THE INTERPLAY AMONG AESTHETIC QUALITY, SONG POPULARITY AND AESTHETIC CHILLS

Melissa Ridder

Abstract

This experimental study investigated the potential interplay among the experience of aesthetic chills in nonexperts, song popularity, and music quality in rock songs as assessed by experts. Aesthetic chills are defined as intense tingling sensations that spread throughout the body in response to music or other aesthetic sources (Panksepp, 1995). We manipulated song popularity and song quality using 12 songs varying along these factors. We found that participants "correctly" perceived songs that experts consider high in aesthetic quality to be higher in quality compared to songs that experts consider low in aesthetic quality, regardless of song popularity. However, an even stronger effect was also found: participants perceived songs high in popularity (and thus more familiar to them) to be higher in quality compared to songs low in popularity (and thus less familiar to them), regardless of actual expert-rated quality. In other words, the participants rated popular songs as higher quality than less popular songs, regardless of expert ratings. The tendency to experience aesthetic chills followed a similar pattern, suggesting that feeling such chills can be one mediator of perceptions of quality. We discuss how the tendency for nonexperts to focus more on familiarity than expert-rated aesthetic quality in their perceptions of song quality aligns with previous music research.

Keywords: *Aesthetic chills; aesthetic quality; music*

The Interplay Among Aesthetic Quality, Song Popularity and Aesthetic Chills

How do regular people decide if a song is good or bad? It is possible that music nonexperts can accurately perceive the same qualities intrinsic to the music that music experts perceive, but research has been somewhat mixed on whether nonexperts agree with experts about music quality (e.g., Lundy & Smith, 2017; North & Hargreaves, 1995). Another possibility is that nonexperts' perceptions of music quality are unduly affected simply by how familiar a song is to them. Familiarity has long known to affect people's perception of many stimuli (Zajonc, 1968), including various aesthetic works like music (Lundy, 2016). A third possibility is that perceptions of music quality are influenced by the experience of aesthetic chills while listening to music. For some people, aesthetic chills (aka gooseflesh, tingling, frisson; Bicknell, 2009), are an important part of experiencing various kinds of art, including music. Averages across studies suggest that about half of the human population sometimes experience such chills when listening to music (Juslin, 2019). While previous research has explored the impact of familiarity and aesthetic chills on music perception, this experimental study aims to investigate the potential interplay of familiarity and aesthetic chills in ratings of rock songs. More specifically, we wanted to test whether those who experience chills are more naturally gifted in their ability to evaluate rock music quality.

The phenomenon of aesthetic chills has been defined as an intense tingling sensation that spreads throughout the body in response to music or other aesthetic sources (Panksepp, 1995). In the past, studies have sought to understand the nature of these chills from physiological and psychological perspectives. The feeling of chills can be identified physiologically by an increase in skin conductivity and piloerection (Poerio, 2018). From a psychological standpoint, the ability to experience aesthetic chills is associated with generally higher scores for openness to experience (McCrae, 2007). Levinson (2004) suggested

that chills serve as confirmation of the resonation between the bodily somatic experience and psychological experiences, with the "fineness of expression", the subtle, skillful expression of emotion in music, enhancing this connection. In this view, experiencing chills is just one component of an overall response, reflecting an alignment between physical sensation and internal psychological impact. Aesthetic motivation, or the desire to seek and appreciate sensory beauty, plays an important role in how people engage with art, including music. This motivation can heighten responsiveness to music's emotional qualities, sometimes triggering intense pleasure responses such as aesthetic chills, marked by sensations like goosebumps and tingling (Blood & Zatorre, 2001; Panksepp, 1995). Experiencing chills has been linked to positive judgments of music, suggesting that for some listeners, chills serve as an indicator of musical quality (Konečni, Wanic, & Brown, 2007; Nusbaum & Sylvia, 2011). This study explores whether aesthetic chills, alongside familiarity, shape nonexperts' ratings of rock music quality.

The contexts for experiencing chills can differ from person to person, but previous research suggests that chills in response to music are predictably associated with subjective experiences (Panksepp, 1995). For instance, an individual will be more likely to experience chills if the song they are listening to is associated with a memory important to the individual (Blood & Zatorre, 2001). Along with past experiences, one study found that the familiarity of a song is linked to more chill experiences (Lowis, 1998). According to the five-factor model of personality, a high score in openness to experience is related to a higher appreciation for different art forms including music (McCrae, 2007). Just as the context is subjective, other studies have found that the chill experiences differed in intensity for participants. Another study analyzed feedback from 98 music experts who noted a chill experience, and the feelings associated with these experiences including being moved, charmed, and nostalgic which were more likely to be mentioned than basic emotions of joy, anger, and fear

(Scherer et al., 2001). While participants' chill experiences are relatively subjective, Panzarella (1980) identified four ubiquitous characteristics of the participants' experiences including: withdrawing attention from one's social and physical environment ("withdrawal ecstasy"), pseudo-sensory feelings like a feeling of "floating" ("motor-sensory ecstasy"), experiencing a better view of the world and/or a yearning to create (musical or visual) art ("renewal ecstasy"), and a feeling of oneness with the artwork ("fusion-emotional ecstasy").

Aesthetic chills have been found to have a relationship with participants' emotionality (experience, intensity, and frequency of emotions). The presence of aesthetic chills can be used to measure the subjective emotional peak of an individual (Grewe, Kopez, & Altenmüller, 2009), demonstrating how chills reflect a high level of emotional engagement. Bicknell (2009) argued that subjective emotionality, rather than music quality, might better explain chill experiences and that higher quality music might not necessarily induce more chills. Similarly, Konečni et al. (2007) had participants take a questionnaire to measure their emotionality and found a positive correlation between emotionality and the likelihood of experiencing chills.

While some studies focus on subjective emotionality, others focus on technical aspects of music that may induce chills. Sloboda (1991) found that chills tend to be induced by certain qualities of music such as a dissonant note followed by resolution, dynamics, loudness, or sudden change in the harmony. Other studies have found similar qualities that make a song more likely to induce chills; Guhn et al. (2007) found that slow movements in a song, a harmonic and melodic interchange, alternating solo instruments, increase in piano volume, an extended frequency range, and a harmonic progression that broke the pattern of the music leading up to it made the participants more likely to experience chills. Pleasant and upbeat music (dependent upon the change in volume and voice of the singer) was also found to produce

more occurrences of a chill response (Grewe et al., 2007; Lowis, 1998). The importance of certain qualities changed depending on the type of music that was applied. The following were ranked in order for classical music, but were inverted for non-classical music: structure, acoustic features, and interpretation (Scherer et al., 2001).

Music popularity significantly influences listeners' perceptions and evaluations of songs. Familiarity with popular tracts often shapes emotional responses, as individuals tend to have stronger connections to music they encounter frequently (North & Hargreaves, 2006). This heightened familiarity can lead to increased enjoyment and a greater likelihood of experiencing aesthetic chills. Konečni et al. (2007) found a positive correlation between emotionality and the likelihood of experiencing chills, suggesting that popular songs may elicit stronger emotional reactions due to their familiarity. In addition, popular songs are frequently associated with shared cultural experiences, which can enhance their emotional resonance (Grewe et al., 2009). This interplay between popular and emotional impact may lead listeners to favor well-known tracts, often regardless of their objective quality as assessed by experts. Understanding this dynamic is essential for grasping how music popularity affects emotional engagement and perception.

Despite the research listed above on aesthetic chills, their relationship with ratings of quality has not been studied. This study seeks to determine if those who experience chills will rate the quality of songs more similarly to experts than those who do not experience chills. We aim to determine if individuals who experience chills will score higher on a scale measuring general aesthetic motivation, which refers to the drive or desire to seek out and engage with aesthetic experiences that provide pleasure or fulfillment. This motivation can influence how individuals respond to art and music, potentially enhancing their emotional reactions, such as chills. We also want to investigate whether the quality of the song has an impact on whether

individuals will tend to feel chills while listening. Lastly, we aim to test whether familiarity has a greater impact on music quality perceptions than the actual music quality as rated by experts. Bicknell (2009) asked the important question, "Is it only great musical works or masterpieces that arouse tears and chills in listeners?" (p. 70).

The Present Study

The current study was thus undertaken to evaluate the following hypotheses:

- *Hypothesis 1 (H1)*: Song popularity (familiarity) will have more of an effect on nonexperts' perceptions of song quality than actual song quality (as judged by experts). Whether actual song quality will have any effect on perceptions of quality is difficult to predict because previous research has been found to support both sides of this issue depending on how it has been studied. Regardless, due to familiarity, nonexperts are expected to rate popular songs higher than unpopular songs, regardless of expert's appraisal of song quality.
- *Hypothesis 2 (H2)*: People will report experiencing greater aesthetic chills for popular songs compared to unpopular songs, regardless of song quality. This would be a parallel finding to H1, except that chills could be one potential mediator of perceptions of song quality.
- *Desire for Aesthetic Scale (DFAS)*: The DFAS is a 36-item measure developed by Smith and Jones (2002) to assess the importance of beauty in a person's everyday life. Example items include statements like, "I find beauty in my everyday surroundings" and "I am often moved by beautiful music." The scale has shown good reliability, with an alpha coefficient of 0.85, indicating strong internal consistency (Smith & Jones, 2002).

- *Hypothesis 3 (H3):* There will be an interaction of actual aesthetic quality and DFAS music scores on the tendency to experience stronger chills. This suggests that individuals who prioritize musical beauty in their everyday lives will be more likely to experience chills in response to high-quality music, meaning that those who care deeply about music beauty will report stronger chills. Understanding how musical beauty interacts with individual preferences leads us to explore whether familiarity with a wider array of musicians impacts discernment in music quality.
- *Hypothesis 4 (H4)*: Do people with greater familiarity with a wide array of musicians show more discernment about music quality? It is possible that those who have a more extensive familiarity with a greater range of past music will be more likely to experience chills to better music. This would show up as an interaction of actual aesthetic quality and music familiarity scores on the tendency to experience chills. Similarly, a study on visual art performed by Winston and Cupchik (1992) observed that the more experienced art viewers compared to inexperienced viewers preferred high quality art over popular art.

Method

Participants

In total, 78 participants started this study at various times, but only 28 completed all or most parts of the questionnaires (35.9%). In terms of gender, there were 16 females and 11 males (and one who did not indicate their gender). Ages ranged from 17 to 50 (M = 31.26; SD = 10.09). In total, 82% of the participants were Caucasian (2 participants were Asian, 1 was Hispanic, 1 was African American, and 1 person did not respond). Only 1 of 28 indicated they were a music major. In terms of college rank, 39% of the participants were first-year students, 7%

were sophomores, 25% were juniors, 18% were seniors, 1 student was a graduate student (4%), and 1 did not respond. The range for average number of musicians people were familiar with out of 200 musicians was 7 to 154 (*M* = 68.41; *SD* = 41.41; *median* = 55.0). DFAS scores out of 216 (measuring a general interest in beauty) ranged from 100 (roughly neutral) to 181 (roughly 5 out of 6 on average; *M* = 134.86; *SD* = 17.36).

Materials

Songs were chosen based on ratings by professional critics from two different sources, *The Rolling Stone Record Guide* (Hoard, 2004), and *MusicHound Rock: The Essential Guide* (Graff, 2000). Albums were chosen at random, and to manipulate aesthetic quality (AQ), those that were rated either very high (80 to 100%) or very low (less than 40%) on a 5-star scale were retained. We then randomly chose songs from each selected album to be used in the study. To manipulate song familiarity (FA), half of the songs used were known to be popular and half unpopular. This was based on Billboard chart performance and the extensive music knowledge of one of the experimenters. In total, 12 songs were used, i.e., three songs for each of the four conditions: High AQ/High FA, High AQ/Low FA, Low AQ/High FA, and Low AQ/Low FA (see Table 1 for the list of songs used). The beginning of the results section provides strong evidence that these manipulations were successful.

The 36-item DFAS was given, which measures the extent to which beauty is important to a person in everyday life. *A Music Familiarity Questionnaire* was also given, which consisted of 200 musicians and the participants had to indicate which ones whose music they had heard before. Aesthetic ratings were made on a 0 to 100 scale, with 50 representing a neutral response. Aesthetic chills were measured with two items: "Did you experience chills?" and "If yes, how strong were these chills?" in which the participant then selected between none, mild, moderate, or extreme to determine what degree the chills were felt.

Procedure

This experiment was approved by the Institutional Review Board (IRB) at Indiana University IRB, ensuring ethical standards were met for participant safety and confidentiality. This study used a within-subjects (repeated measures) design, so all participants saw every aspect of the experimental conditions. On both a psychology majors' Canvas site and in a traditional introductory psychology course subject pool at Indiana University East, participants were invited to take part in a study on the "Aesthetic judgment of music". Students who emailed the lead experimenter were given a standard email response with instructions and access to a Google Drive folder containing the 12 songs and consent forms. The participants were instructed to listen to the 12 songs in the order provided at least two different times to control possible order effects and familiarity. We counterbalanced the order of songs into six different orders within each condition by using a standard technique. Participants then filled out an informed consent form and answered all the questionnaires noted above at home and submitted them to the lead experimenter, who sent back a debriefing form and an opportunity to be put on a list to receive a summary of the results once the study was completed.

Results

Manipulation Checks

The manipulation of song familiarity via popularity was reasonably successful. Songs that were intended to be more familiar to participants due to greater popularity in society were verified from participants' responses to the question of whether they had heard the song before the study. For songs high in AQ as judged by professional critics (i.e., "experts"), the percentage of participants who had heard the more popular songs before (M = 79.76%; SD = 26.20%) was significantly higher than the percentage of participants who had heard the less popular songs high in AQ (M = 7.14%; SD = 16.62, t(23) = 14.92, p <

.001). Similarly, for songs low in AQ, the percentage of participants who had heard the more popular songs before the study (M = 59.52%; SD = 41.93%) was significantly higher than the percentage of participants who had heard the less popular songs low in AQ (M = 7.14%; SD = 13.93%, t(25) = 7.12, $p < .001$).

Hypothesis Tests

To test H1, we first ran a two-way repeated measures ANOVA with song aesthetic quality (according to experts) and song popularity as within-subjects variables. The dependent variable was *perceived song quality* rated by each participant from 0 to 100. H1 was supported as participants rated popular songs higher than less popular ones, regardless of expert ratings. Specifically, there was a significant main effect of song aesthetic quality: songs judged by experts to be higher in aesthetic quality were in fact perceived by our participants as higher in quality (M = 68.86; SD = 15.04) compared to songs judged to be lower in aesthetic quality by experts (M = 57.78; SD = 20.62), regardless of their popularity, (F(1, 27) = 13.00, p = .001). However, the effect size was small (eta-squared = .32). There was also a significant main effect of song familiarity: songs that were popular in general (M = 73.14; SD = 18.71) were perceived by participants to be higher in quality compared to songs that were not popular (M = 53.50; SD = 16.95), regardless of their actual quality as judged by experts (F(1,27) = 47.97, $p < .001$). In this case, the effect was medium (*eta-squared* = .64), making the effect for song popularity exactly twice as large as the main effect for aesthetic quality. There was no interaction of song aesthetic quality and song popularity (F(1, 27) = .23, p = .64). It is also notable that experts rated the high quality songs much higher than the low quality songs (80 or higher vs. below 50), whereas the participants on average only rated the high quality songs about 10 points higher than the low quality songs (68.86 vs. 57.78).

To test H2 that experiencing aesthetic chills could serve as one possible proxy for perceptions of aesthetic quality, we ran a parallel analysis but substituted the perceived song quality dependent variable with participants' *reported level of aesthetic chills*. H2 was roughly supported as there was a marginally significant main effect of song aesthetic quality: songs judged by experts to be higher in quality created marginally stronger aesthetic chills (M = .45; SD = .60) compared to songs judged by experts to be lower in aesthetic quality (M = .29; SD = .40), regardless of their popularity (F(1, 27) = 3.74, p = .064). The effect size was very small (*eta-squared* = .11). There was a significant main effect of song familiarity: songs that were popular in general created stronger aesthetic chills (M = .55; SD = .68) compared to songs that were not popular (M = .19; SD = .32), regardless of their actual quality as judged by experts (F(1,27) = 14.38, p < .001). The effect was small (*eta-squared* = .35). There was no interaction of song aesthetic quality and song popularity on the reported level of aesthetic chills (F(1, 27) = .011, p = .92). Although the effects for level of aesthetic chills were smaller than they were for perceptions of song quality, the level of chills experienced for familiar songs were again higher than they were for unfamiliar songs, and the effect size for song familiarity was again larger than it was for actual song quality (about three times larger). It should be noted that chills were not experienced often by participants and the overall strength of chills (0 = none, 1 = mild, 2 = moderate, 3 = extreme) across all 12 songs was relatively low (M = 0.24; SD = 0.22).

H3 was not supported in that there was not a positive correlation between DFAS average music item scores and the intensity of aesthetic chills (r = .14, p = .49). We then investigated whether people with high DFAS music scores feel greater chills to high AQ songs compared to low AQ songs. We did a median split for DFAS music where high was defined as 5 or more out of 6 and low was defined as less than 5 out of 6. However, there was no significant interaction between DFAS music

level and AQ on level of chills experienced ($F(1, 25) = .22$, $p = .64$). A complicating factor for this analysis is that there was little variability in participants' DFAS scores, possibly because participants all self-selected into a music study. Because overall DFAS scores were so high, it was not possible to analyze people who had truly low DFAS scores as they were not present in our sample. Overall, the data suggests that people who felt chills for high AQ songs also felt chills for low AQ songs. Thus, the tendency to feel chills toward music is more of a personality variable (the desire for aesthetics) than anything about the quality of music.

To test H4 - Do people with high music familiarity music scores feel greater chills to great songs (high AQ songs) compared to weak songs (low AQ songs)? - we did a median split for music familiarity scores where high was defined as greater than 55 (out of 200; $n = 13$) and low was defined as less than 55 or less ($n = 14$). However, there was no significant interaction of music familiarity level and AQ on level of chills experienced ($F(1, 25) = 1.13$, $p = .30$).

Discussion

Our nonexpert music participants agreed with music experts about the quality of songs in our study, but song popularity had an effect about twice as large as the actual quality. In other words, if participants tended to be familiar with a song, this had twice as strong of an effect on their perceptions of quality as did the actual quality of the song as judged by experts. This also fits with Lundy's (2016) assertion that a familiarity bias is the grandfather of all nonaesthetic biases, i.e., when the level of familiarity is not similar between songs then other biases are also more likely to occur.

Similar results were obtained when the level of aesthetic chills was used as the dependent variable: our nonexperts reported stronger aesthetic chills for songs that experts judged to be better compared to songs judged by experts to be weaker songs, but song familiarity had

an effect about twice as large as did actual song quality. In other words, if participants tended to be familiar with a song, this had about three times as strong of an effect on their level of experienced aesthetic chills as did the actual quality of the song as judged by experts. Taken together, the findings suggest that aesthetic chills may play a role in shaping perceptions of song quality; however, more research is required to thoroughly examine this potential relationship. If one experiences chills, it may make one more likely to rate songs higher in perceived quality.

The negative results for hypotheses 3 and 4 suggest that experiencing aesthetic chills to objectively better music (as rated by experts) is not more likely for people who either care more about music in general or people who have a greater familiarity with many musicians. One interpretation of the data is that a lot of what is referred to as "aesthetic" chills are not aesthetically motivated at all but created by what Lundy (2016) referred to as nonaesthetic factors, such as familiarity/nostalgia. Future studies could find ways to gather data from larger samples of people, but this is challenging. Bringing people into a lab to complete the study may be necessary but then one loses some ecological validity. Future research would also benefit from finding songs that create higher levels of chills among participants, which were mild for the most part in this study. Regardless, we did find some evidence that chills can mediate perceptions of quality, but familiarity tends to be a stronger factor in perceptions of quality and the tendency to feel aesthetic chills. Thus, quality does not appear to be essential for nonexperts to feel chills, so it may not always be appropriate to call them "aesthetic" chills at all. For instance, feelings of nostalgia are partly idiosyncratic to individual listeners and thus somewhat external to the music's aesthetic properties. Some seemingly aesthetic chills could thus in some cases actually be considered nonaesthetic chills that fit within Lundy's (2016) list of nonaesthetic biases.

This study sheds light on the interplay between song quality, popularity, and listeners' perceptions in music appreciation. The results reveal that participants tended to rate songs higher when they were more familiar, aligning with Lundy's (2016) assertion that familiarity bias can significantly influence aesthetic judgments. Although participants agreed with expert evaluations of song quality, the influence of popularity on perceived quality was notably stronger. This finding suggests that familiarity plays a crucial role in shaping perceptions of both song quality and the intensity of aesthetic chills experienced. The data also indicated that aesthetic chills were reported more frequently for popular songs, emphasizing the connection between familiarity and emotional responses to music. However, hypotheses regarding the relationship between aesthetic chills and individual differences in music appreciation did not receive support. The lack of significant findings in these areas raises questions about the true nature of aesthetic chills and their motivations. Future research should aim to gather data from larger, more diverse samples while considering ecological validity. Exploring the types of songs that elicit stronger chills and further examining the role of nostalgia in music appreciation may enhance our understanding of these complex dynamics. This study highlights the need for continued exploration into the factors that shape music perception, suggesting that the aesthetics of music cannot be fully understood without considering the influence of familiarity and personal associations. ■

REFERENCES

Bicknell, J. (2009). *Why music moves us*. New York: Palgrave Macmillan.

Blood, A., & Zatorre, R. (2001). Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward and emotion. *Proceedings of the National Academy of Sciences of the United States of America*, 98(20), 11818-11823. Retrieved from http://www.jstor.org/stable/3056798.

Brackett, N., & Hoard, C. (Eds.). (2004). *The new Rolling Stone album guide* (4th ed.). New York: Fireside.

Costa, P. T., & McCrae, R. R. (1992). The five-factor model of personality and its relevance to personality disorders. *Journal Personality Disorders*, 6(4), 343-359.

Grewe, O., Kopiez, R., & Altenmüller, E. (2009). The chill parameter: Goose bumps and shivers as promising measures in emotion research. *Music Perception*, 27(1), 61-74.

Guhn, M., Hamm, A., & Zentner, M. (2007). Physiological and musico-acoustic correlates of the chill response. *Music Perception*, 24, 473-483.

Huron, D., & Margulis, E. H. (2010). Musical expectancy and thrills. In P. N. Juslin & J. A. Sloboda (Eds.), Handbook of music and emotion: Theory, research, applications. (pp. 575-604). New York, NY: Oxford University Press.

Juslin, P. N. (2019). *Musical emotions explained: Unlocking the secrets of the musical affect*. New York, NY: Oxford University Press.

Juslin, P. N., & Isaksson, S. (2014). Subjective criteria for choice and aesthetic judgment of music: A comparison of psychology and music students. *Research Studies in Music Education*, 36, 179-198.

Konečni, V. J. (2009). The aesthetic trinity: Awe, being moved, thrills. *Bulletin of Psychology and the Arts*, 5, 27-44.

Konečni, V. J., Wanic, Ra A., & Brown, A. (2007). Emotional and aesthetic antecedents and consequences of music-induced thrills. *American Journal of Psychology*, 120, 619-643.

Laeng, B., Eidet, L. M., Sulutvedt, U., & Panksepp, J. (2016). Music chills: The eye pupil as a mirror to music's soul. *Consciousness and Cognition: An International Journal*, 44, 161-178. http://dx.doi.org.proxyeast.uits.iu.edu/10.1016/j.concog.2016.07.009.

Levinson, J. (2004). Musical chills and other musical delights. In J. Davidson (Ed.). *The Musical Practitioner* (pp. 335-351). Aldershot: Ashgate.

Lowis, M. J. (1998). Music and peak experiences: An empirical study. *The Mankind Quarterly*, 39, 203-224.

Lundy, D. E. (2016). Decontaminating taste: Minimizing nonaesthetic biases in aesthetic appraisal. *Review of Arts and Humanities*, 5, 16-16.

Lundy, D. E., Allred, G. E., & Peebles, B. L. (2019). How good is this song? Expert versus nonexpert aesthetic appraisal. *Psychology of Aesthetics, Creativity, and the Arts*, 13, 293-304.

Lundy, D. E., Schenkel, M. B., Akrie, T. N., & Walker, A. M. (2010). How important is beauty to you? The development of the Desire for Aesthetics Scale. *Empirical Studies of the Arts*, 28, 73-92.

Lundy, D. E., & Smith, J. L. (2017). It's tough to be a critic: Professional versus nonprofessional music judgment. *Empirical Studies of the Arts*, 35, 139-168.

McCrae, R. R. (2007). Aesthetic chills as a universal marker of openness to experience.

Motivation and Emotion, 31(1), 5.

McEvilly, D. K. (1999). Chills and tempo. *Music Perception*, 16(4), 457-462. http://dx.doi.org.proxyeast.uits.iu.edu/10.2307/40285804.

Mori, K., & Iwanaga, M. (2015). General reward sensitivity predicts intensity of music-evoked chills. *Music Perception*, 32(5), 484-492. http://dx.doi.org.proxyeast.uits.iu.edu/10.1525/mp.2015.32.5.484.

North, A. C., & Hargreaves, D. J. (1995). Eminence in pop music. *Popular Music and Society*, 19, 41-66.

North, A. C., & Hargreaves, D. J. (1998). Affective and evaluative responses to pop music. *Current Psychology*, 17, 102-108.

Nusbaum, E. C., & Sylvia, P. J. (2011). Shivers and timbres: Personality and the experience of chills from music. *Social Psychology and Personality Science*, 2(2), 199-204.

Panksepp, J. (1995). The emotional sources of "chills" induced by music. *Music Perception*, 13(2), 171-207. http://dx.doi.org.proxyeast.uits.iu.edu/10.2307/40285693.

Panzarella, B. (1980). The phenomenology of aesthetic peak experiences. *Humanistic Psychology*, 20, 76.

Poerio, G. L. (2018). More than a feeling: Autonomous sensory meridian response (ASMR) is characterized by reliable changes in affect and physiology. *PLoS ONE*.

Rickard, N. S. (2004). Intense emotional responses to music. A test of the physiological arousal hypothesis. *Psychology of Music*, 32, 371-388.

Scherer, K. R., Zentner, M., & Schacht, A. (2001). Emotional states generated by music: An exploratory study of music experts. *Musicae Scientiae,* 2, 149-171. [volume may be wrong].

Sloboda, J. (1991). Music structure and emotional response: Some empirical findings. *Psychology of Music*, 19, 110-120.

Vuoskoski, J. K., Thompson, W. F., McIlwain, D., & Eerola, T. (2012). Who enjoys listening to sad music and why? *Music Perception*, 29(3), 311-317.

Williams, P. G., Johnson, K. T., Curtis, B. J., King, J. B., & Anderson, J. S. (2018). Individual differences in aesthetic engagement are reflected in resting-state fMRI connectivity: Implications for stress resilience. *NeuroImage*, 179, 156-165.

Winston, A. S., & Cupchik, G. C. (1992). The evaluation of high art and popular art by naïve and experienced viewers. *Visual Arts Research*, 18, 1-14.

Zajonc, R. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology*, 9, 1-27.

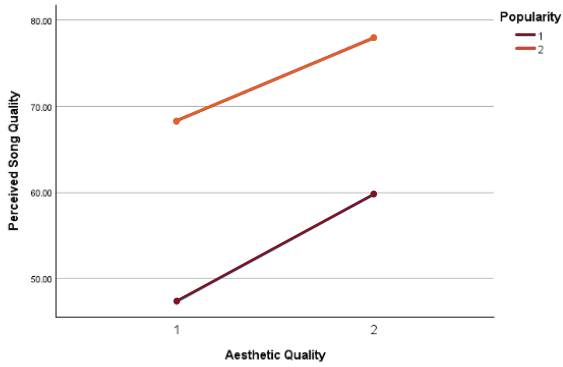

Figure 1. Effect of Aesthetic Quality and Popularity on Perceived Song Quality

Condition	Song Title	Song Length	Song Artist
High AQ/High FA	Smells Like Teen Spirit	5:01	Nirvana
High AQ/High FA	Purple Haze	2:50	Jimi Hendrix
High AQ/High FA	Gimme Shelter	4:30	The Rolling Stones
High AQ/Low FA	Walking On a Wire	5:28	Richard & Linda Thompson
High AQ/Low FA	Only Shallow	4:17	My Blood Valentine
High AQ/Low FA	Cross-eyed and Painless	4:47	Talking Heads
Low AQ/High FA	Lady	2:57	Styx
Low AQ/High FA	Hard to Say I'm Sorry	3:41	Chicago
Low AQ/High FA	All Out of Love	4:03	Air Supply
Low AQ/Low FA	No, No, No.	3:40	Ted Nugent
Low AQ/Low FA	Slave To This	5:03	Soft Cell
Low AQ/Low FA	Wasted Youth	4:26	J. Geils Band

Table 1. Songs conditions, titles, lengths and artists.
AQ = Aesthetic Quality and FA = Familiarity