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The Effects of Visual Stimuli on Induced Emotional Responses in Popular Music

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ABSTRACT

Many studies have established a link between music and visual stimuli (film music, visual imagery and live performances of classical music); however, popular music has gained less academic attention. The purpose of this study is to investigate the effects of visual stimuli, in the form of music videos, on a listener's induced emotional response in popular music. Twenty-six participants were asked to listen to four musical examples by Beyoncé, in both audio-only and audio-visual conditions, and rate their induced emotional response using the GEMS-9 scale after each condition. The musical examples in this experiment demonstrated that *power* was the strongest emotion in both conditions, *sadness* had the greatest increase from the audio-only to the audio-visual condition, and *peacefulness* was the only emotion that did not increase from the audio-only to the audio-visual condition. Overall, the experiment demonstrated that average total emotion was significantly stronger in the audio-visual condition; therefore, supporting the hypothesis that the addition of visual stimuli increases the strength of the listeners' induced emotional response in popular music.

1. INTRODUCTION

Popular music represents a large part of the music industry in the twenty-first century, and since the creation of MTV in the 1960s it has become inextricably linked with a visual medium. Whilst there has been research demonstrating that there is a connection between music and visual stimuli (for example in the form of film music, visual imagery or live performances of classical music), limited research has explored the relationship between popular music and music videos. With visual stimuli being significant in the marketing and consumption of this genre, this experiment aims to investigate the effects of visual stimuli on induced emotional responses in popular music.

Music and emotion. Research relating to music and emotion incorporates both perceived emotion, which is expressed or evoked by the music, and induced emotion, which is felt by a listener when experiencing the music (Evans and Schubert 2008; Gabrielsson 2002; Kawakami 2013b). The term 'music emotion' often encompasses both forms of emotion; however, studies have demonstrated that perceived and induced emotion do not necessarily coincide (Gabrielsson 2002; Juslin 2005). Evans and Schubert's (2008) study found that 61% of participants expressed a positive relationship between perceived and induced emotion. Furthermore, negative relationships have also been demonstrated, as sad music does not necessarily induce a sad emotion in the listener (Kallinen and Ravaja 2006; Kawakami 2013a; Schubert 1996). In an alternative study regarding induced emotion and familiarity, Ali and Peynircioğlu (2010) suggested that 'familiarity increased the intensity of emotional responses to music' (Ibid, 177) when the stimuli were played repetitively over a long period of time.

It has been suggested that perceived emotion is expressed by musical features such as tempo, dynamics, harmony and mode (Juslin and Laukka 2004; Gabrielsson and Lindström 2001). Laukka et al. (2013) proposed that happiness is conveyed by a 'fast tempo, staccato articulation, moderately high sound level, high pitch, consonant harmony, and a major mode, whereas sadness is conveyed by a slow tempo, legato articulation, low sound level, low pitch, dissonant harmony, and a minor mode' (Ibid, 434-435); however, Juslin and Laukka (2004) found that there are subtle overlaps between emotional categories. This is supported by Vieillard et al.'s research (2008) that suggested peacefulness is often conveyed by a major mode and slow tempo, coinciding with certain features of happiness and sadness from Laukka et al.'s (2013) study.

A suggestion as to how music is able to induce emotion is provided by the 'multiple mechanisms' theory (Juslin and Västfjäll 2008; Juslin 2013). It consists of eight mechanisms: *brain stem reflex, rhythmic entrainment, evaluative conditioning, contagion, visual imagery, episodic memory, musical expectancy,* and *aesthetic judgement* and of interest to my study is *visual imagery*. This is where the listener 'conjures up visual images while listening to the music' and is defined as 'an experience that resembles perceptual experience, but that occurs in the absence of relevant sensory stimuli' (Juslin and Västfjäll 2008, 566).

Music and film. The relationship between music and visual stimuli has been researched from various perspectives. Regarding film music, Cohen (2001) suggested that 'music makes an episode more real, more vivid, more emotionally relevant' and 'is one of the strongest sources of emotion in film' (Ibid, 249, 254) as the music's emotional associations attach to the visual attention. Furthermore, she distinguishes between music in the 'diegesis' (in the film's world) and 'non-diegesis' (outside of the story space), claiming that non-diegetic sound provides information 'to generate emotional information' regarding the story (Cohen 2010, 886).

Magliano et al. (1996) researched how film music is able to 'infer' positive or negative emotions by predicting future events, an example being that ominous music can create

tension and predict that something bad is going to happen. In their study, however, visual and discourse factors created stronger inference than music, and a similar outcome was also found by Steffens' (2018) research where in three of four cases the intended emotion through film music was conveyed incorrectly. In contrast, by varying the style of music accompanying a short film (relating to orchestration, use of motifs and, the place and length of the music), Bullerjahn and Guldenring (1994) were able to conclude that music is suggestive of a film's genre as it 'influences the understanding of the plot' (Ibid, 99).

In another study, Geringer, et al. (1996) considered 'the effect of visual information on…affective and cognitive responses to music' (Ibid, 240). Participants were divided into music-plus-video and music-only conditions, and they listened to two passages from the Disney film *Fantasia*. The experiment concluded that participants were more emotionally involved with the music in the music-plus-video condition.

Music and visual stimuli. Schutz (2008) has claimed that 'vision influences many aspects of music – from evaluations of performance quality and audience interest to the perception of loudness, timbre, and note duration' (Ibid, 83). Furthermore, Tsay (2013) has suggested that 'people consistently report that sound is the most important source…in evaluating performance in music' (Ibid, 14580); however, she concluded that 'people actually depend primarily on visual information when making judgements about music performance' (Ibid). The experiment suggested that people were more likely to correctly identify the winner of a music competition in the video-only condition than in audio-only or audio-visual conditions, demonstrating our 'dependence on visual cues' (Ibid). Mitchell and MacDonald's (2016) study also came to a similar conclusion as participants were asked to identify a target performer from a video-only or audio-only condition, and results showed that participants had greater success identifying the target performer in the video-only condition.

Drawing on Juslin and Västfjäll's (2008) aforementioned concept of *visual imagery*, Vuoskoski and Eerola (2015) conducted an experiment to establish how contextual information can influence the emotions induced by music. Participants listened to the same piece of music and were divided into two groups: the sad narrative group (told the music was from a World War II film) and the neutral narrative group (told the music was from a nature documentary). The study concluded that 'contextual information about a piece can have an impact on the emotional effects' (Ibid, 270) as the sad narrative group showed intensified sad emotions and the neutral group did not. Furthermore, the experiment showed that contextual information preceding listening can evoke music-induced *visual imagery* which produces a stronger emotional response, as 80% of the sad narrative group reported 'thinking about imagery relating to concentration camps and/or the Second World War' and 80% of the neutral narrative group 'reported thinking about nature-related imagery' (Ibid, 269).

Sun and Lull (1986) investigated why people are motivated to watch MTV videos and analysis revealed that reasons for watching MTV were not the same as those for watching television or music listening. The most common reasons given were in order to watch a particular group or singer, for entertainment, and because of the visual aspect. Many stated that the visual portrayed the meaning of the song, and there were also comments about MTV causing a strong emotional response to the music, suggesting that the addition of a visual in popular music increases the strength of an emotional response. My experiment will build on this study with empirical evidence using the Geneva Emotional Music Scale (GEMS) (Zentner et al. 2008).

The studies outlined above are relevant to my research as they demonstrate that there is a strong relationship between music and visual stimuli, whether the visual is in the form of a film, music video, live performance or visual imagery; however, limited research has focused on the effects of visual stimuli on induced emotional responses in popular music. It is important to distinguish between perceived and induced emotions (Gabrielsson 2002) as the present study investigates how popular music makes the listener feel. Musical features associated with happy and sad emotions (Laukka et al. 2013) offer a suggestion as to why certain musical examples have a higher rating than others in certain emotional categories. Furthermore, Juslin and Västfjäll's (2008) concept of *visual imagery* demonstrates that there is a link between music and visual stimuli, as does literature related to film music, and other audio-visual studies. My study will expand on previous research by examining the relationship between visual stimuli and popular music, and my hypothesis is that the addition of a visual will increase the strength of the listener's induced emotional response.

2. METHOD

Design. This experiment used a within-participants design where all participants were exposed to both conditions. The independent variable was the two conditions, audio-only and audio-visual, and the dependent variable was the strength of induced emotion. The emotions were divided into nine categories: *wonder, transcendence, power, tenderness, nostalgia, peacefulness, joyful activation, sadness* and *tension*. In an attempt to standardise musical exposure, participants were asked to complete a survey on a computer/tablet to ensure the visual was experienced on a similar sized screen, and using headphones to reduce background noise and improve concentration. Extraneous variables were also considered by asking participants which songs were familiar to them. This information was recorded to identify whether familiarity had an effect on the emotional response. The listening order of musical examples and their conditions varied across four surveys which have been summarised in Appendix 1.

Participants. The study involved 26 participants who were either past or present students of Durham University, or residents in the North East of England. All participants (see Appendix 2) were aged 18 or over in accordance with ethical approval. There were 19 females, 7 males, and all

aged between 19 and 60 (M = 27.38, SD = 13.72). Participants were recruited by opportunity sampling as they were invited to take part in the experiment.

Materials and stimuli. The questionnaire was designed and distributed via Online Surveys, and emotional responses were recorded using the Geneva Emotional Music Scale (Zentner et al. 2008). The GEMS-9 scale included the nine emotional categories outlined above. The following instructions were given to each participant, ensuring that they rated their *induced* rather than *perceived* emotion on a scale of 1 to 5:

> When providing your ratings, please describe how the music you listen to makes you *feel* (e.g., this music makes me *feel* sad). Do not describe the music (e.g., this music is sad) or what the music may be expressive of (e.g. this music expresses sadness). Bear in mind that a piece of music can be sad or can sound sad without making you feel sad. Please rate the intensity with which you felt each of the following feelings on a scale ranging from 1 (*not at all*) to 5 (*very much*). (Ibid)

As a control variable, one artist was used to increase the likelihood that changes in emotional response were due to changing conditions, rather than variations in vocal style or timbre between singers. The musical examples chosen were four songs, from three different albums, by the popular music artist Beyoncé, and participants listened to each example in both the audio-only and audio-visual conditions. The songs were:

- "I Was Here" (*4* 2011)
- "Pretty Hurts" (*Beyoncé* 2013)
- "Formation" (*Lemonade* 2016)
- "All Night" (*Lemonade* 2016)

The visual is an important aspect of Beyoncé's music as she stated that '[she sees] a visual or a series of images that are tied to a feeling or an emotion' (Knowles-Carter 2013). Her previous two albums (*Beyoncé* 2013; *Lemonade* 2016) are 'visual-albums' (Knowles-Carter 2013) where each track on the album has an accompanying music video. The musical examples used in this study incorporate a broad range of music video styles, including a variety of emotions and performance roles adopted by Beyoncé. "I Was Here" shows her stood on stage performing with powerful images depicting poverty and natural disaster projected behind her, "Pretty Hurts" sees her take on the role of a character in a beauty pageant, "Formation" sees her perform the song including mass choreographed dance and protest, and "All Night" depicts her singing combined with images of joyful families. Her most successful songs were avoided in an effort to reduce familiarity with participants.

Procedure. Participants were sent a URL in order to access the survey, and after reading the Study Information and Participant Consent Form they were asked to submit their age and gender. In awareness of survey length, each song was formatted to play a specific section (see Table 1).

Table 1. Song Sections Used in Musical Examples According to YouTube Video Timings

Song	Section
I Was Here	1:30 – 4:33
Pretty Hurts	0:00 – 3:14
Formation	3:20 – 4:48
All Night	1:30 – 6:00

Participants then conducted a headphone volume test using Beyoncé's song "Countdown" (beginning with a loud chorus section) and were asked to 'set the volume just below the limit where it becomes uncomfortable' to ensure the volume was at an equivalent level between participants. They then listened to the four musical examples, each in the audio-only and audio-visual condition, answering the GEMS-9 scale after each playing in each condition. To conclude the experiment, they were asked which examples they were familiar with (see Appendix 2).

3. RESULTS

The analysis involved calculating means and standard deviations by importing the data into Microsoft Excel. The average total emotion for all emotions in the audio-only condition was 18.69 (SD = 4.03) as compared to the audio-visual condition, 21.09 (SD = 4.84). This demonstrates an increase in the strength of induced emotional response from the audio-only to the audio-visual condition (see Figure 1). Average total emotion for each condition was calculated by taking the sum of the average ratings for each emotion.

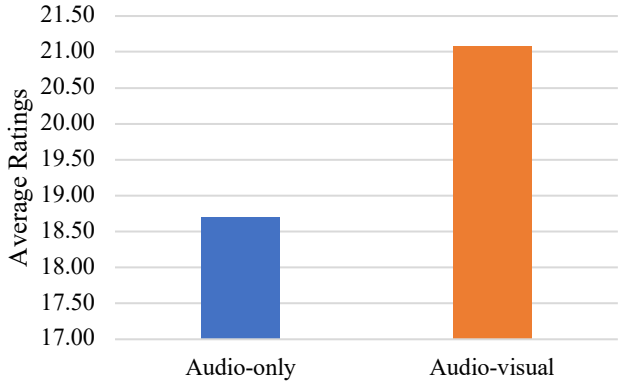

Figure 1. Average total emotion rating per condition

Table 2a shows the average rating, and Table 2b the standard deviation, for each emotion in each condition. The results show that the induced emotional response was stronger in the audio-visual condition for all emotions except *peacefulness*. *Power* had the strongest rating in both conditions, and *sadness* had the greatest increase from the audio-only to the audio-visual condition (+0.63). Tables 2a and 2b have been represented in a bar graph where the grey line denotes standard deviation (see Figure 2).

Table 2a. Average Rating for Each Emotion

	Wonder	Transcendence	Power	Tenderness	Nostalgia	Peacefulness	Joyful Activation	Sadness	Tension
Audio-only	2.30	2.15	2.84	2.07	1.93	1.95	1.88	2.00	1.57
Audio-visual	2.74	2.33	3.09	2.45	2.29	1.91	2.00	2.63	1.68
Increased by	0.44	0.17	0.25	0.38	0.36	-0.04	0.12	0.63	0.12

Table 2b. Standard Deviation for Each Emotion

	Wonder	Transcendence	Power	Tenderness	Nostalgia	Peacefulness	Joyful Activation	Sadness	Tension
Audio-only	0.80	0.70	0.95	0.60	0.56	0.56	0.67	0.59	0.61
Audio-visual	0.84	0.87	1.00	0.83	0.80	0.66	0.83	0.78	0.71

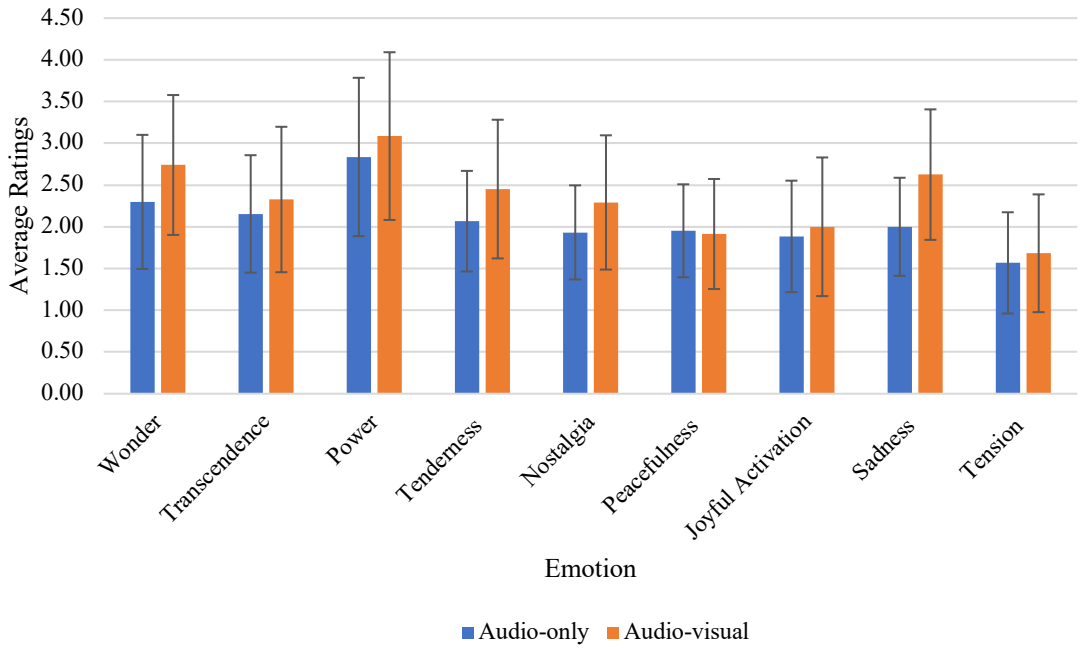

Figure 2. Comparison between average ratings of each emotion per condition

Table 3. P-values for Each Emotion Between Conditions

Emotion	df	*t*	*p*-value
Wonder	25	-3.6276	.0013**
Transcendence	25	-1.3322	.19
Power	25	-2.1547	.04*
Tenderness	25	-2.9696	.0065**
Nostalgia	25	-3.2336	.0034**
Peacefulness	25	0.40589	.69
Joyful Activation	25	-1.0073	.32
Sadness	25	-5.266	< .001***
Tension	25	-1.0224	.32
Average Total	25	-4.5801	< .001***

*Note. p < .05 *, p < .01**, p < .001***

Furthermore, there was a strong correlation (r = .83) between the averages of both conditions, demonstrating that participants had similar emotional responses across the two conditions. However, the increase in the audio-visual condition for certain emotions, and consequently the average total emotion, was large enough that it was statistically significant (p < .05), concluding that it is unlikely these results occurred by chance (see Table 3). The p-values were calculated by doing t-tests using RStudio software. *Wonder, power, tenderness, nostalgia*, *sadness* and average total emotion produced statistically significant p-values, whilst *transcendence, peacefulness, joyful activation* and *tension* did not.

Table 4. Average Peacefulness Rating in Each Musical Example

	I Was Here	Pretty Hurts	Formation	All Night
Audio-only	1.81	2.62	1.19	2.19
Audio-visual	2.08	1.77	1.19	2.62
Increased by	0.27	-0.85	0.00	0.43

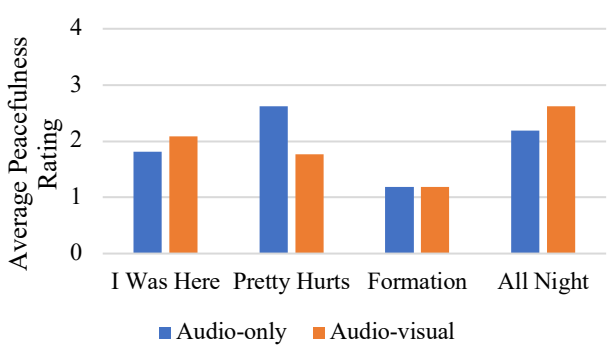

Figure 3. Average peacefulness rating in each musical example

Secondary analysis explored the results of individual emotions. Figure 2 shows that *peacefulness* was the only average emotion to decrease from the audio-only to the audio-visual condition (audio-only = 1.95, audio-visual = 1.91). Table 4 and Figure 3 show the average *peacefulness* ratings per song where "All Night" had the greatest increase from the audio-only to the audio-visual condition (+0.43). "Pretty Hurts" had a large decrease from the audio-only to the audio-visual condition (-0.85), the only negative result of all responses, and had the strongest *peacefulness* rating in the audio-only condition (2.62).

Figure 2 shows that average *power* had the strongest rating in both conditions (audio-only = 2.84, audio-visual = 3.09). Table 5 and Figure 4 show the average ratings for *power* where there was an increase from the audio-only to the audio-visual condition for all musical examples. "I Was Here" had the strongest rating and greatest increase from the audio-only to the audio-visual condition (+0.42), and "Pretty Hurts" had the least strong rating and smallest increase from the audio-only to the audio-visual condition (+0.04).

Table 5. Average Power Rating in Each Musical Example

	I Was Here	Pretty Hurts	Formation	All Night
Audio-only	3.35	2.23	3.31	2.46
Audio-visual	3.77	2.27	3.58	2.73
Increased by	0.42	0.04	0.27	0.27

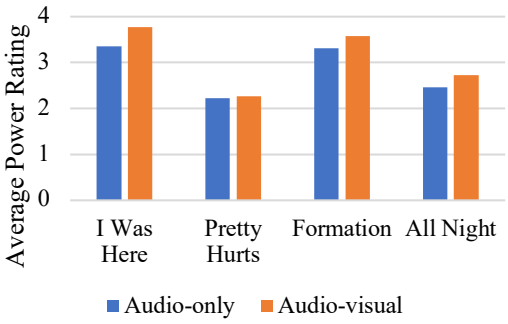

Figure 4. Average power rating in each musical example

Figure 2 shows that average sadness had the greatest increase from the audio-only to the audio-visual condition (audio-only = 2.00, audio-visual = 2.63). Table 6 and Figure 5 show that "I Was Here" had the greatest sadness increase from the audio-only to the audio-visual condition (+1.43), and whilst "Formation" had the least strong rating for sadness in both conditions, Table 7 and Figure 6 show that it had the strongest rating for joyful activation in both conditions.

Table 6. Average Sadness Rating in Each Musical Example

	I Was Here	Pretty Hurts	Formation	All Night
Audio-only	2.38	2.62	1.23	1.77
Audio-visual	3.81	3.38	1.42	1.88
Increased by	1.43	0.76	0.19	0.11

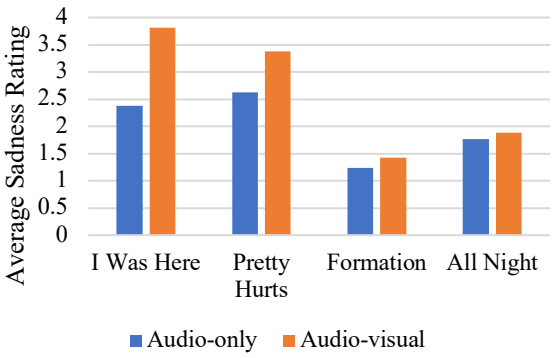

Figure 5. Average sadness rating in each musical example

Table 7. Average Joyful Activation Rating in Each Musical Example

	I Was Here	Pretty Hurts	Formation	All Night
Audio-only	1.69	1.27	2.50	2.08
Audio-visual	1.73	1.46	2.60	2.23
Increased by	0.04	0.19	0.10	0.15

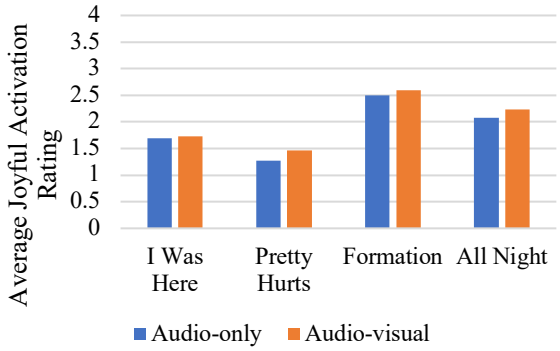

Figure 6. Average joyful activation rating in each musical example

As summarised in Table 8a, average familiarity showed that "Formation" was the most familiar (38.46%) and "All Night" the least (15.38%). Overall, participants were familiar with 26.92% of the musical example playings. Table 8b shows that in the audio-only condition, participants that had no familiarity with the musical examples had an average total emotion rating of 17.86 as compared to 19.30 for participants that had some familiarity. In the audio-visual condition, participants with no familiarity had an average total emotion rating of 19.70 as compared to 22.10 for participants that had some familiarity. These results demonstrate that participants with some familiarity experienced a stronger induced emotional response in both conditions. Familiarity ratings were calculated by taking an average of total emotion ratings for 'no familiarity' participants and 'some familiarity' participants for each condition.

Table 8a. Familiarity of Musical Example Playings

	I Was Here	Pretty Hurts	Formation	All Night	Total
No. of familiar playings	5	9	10	4	28/104
% familiarity	19.23	34.62	38.46	15.38	26.92

Table 8b. Average Total Emotion Rating for 'No Familiarity' and 'Some Familiarity'

	Average audio-only	Average audio-visual
No familiarity	17.86	19.70
Some familiarity	19.30	22.10
Increased by	1.44	2.40

4. DISCUSSION

The main results of the study can be summarised as follows:

1. Average total emotion significantly increased from the audio-only to the audio-visual condition.
2. Average *peacefulness* was the only emotion that did not increase from the audio-only to the audio-visual condition.
3. Average *power* had the strongest rating in both conditions.
4. Average *sadness* had the greatest increase from the audio-only to the audio-visual condition.
5. "Formation" had the strongest *joyful activation* rating in both conditions.

It was hypothesised that the addition of a visual stimulus would increase the strength of the induced emotional response, and overall average total emotion ratings did significantly increase from the audio-only to the audio-visual condition. This study supports previous findings of Geringer et al. (1996) who concluded that a visual makes a listener more emotionally involved with the music, and Tsay who demonstrated 'our dependence on visual cues' (2013, 14580). It also corresponds with Sun and Lull's (1986) research that suggested the visual caused a stronger emotional response; however, in the present study this has been demonstrated with empirical evidence. Furthermore, the results align with Vuoskoski and Eerola (2015) as the contextual information provided by the video had an impact on the music's emotional effects, sometimes in a negative, but mostly in a positive way.

Average *peacefulness* decreased from the audio-only to the audio-visual condition due to the large decrease in "Pretty Hurts". The study suggests that the decrease could be due to the visual as it was the only factor that changed between conditions. The video, depicting distressing images surrounding pressures on body image, amplifies the message of the song which may not be grasped as pertinently from the lyrics alone; hence, offering an explanation for the average *peacefulness* decrease in the audio-visual condition. Furthermore, "Pretty Hurts" may have had the strongest rating for *peacefulness* in the audio-only condition due to its musical features which may align with Vieillard et al.'s (2008) research that a slow tempo and major mode are expressive of *peacefulness*.

"All Night" had the greatest *peacefulness* increase from the audio-only to the audio-visual condition, which could be due to the introduction demonstrating non-diegetic sound. The people in the video cannot hear the introductory monologue or music, which might relate to Cohen's (2001; 2010) study who found that non-diegetic sound allows the audience to 'generate emotional information' which 'makes an episode more real [and] more emotionally relevant' (2001, 254; 2010, 886).

Average *power* was the strongest average induced emotion in both conditions, which could be due to the messages that the songs express lyrically and visually. "Pretty Hurts" had the least strong *power* rating and the smallest increase from the audio-only to the audio-visual condition, which again may be due to pressures on body image that are described in the lyrics and depicted in the visual that are more likely to evoke emotions of *sadness*. "I Was Here" had the strongest *power* rating in both conditions, and the greatest increase from the audio-only to the audio-visual condition, which is likely due to the visual depicting powerful images relating to natural disaster and poverty. As the lyrics do not reference these events, the context can only be known through the visual. This supports the conclusion that the increase in emotional response is likely due to the addition of the visual stimulus, the only changing factor between conditions.

Average *sadness* had the greatest increase from the audio-only to the audio-visual condition, which is mainly due to "I Was Here" having the greatest increase of any individual song. This further supports the conclusion that the increase is likely due to the visual providing distressing images. Interestingly, however, the song also had a strong *sadness* rating in the audio-only condition even though the lyrics do not describe the distressing topics of the video. It could be suggested that this is due to the song displaying musical features that Laukka et al's (2013) research relates to perceived *sadness*. The section of this song that was played displayed a relatively slow tempo, legato delivery, moments of low sound level, moments of low pitch, dissonant interactions between the vocal line and harmony, and a minor tonality. Due to these features and the strong *sadness* rating in both conditions, it could be suggested that

regarding "I Was Here", perceived and induced *sadness* coincide.

"Formation" had the strongest *joyful activation* rating in both conditions. This may be due to the musical features, many of which correspond with those that Laukka et al.'s (2013) research describe as perceived happiness. It had the fastest tempo of the four musical examples, moments of staccato delivery, moderately high sound level and was relatively high in pitch. Due to the song's musical features and the strong *joyful activation* rating in both conditions, it could also be suggested that regarding "Formation", perceived and induced *joyful activation* coincide.

In relation to familiarity, the results of this study align with Ali and Peynircioğlu's (2010) research as participants who displayed some familiarity had a stronger average total emotion rating in both conditions (audio-only = 17.86 for 'no familiarity', 19.30 for 'some familiarity', and audio-visual = 19.70 for 'no familiarity', 22.10 for 'some familiarity').

Although this study has demonstrated that visual stimuli in popular music increases the induced emotional response, there are limitations to be discussed. The study did not have an equal male-female ratio or balanced age range, as 19 out of 26 participants were female and 21 out of 26 were below the age of 25, and additionally the majority of participants were music students. A future study may investigate whether the emotional response would produce a similar increase in a balanced participant sample. Due to the time constraints of the project, opportunity sampling was used; however, random or stratified sampling, and a larger sample size may be more representative of the population. This study was distributed online and it cannot be guaranteed that participants listened to the full musical example, or used headphones or a computer/tablet. Future studies could, therefore, conduct the experiment in a laboratory, which would ensure that musical examples are experienced with the same equipment, further standardising the experiment. In the present study each example was presented in both conditions consecutively which may have affected the rating in the second condition due to participants remembering their first condition rating. Future studies could, therefore, present the audio-only and audio-visual versions of musical examples non-consecutively. In this study, musical examples varied in length and this may have impacted the participant's emotional response. Longer examples will increase familiarity (Ali and Peynircioğlu 2010), likely increasing the strength of an emotional response; therefore, future studies could use examples that are equal in length.

In comparison to Western classical music or other world musics, popular music is a recent development, which allows for new and interesting research on a relatively undocumented topic. Future research could establish whether a listener has a stronger emotional response at a live music event versus watching a music video. These two mediums represent different ways in which a visual can be transmitted, and live popular music performances are known for their impressive stage and light shows causing a strong visual impact (such as Beyoncé's 2018 Coachella performance which was described as 'visually grand' by the New York Times). Furthermore, by using different, and a greater variety of musical examples that incorporate the nine emotional categories of GEMS-9, future research could investigate why *transcendence, peacefulness, joyful activation* and *tension* were not statistically significant in this study and whether they may be significant with alternative musical examples. This study focuses on popular music videos that are often aiming to portray the same emotions as the music, however, future research could consider examples where the music and visuals portray contrastive emotions (e.g. happy music and sad visuals), or it could try to explain under what conditions the visuals have a negative impact upon the emotional power. Understanding the relative contribution of visuals and music could be achieved by future research including a visual-only condition. Time constraints of this project did not allow for this, however, if a future study were to include this condition it would allow one to make estimations regarding the individual contributions of the visual and audio elements of the videos in inducing felt emotional power.

The relationship between music and visual stimuli has been strongly established in a variety of musical contexts; however, limited research has focused on the impact of popular music videos on a listener's emotional response. As average total emotion significantly increased in the audio-visual condition, this study has concluded that the addition of visual stimuli in popular music increases the strength of the listener's induced emotional response.

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APPENDIX 1.

Order of musical examples in surveys variants where A = audio-only and A-V = audio-visual.

Survey A	Survey B	Survey C	Survey D
I Was Here (A)	All Night (A-V)	Formation (A)	Pretty Hurts (A-V)
I Was Here (A-V)	All Night (A)	Formation (A-V)	Pretty Hurts (A)
Pretty Hurts (A)	I Was Here (A-V)	Pretty Hurts (A)	All Night (A-V)
Pretty Hurts (A-V)	I Was Here (A)	Pretty Hurts (A-V)	All Night (A)
Formation (A)	Formation (A-V)	I Was Here (A)	Formation (A-V)
Formation (A-V)	Formation (A)	I Was Here (A-V)	Formation (A)
All Night (A)	Pretty Hurts (A-V)	All Night (A)	I Was Here (A-V)
All Night (A-V)	Pretty Hurts (A)	All Night (A-V)	I Was Here (A)

APPENDIX 2.

Participant Information and Song Familiarity

Participant	Age	Gender	Familiarity
A	21	F	None
B	19	M	Formation, Pretty Hurts
C	50	F	All Night, Pretty Hurts
D	60	F	All Night
E	50	F	None
F	21	F	Formation, Pretty Hurts
G	22	M	All Night, Formation
H	21	F	None
I	20	M	None
J	59	M	I Was Here, Pretty Hurts
K	20	F	Formation, Pretty Hurts
L	20	F	None
M	21	F	Formation
N	20	M	None
O	21	F	Formation
P	54	M	None
Q	21	F	Formation, I Was Here
R	25	F	None
S	20	F	Formation
T	21	F	All Night, Formation, I Was Here, Pretty Hurts
U	20	F	Formation, Pretty Hurts
V	22	F	Formation, I Was Here
W	21	M	None
X	20	F	None
Y	21	F	None
Z	22	F	Pretty Hurts