intensity of their own emotions at the time [17]. As those scoring high on openness to experience are more aware of, and more capable to judge their own emotions, we expect them to be more likely to chose for the mood taxonomy.

H1: *Those scoring high on openness to experience are more likely to choose for mood.*

Conscientiousness
Conscientiousness refers to characteristics such as self-discipline. People that score high on the conscientiousness scale tend to be more organized, plan oriented, and determined compared to those scoring low [3]. They also live lives that are overall less emotional, more balanced, more predictable, and will encounter fewer emotionally intense situations (fewer extreme lows, as well as fewer extreme highs). This dimension is considered to be the least emotionally charged, and is correlated with positive and negative emotions [8, 17]. Therefore, we expect this dimension to be more related to activity and genre, as these taxonomies bear more concreteness and are less emotionally charged.

H2: *Those scoring high on conscientiousness are more likely to choose for activity or genre.*

Extraversion
Extraverts are considered to be very sociable, energetic, optimistic, friendly, and assertive [3]. Findings show that for high extraverts, they might use physical and other energizing activities to distract themselves from negative emotions. However, this is a last resort and is only used when all other paths toward active modification are not available [4]. Although this does not seem to be a situation that would happen often, we think that extraversion may be a predictor for choosing activity.

Tooltip descriptions
Mood:
"Browse for music that fits how you're feeling."

Activity:
"Browse for music that fits what you're doing."

Genre:
"Browse for music by music style."

H3: *Those scoring high on extraversion are more likely to choose for activity.*

Neuroticism
The neuroticism dimension indicates emotional stability and personal adjustment. High scoring on neuroticism are those that frequently experience emotional distress and wide swings in emotions, while those scoring low on neuroticism tend to be calm, well adjusted, and not prone to extreme emotional reactions [3]. Additionally, those who are highly neurotic do not believe that emotions are malleable, but rather difficult to control and strong in their expressions [8]. Previous research has found that music is used to regulate emotions [16]. As neurotic people do not consider emotions to be easily changed, we believe that they prefer to browse for music by activity or genre.

H4: *Those scoring high on neuroticism are more likely to choose for activity or genre.*

Method
To investigate personality and taxonomy preferences, we made use of a fake music application named "Tune-A-Find." This application was created to study user interaction and music preferences in a simulated music streaming service environment. The application consists of a simple interface with three taxonomies (mood, activity, and genre) for participants to browse for music (see Figure 1). A tooltip provided users a description of each taxonomy. We randomized taxonomy order to prevent order effects.

Prior to the start, we told participants that they were going to test a new music streaming service. Additionally, we instructed them to interact with the system in the for them most ideal way in order to limit experience bias.

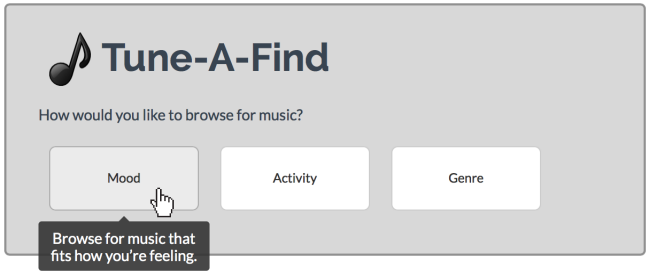

Figure 1: Screenshot of Tune-A-Find with "mood" tooltip. See left bar for all tooltip descriptions.

We collected participants' first taxonomy choice to investigate their intrinsic taxonomy preferences. At the end of the study, we asked them to fill in the 44-item Big Five Inventory on a 5-point Likert scale (disagree strongly - agree strongly) in order to measure personality.

We recruited 326 participants through Amazon Mechanical Turk. Participation was restricted to those located in the United States, and also to those with very good reputation to avoid careless contributions. Participants were recruited at various times of the day to balance night and day time music application usage. Several comprehension-testing questions were used to filter out fake and careless entries. This left us with 297 completed and valid responses. Age (19 to 68, with a median of 31) and gender (159 males and 138 females) information indicated an adequate distribution.

Findings
Using a chi-square test of independence, we tested our hypotheses by looking at the relationship between participants' five personality dimensions and the chosen music taxonomy (mood, activity, and genre). We discuss our results in the following sections. The phi coefficient

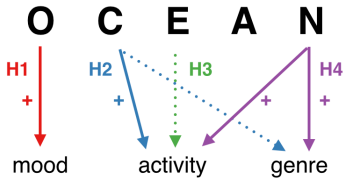

Figure 2: Hypotheses visualization. (O)penness to experience, (C)onscientiousness, (E)xtraversion, (A)greeableness, (N)euroticism. Solid lines represent accepted hypotheses, dotted lines the rejected ones.

(ϕ) was used as the index of effect size. All findings indicate a moderate effect size. A recall of our hypotheses can be found in Figure 2.

Mood (n=68)
Chi-square test results indicated a marginally significant effect between openness to experience and mood $\chi^2(1, N = 297) = 3.117$, $p = .07$, $\phi = .202$. This means that those who scored high on openness to experience were more likely to choose for mood than for activity or genre. All other personality dimensions were not significant.

Activity (n=16)
The chi-square test results for activity indicated a significant effect of neuroticism $\chi^2(1, N = 297) = 12.663$, $p < .001$, $\phi = .306$. Additionally, we found a marginal significant effect of conscientiousness $\chi^2(1, N = 297) = 3.210$, $p = .07$, $\phi = .204$. However, no significant effects were found for extraversion $\chi^2(1, N = 297) = .507$, ns or the other dimensions. Results indicate that those who scored high on neuroticism or conscientiousness were more likely to choose activity.

Genre (n=213)
The chi-square test results for genre showed a significant effect of neuroticism $\chi^2(1, N = 297) = 6.583$, $p = .01$, $\phi = .249$, but no significant effect was found of conscientiousness $\chi^2(1, N = 297) = 0$, ns or the other dimensions. This implies that those who scored high on neuroticism were more inclined to choose for genre.

Discussion

We found that those scoring high on openness to experience are likely to choose for mood (H1). Our hypothesis regarding high conscientiousness was partially supported (H2). High conscientiousness increased preference for activity, but not for genre. This could be explained by the fact that highly conscientious people are characterized as hard-working, task- and goal-oriented (taking to an extreme, they can be workaholics and perfectionists) [14]. Therefore, it can be that those scoring high on this dimension prefer a taxonomy where they can find music that fit their task or goal rather than looking for music based on genre. No significant results were found for our hypothesis between high extraversion and a preference for activity (H3). Extraverts are only likely to use physical and energizing activities as a last resort when all other paths toward modification of negative emotions are not available [4]. This could explain the rejection of our hypothesis, as these kind of situations are unlikely to occur frequently. Lastly, we found support for our hypothesis that those scoring high on neuroticism are more likely to choose for activity or genre (H4).

Conclusion

Our data suggest that personality traits are a predictor for music taxonomy preferences used in music streaming services. Given our results, there are several HCI related implications to consider. Personality information has already been proposed to improve recommendations in recommender systems (e.g., [5, 18]). Based on our results, personality information could be further incorporated to personalize user interfaces. E.g., preferred taxonomies could be displayed prominently, while other taxonomies are less emphasized, or music streaming services could recommend music based on the preferred taxonomy.

The current study focused on independent music taxonomies (mood, activity, and genre), but, for instance, our results show that high neuroticism is related to both activity and genre. People may hence not prefer one music taxonomy, but may be interested in combinations (e.g., sad pop music, funky road trip music, or happy

cooking music). Furthermore, we will look at category preferences within a taxonomy. Such as, categories within mood (e.g., happy, sad, angry), activity (e.g., sleeping, relaxing, partying), and genre (e.g., pop, rock, jazz). Finally, cultural differences could play a role in taxonomy usage. Future work should address this.

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