The Relation between Expectations and Appraisal in Music Discovery driven by Music-related Imagery

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***Abstract* -- This research is an attempt to dissect the relationship between expectations that arise from music related imagery, and the subsequent appraisal of the music itself when discovering music online. A website, entitled Uncover, was developed to detect any disparities between the attractiveness, reliability and usability of three types of music-related images: album covers, promotional images of artists and images made during live performances. This was done by registering and analyzing the behaviour of users while they were discovering new music. While the first two types are relatively common as visual presentations of musical items in online music services, the latter is rarely used. The results of this study confirm that this image type is a valuable addition to the more prevalent image types, while acknowledging that each type has their own strengths and weaknesses. The appropriateness of using certain types of images, will thus depend on the intention behind their utilization.**

Keywords -- Music, Expectations, Music-related imagery.

I. Introduction

Developments such as the proliferation of the internet and affordable consumer technologies, have given rise to an era where everyone has instant- and unlimited access to nearly all the music that has ever been created; practically for free. The drastically diminished costs of digital work stations and studio equipment, as well as a plethora of free online distribution channels, has led to more music being made and released than ever before. We have entered a time of abundance in musical supply (and demand); a condition which requires us to reconsider aspects of the music experience, including listening- and selection behaviour. Rather than managing restrictive factors such as access and costs, these new conditions demand that filtering through the 'noise' (in order to find something worthwhile) has become the main challenge.

Online music services have emerged to assist in this endeavour, but their rising popularity is a cause for both celebration and concern. On the one hand, immeasurable amounts of music can be found and listened to with more ease than ever before. Music that was long forgotten about is being excavated and offered alongside music which was made only yesterday - opening up niches to the greater public. The cost of use is also low, making it less risky for people to try something new. On the other hand, online music services rely on recommendation systems to provide a personalized browsing- and listening experience to their users. By using customer profiling, these services are able to suggest music their users will likely enjoy, based on a growing number of parameters. These parameters have been the object of study for over a decade (mainly in the field of Music Information Retrieval), and can roughly be divided into: musical content (e.g.timbre), musical context (e.g. user tags), user properties (e.g. preference) and user context (e.g. mood) [13]. Some of this information is explicitly available from the audio file or user behaviour. However, many recommendation efforts are based on a technique called collaborative filtering - which uses personal preferences to compare and recommend musical items between seemingly similar users.

While these efforts make sense from a commercial point of view (aspiring to maximize the number of plays), the collaborative filtering technique seems to hinder, instead of assist, the user in discovering new music. It is known to be prone to popularity bias [3], where the music that is listened to the most, is also recommended the most. In effect, only a small portion of the music is effectively being recommended. Additionally, collaborative filtering leads to users getting caught in their personal filter bubble [12], where they are recommended music similar to what they already know or like. The result is a coherent, yet highly regulated and limited selection of music that is being suggested to the user. Alternatively, instead of using profile stereotypes to guide their users through their vast music collections, online music services could aspire to empower their users. This may be achieved by encouraging their users to rely on their own imagination before they select music they wish to explore, by allowing them to better anticipate what is to come. While this envisioning is largely done subconsciously, this pre-listening activity has found to be an integral part of the overall emotional response to music [8] and may thus be beneficial to endorse – potentially allowing the user to explore the music in a less regulated manner.

An principal aspect of this anticipatory process is the visual presentation of musical items. While physical music stores rely on album covers and store decorations (such as promotional flyers for events and music releases) as main means of displaying their supply, online music services have the opportunity to use the plethora of music-related imagery available online - assuming they

appropriately manage relevant copyright and licensing issues. A broad collection of imagery associated with the artist may be used to, for instance, convey information about their age and geographical location. Images conveying information about the music itself may include those that depict stereotypical genre identifiers (e.g. typical fan appearance), lyrical content,and visualisations of the most suitable listening environment. Considering this opportunity, the fact that prominent online music services usually limit the visual presentation of their items to the front of the album cover, and sporadically a promotional photograph, can be considered tenuous. While many types of images may be considered useful to provide users with visual information, we are particularly interested in the potential of images made during live performances. Although this type of music-related imagery is widely available online (though not free from usage restrictions), and possesses a great deal of visual information with regards to the artist and their music, they are used only sporadically in online music services as well as academic research. The information contained in these images are not often found in other types of imagery, for instance the instruments that are being used, the type of venue the artist performs at and the overall atmosphere they create during their performance. We thus feel it is imperative to research the potential use of live performance images in the presentation of both artist and their music.

The objects of study in this research include three types of music-related imagery: album covers, promotional photographs of artists and photographs made of artists during live performances. We are interested to find, any disparity between these image types regarding their attractiveness (the relative frequency that one type is selected instead of the other types) as well as their reliability on providing users with valid expectations, regarding to the music they display. Moreover, we study their ability in helping people find music they enjoy (their usability) - which is the primary goal of online music services and music discovery in general. We hypothesize that live performance imagery are an attractive, reliable and usable addition to the currently dominant types of images used in online music services, based on the rich and unique visual information they contain.

While music related imagery have often been the object of study, we believe that the same cannot be said the of the validity of the expectations they provoke regarding the music they represent. In order to study the relationship between expectations and appraisal, during the discovery of new music driven by music related imagery, we developed an online music services entitled Uncover[1]. This website was devised to register the selection behaviour, the formation of musical expectations and the subsequent appraisal of the music by its users. By posing as an online environment merely existing for the discovery of new music, the ulterior motive of comparing the attractiveness, reliability and usability of the three images types was purposely obscured, since this could potentially influence visitor behaviour. Furthermore, the website was designed to mimic the aesthetic and convenience of existing online music servicesin order to avoid the user from being too aware that they were surveyed. The name Uncover was chosen to reflect our efforts in replacing album covers with alternate image types, as well as creating an environment where users were able to uncover new music.

This paper is structured as follows. In section II, relevant academic work will be reviewed, considering developments in music selection behaviour and the relationship between visual presentation and the music itself. Also, the increasing importance of live performances in the modern music industry will be illustrated. Section III describes the methodology used in the Uncover project, in order to expose any differences between the three image types, regarding their attractiveness, reliability and usability for music discovery. In section IV, the results will be presented, and their implications will subsequently be discussed in section V. The final section VI will summarize and conclude the study.

II. CONTEXT

This section gives an overview of previous research relevant to this project. Here, we aim to demonstrate the potential and necessity of using new types of imagery in the visual presentation of music, with a focus on images made during live performances. We have identified three principal developments that have produced this specific interest. First, changes in music listening- and collecting behaviour caused by technological developments will be examined, underlining the need to facilitate users in browsing music collections more efficiently. Second, we will elaborate on the relationship between music and their visual presentation, advocating the opportunity of using a broader range of image types. Finally, recent developments in the dominant business model of professional musicians will be examined to emphasize the incremental importance of live performances in the modern music industry - while substantiating our decision to focus on images made during these performances. Before investigating these developments, however, it is important to illustrate the role and significance of expectations, in the context of music.

A. Expectations in music

Auditory learning is largely shaped by the frequency of occurrence of auditory stimuli. What we expect musically, is reflection of what we have encountered in the past - a phenomenon known as the mere-exposure effect [16]. Being able to correctly predict the future has significant biological advantages: it allows us to take action in order to increase the likelihood of a preferred outcome, and aids us in avoiding danger. In the context of our research, this amounts to the advantage of being able to predict what a musical item will sound like, and deciding whether or not it is in your interest to delve into (to avoid wasting time and energy). It has also been suggested that, instead of merely causing a bias towards familiar items, people receive lot of pleasure from this ability to make correct predictions about the music, a phenomenon dubbed the prediction effect [8]. In short, people do not only like what they have encountered before - they also enjoy finding their expectations to be valid. This supports the idea that online music services could choose to inform rather than guide their users, by stimulating the interplay between prediction and appraisal.

[1] http://www.uncoverthemusic.com/

When browsing for music by utilizing online music services, the construction of expectations regarding music is usually based on a combination of textual (e.g. descriptions, reviews and number of likes), visual (e.g. album covers or promotional photographs) and auditory (e.g. audio samples) information. While the latter is generally regarded as the most obviously suitable source of information, the visual aspect is probably the most effective feature to form expectations on when browsing through the large collections of music provided by these services. Not only is it faster to assess a multitude images than it is to absorb textual information or listen to audio samples, it is also impossible to preview musical items while simultaneously listen to another piece of music. The visual presentation of a musical item also plays an important part in the complete musical package. For example, album covers are usually designed to resonate with the musical content they portray, and promotional photographs of artists can be considered deliberate attempts of identity formation.

B. Collecting music in the digital age

The dawn of the digital age has had its consequences on the way people listen, collect and select music, as tangible items (such as vinyl records) are steadily being replaced by digital files as the main musical format. This development has caused the number of physical record shops to be in decline for most of the past decade, alongside a diminishing support by technology companies for these older media formats[2].

Collections of tangible music items have been regarded as being an extension of the owner's identity [7]. It indicated that a relationship existed between the owner and the artists found in the collection, and the music collection could be seen as a cultural autobiography - as many items were inextricably connected to specific moments during the owner's life. Collectors of digital music, on the other hand, were found to be less committed to their music collections. This was mainly due to the fact that the act of downloading a song and buying a tangible item were not found to be equally valuable experiences, and that digitally stored music is more transient: files are easily lost, deleted and replaced. In comparison to hard copy collectors, who were found to be more committed to the artists they supported, digital music collectors were more eclectic in their downloading and listening behaviour [7]. Since they are less restricted by financial-, availability- and physical storage restrictions, they are able to sample a broader variety of music, and support a larger number of different artists.

As people are collecting larger and more varied collections of digital music, the ease of browsing this collection becomes increasingly important. As we shall see in the following paragraph, the visual presentation of musical items has always played an important role in this filtering activity. However, this role is becoming even more decisive as the supply of available music increases.

[2] This is exemplified by the discontinuation of the Technics SL-1200 MK-II vinyl turntable in 2010, and the absence of a CD player on the current generation of Apple laptops.

C. Visual presentation

Studies show that while the main perception of music revolves around the listening experience, the visual presentation plays an important role in how people select, classify and evaluate music. For instance, both album covers and promotional photographs have been found to contain valuable information that allows people to place them into a musical context [10][11]. This is exemplified by the fact that, while shopping for music, people us album covers to identify items of music-genres they enjoy [4]. While the most basic function of music packaging has traditionally been the protection of the record contained, the cover design also serves as a visual representation of the music, as well as a marketing tool for the artist [9]. The elements that make up a 'good' cover design have been considered those out of which a personality emerges: a package suitable only to that particular artist, serving as a mental image for the music contained.

Over time, the attributes of album covers have undergone countless alternations based on changing packaging constraints. The design attributes of the long-playing record (LP) format,which became the industry standard from 1948 onwards, were very different from those of the audio cassettes introduced in the 1970s, and the ensuing compact disc (CD) introduced in the 1980s. While the most obvious difference was size, another issue was the way these formats were browsed. While vinyl records were mainly seen from the front, both cassette tapes and CDs were often browsed from the side, which only included the names of the artist and the record. Since then, devices such as PC's, laptops, portable music players and smart-phones have become the predominant means for browsing and listening to music. These devices brought forth both new opportunities and limitations for the visual presentation of music. Issues such as screen size, image quality and connection speed force artists, music stores and other media services to reconsider the visual presentation most suitable for their promotional activities. These contemporary devices allow for completely new forms of visual presentation, some of which have been embraced by both the music industry and the public. An example of this is the music video, which was inspired by commercial television advertisements in both format and purpose [2], and became an important component of the promotional package since the 1980s. More recently, artists have been experimenting with interactive websites, mobile phone applications and visual albums to accompany the release of a new album[3].

In the course of history, the visual presentation of music has often adapted in correspondence to developments in the media formats that were being utilized. Currently, as the devices used to browse and listen to collections of music are becoming smaller, the interfaces and imagery used on these devices need to be increasingly informative. This development demonstrates both the potential and necessity to experiment with a broader range of image types, in the visual presentation of musical items.

[3] Björk released her album Biophilia in 2011 in the form of a series of mobile phone applications - calling it the 'world's first app album'. In 2013, Beyonce released her self-titled 'visual album' by accompanying each of the tracks with a short film.

D. Live performances

In the past decade or so, a major disruption of the dominant business model for music releases has occurred, causing live performances to become an increasingly important part of professional musicianship. As copying and sharing digital content has become commonplace, securing an income through copyright enforcement has become an increasingly difficult and ineffective endeavour. As some have noted, paying for music has, to a certain extent, become voluntary. In economic terms, music has become what can be characterized as a public good: being both non-excludable and non-rivalrous in consumption. These circumstances have led many people to believe that the future of the music business lies in one of its last unique, excludable and non-duplicable products: the live performance. Some believe that 'the era of copyright' is over and 'the era of live performance' is at hand [14]. Whether or not this is truly the case remains to be seen. However, recent study shows that for many musicians, the income generated by performing outweigh the earnings from streaming revenues and record sales [5].

While live performance imagery is often used for the promotion of these live performances, it seems reasonable to suspect that they can also be used to inform people about an artist in more general terms. It has been proposed that, during live performances, artists are not merely performing the music they have recorded. Rather, they also perform what may be called their musical personae (or image) by actively managing the impression which they leave on the audience [1]. When judging a live music performance, people have surprisingly been found to depend primarily on visual information, rather than auditory input [15]. This was due to fact that many aspects of the performance are predominantly, or even exclusively, visual. For instance, facial expressions, body language and overall appearance both inform and influence the perception of the performance [6]. Other information exclusively found in live performance imagery are, for example, the instruments being used, the type of setting the artists performs at and the overall atmosphere created during their performance.

While this section has hinted at the potential of using live performance images as sources of information, to the best of our knowledge no research has yet been done on their usability in assisting people to discover new music they may enjoy. The following section will describe the approach we took to investigate this potential.

III. METHODOLOGY

The research described in this paper was aimed at finding out whether certain types of images are more advantageous than others, in informing people about the music they portray, and assisting people to discover music they enjoy. This was meant to help clarify the relationship that exists between expectations and the subsequent appraisal of music. Also, we were interested whether or not live performance imagery is a valuable addition to the visual presentation of music (next to the prevailing album covers and promotional imagery). To find out, we developed an online experiment in the form of an online music service, entitled Uncover[4]. By using an interactive environment instead of a survey, we were able to capture more detailed and less premeditated behavioural data. This website was initially spread via e-mails and forums, but further disseminated through social media. Over the course of approximately one month - starting on the 3rd of July, 2014 - the behaviour of its visitors was registered and stored in a database.

A. Content

On the website, visitors were asked to select music based on an image gallery containing three types of images: Album covers (A), Live performance photographs (L) and Promotional photographs (P). We decided to also include the back of the album cover. While these are usually omitted in most online music services, they may also contain valuable information about the musical item (such as track titles), and may thus be another interesting addition to the visual presentation. Overall, the back and the rear cover will be considered combined as (A), but wherever appropriate, a distinction will be made between Album cover Front (A*f*) and Album cover Back (A*b*).

The artists available on the website were selected first and foremost on their relative obscurity. In order to allow the user to form fresh expectations, it was important to limit the chance that the user already knew the artists. We did not, however, intend to delve too deeply into obscure niches, since this would possibly negatively influence the likability of the certain artists. We also decided to only include artists who had recently (since January 2013) released a new album. This, we figured, would further diminish the chance people already knew the artist. To compile the final collection of artists, we turned to the collection of music offered on an established online music vendor: Boomkat[5]. This web shop focuses on music that, as they proclaim, 'exists beyond the radar', and could be labelled as alternative, underground or independent.

Aside from being relatively obscure and contemporary, the artists chosen for the website also needed to satisfy a number of other criteria. First, they needed to have both promotional and live performance imagery available online. Second, these images needed to be of sufficient image quality. Third, the artists needed to have released a music video for one of the tracks from the album. The decision to use music videos instead of audio clips was based on their integral role in artist image formation, as well as to accentuate the synergy between audio- and visual presentation. We also believe that music videos perform better at capturing the attention of the visitor compared to audio clips, causing them to be less distracted and thus providing us more reliable data.

After omitting several artists that we thought to be too popular, a total number of 70 artists were found that satisfied each of the above criteria. For each of these artists, the images: A*f*, A*b*, P (2 in total) and L (2 in total) were taken from online sources. An aggregate of 420 images were then cropped to a similar size for uniformity, and mitigating bandwidth usage, additionally allowing visitors to visit the site on their mobile telephones.

[4] http://www.uncoverthemusic.com
[5] http://www.boomkat.com

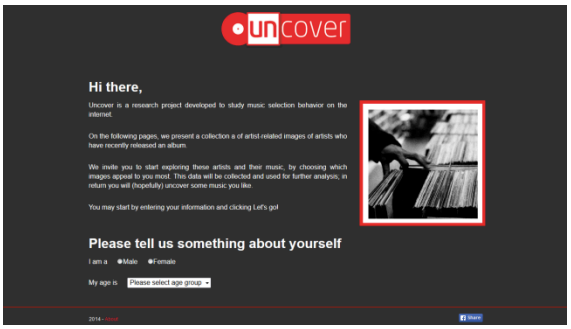

Figure 1 - Welcome page

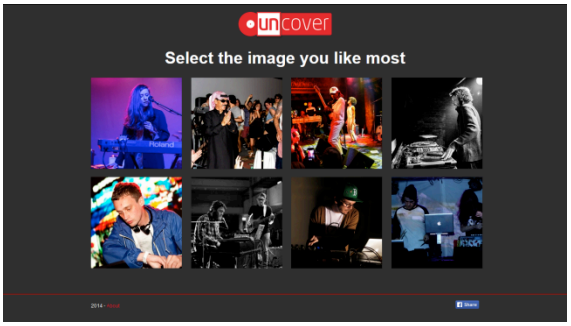

Figure 2 - Image selection page

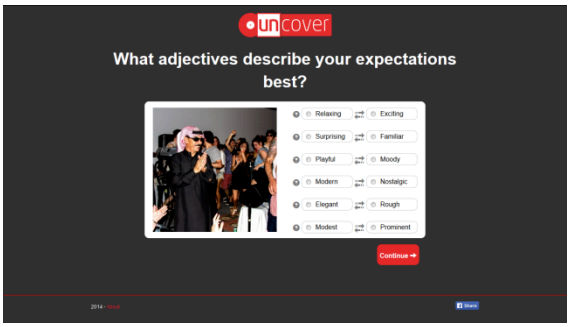

Figure 3 - Adjectives selection page

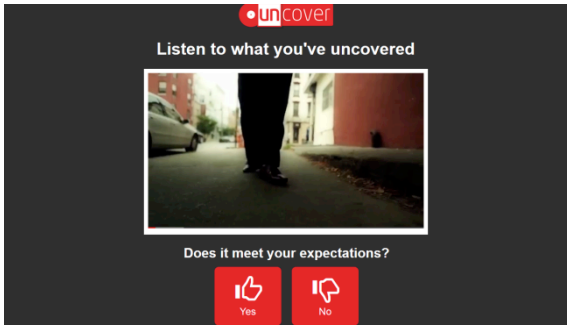

Figure 4 - Evaluation page

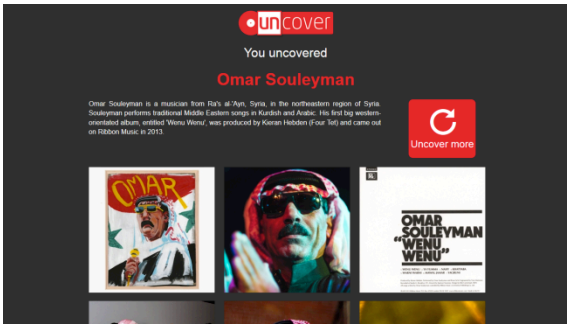

Figure 5 - Artist page

B. Visitor experience

This section demonstrates the flow of the Uncover website, describing how it would typically be experienced by a visitor. When she participates for the first time, she will arrive on the Welcome page (see Figure 1), where she is able to read a short introduction about the project. It is important to note that there is no mention of what the goal of the research is, as this may bias the visitor into selecting certain types of images over others. After reading the introduction, she is asked to enter her age and gender.

She is then shown eight images on the Image selection page (see Figure 2), from which she is asked to select the image that she likes most. Both the artists and images shown on this page are randomly chosen. However, the image types that are included on this page are determined by one of three experiments, randomly chosen for each visit. One experiment is a mixture of images including every image type: (A), (L) and (P) - we shall refer to this as the MultipleImage experiment. The second experiment is a mixture of only (L) and (P) images, we shall refer to this as the LivePromo experiment. The SameImage experiment depicts a collection of images from only one image type: (A) or (L) or (P).

After choosing the image she likes most, the visitor reaches the Adjectives selection page (see Figure 3). On this page, she is asked to make a selection out of a predetermined list of opposing adjectives - which are aimed at helping the visitor in expressing the expectations that the chosen image provokes, about the music it displays. These adjectives were chosen based on their appropriateness in describing music, and on their opposing nature, which allows the visitor to consider which end of a spectrum their expectations are situated. The pairs of opposing adjectives were: Relaxing/Exciting, Surprising/Familiar, Playful/Moody, Modern/Nostalgic, Elegant/Rough and Modest/Prominent.

When the most applicable adjectives had been chosen, the visitor was able to watch a music video from the artist on the Evaluation page (see Figure 4). Whilst viewing and listening to the music video, the visitor was asked to answer three questions. First, whether or not she already knew the artist. This was important to note, as the research was aimed at studying the behaviour of people discovering new music, and visits where the user already knew the artist were thus to be omitted from the final dataset. Secondly, the visitor was asked whether or not the music met the expectations that were raised by the chosen image. Finally, the visitor was asked whether or not she liked the music.

By answering these three questions, the visitor was able to go to the Artist page (see Figure 5), where she would uncover the identity of the artist she had selected. Along with the name of the artist, this page included a short description of people behind the musical project, their previous work and information on their recent release. This page also showed all the images we had selected for this artist, as well as links to the music video and the artist's discography. By clicking the Uncover more button, the visitor was able to return to a refreshed Image selection page, inviting her to repeat the process.

C. Data collection

For each visit, an entry within the website's database was created and maintained. Each entry contained several attributes, and the visit was only registered when every attribute had been successfully entered (meaning, all the steps of the website had been completed). Together, these attributes served as the representation of the visitor's behaviour, given the stimuli that were provided to them.

First, a unique visitor ID was registered and subsequently linked to the visitor's IP address, allowing us to recognize a unique or returning visitor and their geographical location. Second, the gender and age group of the visitor were documented. Third, we made note of the experiment (MultipleImage, LivePromo or SameImage) that was used to determine which images were displayed on the Image selection page. The fourth attribute was the image, and artist, that had been selected. The fifth attribute was the collection of adjectives that had been chosen by the visitor to describe their expectations. The sixth, seventh and eighth attributes were True or False answers to the questions whether or not the visitors already knew, expected and enjoyed the music. The final attribute was the date and time at which the experiment was completed.

After the data had been gathered, we decided to remove a number of entries to attain a clean, complete and unbiased dataset. First, the entries where the visitor had indicated they already knew the artist were omitted, since we were only interested in the behaviour of people discovering music unknown to them. Secondly, a number of entries were removed where no adjectives had been chosen, and where the visitor had additionally answered False to the subsequent questions about whether or they knew, expected or liked the music. While these entries may have been legit (it is possible that no adjectives were appropriate for a particular image and the visitor had a negative response to each of the enquiries), they were considered to be incomplete, and thus unusable for the research. The only entry by a person aged younger than 20 years old was also omitted, so that a more orderly age-group distribution was achieved. In total, 39 entries were removed from the dataset.

C. Technical design

For the creation of the website, it was necessary to develop and integrate three separate components. The first was the web server, which was written in ASP[6], a free web framework for building websites. The second component was a SQL database, hosting all the artist- and visitor information. The third and final component was a storage environment, on which all the images were stored. The website is hosted on Microsoft's Azure[7] cloud platform. The logo of the project was designed using Adobe Illustrator, and the website design was made using an application called MACAW[8].

[6] http://www.asp.net/
[7] http://azure.microsoft.com/
[8] http://macaw.co/

IV. RESULTS

This section gives an overview of the data that was gathered through the Uncover website. The interpretation of this data, including her implications, shall be presented in the subsequent Discussion section. The goal of this data collection was to clarify the relationship between expectations and appraisal in music discovery, and to compare selection frequency (attractiveness), expectation validity (reliability) and like rates (usability) amongst image types. Additionally, we were interested to find any differences that may exist between age groups and gender.

A. Population

After omitting the unusable entries, 324 entries from 78 unique visitors remained, resulting in an average of 4,2 visits per unique visitor. The majority of visits originated from The Netherlands, however, several of the visitors stemmed from different countries, namely: Austria, France, Greece, The U.K., The U.S.A., Thailand and Turkey. As Table 1 shows, the population was predominantly male, and 60% of the visitors was between 25 and 34 years of age. A relatively large portion (20%) of the visitors was over 54 years old.

B. Attractiveness

Table 2 shows the website visits, distributed over experiment and image type. The experiment used to determine the images that where displayed (as well as the image type used in the SameImage experiments) was not chosen deliberately by the visitor but was randomly determined. The MultipleImage experiments included every image type in the collection of images presented on the Image select page. It is therefore most suitable experiment for giving an overall impression of selection behaviour. As the table shows, (L) images were selected most often (47 times, or 40%), followed by (P) images (39 times, or 34%) and (A) images (30 times, or 26%). Interestingly, there is hardly any difference between the amount of times A*b* and A*f* had been selected. The LivePromo experiment was performed to compare the (L) and (P) image types. As the Table 2 shows, the selection frequency was found to be evenly distributed: (L) images were chosen 50 times, (P) images 49 times.

C. Reliability

This section encompasses the relative validity of the expectations that were elicited by the chosen images, illustrating the reliability of the three image types in terms of setting valid expectations regarding the music. We determine this by looking at the answers the visitor had provided on the Evaluation page, where they were asked whether or not their expectations (expressed on the Adjectives selection page) were deemed to be valid. Table 3 shows the distribution per image type, over whether or not the music was expected and liked. Overall, 57% (185) of the total number of 324 visits involved images that provided the visitors with valid expectations. Distributed over image type, the percentage of valid expectations from total visits is 50% for (A*b*), 68% for (A*f*), 58% for (L) and 55% for (P). It is important to remember that while (A) appears to be relatively reliable, the amount of times these images were presented to (and thus selected by) the visitor is much lower than the other image types.

D. Usability

The usability of the different image types is determined by looking at the ratio they have led visitors toward music they enjoyed, regardless of their reliability. This information is obtained from the answers the visitors provided on the Evaluation page, where they were asked whether or not they had enjoyed the music. Table 3 and 4 show the distribution per image type, over whether or not the music was expected and liked in absolute and relative terms. When ignoring reliability, a total number of 198 images have led to the visitors enjoying the music (which leads to an overall like rate of 61%. The like rate of reliable images (74%), was higher compared to that of the unreliable images (44%), supporting the existence of the mere-exposure, or prediction effect. When we examine the like rate of the reliable images, distinguished per image type, these were found to be: 71% for (A*b*), 84% for (A*f*), 76% for (L) and 69% for (P). Again, the like rate of (A), 79%, needs to be considered as indicative rather than conclusive, based on their lower frequency.

E. Additional results

Another possibly interesting result is the ratio of visits where the image did not set valid expectations, but nonetheless led to the music that the visitor enjoyed (also known as serendipity). In aggregate, 44% (61) of the images that had not led to valid expectations were liked. Divided over image type, the rate was found to be: 47% for (A*b*), 42% for (A*f*), 40% for (L) and 48% for (P).

Table 5 and 6 show the distribution of the expectation and like frequencies, distributed over age groups and gender respectively. Regarding gender, the most striking difference between male and female visitors was the relatively low frequency of serendipity found in females. In only 31% of the entries where the image did not provide valid expectations, the music was enjoyed nonetheless. In contrast, in approximately 50% of the entries where male visitors had invalid expectations, serendipity occurred. The most remarkable finding in Table 4 is that visitors between the ages of 25 and 29 most frequently had valid expectations (86 out of 134 instances, or 64%). While visitors older than 54 also frequently had valid expectations (61%); visitors aged between 20 and 24 had the lowest frequency (40%). This table also shows that visitors older than 54 had the highest like rate when having valid expectations (34 likes out of 40, or 85%).

The adjectives provided on the Adjectives selection page were only provided to assist the visitor in expressing their expectations. However, the Surprising/Familiar opposition tells us whether the visitor was expecting the music to be relatively conventional, or more eccentric. This assessment made by the visitor is important when she is actively trying to discover music that is unlike anything she is used to hearing. Table 5 shows the amount of times the music was expected to be Familiar, Surprising or that it was intentionally left blank (meaning that this attribute was not appropriate for the chosen image). Approximately half (158, or 49%) of all the images led to the visitor expecting more peculiar types of music, while 32% (103) was thought to display fairly common types of music. In 19% of the images, the visitor deemed other attributes more fitting in expressing their expectations.

Age group	Female	Male	Total
20-24	22	10	32
25-29	43	91	134
30-34	6	57	63
35-44		7	7
45-54	5	18	23
54plus	29	36	65
Total	105	219	324

Table 1 - Visits, distributed over Age group and Gender

Experiment	A*b*	A*f*	A	L	P	Total
MultipleImage	14	16	30	47	39	116
PromoLive				50	49	99
SameImage	15	21	36	40	33	109
Total	29	37	66	137	121	324

Table 2 - Selection, distributed over Experiment and Image Type

Evaluation	A*b*	A*f*	A	L	P	Total
Expected	14	25	39	79	67	185
&liked	10	21	31	60	46	137
&disliked	4	4	8	19	21	48
Unexpected	15	12	27	58	54	139
&liked	7	5	12	23	26	61
&disliked	8	7	15	35	28	78
Total	29	37	66	137	121	324

Table 3 - Expect & Like, distribution over Image Type (#)

Evaluation	A*b*	A*f*	A	L	P	Total
Expected	48%	68%	59%	58%	55%	57%
&liked	71%	84%	79%	76%	69%	74%
&disliked	29%	16%	21%	24%	31%	26%
Unexpected	52%	32%	41%	42%	45%	43%
&liked	47%	42%	44%	40%	48%	44%
&disliked	53%	58%	23%	60%	52%	56%
Total	100%	100%	100%	100%	100%	324

Table 4 - Expect & Like, distribution over Image Type (%)

Evaluation	20-24	25-29	30-34	35-44	45-54	54plus	Total
Expected	13	86	32	4	10	40	185
&liked	9	62	20	4	8	34	137
&disliked	4	24	12		2	6	48
Unexpected	19	48	31	3	13	25	139
&liked	7	23	17	1	2	11	61
&disliked	12	25	14	2	11	14	78
Total	32	134	63	7	23	65	324

Table 5 - Expect & Like, distributed over Age group

Evaluation	Female	Male	Total
Expected	57	128	185
&liked	42	95	137
&disliked	15	33	48
Unexpected	48	91	139
&liked	15	46	61
&disliked	33	45	78
Total	105	219	324

Table 6 - Expect & Like, distributed over Gender

Adjective	A*b*	A*f*	A	L	P	Total
Familiar	7	3	10	54	39	103
Surprising	15	28	43	52	63	158
Left blank	7	6	13	31	19	63
Total	29	37	66	137	121	324

Table 7 - Expectations on Familiarity, distributed over Image Type

Attribute	A	L	P	Overall
Attractiveness	26%	40%	34%	-
Reliability	59%	58%	55%	57%
Usability	79%	76%	69%	61%

Table 8 - Overview of the attractiveness distribution, reliability rate and usability rate of the three image types

V. DISCUSSION

This section gives an analysis of the results regarding the attractiveness, reliability and usability of the three image types (collected in Table 8). Additionally, their implications for both music services and professional musicians shall be discussed, as well as the opportunities to extend and reinforce the results in the future. However, we first consider the results that clarify the relationship between expectations and appraisal.

A. Expectations and appraisal

Overall, most visits to the Uncover website resulted in the visitor forming valid expectations based on the images they chose, as well as liking the music they discovered. Additionally, most of the people whose expectations turned out to be valid, also ended up enjoying the music they uncovered. While this may be seen as evidence in favour of the mere- exposure, or prediction effect, the relationship between expectations and subsequent appraisal was found to be more complex. This is exemplified by the instances where the visitors had not expected the music, but had nevertheless liked it (serendipitous music discovery), as well as the instances where the visitor had valid expectations regarding the music, but had disliked it. These instances show that having valid expectations may lead to both delight predictability as well as disappointment, and that the element of surprise should not be underestimated. Furthermore, the result that female visitors were found to be less willing to be surprised, suggests that the strength of this familiarity bias varies between distinct demographic groups, as well as individuals.

B Album covers

Album front covers appear to perform best at both allowing visitors to form valid expectations, as well as leading to music they liked, yet were found to be the least attractive image type. As has been noted, since their relative frequency of occurrence during the experiments was relatively low, this finding needs to be considered as indicative rather than conclusive. That being said, the results demonstrate that the album front cover is still one of the most effective forms of visual presentation, being the best performing image type in both reliability as well as usability. The album back cover, however, performed the worst of all image types, except in the case of serendipitous music discovery - where it performed best. Surprisingly, the album back cover was chosen almost as often as the front cover. We speculate that the reliability and usability of the album front cover stem from their historically dominant role in the presentation of musical items. Seventy years since it was first introduced, the album cover has become a cornerstone for visually presenting music, and people have possibly grown adept at interpreting its markers.

C. Live performance imagery

Live performance images were selected more often than both album covers and promotional photographs in general, and in the MultibleImages experiment (making them the most attractive image type), but this inclination disappeared when pitched against only promotional images in the PromoLive experiment. They also performed relatively well at allowing the visitors to develop valid expectations: they were found to be more reliable than promotional imagery, and only slightly less reliable than album covers. Live performance imagery also outperformed promotional imagery when considering usability - resulting in relatively more music being liked. The exact reason for this remains unclear. While it is possible that live performance images allow the viewer to absorb and dissect the artist's musical persona, it is also possible that this type of imagery is more interesting to look at. Live images may simply contain more visual information, demanding the visitors to immerse themselves in the picture if they wish to see what is going on. Additionally, photographs made during live performances sometimes capture the raw energy of the event, showing an artist in the midst of their performance. This potentially causes the images to be more exciting and authentic than the other image types, which are often more restrained and stylized - offering a possible explanation why people might be more attracted to them.

D. Promotional imagery

As Table 2 shows, promotional photographs were chosen only slightly less often than live images in the MultipleImages experiments, and this difference was even more negligible in the LivePromo experiment. However, these images performed rather poorly at delivering valid expectations. What this illustrates is that promotional imagery, while being attractive, are relatively unreliable sources of information. While these images range from being relatively bare (e.g. the face of an artist), to being highly stylized (often a conscious attempt to create a uniform and easily recognizable visual package), they seem to be a more artificial attempt of personality formation, as compared to the authenticity of the musical personae depicted in live performance imagery, and it seems that visitors are less captivated by this relatively contrived form of visual presentation. The unreliable character of these images may be purposely employed by artists and online music services, however, to obscure the music that is being portrayed - confounding the potential listener and forcing her to listen to the music before being able to appraise it. This would potentially allow the artist to surprise their potential listeners, an insight that can also be seen found in Table 7. Here, the majority of promotional images were thought to lead to Surprising music - music the user had never heard before.

E. Implications for music services

The results found in this research show the usability of using live performance images, establishing them as valid sources of information to be used during the discovery of music. As they have also been found to be both attractive and reliable sources of information (more attractive and reliable than the frequently used promotional imagery), online music services and users could benefit from the inclusion of live performance

imagery in the visual presentation package is provided for each artist and musical item. Doing so would allow the users of these services to form more valid expectations before listening, supporting them in making a more informed, autonomous decisions. This form of user empowerment could potentially become a competitive advantage for online music services, seeking to differentiate themselves from similar services in the near future. Alternatively, online music services could also choose to use the information contained in these images as parameter used to improve their recommendation systems.

F. Implications for artists

The type of image most suitable for visually presenting or promoting an artist largely depend on their professional and artistic intentions. Some artists actively try to become more popular by increasing their exposure to the public - requiring a more open, inviting attitude compared to artists who want to remain relatively obscure. Artists with a more inviting attitude are likely to benefit from using live performance imagery in their promotional activities. These images will improve the accessibility of the artists by informing their potential audience in a less contrived manner, in comparison to promotional imagery. In contrast, artists who wish to remain more obscure may be better off using promotional imagery to intrigue potential listeners, create more room for the unexpected.

Another element that determines the image type most appropriate for an artist, is their targeted audience. In general terms, females were found to be less open to surprises than men: the chance that they liked something they had not expected beforehand is relatively slim. This insight, if generalizable, would require artists with a predominantly female audience to use live imagery and album front covers rather than promotional imagery, based on their superior reliability of providing valid expectations. Additionally, this insight could also be used by online music services where information regarding gender has already been established. While there seems to be some dissimilarity between age groups concerning the most effective image type, these differences were too modest to be generalized.

G. Future work

To get a deeper understanding on these issues, as well as the attractiveness, reliability and usability of the three types of images (as well as insight into the usability of additional image types) - further research is required, including in-depth interviews with the visitors of the site. These interviews would allow us to comprehend, for instance why certain types of images are preferred over other types, and find out what differences exist in the behaviour of people of varying gender and age. Besides conducting interviews, the research would benefit from extending the period of the data gathering. Since the data only included visits during the first month after the launch of the website, extending this period would allow us to include additional visits - either reinforcing the certitude of the existing conclusions, or possibly leading us to a different set of insights.

H. Limitations of the results

While the results found in this paper indicate the relative strengths and weaknesses of each of the different image types, it is difficult to interpret the visitor behaviour leading up to these findings. It is also hard to determine to what extent the results have been influenced by the selection of artists used for research (which, ironically, constituted a filter bubble), the images chosen for each artists (differences between images possibly biasing the research), or the way the research was designed (the use of attributes and the way the questions were asked). We acknowledge that these ambiguities may limit the scope of the results, yet we are convinced the findings are sufficiently robust in order to accomplish the goals we had initially established.

VI. CONCLUSION

This research has been a first step in illuminating the relationship between expectations that arise from music related imagery, and the subsequent appraisal of the music itself when discovering music. While album covers and promotional imagery are still the dominant image types used in the visual presentation of music, the research described in this paper illustrates the potential of using images made during live performances in order to inform users on the artist and their music. The Uncover website was developed to register the behaviour of people while they select music they wish to discover, based on several types of imagery. This effort was primarily aimed at finding any disparities between the attractiveness, reliability and usability of album covers, promotional imagery and live performance imagery.

The results indicate that album (front) covers still serve as a reliable and attractive portrayal of the music, likely based on their long standing association with musical items. The promotional imagery have found to be the least reliable for creating valid expectations, but may nonetheless be valuable in order to decipher the artist's personality. The image type that interested us the most, however, were the images made during live performances. As we had hypothesized, these images were found to be an attractive, reliable and usable addition to the currently dominant types of imagery used in the visual presentation of music. These findings lead us to conclude that both contemporary music services, as well as artists themselves could benefit from using live performance images in the visual presentation of their musical items. However, this benefit may differ depending on the intentions these services and artists may have, as well as differences between their (potential) users and audience.

As changes in the demands of visually presenting music are inevitable, online music services and professional musicians need to embrace these changes - and strive to utilize the new opportunities that will arise.

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