AD 691 | Design and Culture Seminar
Color in Streamed/Downloaded Digital Popular Music
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Abstract

This paper investigates the relation of music and image in the context of making a choice on which song to listen to. This broad topic, how much the image affects people's listening choices, is narrowed by time, element and medium for the purposes of this study. The element of color in both image and sound is taken as the main variable that will be focused on. Color is chosen for the comparison since it is used as a common term between the people, who design the visuals, and the people, who design the audio, in theatre. The time era is limited to online-listening-era, where people use programs like Spotify, Amazon, Grooveshark and iTunes for listening. Since, these platforms allow one to get access to individual songs rather than the whole album, individual songs or singles are taken as the examples. Later emotional responses to the covers and the songs are collected and compared to each other. Unfortunately, the research results are inconclusive and indicate that the images might or might not reflect the song and there is not strong tendency for either way.

1. **Introduction**

Today, most people no longer buy or sell vinyl records, cassettes or CDs. Instead, they buy or stream music from online services such as Spotify, Amazon and iTunes. Thus, the covers and the booklets are mostly gone or as Peter Saville, an album cover designer, would say it is dead (Gregory 2008). However, the cover images still exist with different design ideas. In one sentence, it can be said that the booklet of a cassette or CD is very different from the poster-like cover of a vinyl, which is also different then the image file accompanying the digital version. The below figures show main pages of Spotify, Amazon and iTunes.

Figure 1: Spotify
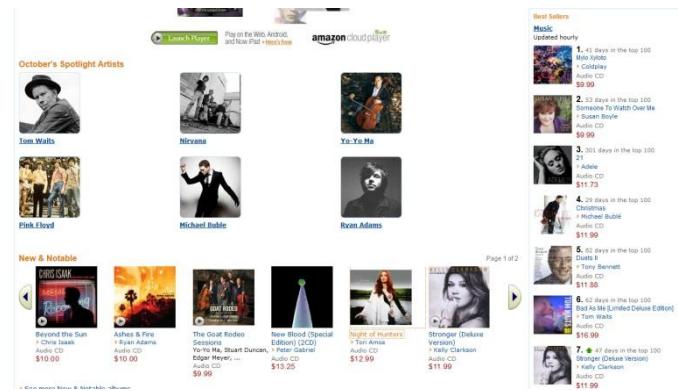
Figure 2: Amazon

Figure 3: iTunes

The three images show that the stores are image heavy and suggest that the images play an important role in our choice. At that point, one can argue that the CDs and cassettes are also put onto the shelves so that their covers are facing the customers. However, there is another main difference that comes with the change in medium is the pricing and accessibility. Today, one can buy a song for price ranging around free (Spotify) to around 1 $ (Amazon)[1] while the prices of the physical mediums were much more expensive at their respective times. Thus, one is much freer from economical binds that might limit their impulsive buying based on their first impression that is solely based on the images.

The question that arises is that, are these graphics heavy user interfaces suitable for offering a selection of auditory stimuli? For this study, the question is narrowed and formulated into the following long question: Is there a correlation of the audio (color of the sound of the music) and visual (the color of the album cover) in the popular music culture during a slice of online-listening-era based on the popular (top of the charts) singles and album colors?

The change in the medium also changes the mechanics of creating an album for release. The structure or the unity of an album is losing its importance as direct access to individual songs are plenty, easier and cheaper than acquiring the whole album. People can directly buy their favorite songs, hits, chart toppers, etc. and form playlists without the need create a mix tape. Thus, single songs that are popular

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[1] The Amazon prices vary. They have been seen as low as 0.6 $ and as high as 1.99 $.

rather than whole albums will be the point of study even though individual cover images for each song may not be available yet.

The year of 2010 is chosen as the sample time. The reasons behind this choice can be explained as follows. Instead of looking for a pattern of change, it is decided to investigate a unit of time. A year is chosen instead of a month is to have more variety as songs can easily stay at the top of a chart for a month and 2010 is the nearest complete year.

a. Color in Image

Finally, the color of sound and the color of the album covers will be taken as the element that will be investigated to see whether the color of the sound and the color of the image match or not. Color is selected as the sole variable because first of all an exhaustive study cannot be completed within the time period as there are a number of variables (even though not all appears on both sides). Second, color is an element that can be observed in sound as well as audio. Even though, the color in image and audio is different they have similar sources, play similar roles in design of image and sound (Thomas 2009).

b. Color in Sound

In visual domain, color corresponds to the different frequencies of light waves. In audial realm, color is again used to describe frequency-based information (Thomas 2009; Thomas 2001; Thomas 2010; Eric 1995). A sound wave can be broken down into simple sinusoidal wave that only have a single frequency in them. These waves are called pure tones. Combination of pure tone defines the timbre of the sound, thus in audial realm, color signifies the timbre of a sound. Timbre is an immeasurable term, which is defined as the component of sound not named pitch and loudness. A simpler explanation would be timbre is the set of properties, which causes two different instruments to have different sounds at the same pitch. A visual explanation would be the shape of a sound wave that is the combination of individual harmonics or pure tones.

This is not to say that all the visual and audial information is based on color. Even though, music as a whole is consists of mass of certain colors organized in time and space, color is sufficient to describe a song as it is the main element of the its building block: sound. In addition, except for time, the other elements also play a role in the visual design, as color is only a single element.

Finally, it must be added that the color in both domains are not the same. The light wave is an electro-magnetic wave while the sound wave is physical wave. However, the same terminology is used in designing and defining both concepts. White is one of the examples of such convention: In sound, white noise means a sound that has every frequency components.

2. Methodology

The study started with the aim of investigating the relationship between the sound and the image in music. However, this broad topic needed to be narrowed in order to have a contained work. Thus, the initial research was conducted to limit the general question into the version that the study will

investigate in detail. For this purposes a number of different data sets that cover various time intervals, mediums and genres have been covered. In the end, due to timing limitations, a data set that gives a kind of a controlled experiment by keeping secondary variables constant is chosen.

However, the data set still needs some refinement and processing before the analysis and/or investigations. After that, the color information in both realms will be compared. This comparison will be done in multiple ways using multiple references in order to do have more than one set of results. Unfortunately, formal psychological tests will not be performed but instead my personal analysis will be used. However, the former approach is still a viable option for future.

Sets of emotional responses to the visuals and audio will be collected via multiple sources in order to have more data for having a more meaningful discussion. Emotional Reaction Model (ERM) developed by Västfjäll et al. (Västfjäll, Gärling and Kleiner 2004) will be the method of extracting emotions. ERM chart has two axes with binary definitions. The y-axis is defined as the activation/high activation – de-activation/low activation scale and the x-axis is defined as pleasantness/positive-unpleasantness/negative scale. Figure 3 shows an empty chart and a chart that was filled by Västfjäll.
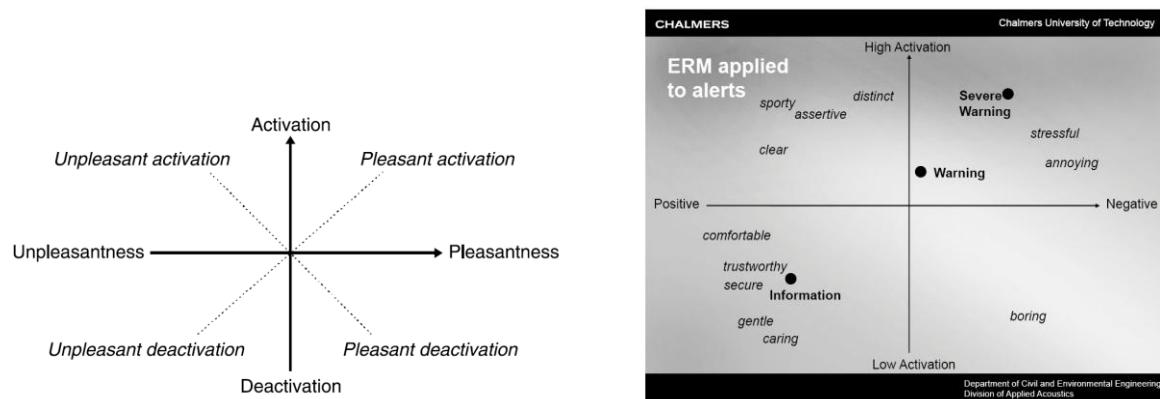

Figure 3: Emotion Reaction Model (ERM) Chart and with examples

Literature study shows a number of studies that investigates the relation between emotions and visual color. An example of a detailed study on colors and emotions can be found in (Kaya et al. 2004). The study provides us with a set of emotional responses to colors given by university-student age people, who are the main users for the music service applications mentioned in the introduction. This can be used for additional data for emotional responses of the covers and the results can be found in Appendix A. On the other hand, such data, relation between emotions and a timbre, cannot be found or not applicable to the music investigated in this study. Therefore, the main data will be extracted by using the ERM model so that the both image and sound have the same representational values.

3. The Database

The database is taken from Spotify's announcement of top songs of 2010 according to their own database ("http://www.spotify.com/us/2010-retrospective/"). The problem with this set of data was it was classified for different countries and the data was subjective to cultural tendencies. For this

purpose, ten songs with on non-weighted-average with the 10 best places in the seven countries are chosen. The final songs are:

- Eminem – Love The Way You Lie
- Lady Gaga – Bad Romance
- Lady Gaga – Alejandro
- Lady Gaga – Telephone
- David Guetta – Memories (Featuring Kid Cudi)
- David Guetta – Sexy Bitch (Featuring Akon; explicit)
- Train – Hey, Soul Sister
- Bob – Airplanes [feat. Hayley Williams of Paramore] – Explicit Album Version
- Stromae – Alors On Danse
- Katy Perry – California Gurls (feat. Snoop Dogg)

The top 25 songs of 2010 from Spotify can be found in Appendix B.

a. Visual Database

The covers or the images of the songs used here are the same images used in Spotify. The sizes of the images are kept same as they are displayed in Spotify. In the below table, the first column shows the original images; in the second column the images are processed so that they only form a gradient from darker to lighter colors that are used in the original image; in the third column the images are created by shuffling the location of the pixels of the original image. The variations are created to remove the non-color information from the images. Finally, the images are as follows:

Original Album Covers	Sorted Colors	Random Colors	Artist – Song
			Eminem – Love The Way You Lie – (1)
			Lady Gaga – Bad Romance – (2)
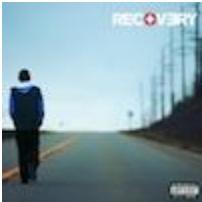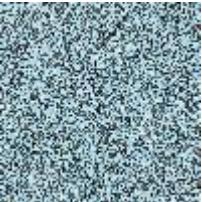
Lady Gaga – Alejandro – (3)
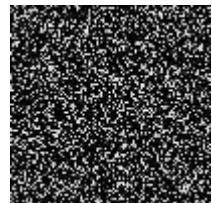
Lady Gaga – Telephone – (4)
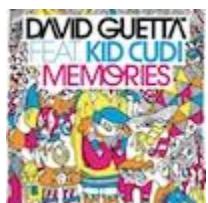
David Guetta – Memories (Featuring Kid Cudi) – (5)
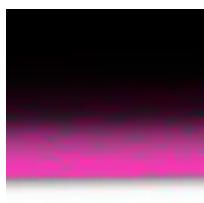
David Guetta – Sexy Bitch (Featuring Akon; explicit) – (6)
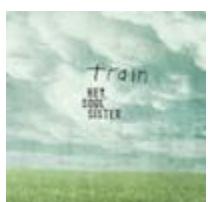
Train – Hey, Soul Sister – (7)
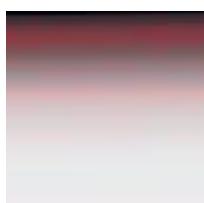
Bob – Airplanes [feat. Hayley Williams of Paramore] - Explicit Album Version – (8)
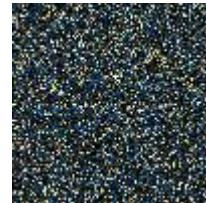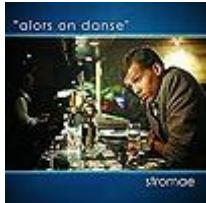
Stromae – Alors On Danse – (9)
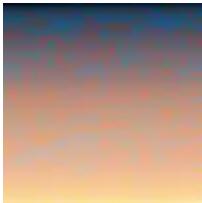
Katy Perry – California Gurls (feat. Snoop Dogg) – (10)

Table 1: Set of Images

It is interesting to see that the images all are different, except for the songs (3) and (4) since they are of the same album. This might show that the pop music does not have a visual style today but then again I believe some might find consistency by introducing sub-genres under pop.

b. Audial Database

Instead of analyzing the whole song certain aspects of the songs are analyzed these are:

- Dominant color(s) in the intro
- Dominant color(s) of the chorus
- Dominant color(s) of the outro

These parts of songs are chosen as they are the main hooks in popular music (Burns 1987), where color is used in different ways.

4. Results and Discussions

The graphs below are filled by listening to the selected parts of the songs and observing the processed images. The songs are listed with their numbers in column four of Table 1. The data is collected by using me as the only tester and even though I tried to be objective, there is a great possibility that the graphs reflect my subjectivity.

The ERM responses for the audial colors in the intros, choruses and the outros can be found in Figure 4, 5 and 6 respectively.
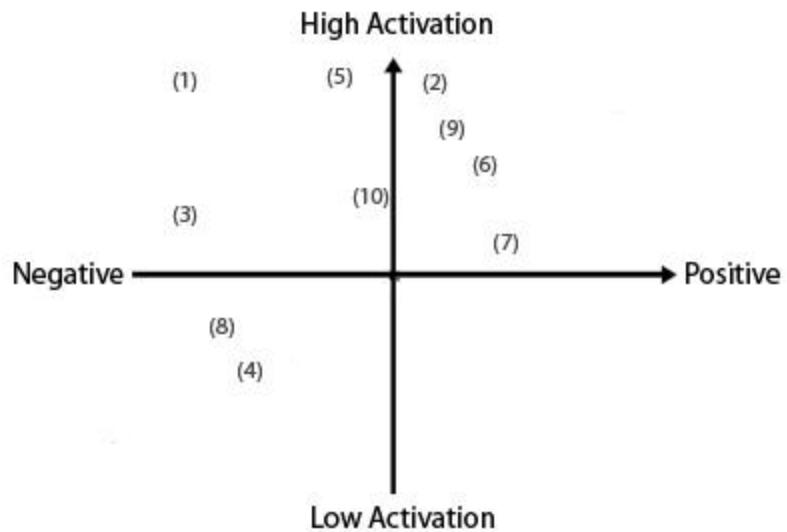
Figure 4: ERM responses for the intros of the songs
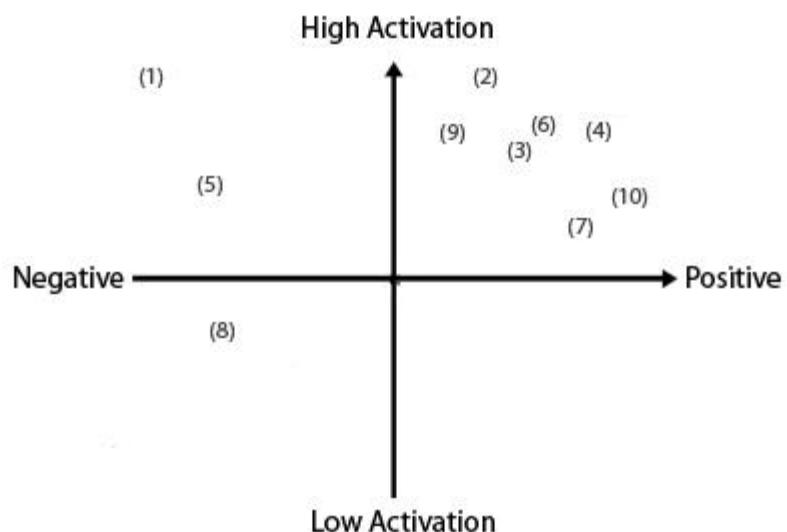
Figure 5: ERM responses for the choruses of the songs
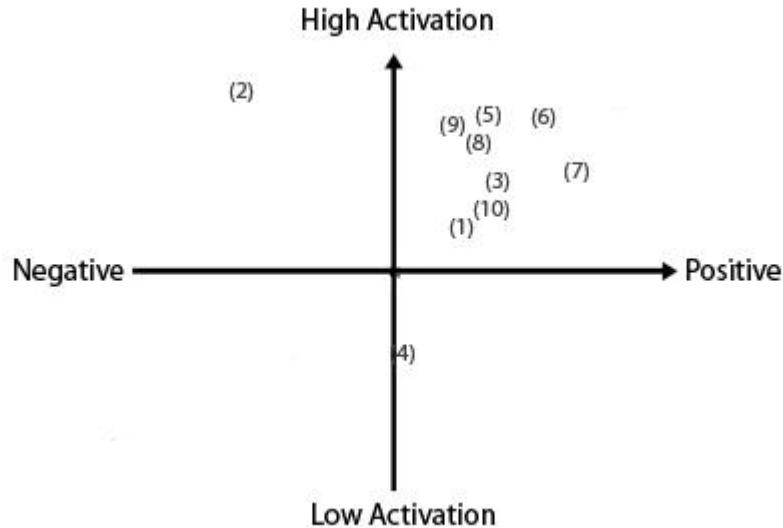
Figure 6: ERM responses for the outros of the songs

Looking at the charts one can see that most of the songs are in the high activation area through intro, chorus and outro. High activation sounds can be explained as sounds that make people move and physically respond to and dance songs or danceable songs feature high activation sounds. However, in the outro there seems to be a tendency for the songs to have sounds that are positive as if they are trying to create a sweet after taste. In the intro, six of the songs are in the negative region; in the outro only one song is mapped to the negative region.

In Figure 7 and Figure 8, the results from applying the ERM chart to the processed cover images can be seen.
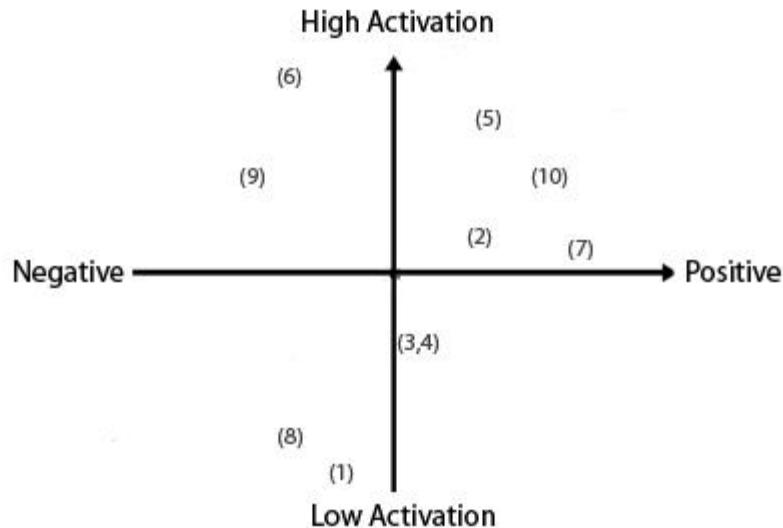
Figure 7: ERM responses for the color gradients of the covers
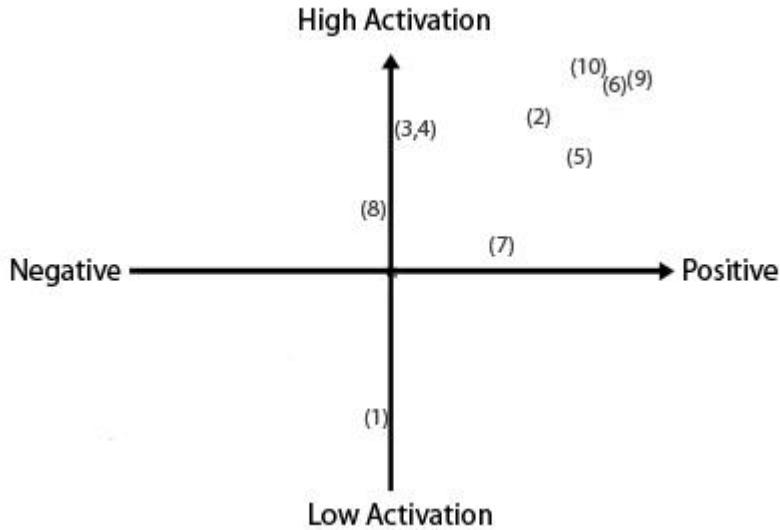
Figure 8: ERM responses for the randomized colors of the covers

When the data is observed in order to find correlations between sound and images, the below results are seen:

- Songs (4), (5) have a similar ERM result in outro and color gradient.
- Song (6) has a similar ERM result in intro, chorus, outro and randomized colors.
- Song (7) has a similar ERM result between intro, chorus, color gradient and randomized colors.
- Song (10) has a similar ERM result between outro and color gradient.

5. Conclusion and Future Work

The current test, unfortunately, showed no correlation or non-correlation between the sound and image. Of the ten songs, four of them have shown some kind of correlation in ERM values, while for the other six the emotional responses to sound and image was unrelated.

However, in an ideal world I would like hear the song through the images since it would give me instantaneous information about the song. Thus, I would have liked the images to be faithful to the sound they accompany, since the end product is music.

The future works for this project would involve other testers in order to extract a more generalized data. This is very important as it might change the results such that the conclusion can be conclusive towards either way. In addition, other methods for mapping images and sounds to emotions should be used to improve the reliability of the work.

In the end, the lack of multiple test subjects from a defined age and cultural group renders this work as not scientific but the results help me identify my understanding of the usage of visible and hearable colors. I believe this study will improve my usage of audiovisual color in my works.

Bibliography

Gregory, Jason. "Designer Peter Saville: 'The Album Cover Is Dead'." GIGWISE (blog), august 17, 2008. http://www.gigwise.com/news/45430/designer-peter-saville-the-album-cover-is-dead (accessed November 13, 2011).

Thomas, Richard. "Music As a Foundation of Theatre." *KTAA/KTSA/OISTAT History and Theory/Scenography Commission Joint Symposium on Scenography, Performance, and Theatricality*. (2009).

Thomas, Richard. "The Function of the Soundscape ." *Theatre Design & Technology*. 37. no. 1 (2001): 18-29. http://web.me.com/zoonds/Zounds_Productions/Function_of_Soundscape_files/Soundscapes.pdf (accessed September 13, 2011).

Thomas, Richard. 2010. "The Sounds of Time." In *Sound: A Reader in Theater Practice*, Edition, edited by Brown, Ross., 177-188. New York: Palgrave Macmillan.

Eric, Tamm. *Brian Eno: his music and the vertical color of sound*. Boston: Da Capo Press Inc, 1995.

Västfjäll, Daniel. Tommy Gärling and Mendel Kleiner. "Preference for Current Mood, Anticipated Emotional Reaction, and Experienced Emotional Reaction." Scandinavian Journal of Psychology, 2004: 27-36.

Kaya, Naz, and Helen H. Epps. "Relationship between Color and Emotion: A Study of College Students." College Student Journal. 38. (2004): 396-405. http://www.jgroshek.com/342/color and emotion.pdf (accessed November 6, 2011).

"http://www.spotify.com/us/2010-retrospective/." Spotify (blog), http://www.spotify.com/us/2010-retrospective/ (accessed October 4, 2011).

Burns, Gary. "A typology of 'hooks' in popular records." Popular Music. 6. no. 1 (1987): 1-20. http://tagg.org/xpdfs/burns87.pdf (accessed November 17, 2011).

Table 2
Frequencies of Emotional Reactions Given to Each Color

Emotions*	Red	Yellow	Green	Blue	Purple	Yellow-red	Green-yellow	Blue-green	Purple-blue	Red-purple	White	Gray	Black
Angry [a]	28 (28.6)	0	0	0	0	0	0	0	0	0	0	3 (3.1)	7 (7.1)
Annoyed [a]	0	0	0	0	0	5 (5.1)	8 (8.2)	7 (7.1)	0	2 (2.0)	0	0	0
Bored [a]	0	0	0	0	5 (5.1)	4 (4.1)	2 (2.0)	0	0	2 (2.0)	5 (5.1)	14 (14.3)	0
Calm [b]	4 (4.1)	0	29 (29.6)	60 (61.2)	28 (28.6)	0	0	16 (16.3)	38 (38.8)	13 (13.3)	8 (8.2)	5 (5.1)	0
Comfortable [b]	0	0	15 (15.3)	4 (4.1)	3 (3.1)	3 (3.1)	7 (7.1)	7 (7.1)	0	0	0	0	5 (5.1)
Confused [a]	0	0	0	0	0	0	2 (2.0)	6 (6.1)	0	0	0	6 (6.1)	0
Depressed [a]	0	0	0	6 (6.1)	0	0	0	0	12 (12.2)	8 (8.2)	0	23 (23.5)	22 (22.4)
Disgusted [a]	0	0	0	0	0	9 (9.2)	26 (26.5)	2 (2.0)	0	3 (3.1)	0	0	0
Empty/void [a]	0	0	0	0	0	0	0	0	0	0	25 (25.5)	0	0
Energetic [b]	5 (5.1)	10 (10.2)	0	0	0	14 (14.3)	0	10 (10.2)	0	0	0	0	0
Excited [b]	18 (18.4)	8 (8.2)	2 (2.0)	0	4 (4.1)	25 (25.5)	6 (6.1)	11 (11.2)	0	12 (12.2)	0	0	0
Fearful [a]	0	0	0	0	5 (5.1)	0	0	0	0	0	0	3 (3.1)	17 (17.3)
Happy [b]	21 (21.4)	74 (75.5)	28 (28.6)	10 (10.2)	21 (21.4)	31 (31.6)	11 (11.2)	36 (36.7)	13 (13.3)	26 (26.5)	0	0	0
Hopeful [b]	0	0	8 (8.2)	0	0	0	0	0	5 (5.1)	0	6 (6.1)	0	0
Innocent [b]	0	0	0	0	0	0	0	0	0	0	33 (33.7)	0	0
Lonely [a]	0	0	0	3 (3.1)	0	0	0	0	3 (3.1)	0	6 (6.1)	4 (4.1)	0
Loved [b]	15 (15.3)	0	0	0	0	0	0	0	0	17 (17.3)	0	0	0
Peaceful [b]	0	0	12 (12.2)	4 (4.1)	0	0	0	0	8 (8.2)	0	13 (13.3)	0	0
Powerful [b]	0	0	0	0	7 (7.1)	0	0	0	0	7 (7.1)	0	2 (2.0)	14 (14.3)
Sad [a]	4 (4.1)	0	0	8 (8.2)	13 (13.3)	0	0	0	10 (10.2)	0	0	30 (30.6)	24 (24.5)
Sick [a]	0	0	0	0	0	0	32 (32.7)	0	0	0	0	0	0
Tired [a]	0	6 (6.1)	0	0	9 (9.2)	0	0	0	5 (5.1)	0	0	5 (5.1)	7 (7.1)
No emotion	3 (3.1)	0	4 (4.1)	3 (3.1)	3 (3.1)	7 (7.1)	4 (4.1)	3 (3.1)	4 (4.1)	8 (8.2)	2 (2.0)	3 (3.1)	2 (2.0)

Note. Emotions are listed in alphabetical order.
The cell numbers indicate frequencies; the percentages are listed in parentheses.
[a] Negative emotions
[b] Positive emotions

	Emotional Association		
Color	Positive	Negative	No emotion
Principle Hues			
Red	63 (64.3)	32 (32.7)	3 (3.1)
Yellow	92 (93.9)	6 (6.1)	0
Green	94 (95.9)	0	4 (4.1)
Blue	78 (79.6)	17 (17.3)	3 (3.1)
Purple	63 (64.3)	32 (32.7)	3 (3.1)
Total	390 (79.6)	87 (17.8)	13 (2.6)
Intermediate Hues			
Yellow-red	73 (74.5)	18 (18.4)	7 (7.1)
Green-yellow	24 (24.5)	70 (71.4)	4 (4.1)
Blue-green	80 (81.6)	15 (15.3)	3 (3.1)
Purple-blue	64 (65.3)	30 (30.6)	4 (4.1)
Red-purple	75 (76.5)	15 (15.3)	8 (8.2)
Total	316 (64.5)	148 (30.2)	26 (5.3)
Achromatic Colors			
White	60 (61.2)	36 (36.7)	2 (2.0)
Gray	7 (7.1)	88 (89.8)	3 (3.1)
Black	19 (19.4)	77 (78.6)	2 (2.0)
Total	86 (29.2)	201 (68.4)	7 (2.4)
Overall	792 (62.2)	436 (34.2)	46 (3.6)

Note. The cell numbers indicate frequencies; the percentages are listed in parentheses.

Appendix B

Song	UK	Finland	Norway	Spain	Netherlands	France	Sweden	Overall
Eminem – Love The Way You Lie	NA	1	1	1	1	7	1	2
Lady Gaga – Bad Romance	3	5	13	3	25	1	8	8.285
Lady Gaga – Alejandro	19	2	10	5	8	9	19	10.28
Lady Gaga – Telephone	1	11	17	6	20	5	13	10.42
David Guetta – Memories (Featuring Kid Cudi)	31	7	8	4	17	2	10	11.28
David Guetta – Sexy Bitch (Featuring Akon;explicit)	43	10	15	2	23	4	6	13
Train – Hey, Soul Sister	18	24	9	9	15	13	5	13.28
Bob – Airplanes [feat. Hayley Williams of Paramore] - Explicit Album Version	2	6	2	49	2	32	7	14.28
Stromae – Alors On Danse	NA	15	32	14	14	11	14	14.28
Katy Perry – California Gurls (feat. Snoop Dogg)	15	19	16	20	5	15	32	15.28
Shakira featuring Freshlyground – Waka Waka (This Time for Africa)	81	9	3	10	4	8	3	16.85
Eminem – Not Afraid	33	12	4	26	11	18	18	17.42
Taio Cruz – Dynamite	29	22	7	25	3	24	23	19
Owl City – Fireflies	24	38	5	27	34	10	2	20
Ke$ha – TiK ToK	17	25	23	8	61	3	20	22.42
Jay-Z – Empire State Of Mind [Jay-Z + Alicia Keys] - Explicit Album Version	12	36	38	24	42	12	37	28.71
Jason Derulo – Whatcha Say	21	34	20	15	70	20	22	28.85
Black Eyed Peas – I Gotta Feeling	36	42	42	12	38	6	27	29
Taio Cruz – Break Your Heart	82	13	12	21	36	29	12	29.85
Rihanna – Rude Boy	5	35	36	32	55	28	39	32.85
Iyaz – Replay	10	37	25	36	NA	58	33	33.16
Mohombi – Bumpy Ride	NA	18	14	84	6	71	28	36.83
Usher featuring will.i.am – OMG	9	54	58	NA	26	41	42	38.33
Black Eyed Peas – Meet Me Halfway	52	46	60	7	95	16	24	42.85
Jason Derulo – Ridin' Solo	8	89	31	73	24	NA	69	49