It's just that sudden feeling of being transported: Music as a digital possession after a romantic relationship ends

Katha V. Patel[1,2], Martia N. Williams[1], Janai Mychelle Adams[1,3], and Anthony T. Pinter[1,4]

[1] The iSchool Inclusion Institute (i3), University of Texas at Austin, Austin, TX, USA
[2] University of Illinois at Urbana Champaign, Champaign-Urbana, IL, USA
[3] Texas State University, San Marcos, TX, USA
[4] University of Colorado Boulder, Boulder, CO, USA

Abstract. After experiencing the break-up of a romantic relationship, people face decisions about what to do with the datafied representations of their lost relationships. Prior work in human-computer interaction (HCI) has focused on how to better design features on social media sites (SMSs) to support that data management. However, these designs do not offer users a way of managing other types of possessions that might be indicative of the relationship. For example, popular media, like music, can act as proxies for the relationship or ex-partner – reminding someone of what they have lost. To begin addressing this, we present findings from a literature review of work focused on the relationship between music, emotion, and memory. We identify three themes in this body of literature: the internal and external locus of emotion in music, using music to hedonically shift one's emotions, and the personal connection to music many people have. From these thematic findings, we argue for considering other types of digital possessions when studying life transitions like a romantic relationship break-up.

Keywords: music · emotion · relationship dissolution · life transitions · literature review

1 Introduction

When romantic relationships end, the former romantic partners are left to sift through the remnants of their relationship. Online, remnants of a relationship might exist on social media sites (SMSs) as pictures and posts that are representative of the relationship, or as encoded connections to others that exist because of the relationship [22]. Recent work has drawn attention to how designers might provide users with tools to cope with the aftermath of a break-up, allowing them to better manage their digital possessions and connections [14].

However, the data that might hold associations to an ex-partner or lost relationship extends beyond the possessions and connections that exist on SMSs.

Just as physical objects can serve as proxies for our relationships to others [21], so can media [4]. As music streaming services like Spotify have become more ubiquitous, individuals might have to contend with the possibility of hearing a song that they associate with their ex at an inopportune moment or having an algorithm suggest that song when least needed [27]. In other words, a digital possession might indicate one's identity to others [26], but could also hold associations and memories that impact one's understanding of their experiences and identity.

In this paper, we present a literature review about the relationship between music, emotion, and memory, positioning music as a type of digital possession that might require management after experiencing a life transition like a break-up. Drawing from psychology and related disciplines, we connect this body of research to work from human-computer interaction (HCI) investigating relationship dissolution and post-dissolution data management. In contrast to prior work from HCI and related fields, which have focused on digital possessions that are closely tied to how one's identity is presented to others, we take a more holistic approach, considering digital remnants that are less personal to any one person. Here, we draw on HCI work investigating the connection between emotion and music, [3, 1] and the use of music in HCI [15] to highlight how music may play a role in going through a life transition such as a romantic break-up.

Specifically, we identify gaps in understanding around how digital media might be a type of possession that can remain available online after a life transition like a break-up. Our literature review was guided by an overarching research question: *How do people process emotions through digital possessions, such as music, after a break-up?* The persistence of these media possessions can remind an individual of their break-up in ways that may cause emotional distress, and thus should be investigated further to motivate designs that help users manage them as part of the break-up process.

2   Methods

To understand how other disciplines have conceptualized the connection between music, emotion, and memory, we conducted a semi-structured lit review focused on those topics. We began by searching for keyword phrases including "impact of music on emotions" and "how music affects behavior" in Google Scholar. We used Google Scholar to provide as wide of a search radius as possible [12]. From our initial search, we identified two articles that directly tied to our interests in the connection between music, memory, and emotion [13, 9]. Using those two articles, we conducted both past-facing and forward-facing literature reviews of the articles that those pieces cited and were cited by, respectively. Our literature search yielded a total of 324 articles. We report the source of those articles, in aggregate, as part of Table 1.

Three authors then split the article corpus and articles coded for relevancy by reading the abstracts. When it was not clear if an article was relevant, the fourth author made a final determination. The relevancy coding process resulted

Table 1. Counts of articles and relevant articles from searches of [9, 13].

	Articles Identified	Relevant Articles	% Relevancy
Cited by Evans	44	14	31.8%
Cited Evans	106	33	31.6%
Cited by Greitemeyer	45	9	20.0%
Cited Greitemeyer	107	18	16.8%

in 74 articles (24.5%), which three authors then redistributed and read, grouping articles thematically and writing memos about the thematic groupings. Three themes resulted from our analysis, which we report next.

3   Findings

To highlight the impact that considering music as a digital possession might have on individuals experiencing a break-up, we present our findings in three major sections. We start by discussing work about the locus of emotion within music. Then, we discuss work focused on exploring how the locus of emotion can be leveraged to shift people's attitudes and emotions in both positive and negative ways. Finally, we analyze the impact that personal connections to specific music might have on the ability of music to sway attitudes and emotions. Throughout our findings, we draw attention to potential implications for HCI research on break-ups and other life transitions.

3.1   The Locus of Emotion in Music

Schubert [28] defines the locus of emotion as "emotion perceived and emotion felt in response to music." The experience of listening to music is commonly associated with emotion – the music moves us. Researchers [17], philosophers [5], and critics [32] have drawn attention to how music can make everyone feel differently. Music can be designed to encourage the listener to feel a specific emotion. However, the listener might also feel emotions differently from what the music is meant to elicit – how the music makes one feel.

   Here lies the importance of acknowledging the distinction between perceived and felt emotion. Our ability to "observe" emotion creates a philosophical dilemma - an acoustic signal surely cannot express emotions the same way a human being can [19] but it can invoke emotions in us. Regardless, there is no doubt that people are not only able to observe emotion in music, but even agree as to what emotion is being conveyed.

   In investigating differences between the perceived and felt emotion of music, researchers have paid attention to the 'location' of emotion in music [16]. In defining the locus of emotion, they distinguished between external and internal loci of emotion. External locus (EL) is the emotions that people perceive the music is trying to convey while listening to it [16]. For example, a music critic may choose to comment on the looming imminent feeling of threat or suspense

that a certain piece of music invokes without actually being personally involved in these emotions. A popular example of external locus is the Jaws soundtrack. The haunting score, composed by John Williams, has left a lasting impact on both the film music landscape and people worldwide. The music in this movie is composed to impart feelings of fear to listeners, amplifying the horror of the visual aspects of the film.

In contrast, internal locus (IL) is the subjective emotional response we feel when listening to music, regardless of the musician's intentions. Just as music is varied and endless, so are our reactions to music. The different reactions that two people have to the same piece of music could be due to individual factors such as taste, mood, and even time of day. The song "Dancing Queen" by Swedish group ABBA is a very upbeat and cheerful piece of music, causing many listeners to dance and sing along, however, certain listeners may perceive the song differently because of previous associations. For example, the song may remind them of their ex or another stressful time in their lives simply because of the context.

Gabrielson [10] investigated the relationship between external locus and internal locus. He proposed four possible relationships between EL and IL: positive, negative, neutral, and no underlying relationship. He emphasized that emotional responses to music are dependent on an interplay between musical, personal, and situational factors. Here, we focus on the more prominent relationships found in subsequent research: positive and negative.

A positive relation between EL and IL occurs when the emotion that the music is composed to elicit does so (*e.g.*, happy music elicits happy emotions; sad music elicits sad emotions). For instance, Stratton & Zalanowski [29] found that positive relationships between EL and IL can extend beyond emotions; Thaut & Davis [31] found that participants felt more relaxed in response to relaxing music, regardless of whether they were able to pick the specific music to listen to or not. However, the opposite can also occur, what Gabrielson [10] terms a negative relationship between EL and IL. Sometimes, the emotion that music elicits in a listener differs from the emotion it was designed to elicit (*e.g.*, happy music causes sad emotions; sad music leads to happy emotions). He argues that these contradictory relationships are idiosyncratic and are generally caused by certain memories and associations with the music. Even though certain songs may be emotionally difficult or "sad," they can still be enjoyable and meaningful to listeners. A knee-jerk reaction in human-computer interaction (HCI) might be to quantify and analyze emotions such as sadness to tailor recommendations to the user. However, this approach fails to recognize the complexity and subjectivity of emotions and the unique context and experiences of the individual. Instead of relying on quantitative measures of emotions, it is important to consider personalized and empathetic solutions that take into account the holistic needs and experiences of the user.

3.2   Using the Locus of Emotion to Hedonic Shift

A negative relationship between the perceived and felt emotions in songs can be used to shift one's emotions in productive or unproductive ways. The "hedonic

shift" is an internal change in one's emotions and/or feelings towards a situation based on cues around them, such as music [20]. It is a shift in their mindset solely based on past experiences mingling with their current state's goals. An individual's situational goals are cued and acted upon emotionally pushing goals that were previously important to the back of their minds [20].

Coming from the word 'hedonism,' an ancient Greek term for pleasure adopted in the late 19th century by the Hedonist movement, the hedonic shift acknowledges the ability of popular media, like music, to shift our emotions. Music is said to have the power to uplift. For example, Douglas [6] found that music can have a positive effect on patients with depression, increasing confidence, self-esteem, social skills, and psychological well-being.

However, hedonic shifts can cut the opposite way – what is meant to be a positive interaction can instead negatively impact one's mood or emotional state. For example, people that have been in serious car accidents explain how even though their car is wrecked, the radio will continue to play. A song that is intended to make people happy may transport them back to the traumatic experience.

Eerola et al. [7] examined how people use music to hedonically shift their emotional state. They explored how people listen to sad music when they are feeling sad, and how listening to that music can improve their mood – it can make them happy. The individual's internal hedonic goal has shifted based on the external situational cue. They find pleasure in discovering a socially acceptable form of the sadness they are feeling [7].

Regardless of the type of hedonic shift involved, it inevitably involves both perceived and felt emotions. Where the perceived emotion of a song can be evaluated and quantified, the felt emotion is far more nebulous. While the impact of perceived emotion is murky and might vary from person to person, it is clear that people form connections to the music that speaks to them, and that felt emotion can have far-reaching impacts on their days and lives. When designing systems, incorporating opportunities that allow people to integrate hedonic shifting related to music in their regular algorithms could positively impact user experiences. For example, one could imagine a feature that leverages a user's past streaming history to ask about a specific song or artist that a user has abandoned listening to. Such a feature could prompt the user to listen to the track again, or provide the means to quickly remove the track from their streaming library.

3.3   Our Connection to Music

Many studies centered around the relationship between music and emotion had participants listen to non-popular music – primarily classical music [30, 18, 16, 28]. The choice to use non-popular music is influenced by the idea that participants may have past experiences that could influence their emotional connection to any selected pieces of popular music [8, 16, 18]. However, because most people listen to popular music – the kind one might find on Spotify or the radio – this research does not provide an accurate representation of how we interact with

music daily. Pieschl et al. [24] acknowledged the idea that using non-popular music could have affected the results of their study, but many researchers have failed to consider the impact of genre and personal connection and the emotions that people feel when listening to music [30, 23].

Even in cases where studies have utilized popular music [2, 11], researchers have sought to control participants' connections to events, memories, and other personal connections they have to specific songs. For example, Brattico et al. [2] recorded brain activity as a response to participants' emotions while listening to happy or sad music that they either liked or disliked. They allowed participants to pick a total of 16 pieces of popular music that would be used for the experiment [2]. But while the participants were able to pick pieces that they liked or disliked, they were told that the pieces "should not be associated with any special personal memories". The authors noted that many of the participants found it challenging to pick out pieces that would fit said criteria because we associate music with significant memories and experiences [2].

The work here focuses heavily on the perceived emotions of a piece of music; yet, consuming music involves experiencing both perceived and felt emotions. It does not accurately reflect how people consume music in their day-to-day lives. Future work might instead aim to intentionally analyze how participants' memories about past break-ups affect the ways that they choose to listen or not listen to different pieces of music. Instead of trying to hide the personal connection that is inevitably present between each person and the chosen music, researchers might instead embrace it, enabling them to delve deeper into how people respond to that music as part of their break-up healing process. To design systems that are truly human-centered it is incumbent upon researchers to understand people's lived experiences in the real world. For instance, music streaming companies like Spotify might reconsider the design of their curation algorithms to give listeners more agency in tailoring their listening experiences after going through a break-up. For example, Spotify could design a feature allowing users to exclude an artist from their recommendations for a set period of time.

4   Discussion & Implications

Our literature review points to the deep connections people can have between a piece of media, like a song, and experiences, memories, and emotions. In the wake of a break-up, what was once a song that sparked a joyful memory may become soured with the memory of the break-up. Our findings illustrate the need for future work to pay attention to other types of possessions (digital and otherwise) that can hold emotional connections to an ex-partner after a break-up. While prior work has identified designs for helping users to manage their data possessions and connections on SMSs (*e.g.*, [25, 26, 14, 22]), our work points to streaming services as another potential source of harm in the wake of breaking up. We suggest possible designs that users might find helpful based on the literature review presented here, but addressing these gaps in knowledge through

empirical investigation of people's experiences could yield other design suggestions to improve user experiences on platforms where media is consumed (*i.e.*, streaming platforms).

5 Summary

In this poster, we presented findings from a literature review of work investigating the connection between music, emotion, and memory. We related our findings to work in HCI about romantic relationship dissolution, highlighting areas for future work to address that might improve user experiences in sociotechnical systems after experiencing a break-up or other life transition.

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