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Understanding the Relationship Between Catchiness and Groove:

A Qualitative Study with Popular Music Creators

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#### Abstract

Groove and catchiness are central properties of popular music that frequently appear together. Yet, a possible relationship has neither been postulated nor examined. In music psychology, groove is commonly understood as a pleasurable urge to move. Catchiness is often tied to the memorability of music, but it is less researched, and definitions are elusive. In this study, we conducted stimuli-guided expert interviews with popular music creators to unveil their understandings of groove and catchiness based on their experiential, practical, and artistic knowledge. These insights allowed us to expand the ontologies of groove and catchiness. We found that groove consists of a bodily experience and positive affect, with participation, immersion and social aspects playing a part as well. We propose catchiness as a multi-dimensional quality that depends on the listener’s perception and experience of music, in which memorization and positive affect are central, and engagement, immediacy, and clarity are other aspects. We found considerable overlap in groove- and catchiness-promoting structures, and hypothesize that they positively interact and support each other, with some exceptions. The perspective of music creators, our detailed discussion of the ontologies, and the hypothesized relationship can broaden the psychological concepts, help with the explanation of previous, and inspire future research.

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**Key words:** music psychology, groove, catchiness, popular music, expert interviews

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In his book on how music hits are created, Seabrook (2015) describes a basic hit type as “a rhythmic groove with a melodic hook on top” (p. 6). He also reveals some goals of music creators: hit producer Denniz PoP set out to “meld beat driven music that people danced to inside the clubs with the pop music people listened to on the radio. The music would combine the hard-hitting breakbeats and bass lines of reggae and hip-hop with the singsongy melodies the Swedes had such a gift for” (p. 29). This points to two key characteristics of popular music that hit music producers apparently strive to combine: danceability and memorability. In music psychology, we posit two concepts that are very close to these characteristics: groove and catchiness. Many music listeners will encounter these daily, and often at the same time, but how they relate or interact is unclear.

Groove has been defined structurally as “a large-scale, multi-layered pattern that involves both pitch and rhythmic materials, and whose repetitions form the basis for either a portion or all of a particular tune” (Zbikowski, 2004, p.275). With their understanding of groove as “pattern and performance,” Câmara and Danielsen (2018, p. 272) go beyond what is played and explicitly include how it is played (e.g., the timbre or microtiming). We follow Câmara and Danielsen and refer to this concept as “groove structure.” In contrast, the so-called “groove experience” is commonly understood according to Janata et al. (2012, p.56): “a pleasant sense of wanting to move along with the music.” While this definition is prevalent, it ignores several central aspects of the experience: groove has been described as a highly participatory state (Danielsen, 2006), as engaging (Roholt, 2014), and as distributed between mind, body, and music (Witek, 2017). Senn et al. (2019) propose a psychological groove model in which the urge to move is at the core but which also includes several other mental processes (pleasure, inner representation of temporal regularity, time-related interest, and motor planning) and depends (music, listener, listening situation). Pfeleiderer (2010) proposes that groove has four

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indissoluble dimensions: structural-cognitive, movement, emotional, and social. A recent study that explores different definitions and connotations of groove (Duman et al., [in press](#), p. 25) arrived at a similar understanding: “Groove is a participatory experience (related to immersion, movement, positive affect, and social connection) resulting from subtle interaction of specific music- (such as time- and pitch-related features), performance- and/or individual difference-related factors.” The literature on groove’s causes and effects is growing fast, and its research directions are manifold (see Câmara & Danielsen, 2018; Levitin et al., 2018; Senn & Kopiez, 2018, for overviews).

Commented [CK1]: Still in press or published?

Despite its importance for popular music (Rösing, 1996), catchiness has received much less scholarly attention, and definitions are still scarce and unclear. Consensuses are that listeners can discriminate between more or less catchy music, and that catchy music is memorable (Van Balen, 2016). Some studies use the terms memorability and catchiness interchangeably (Russell, 1987), or speak of “sticking in mind” (Honing, 2010). Burgoyne et al. (2013, p.1) defined catchiness as “long-term musical salience, the degree to which a musical fragment remains memorable after a period of time” and measured it as the time it took participants to recognize a song, with shorter recognition time suggesting greater catchiness. Different methodological approaches have been used to test musical memorability: music analysis and theoretical reflections (Burns, 1987; Hume, 2017; Kronengold, 2005; Traut, 2005), music information retrieval and listening experiments (Aljanaki et al., 2014; Burgoyne et al., 2013; Honing, 2010; Korsmit et al., 2017; Van Balen et al., 2013), counting how many people in a concert audience sing along (Pawley & Müllensiefen, 2012), or measuring neural activity (Scott et al., 2020). As Charles Kronengold (2005, p. 392) noted, however, finding out what makes music catchy is complex: “And isn't it interesting that we can't develop universal formulas for catchiness, memorability and distinctiveness? There are just too many factors involved.”

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Kronengold distinguishes here between memorability and catchiness, and we can find hints that these two are not quite congruent elsewhere. The Lexico dictionary’s definition of catchy (Lexico.com, 2022) adds: “(a tune or phrase) instantly appealing and memorable.” Its list of synonyms includes further musical qualities: captivating, popular, singable, melodious. This suggests that “catchy” can have multiple aspects: memorability, appeal, popularity, easy to sing, interest, and the time-related notion of instantaneousness.

A related phenomenon has received more scholarly attention: involuntary musical imagery, “a conscious mental experience of music that occurs without deliberate efforts to initiate or sustain it” (Liikkanen & Jakubowski, 2020, p. 1195), called earworm when the imagined music keeps repeating. The phenomenon requires two stages: the memorization of music and the following recapitulation. Research suggests that earworms are more likely from catchy music (Beaman & Williams, 2010; Byron & Fowles, 2015; Moeck et al., 2018). Empirical research on musical features associated with earworms focused on melodic aspects (e.g., Jakubowski et al., 2017), but Schlemmer and Hemming (2018) suggest that almost any musical parameter can play a role. Hence, like Kronengold about catchiness, they refuse the idea of a general earworm formula. Yet, similar to Seabrook (2015), they also postulate that popular music songwriters write catchy passages to increase the popularity of music. Earworms frequently coincide with physical engagement, such as singing or tapping along (Hemming, 2009).

To our knowledge, no research has yet directly connected groove and catchiness. However, previous research suggests that they positively interact. Groove has been described as drawing the listener in (Feld, 1988), and we can imagine this contributes to catchiness. Body-movement

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has been defined as central to earworms (Floridou et al., 2015), and physical involvement while listening to music makes earworms more likely (Campbell & Margulis, 2015). Familiarity facilitates groove experiences (Senn et al., 2018), and we can assume that catchy music becomes familiar more easily. Rhythmic feels and groove have been analyzed as hooks, and some riff-like hooks generate groove and momentum (Byron & O’Regan, 2022). In a recent study in which participants described groove experiences, “catchy” came up several times (Duman et al., in press). One potential reason why the relationship was not examined previously is that a universal relationship can easily be dismissed with music examples that have one but not the other (e.g., catchy children’s songs like Pinkfong’s “Baby Shark” and techno tracks like Jeff Mills’ “The Bells”). This still leaves open whether and how they interact in popular music when both are present.

Most of the empirical work on groove and catchiness is quantitative, and qualitative studies are comparably rare. We could not trace any extensive qualitative work on catchiness, only brief anecdotal evidence, snippets of interviews, some journalistic writing (e.g., Seabrook, 2015), and practically oriented guidebooks (e.g., Blume, 2004). Yet, a qualitative exploration of catchiness could lead to a better understanding and definition, as a base for further study and for relating it to groove. Groove experiences play a role in older scholarship that contain extensive interviews with jazz musicians explaining how it feels to swing (Berliner, 1994; Monson, 1996). However, these experiences are not the focus of these books. In a mixed-methods study, Witek (2009) conducted expert interviews on groove to better understand the related feelings, and combined these interviews with questionnaires and empirical measurements. Hosken (2020) conducted a listening experiment in which laymen participants described and analyzed groove in written form. Duman et al. (in press) had participants provide free-text descriptions of what makes a song groove. These qualitative studies allow a more in-

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depth and comprehensive understanding of groove. In this study, we combine extensive expert interviews with a rigorous methodology to shed light on a different perspective: that of the music creators. This allows us to learn from their experience, intentions, goals, and artistic and practical knowledge. We are investigating these to learn about (1) how music creators understand groove and catchiness, and (2) how they promote these phenomena in their daily practice. Based on that, (3) we explore potential relations and interactions between groove and catchiness.

## **Method**

### **General Approach**

We followed an approach by Bogner et al. (2014) on how to design theory-generating interviews with experts, adapting where necessary. These guidelines are well-suited for expert interviews that investigate the three types of knowledge we were interested in:

- technical knowledge of how to play, produce, or compose music
- processual knowledge of what is done in common practice
- interpretative knowledge of putting thoughts and experiences into context and perspective

The approach resembles grounded theory (e. g., Mey & Mruck, 2010), as theories are developed “bottom-up” and grounded in expert knowledge. Usually, it includes data collection until a saturation of variation is reached. As this study is a first exploration, we instead use a fixed sample size, acknowledging that this makes conclusions preliminary. We deemed five in-depth interviews sufficient for a richly detailed, preliminary picture of the relationship between groove and catchiness.

### **Design**



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We designed semi-structured interviews that loosely followed a pre-defined questionnaire (Bogner et al., 2014; Smith & Osborne, 2008), as is typical for expert interviews (Meuser & Nagel, 1991). Our questionnaire consisted of two parts: first, questions for discussing the topics in general, such as how groove and catchiness are understood, what role they play in the expert’s work, how they come about, and whether they are related. In the second part, we played short musical stimuli as an elicitation method and a linking element between the different participants. These stimuli—which the experts considered for their relative groove and catchiness qualities—further anchored and substantiated the discussion by focusing on specific examples. The experts were encouraged to exemplify further through singing or clapping, which they did on many occasions. We mentioned the context of popular music in the questionnaire several times, but neither defined it, nor asked the experts to provide definitions. The first author conducted the interviews and took on a co-expert role (Bogner et al., 2014) which is deemed adequate and beneficial for this task and extended discussions. It is common among musicians to talk in technical terms or assume that the counterpart will understand implicitly, so we took special care that implied knowledge was explicitly described.

The interviews were conducted in German. The words “catchiness” and “groove” were presented in English, as they are common loan words in musician’s parlance and we expected the experts to understand them. Groove even has an entry in German dictionaries (Dudenredaktion, 2022) and is not translated in research texts (e.g., Pfleiderer, 2010). Catchy is often translated as “markant” or “eingängig” in research texts (e.g., Schlemmer & Hemming, 2018, or Rösing, 1996), but commonly understood by musicians.

### **Participants & Researchers**

To find interviewees with high reputation in the field (see Littig, 2009, for a discussion of what makes an expert), the first author asked 30 professional musicians and sound engineers from

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his personal network to suggest suitable candidates working in popular music. The resulting list of suggestions encompassed around 50 suitable experts and had a severe bias towards men. Selection criteria were the frequency of mention and argumentations of why someone would make a good interviewee, e.g., authoring a book or previously participating in interviews on similar topics. We aimed to balance representation of male and female participants and avoided overrepresentation of instruments, genres, or age. As not all selected experts agreed to participate, compromises had to be made. Sufficient command and understanding of German was required.

We conducted five interviews with notable members of Swiss and German popular music scenes, who cover a large range of styles, instruments, and age groups (Table 1). They were professional performers, composers, producers, and session musicians.

[Insert Table 1 here]

The background and preconceptions of the researchers influence and bias the research at all stages in qualitative research. While we cannot discuss all possible influences in detail, our background can provide context for the dependability and confirmability of our results.

Authors 1, 2, and 4 are experts in groove research. The second author also has a background in ethnomusicology, while the third author’s work centers around music meaning and analysis. All authors have researched popular music, but none has focused on catchiness before. The first author, who conducted the interviews, is also a professional jazz saxophone player. He performed together with participants N, B, and F in very few instances, while he had not met H and M before. His practical knowledge, familiarity with the typical parlance, and reputation made it natural to take on the role of a co-expert in the interviews. During these, he held back

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on established research theories and his personal assessment of the stimuli (Dimbath, 2013), but focused on engaging with the experts’ views.

### **Stimuli**

We used six short musical excerpts (duration between 18–30 s) of popular music from different styles. Additionally, each expert brought one or two stimuli to exemplify their views on groove and catchiness, which were played and discussed at the beginning of the interview. We chose real music examples for high ecological validity. We expected these to be discussed in detail, and we anticipated discussions revolving around the combination of different patterns in polyphonic music.

Audio stimuli are rarely used in interview settings, therefore we adapted methodologies commonly used with visual materials. We intended the researcher-selected stimuli as *cues* to stimulate the memory of experiences and exemplify practices (Allett, 2010; Barton, 2015; Dimbath, 2013; Kwasnicka et al., 2015; Törrönen, 2002), and as *microcosms* to which participants can express their values, ideals, and positions (Kwasnicka et al., 2015; Törrönen, 2002). We also selected stimuli as *provocation* (Barton, 2015; Törrönen, 2002); that is, excerpts that we expected our experts to recognize as not groovy or catchy.

We aimed for two stimuli as positive examples for groove and catchiness, two to investigate how far groove and catchiness appear independently from another (one high-groove low-catchiness, and one low-groove high-catchiness), and two low-groove and low-catchiness examples (Table 2). The authors selected a pool of potential stimuli and then decided which ones fit these categories best. We avoided vocal parts, as lyrics could potentially focus the discussion of catchiness on these. In the end, the role of lyrics did not come up in the interviews.

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We did not control for familiarity and combined three well-known with three less well-known songs. This variety, assumed classifications, and functions of stimuli should reduce the risk that the experts feel the need to confirm a hypothesized connection between groove and catchiness.

[Insert Table 2 here]

### **Procedure**

We conducted two test interviews to optimize the questionnaire and verify the stimulus selection. The final interviews took between 68 and 106 minutes. Due to the global pandemic during winter 2020/2021, we conducted the interviews online, via Zoom (version 5.4.2) or Skype (version 8.65.0.78).

Audio was recorded in Audacity (version 2.2.2) via the internal microphone of a 2017 Apple MacBook Pro. We set transcription rules (following guidelines by Dresing & Pehl, 2010), which included anonymization and transcription of sung or clapped passages in musical notation. We sent the transcriptions to the respective expert for a member check (Flick, 2010).

Quotes that appear in this paper were translated and naturalized by the first author.

To allow for voluntary preparation, the experts received participant information, a list of planned questions, and access to the stimuli several days before the interviews. Participants gave written informed consent in accordance with the declaration of Helsinki. The procedure was approved by the University of Birmingham’s Humanities and Social Sciences Ethical Review Committee.

### **Analysis**

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We used MaxQDA Plus 2020 (version 20.4.0) to perform a qualitatively oriented content analysis based on the principles of Mayring (2010). In Bogner et al. (2014), this is a four-step procedure:

1. Coding: inductive categorization of each statement. Statements were frequently coded with multiple themes. The resulting categories were anchored by a definition and an example, and grouped hierarchically where appropriate.
2. Thematic comparison: grouping of thematically corresponding categories across the interviews, and comparison of their content in terms of agreements, disagreements, or omissions between experts.
3. Conceptualization: changing the viewpoint of the analysis from collecting and grouping expert views to material-based interpretations by the researchers informed by established concepts.
4. General Theory: concepts are systematized and related to each other on a general level. The results are analytic condensates that can be linked to established theories or lead to new hypotheses.

All interviews were coded and analyzed by the first author, while the second author coded one of the interviews independently. The two coders compared their individual codebooks including exemplary quotes and definitions. The first coder additionally selected coded segments to illustrate the variety in the experts' themes and to provide more material on infrequent themes in the second coder's subset. One theme only found by the second coder aside, the same themes were found, but some differences arose in naming and granularity of categorizations. In these cases, the two coders discussed whether the first coder's categorization was reasonable and made adjustments if this was not the case. For example, we decided to include the theme only found by the second coder (aesthetic quality) but we spread it over different categories depending on the context. The resulting codebook was discussed and category labels were

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decided with the fourth author. The first author conducted step 3 and 4 of the analysis in consultation with the fourth author. The third author commented on the outcome.

## **Results and Discussion**

The analyses led to a codebook with four top-level categories that provide the structure for this section. We present our findings in regard to the (1) ontologies of groove and (2) catchiness, and discuss their components in subsections. Afterwards, we investigate (3) how the experts intend to promote groove and catchiness through five intended factors. We then present our theory about (4) different ways in which groove and catchiness are related.

### **Ontology of Groove**

Directly asking the experts how they understood groove mostly received brief answers. Yet, throughout the course of the interview, each expert frequently added further nuances, and a more detailed picture of how they understood groove unveiled itself over time and in different contexts. The experts talked about groove from two perspectives: while playing music and as expert listeners. If the context is not specified in a quote or surrounding text, the quotes should be read as the latter.

### ***Groove as Structure and Experience***

In musician’s parlance, groove often refers to what we defined as groove structure, but the experts also conceived groove as something that is felt and experienced.

*Sometimes I’m just a drummer and record something or play with a band, with a rhythm section, and it feels tremendously good in that moment. Then, that’s it, right? That’s the feeling. (M)*

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They alternated between talking about groove as structure and as experience, but usually set them apart clearly. They saw groove structure as the reason for groove experiences:

*There is a clearly rhythmic viewpoint [on groove analysis]: how to organize rhythms in ways that they can unfold sensual movement [or] kinetic energy? (B)*

The experts further implied this causation in many examples about how they change groove structures to encourage or intensify groove experiences.

In addition to the actual music, and in line with previous research (Senn et al., 2018, 2019), all our experts recognized the individual listener as an important influence on groove experiences. They claimed that mostly musical taste, but also musical expertise can decide whether they get into the groove or not. The third dependent in Senn et al.’s groove model—the listening situation—came up only occasionally, e.g., specific expectations in a dance club, or that bad acoustics at live concerts stifle groove experiences for performers and audience. In the remainder of this section, we will focus on groove experiences.

### ***Core Components of Groove Experiences***

The shortest answer given to what groove is shows an omnipresent core component of groove:

*[Groove is] when music makes me move. (N)*

This aspect of groove was mentioned in all the interviews, echoing its position within the many understandings of groove in the psychological literature. The experts saw movement to music as an indicator of groove, whether it is subtle head bobbing or expressive dance. They closely associated dancing with groove, but to them, the amount or vigorousness of the movement did not reflect the intensity of the groove experience, and actual movement was not necessary. The type of movement was seen as relative: whether one wants to swing one’s hair, stamp

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vigorously and raise one’s fist, react with more filigree movement or just sway a lighter in the air depends on the type of music, how it is played, and how it feels in the body.

However, some form of bodily feeling emerged as prerequisite for groove, and therefore we will speak of a *bodily experience* instead of movement hereafter. This bodily experience corresponds to the second aspect of groove in Roholt’s (2014, p.2) phenomenological definition: “the felt dimension (the feeling of a “leaning” groove or one that “pushes,” “pulls,” and so on).” Our experts said that this bodily experience of groove resonates in the whole body, but can also affect specific body parts. We collected the descriptions of bodily feelings that our experts associated with groove experiences (Table 3). The list includes motor-related experiences but also visceral ones, a distinction previously found for musical entrainment (Labbé & Grandjean, 2014). Understanding this component broader than the *urge* to move makes sense considering the perspective of the musicians who *must* move to play music.

[Insert Table 3 here]

All experts besides N conceived groove as having a second core component that goes beyond the bodily experience—positive affect. They stated that mere body movement to music or even dance is not necessarily a groove experience, and that a second component is required.

*When we talk about groove, it’s about a rhythmic pull that has a sensuality and a corporeality [...]. (B)*

B expressed the multi-dimensionality of groove here, and we already saw an example for positive affect in M’s description of groove as a “tremendously good” feeling above. When describing this component, our experts talked interchangeably about emotions, feelings, moods, aesthetic judgements and liking.



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*Groove emerges when music touches me emotionally. It does not matter how. It does not matter what, how or who it is. If it touches me emotionally in that moment, then it is groove for me. (M)*

As we see, the list of affective phenomena that were associated with groove is quite diverse (Table 3), but most of them are of positive valence (Scherer, 2000)—they are pleasant. Some experts specified that negative affect, such as disturbance or stress, would stifle groove. Hence, we also interpret the affective phenomena with more ambiguous valence (e.g., surprise, being touched) to be positive and pleasurable in this context. This is in line with Duman et al. (in press) who include a dimension of groove by the same name, and comparable to Pfleiderer’s (2010) “emotional dimension” of groove. Our result is somewhat similar to pleasure, the second component in Janata et al.’s (2012) definition of groove. Pleasure is itself a positive affect, and plays a role in other positive affective phenomena. Yet, positive affect can include more dimensions, such as arousal. There are also different understandings of pleasure (Alwood, 2017; Katz, 2016). In some cases, positive affect and pleasure are used interchangeably. Janata et al. (2012) switches to pleasure in the definition after mostly discussing positive affect, and the pleasure scale in the Experience of Groove questionnaire (Senn et al., 2020) includes questions about both mood and liking.

Regardless of this complexity, it is hard to say why we found evidence of broader positive affect compared to pleasure in this study. When talking about groove experiences in hindsight, participants may find it easier to talk about emotions, moods, and feelings compared to pleasure directly, as these terms are more commonly used in public discourse about music. Additionally, we can assume that our participants all have a strong affinity and emotional connection to popular music (although Duman et al., in press, found a similar result with a more diverse set of participants).

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In our study, bodily experiences and positive affect were the most immediately apparent and most asserted characteristics of groove experiences, not unlike the two dimensions of Janata et al.’s (2012) definition. Therefore, we labeled them core components, but further research is needed before we can conclude that the other aspects we found for groove (and catchiness below) are generally less important.

### ***Social, Participatory, and Immersive Components***

We found social phenomena to be another dimension of groove. Pfliederer (2010) spoke of a social dimension, in which listeners, dancers, and musicians are incorporated physically, emotionally, and cognitively. Several statements referred to this dimension:

*Groove is collective ownership. When something grooves in a specific way, many people have access. They are not excluded. [...] There is a clear band flow, in a way that a group creates the groove as an organism. [...] It must give you a sense of security that you can trust. You can forget the rest around you [...], because you can trust the flow, and the organic together, and the carrying. (B)*

We see that groove was understood as a way of building a connection between audience and musicians. Groove reportedly creates a sense of community within the band, and it is often interpreted as a group effort that arises from interaction between players, not an individual achievement.

Duman et al. (in press) defined groove as a participatory experience, related to immersion and social connection. Similarly, in our interviews, groove was understood as making the audience interact and (actively) engage with the music, (e.g., B’s description of groove experience as a rhythmic “pull” above). Common forms of participation in groove are clapping or dancing, which initiate or heighten the feeling of an immersive groove experience:

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*I immediately start to bob my head and then I am simply in it [the groove]. (F)*

Immersion is a form of participation that is not necessarily movement-related, and may be required to get into a certain state in the first place. In groove experiences, immersion and participation involve and combine mind and embodiment. What Danielsen (2006) called “the state of being in groove” and what F referred to above is such an immersive-participatory experience.

### ***Experiencing Groove While Playing Music***

As in previous interview studies with musicians (Berliner, 1994; Monson, 1996), the feeling while playing music was discussed. Descriptions of these groove experiences included effortlessness:

*Once you know how things work, you are playing it, and then - especially with [band name] this is extreme - there is a certain point at which it runs by itself. You do not need to do anything at all. (H)*

This effortlessness may just be one side of the experience, however. Danielsen (2006) considered opposing attitudes or feelings an important characteristic of funk music and our experts made similar remarks:

*It's a wonderfully paradoxically attitude. It requires ease, openness, a prolongation of the moment, and the joy to appreciate that. And to let it happen and not deliberately steering it. On the other hand, it needs a major focus, major concentration. And in my opinion, the groove works in this tension. (B)*

In psychology, the so-called flow state is highly immersive and participatory, and combines a perceived effortlessness with complete concentration (Csikszentmihalyi, 1975; Stupacher, 2019). Music performance has been a topic for examining flow experiences since the 1970s, and similarities between groove and flow have been speculated about (e.g., Janata et al., 2012).

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Flow experiences promote strong positive affect (Csikszentmihalyi & LeFevre, 1989), which might partly account for the “tremendously good feeling” (M) of playing while being in groove. It is unclear whether a similarly strong flow experience can be achieved as a listener, and this aspect could be a potential difference between groove as a player and as a listener.

### ***Limits of Groove***

Is every pleasurable movement to music a groove experience? Following Janata et al.’s (2012) definition, we would have to answer in the affirmative, but at the same time, we can imagine situations where this might not hold: choreographed dance, exercise classes, or mindlessly tapping along to a movie soundtrack involve a pleasurable urge to move, but not necessarily Danielsen’s (2006) state of being in groove. This topic is rarely discussed in the literature but came up in our interviews, e.g., when discussing the low-groove high-catchiness stimulus (Eric Clapton’s “Wonderful Tonight”):

*This is rather a beat than a groove principle. This [also] requires rhythm and a kind of structure in which the drums play a certain part. [...] This means, for me, this does not groove in a narrow sense. I would not denote this as groove music, but I would denote this as rhythmic, as beat music. (B)*

This expert further acknowledged that this example had positive affect and conveys an urge to move, but would not groove:

*But for me, groove is something specific, it’s a kind of art. It’s a form of balance between forward drive and rhythmic organization. [...] Slow pieces can also groove, but it is not the main feeling that is transported here [with this excerpt]. The lighter goes up because of an emotionality, a sway, because of the content, that’s more of a sentiment. That has actually less to do with groove in the sense of movement or a mainly kinetic momentum. (B)*

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According to B, this movement, originating from an emotion, is of the wrong kind to call it groove. Other experts shared thoughts in the same direction but concluded that it still is a groove experience. They distinguished it as a different kind of groove, with other associated bodily experiences, dance moves, and related musical features. Another discrepancy arose regarding the low-groove low-catchiness “Music for Airports.” M experienced a “gridless” and waterlike groove, while the others attributed no groove. Hence, the limits of groove vary for our sample, and the different qualities described support Hosken’s (2020) idea of a plethora of groove experiences.

## **Ontology of Catchiness**

### ***Core Components***

When directly prompted to explain what catchiness is, many answers referred to memorization.

*When something catches on, then it is the hit, so to speak. So, catchiness is when something gets stuck [in mind] and in worst case mauls you for three days. (H)*

This supports Russell’s (1987) assumed equivalence of memorability and catchiness, but further relates catchiness to earworms (as in Beaman & Williams, 2010; Moeck et al., 2018), and marks it as a factor for popularity (as in Seabrook, 2015; Schlemmer & Hemming, 2018). According to our experts, catchy music can be memorized through mere exposure. Two experts recounted stories where a song was very strongly etched in their minds because of specific listening situations (their first Salsa concert in New York or a long drive late at night after a concert), and stated that such an experience can make music catchy as well, and hearing this music always brings back the memory of that experience. We call this component of catchiness *memorization and recognition*, to reflect its two consecutive stages: first, the memorization of music, and second, the recognition at a later (potentially imaginary) hearing.

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We found that catchiness is multi-dimensional, as affective experiences are involved as well, making catchiness quite comparable to groove in that regard.

*The simple answer is: [Music is catchy] when it touches you. [...] Because not everybody can say: “I can sing this melody for you.” At least, simply put: you can memorize it and it does something to you. And then it is catchy for me. (M)*

Similar statements were made by all experts besides N, who again did not mention an affective component. The experts suggested that an emotional reaction to specific music would be a prime reason why it is memorable in the first place. Emotions are known to play a role in memorization (Buchanan, 2007), and positive music-induced emotions have been shown to enhance the memory for music (Eschrich et al., 2008). Like groove, catchiness was said to require positive valence:

*Catchiness has, for me, something to do with buoyant spirit<sup>1</sup>. And this [Wonderful Tonight] has no buoyant spirit at all. [...] It hits you and you recognize it immediately. It has super awesome harmonies. And then this emotional merit because of that, such chords. [...] It sticks at least as much as a riff, of course. But catchy, I don't know. I can't say that I find the word to fit 100%. (H)*

Interestingly, this statement seems to imply that H experienced a positive affect while listening but that he misses a perceived positive affect. Such distinctions were not brought up by the others. The affective aspect of catchiness was previously not discussed extensively in the literature, but some connections were drawn. Russell (1987) reports a correlation between perceived pleasantness and memorability, while Burgoyne et al. (2013) postulates that recognizing music would be pleasant. Affective aspects have been linked to earworms: they are more likely to start in positive affective states (Williamson et al., 2012) and people usually like

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the songs that get stuck (Beaty et al., 2013; Hyman et al., 2013). We conclude that positive affect is a core component of catchiness.

### ***Immediacy, Engagement, and Clarity***

Aside from these components, the experts attributed other aspect to catchiness: luring the listener into listening, and therefore asking for engagement with the music, combined with a certain immediacy.

*If I would compare it to a book, then the lick at the beginning is the first sentence. This decides if it pricks up one's ears. (F)*

The potential of salient musical phrases, such as a lick, to lure listeners has been postulated previously (Honing, 2010). The associated immediate engagement is illustrated in the definition of catchiness as “instantly appealing and memorable” (Lexico.com, 2022) and thought of as necessary for (mainstream) popular music, which is otherwise often skipped quickly on modern platforms (Seabrook, 2015). This immediacy goes beyond mere attention grabbing and extends to another characteristic of catchiness: catchy music is easily and quickly grasped.

*[Catchiness means to me] that it is immediately clear what it is about. So, for me it is not primarily popularity, or that you can sing along directly. Or that it is so dumb that every idiot understands it. It is a matter of making immediately clear what the point is. (B)*

This concept of catchiness clearly goes beyond simple memorability. Yet, we can connect clarity with memorization: immediate clarity aids strong expectations, and thus facilitates memorization.

### ***Forms of Structural Catchiness***

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Hooks, defined as “the most salient, memorable, and easy to recall moment of a musical phrase or song” (Honing, 2010, p.147) play a large role in the discussion of catchiness and vice versa, as the two seem closely related—hooks are even defined as catchy passages of music (Byron & O’Regan, 2022).

*[About The Sugar Hill Gang’s “Rapper’s Delight”] Everybody who knows this song recognizes it instantly from the bass line. Few know the keyboard chords or the guitar lick, but everybody knows the bassline. No one knows what the drums play [...] but everybody knows this bass line. (N)*

This suggests that individual parts are catchy, not necessarily whole songs or sections, and that the salient hooks can reduce the salience and catchiness of other parts (Kronengold, 2005). But above this level of individual hooks, catchy music can also stand out on a larger scale:

*In my case, I’m surrounded by music all day, and I sometimes have the feeling that the senses are dulled. This means, that there actually isn’t that much that catches me, and I can name relatively precisely what catches me. (F)*

What is it that makes music salient? The experts differentiated two forms of structural catchiness, which we name textual and non-textual, following Burns’ (1987) nomenclature for hooks. Textual catchiness derives from composed elements, such as melody, rhythm, harmony, or lyrics, and is regarded as the more obvious form of catchiness:

*What normally constitutes catchiness is that you immediately hear a melody and can hum with a melody, a theme, or a hook, or the like. (B)*

Research on what causes earworms is often about textual catchiness (Beaman & Williams, 2010; Jakubowski et al., 2017). In contrast, non-textual catchiness derives from aspects of performance, such as instrumentation, dynamic changes, embellishments, or accidents. It can stem from music production, such as sound effects or a distinctive mix. The experts reported that they usually recognize familiar songs almost immediately, faster than the duration of a



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melody or chord progression, which suggests that the song’s non-textual timbral landscape is catchy. This is supported by Krumhansl (2010), who showed that snippets as short as 0.4 s can be sufficient to recognize a song. The musical context was reported as an additional factor, as surprising one-time events, such as breaks or sudden changes, can be catchy as well.

### ***Perceived and Experienced Catchiness***

Most previous research conceived catchiness as a purely musical quality, inherent to the music: “The memorability of purely instrumental music must be linkable ultimately to its properties as a patterned sequence of sounds” (Russell, 1987, p.335). Our experts differed from that view and expected individual differences in what appears catchy to listeners:

*Our catchiness, for us as musicians or jazz musicians – I mean, “Giant Steps” is super catchy. [...] When I play that to the flower lady next door, she will look at me with wide-opened eyes: “Erm, what’s that?” [...] It is subjective in any case. (M)*

Such listener-related factors for catchiness were found in previous research: musical taste (Russell, 1987; Schlemmer & Hemming, 2018), and expertise and familiarity (Russell, 1987). It is also likely that individual differences in memory for music play a part.

There were also discrepancies in our experts’ judgement of the two supposedly low-groove low-catchiness stimuli: two found the distinctive soundscape of Music for Airports catchy, and one thought the recognizable and striking performance of the Shaggs was catchy. If we accept the individual listener as factor for catchiness, it cannot be purely intrinsic to music, but rather a perceived musical quality. Hence, we suggest that catchiness is an interaction between listener and music.

Our experts frequently spoke about music catching them, and being caught or captivated by the music, indicating an exchange of agency and an immersive state of being. F described it as something “to be felt in the whole body.” If we accept that catchy music captivates the listener,

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puts them in an immersive state, and consider that affects play a role for catchiness, catchiness can be conceived as an experience. The soundness of this interpretation, how it is characterized beyond the sensation of being caught by (or in) music, and how it differs from perceiving music as catchy would need to be explored further in the future. Interestingly and unlike groove, catchiness does not seem to play much of a role while playing music.

### **How Groove and Catchiness are Promoted**

The experts described groove and catchiness as central, even the most important music-related aspects of popular music. Groove and catchiness reportedly contribute significantly to making popular music popular and successful. Hence, groove and catchiness are major goals for musicians during different stages of music creation and function frequently as indicators of creative success.

Throughout the interviews, statements about what groove and catchiness are were intertwined with analyses of what is needed to make music catchy and groovy, and how this happens in practice. In our analysis, we disentangled these into three different stages (Figure 1):

- a) The strategies, i.e., the musical properties that musicians use and manipulate to foster groove and catchiness.
- b) The intended factors, i.e., the criteria the musicians intend to fulfil, which are either necessary for groove and catchiness or make them more likely (discussed in more detail below).
- c) The core components that constitute groove and catchiness, as discussed above.

How the stages relate to each other is influenced by the individual listener: their taste, familiarity with the song or style, current mood, or expertise helps determine the nature of the next progression.

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[Insert Figure 1 here]

### ***Strategies***

We categorized the strategies based on the stage of music creation in which they appear: what happens before (composition), while (performance), and after (production or sound design) music is realized. This distinction is not always clear as these processes can blur and blend. The interviews yielded a large collection of strategies, but a comprehensive analysis of these is beyond the scope of this article and only partly expedient, since the experts asserted that while some general rules of thumb may exist, detailed strategies for groove and catchiness are relative and not universally applicable.

*It's difficult to turn this into fixed rules because it can be so different from situation to situation what's important and what's not in the music. One must decide based on the situation. (N)*

Hence, we will touch on strategies only briefly in relation to intended factors. An overview of the strategies can be found in the supplementary materials.

### ***Intended Factors***

Five factors emerged from our interviews which the experts were keen to promote in their music to maximize the potential for groove and catchiness. These factors are attributes of how the music is perceived and processed by listeners, highlighting their subjectiveness. Figure 1 shows that the five factors are not entirely independent, as most of them support each other or overlap. How often these factors appeared in the individual interviews, and how often in discussions about groove or catchiness can be seen in Table 4.

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[Insert Table 4 here]

**Affectiveness.** The intention of the music or is to foster affective phenomena. We understand affectiveness as capability of the music or performance to trigger an affective response, not the actual affect felt by the listeners. Obviously, it is closely related to the positive affect component of groove and catchiness. But affectiveness as a capability of music is wider than that, and it influences the other components as well as the other intended factors.

*And then my ears opened because I like the harmonies and the sound so much. And I just think: “This is awesome! What’s happening here?” And then when the beat enters, with brute force actually [laughs], you are yanked up. [...] In that regard that entrance of the beat, for me, is a jump-into-the-air or raise-your-arms-in-the-air moment. That is simply big. I feel joy immediately. (F)*

This example shows groove and catchiness as consequences of affectiveness. Based on the match with the personal taste of the listener, there is an immediate and strong positive affect and experience. The affect fosters curiosity and attention (Jeffries et al., 2008) and makes the music stand out. A sudden change in the music’s fabric then leads to a positive feeling of disruption that promotes a strong bodily experience.

The experts understood liking the music as an important contributor to affect. They intend to achieve this by optimizing music for their target group and providing a (subjectively) high aesthetic quality. Other strategies to stimulate affect include a performance that reflects the performer’s personality, to which the listener can then connect, or a performance that conveys clear emotions.

*There’s a blues element in it, it sounds bluesy. Blues is pain, and romantic. And also, groovy. And the sound, of course, the touch! [...] You have this beautiful, bluesy, and sentimental melody. And I think that makes the difference. (M)*

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Pain is here a perceived negative emotion, not a felt one. The blues signifies pain, but it is not painful to listen to. Hence, a musician’s intended perceived emotion is not necessarily what the listener feels, and they can potentially experience positive affect and thus groove or catchiness with such music (although H disagreed, as we have seen above).

**Attention.** Grabbing attention emerged as important factor for groove and catchiness. It came up in various forms: interest, attention, surprise, kick, tease, alertness, boringness, focus, curiosity, aha experience, unexpectedness, keep going, wanting to listen, get hooked, prick up one’s ears, gets me to listen closely, thrill, keep interest up, don’t lose flow. In the following case, Rose’s “Waterfall” grabbed the expert’s attention immediately due to the sound design and genre that the participant liked:

*Insofar, something that comes to mind at first hearing is: yeah, cool! (F)*

But the unvarying excerpt we chose did not hold the expert’s attention for long:

*The thing is that I wanted to know soon what else will happen [in this music]. [...] Once I have understood that not much else is going to happen, I lose interest. (F)*

The music became dull, and, as an overall judgement, the participant found the excerpt to be neither catchy nor groovy. She speculated that through the course of the full track, more layers are added, which, together with dancing, would probably sustain the attention and allow for groove. Hence, we need to distinguish the immediate “focused attention” that brings the listener’s focus to the music from the ‘sustained attention’ that motivates to stick with the music through continued interest. This distinction refines Senn et al.’s (2019) groove model, which features interest that arises from the music’s rhythmic organization (dubbed ‘time-related interest’).

Attention is a major factor for memorization, as it is closely linked to working memory (Baddeley et al., 2014). Madsen and Geringer (2000, p. 106) suggested that the “focus of

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attention over time might well be the most important variable in all music listening” and it has been hypothesized that popular music evolved to optimize the potential for grabbing attention (Leivellé Gauvin, 2017). Therefore, it is not surprising that our experts mentioned a large and refined range of strategies to generate attention: combining parts to bring out certain elements or moments, working with a foreground-background dichotomy, changing levels of the music, employing funny or strange sounds, introducing novel elements, thinking dramaturgically, creating a distinctive character, and disrupting expectations, while avoiding monotonous or boring music that is either too repetitive, vague, lacks intention, or does not have enough elements. They see participation and affectiveness as ways to keep interest high.

**Accessibility.** Being able to follow the music, to get access to it, was brought up often, vehemently, and as prerequisite for experiencing groove.

*I mean, I can have some Nordic Björk-like, funny, oversampled, overedited, mirror-loops - anything. But if there is a motif, something that has a continuum, then this is exactly what I celebrate in that moment and go with the groove. (M)*

In this example, M evokes a complex musical fabric that is hard to follow. Yet, a single easy-to-follow element can change that, giving access to the music and thus enabling groove experiences. Similar remarks were made by the others, for example about the important function of simple rhythms in metrically complex music. Such music can otherwise be difficult to follow, but the experts also explained that groove allows to grasp music in an embodied way instead of intellectually (as did Roholt, 2014):

*You can analyze that as musician or musicologist and understand that it is 5 against 4. [...] But you can also grasp it intuitively, and then it is comparable to a dance move. [...] The music is not designed just for insiders. It should be experienced directly. It*

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*must blow you away, even people that don't understand how complex it functions on the inside. (B)*

According to the experts, the accessibility of music is mostly decided on a compositional level: complexity, repetition, and continuity were mentioned as main aspects to balance for music to be followable without being boring, which is often done by combining reciprocal parts. We can interpret this as a balance between our two factors accessibility and attention.

The groove literature refers to similar ideas: several studies showed a relation between syncopation (as a form of rhythmic complexity) and groove (Witek et al., 2014, 2015, 2017; Sioros et al., 2014), in which medium syncopation levels were optimal for groove.

The experts also stressed that the ease with which a basic musical idea or statement is conveyed influences the accessibility. Additionally, all experts acknowledged that the listener determines how accessible a piece of music is individually, as expertise and familiarity are thought to help following or understanding (as in Madison & Schiölde, 2017; Orr & Ohlsson, 2005; Pressing, 1999).

Accessibility also influences the memorability of music, as simpler or better understood music should be easier to memorize. Thus, accessibility was described as central for catchiness.

*The more complex something gets, the harder it is to grasp and understand it. And catchy is for me the notion of simplicity, that something is understood fast and that everybody can understand it. (N)*

This is reminiscent of Kramarz's (2014, p.15) observation about popular music in general: “particularly easy to grasp, simply structured and thus not too complex.” On the empirical side, Russell (1987) found that music with low perceived complexity is easier to recognize. The amount of information is not the only reason why comprehensibility is important: music that is

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easy to grasp is also more predictable, which leads to the creation of stronger expectations in listeners, which in turn benefits emotional reactions (Meyer, 1956; Huron, 2006).

**Participation.** We have already discussed above how participation and immersion are important in groove experiences. The experts also reported mental engagement, such as filling in the beat when listening to syncopated music (Witek et al., 2017). Besides these and the already discussed flow, there is also trance.

*This can of course, late at night, alcohol, mind-expanding substances, and the right time of the day assumed, definitely trigger the trance effect. And probably will. (N)*

This notion is reminiscent of Malbon’s (1999, p. 105) “ecstatic experiences,” a drug-assisted variant of the “oceanic experience,” a highly participatory and immersive state of being that is central to clubbing, among other practices. While the experts acknowledged the effects of social context and the use of drugs as part of the motivation for participation, their strategies for inviting participation concentrated on musical properties and meeting the audience’s taste.

For catchiness, active participation may seem less fundamental at first, but it is striking how often it came up when defining catchiness: several statements referred to singing or humming along to catchy music.

*This means, if the cleaner cleans the hall after the concert and whistles, you know depending on what they whistle: that is a hit! (H)*

This is supported by studies about earworms which show that singing, humming, whistling, or clapping along is very common (Schlemmer & Hemming, 2018). Active participation has further played a part in assessing the catchiness of songs, as Pawley and Müllensiefen (2012) effectively measured the latter by counting how many people sang along. Our experts brought that up as an indicator for catchiness as well:



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*[About the White Stripe’s “Seven Nation Army”] That’s a hymnic, rocky, Stadium, beer-drinking melody. It’s very simple, it’s always that [claps]. We can do that, every person in Europe can do that. You never listen to the vocals there. 90 of 100 people can’t tell you anything about the vocals. But everybody can say: hey that’s [sings the song’s riff with a drunken voice]. And that’s it. (M)*

Once again, as with the clubbing context, we note the combination of a specific style of music with a specific social context that promotes participation.

**Distinctiveness.** Music needs to stand out in some form to be memorable and catchy, especially for experts that are surrounded by a variety of music every day. Hence, the distinctiveness of music is related to grabbing attention.

*Whenever the ear opens for a short moment, when you are shortly ripped out of the daily grind that you know already and say: “Oh, what’s that?” (N)*

This example resembles Van Balen’s (2016, p. 190) definition of distinctiveness: “a violation of schematic expectations.” Innovations and the use of unexpected material or contexts can make music distinctive, but there are also other ways to achieve this:

*I have chosen this because it has such a special character. Despite it being a well-known groove from the drummer, one recognizes the songs immediately. [...] In that respect, it has a clear catchiness for me. (B)*

This statement about his self-selected song implies that a strong character also leads to catchiness through an immediate clarity that strengthens expectations. Distinctiveness can be achieved through composition, performance (including recognizable musicians) and post-production.

For B, the two factors distinctiveness and accessibility stand in a certain tension:

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*Catchiness means to be immediately comprehensible - but also distinctive. This ambivalence is interesting for me. (B)*

The importance of distinctiveness for catchiness is so far not supported empirically. Van Balen (2016) hypothesized a positive relationship between distinctiveness and recognizability, but in his experiments the more typical sections (as calculated with MIR) were also more recognizable.

How important is distinctiveness for groove? A few statements seemed to imply that the little things that make a groove as structure distinctive also enhance the feeling of groove. However, our data does not allow a conclusion that distinctiveness is an important factor for groove.

### **How Groove and Catchiness Relate**

As established above, groove and catchiness share one core component: positive affect. Table 4 shows that the other components also overlap: bodily experience did come up when discussing catchiness, and memorization did for groove, albeit less frequently compared to positive affect. We further saw that they share four intended factors. This overlap suggests that the frequent cooccurrences of groove and catchiness in popular music are not merely coincidence—apparently, similar mechanisms are at work for both. Therefore, we can assume a vicinity between groove and catchiness, but how close are they and where lie the differences?

A single musical structure can be perceived as groovy and catchy at the same time. But clearly, not all groovy music is also catchy, or vice versa (see e.g., discrepancies in strategies in the supplementary material). Furthermore, they are ontologically different. We encountered groove as structure, a purely musical quality, but also as an experience, and a state of being. We understood catchiness as a perceived musical quality, and only speculated about a potential experience.

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That raises the questions whether catchiness can be a factor or dimension of groove and whether groove can be a factor for catchiness. The experts discussed interaction between groove and catchiness extensively, and often analyzed this in the context of the layered musical patterns of our polyphonic stimuli or other examples. Hence, as the relationship between patterns seems to be important to answer these questions, our analysis also focused on this context. We were able to distinguish three potential forms of interaction between groove and catchiness (Figure 2), which suggest hypotheses of how groove and catchiness interact.

[Insert Figure 2 here]

### ***Mutual Support***

In this kind of interaction, catchiness and groove mutually support each other but remain separable. One or more high-groove patterns, often played by the rhythm section, are combined with a catchy melody or riff. Of our stimuli, “Smoke on the water” with its steady backdrop of drums and eighth note bass, above which guitar and organ play the famous riff, falls in this category, and was analyzed similarly by all experts.

*It's not the guitar riff, it's the drums and bass that create the groove in “Smoke on the water.” It's the 16<sup>th</sup> note hi-hat, the 8<sup>th</sup> note bass, the quarter note bass drum, and the back beat. It's not the guitar that moves the booty. The guitar is the distinctive feature of the song, but not the booty shake factor. (N)*

The same expert went on to explain that the interaction between the patterns is the key for a sustainable groove, as these patterns would not be sufficient for long on their own:

*The lick alone would not elicit much [groove]. And if you just play these pumping 8<sup>th</sup> notes, it will become boring. It really belongs together. (N)*

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So, a catchy element sustains groove, but the catchiness of patterns is also enhanced by combining it with groovy patterns.

*Catchiness often works mainly through the relation between melody and the groove. [...] The catchiness here operates based on the groove and the immediate [sonic] density of this simple line. (B)*

The experts assert that the interaction between catchy and groovy patterns results in a polyphonic sequence that is groovier and catchier than the individual patterns by themselves.

*That's how it [the riff] gets moving. Because without that [the bass] it would not move. No one moves to [sings riff]. [sings 8<sup>th</sup> note bass] – now it starts to move. That's the great thing about groove: you put a melody on top and at the base you have your rolls. That's how they built the pyramids: wooden rolls to haul the stones to the top. (H)*

One expert explained this positive interaction by referring to how groove and catchiness activate different parts of the body:

*It is ideal because you run on a double track. On one side, it's about the bones and on the other side it's stuck in your brain. [...] When they danced like this, as I've just showed [he was dancing while “Cissy Strut” was playing], they also formed their mouth like when whistling. That means I already sang along mentally. (H)*

The foreground-background interaction discussed in this subsection is frequent in popular music and reminds us of Denniz PoP's intentions reported at the beginning of this text. It is further accentuated by compositional processes, such as composing hooks over an already produced backing track (“track-and-hook method,” Seabrook, 2015, p. 200) or band-composed songs with clear distribution of roles.

### ***Fusion***

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While the experts categorized patterns as either groovy or catchy with ease in some cases, they stated that it would not be possible to distinguish groove and catchiness in others. Of our stimuli, The Meter’s “Cissy Strut” was analyzed as such a case by all the experts. All the patterns—drums, bass, guitar, and organ—are by themselves both catchy and groovy. We label the associated interaction *fusion*.

*The whole construct is catchy, the lick [and] the two hits at the end that the drums play as well. It's this thing that lets it begin from the start again. [...] That's the complete concept of groove for this song. (N)*

Put together in this way, it is no longer possible to assess which patterns predominantly promotes groove or catchiness. But not only the perceived causes blend—in a *catchy groove*, the experience of groove and catchiness also seem to fuse.

*When it is a style that is relevant for me and to which I am reacting, it captures me instantly and then groove and catchiness are the same thing. [...] Then it is a common experience. Then all that creates catchiness and all that creates groove is everything put together. (F)*

Here, it seems to be no longer possible to dissociate groove from catchiness (apparently in its experiential form) for F. Fusion was discussed less often than mutual support, but we cannot conclude that it is less frequent in practice. Potentially, for music creators, who are used to deconstructing what they hear, the experience of mutual support may be more relatable, while listeners with more “holistic” listening habits might not distinguish between simultaneously running groovy and catchy patterns and experience fusion more often.

### ***Deliberate Independence***

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Based on the two preselected high-groove high-catchiness stimuli, we concluded that groove and catchiness can positively interact, even fuse. But what about the stimuli that were supposed to be high in one category and low in the other?

This hypothesized categorization of stimuli was mostly affirmed and we report all deviations above (see sections “limits of groove” and “perceived and experienced catchiness”). The experts expressed that groove and catchiness were unbalanced in these stimuli and consequently negated a universal relationship, as shown here regarding Eric Clapton’s “Wonderful Tonight”:

*In this case, catchiness does not work primarily because of groove. You recognize the guitar sound, the distinctive kind of phrasing, the line. With these examples, we move further and further away from groove being a factor why the song is instantly clear. (B)*

What might be the potential criteria for independent groove and catchiness? A simplistic rule of thumb may be whenever the other is not part of the song’s concept, maybe even deliberately avoided. For example, the experts that found Brian Eno’s sound tapestry catchy analyzed it as not intending to groove. Comparably, what makes Rose’s “Waterfall” stand out and interesting might be related to how it develops over time, but this could not be appreciated due to the short length of our excerpt. This illustrates the third possible relation between groove and catchiness in polyphonic music: no interaction, but *deliberate independence*, when one of the two is not or hardly present.

### **Limitations**

There are three major limitations to this study. Foremost, the small sample size of five experts that makes it somewhat exploratory. As we did not sample participants until a data saturation of variability within themes was reached, we cannot extensively generalize our results. Additionally, the experts give a certain bias to the study, each individually, but also as a group of popular music creators and aficionados. It is possible that for people less interested,

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involved, or familiar with popular music, affective reactions would be less pronounced for groove and catchiness.

Another bias are the stimuli, which were selected by the researchers with a specific categorization and role. We played these during the interviews in a fixed order, going from presumably strong connections between groove and catchiness to weaker or no relationship.

This order and the clear categorization may have been obvious, influencing the results.

Lastly, we cannot completely rule out a confirmation bias, as the interview design centered the question of a relationship between groove and catchiness, which the experts could easily agree on. However, handing out the questionnaire and stimuli beforehand, as well as performing a member check afterwards, should guarantee that there are no pressed-for answers that the experts cannot stand behind. Additionally, selecting stimuli with specific functions presented many possibilities to deny a relationship, which were utilized and lead to the inclusion of “deliberate independence” in our results.

### **Conclusion**

In this study, we explored the views and experience of five popular music creators on groove and catchiness, how they attempt to achieve these in practice, and how groove and catchiness are related. We have four major findings:

We expanded on the definitions and highlighted detailed understandings of the concepts.

First, we found more broadly defined groove components—a bodily experiences combined with positive affect. According to our results, positive affect is necessary, and groove cannot be reduced to a single movement-related dimension. Further, our results suggest that

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participatory, immersive, and social aspects are important for the concept of groove, and hence should receive more attention in future research. We also saw similarities between playing while in a groove state and flow experiences. We explored the limits of groove experiences and found groove experiences (individually) differing in quality—two ideas that require further research.

Second, regarding catchiness, we contributed several new insights: we found evidence that catchiness is not solely about memorability, but also requires positive affect, and is further related to engagement, clarity, and immediacy. Based on our analysis, we suggest that catchiness is not entirely intrinsic to music, and defined it as a multi-dimensional perceived quality of music, potentially even an experience. Additionally, we found two different fabrics of structural catchiness: textual and non-textual. Our results and the detailed discussion of the ontologies of these two phenomena provide a valuable source for how they are understood by music creators but can also influence how researchers think about them, incorporating artistic knowledge, expertise, and philosophy in the psychological concepts.

Third, we collected and analyzed detailed information on how music creators work with groove and catchiness and what goals and strategies they have for this purpose. The perspective of musical creators, and especially their motivations and intentions, is a useful addition to the more common measurements and analysis of recordings and performances by listeners and researchers. It can inspire focused investigations and help with explanation of previous and future results.

Fourth, grounded in the experts’ knowledge and reactions to the music that we presented, we built a theory about how groove and catchiness are related. We have seen that these two central



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pillars of popular music can be combined easily, as there is considerable overlap in groove- and catchiness-promoting structures and how they are perceived. We have further seen that they positively interact and support each other, with some exceptions. We will examine this theory with listening experiments in the future.

On a methodological level, this study successfully combined in-depth expert interviews with a listening task. The choice of experts and stimuli gives the study a certain bias. With six fixed stimuli and five experts, we were able to see strong common trends with somewhat varying emphases, and a few individual differences. The data was sufficient to construct theories, but we cannot claim that these theories apply equally to the whole expert community, the nonexpert listener, nor to all kinds of popular music.

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## References

- Aljanaki, A., Bountouridis, D., Burgoyne, J. A., Van Balen, J., Wiering, F., Honing, H., & Veltkamp, R. (2014). *Designing games with a purpose for data collection in music research. Emotify and hooked: Two case studies*. Springer. [https://doi.org/10.1007/978-3-319-12157-4\\_3](https://doi.org/10.1007/978-3-319-12157-4_3)
- Allett, N. (2010). Sounding out: Using music elicitation in qualitative research. *NCRM Working Paper Series, 04/10*.  
<http://hummedia.manchester.ac.uk/schools/soas/morgancentre/research/wps/14-2010-03-realities-music-elicitation.pdf>
- Alwood, A. (2017). How pleasures make life better. *Kriterion - Journal of Philosophy, 31*(1), 1–24.
- Baddeley, A., Eysenck, M. W., & Anderson, M. C. (2014). *Memory* (2nd ed.). Psychology Press. <https://doi.org/10.4324/9781315749860>
- Barton, K. C. (2015). Elicitation techniques: Getting people to talk about ideas they don't usually talk about. *Theory and Research in Social Education, 43*(2), 179–205.  
<https://doi.org/10.1080/00933104.2015.1034392>
- Beaman, C. P., & Williams, T. I. (2010). Earworms (stuck song syndrome): Towards a natural history of intrusive thoughts. *British Journal of Psychology, 101*(4), 637–653.  
<https://doi.org/10.1348/000712609X479636>
- Beaty, R. E., Burgin, C. J., Nusbaum, E. C., Kwapil, T. R., Hodges, D. A., & Silvia, P. J. (2013). Music to the inner ears: Exploring individual differences in musical imagery. *Consciousness and Cognition, 22*(4), 1163–1173.
- Berliner, P. F. (1994). *Thinking in jazz: The infinite art of improvisation*. University of Chicago Press.

“The relationship between catchiness and groove”

- Blume, J. (2004). *6 steps to songwriting success—The comprehensive guide to writing and marketing hit songs*. Billboard Books.
- Bogner, A., Littig, B., & Menz, W. (2014). *Interviews mit Experten. Eine praxisorientierte Einführung*. Springer VS.
- Buchanan, T. W. (2007). Retrieval of emotional memories. *Psychological Bulletin*, *133*(5), 761–779. <https://doi.org/10.1037/0033-2909.133.5.761>
- Burgoyne, J. A., Bountouridis, D., Van Balen, J. M. H., & Honing, H. (2013). Hooked: A game for discovering what makes music catchy. In A. de Souza Britto Jr., F. Guyon, & S. Dixon (Eds.), *Proceedings of the 14th Society of Music Information Retrieval Conference* (pp. 245-250). ISMIR.
- Burns, G. (1987). A typology of ‘hooks’ in popular records. *Popular Music*, *6*, 1–20. <https://doi.org/10.1017/S0261143000006577>
- Byron, T. P., & Fowles, L. C. (2015). Repetition and recency increases involuntary musical imagery of previously unfamiliar songs. *Psychology of Music*, *43*, 375–389. doi:<https://doi.org/10.1177/0305735613511506>
- Byron, T., & O’Regan, J. (2022). *Hooks in popular music*. Springer Nature. <https://doi.org/10.1007/978-3-031-19000-1>
- Câmara, G. S., & Danielsen, A. (2018). Groove. *The Oxford handbook of critical concepts in music theory*. <https://doi.org/10.1093/oxfordhb/9780190454746.013.17>
- Campbell, S. M., & Margulis, E. H. (2015). Catching an Earworm Through Movement. *Journal of New Music Research*, *44*(4), 347-358. <https://doi.org/10.1080/09298215.2015.1084331>
- Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety*. Jossey-Bass Publishers.

“The relationship between catchiness and groove”

Csikszentmihalyi, M., & LeFevre, J. (1989). Optimal experience in work and leisure. *Journal of Personality and Social Psychology*, 56(5), 815–822. <https://doi.org/10.1037/0022-3514.56.5.815>

Danielsen, A. (2006). *Presence and pleasure: The funk grooves of James Brown and parliament*. Wesleyan University Press.

Dimbath, O. (2013). Visuelle Stimuli in der qualitativen Forschung: Potenziale und Grenzen des fotogestützten interviews. *Soziale Welt*, 64(1/2), 137–152.

Dresing, T., & Pehl, T. (2010). Transkription. In G. Mey & K. Mruck (Eds.), *Handbuch Qualitative Forschung in der Psychologie* (pp. 601–613). VS Verlag für Sozialwissenschaften.

Dudenredaktion. (2022). Groove. In *Duden online*. Retrieved September 14, 2022 from <https://www.duden.de/rechtschreibung/Groove>

Duman, D., Snape, N., Danso, A., Toiviainen, P., & Luck, G. (in press). Groove as a multidimensional participatory experience. *Psychology of Music*.

Commented [CK2]: Still in press or published?

Commented [CK3]: Add issue + page #s

Eschrich, S., Münte, T. F., & Altenmüller, E. O. (2008). Unforgettable film music: The role of emotion in episodic long-term memory for music. *BMC Neuroscience*, 9(1), 48. <https://doi.org/10.1186/1471-2202-9-48>

Feld, S. (1988). Aesthetics as iconicity of style, or ‘Lift-up-over Sounding’: Getting into the Kaluli groove. *Yearbook for Traditional Music*, 20, 74–113. <https://doi.org/10.2307/768167>

Flick, U. (2010). Gütekriterien qualitativer Forschung. In G. Mey & K. Mruck (Eds.), *Handbuch qualitative Forschung in der Psychologie* (pp. 601–613). VS Verlag für Sozialwissenschaften.

“The relationship between catchiness and groove”

- Floridou, G. A., Williamson, V. J., Stewart, L., & Müllensiefen, D. (2015). The Involuntary Musical Imagery Scale (IMIS). *Psychomusicology: Music, Mind, and Brain.*, 25(1), 28–36. <https://doi.org/10.1037/pmu0000067>
- Hemming, J. (2009). Zur Phänomenologie des "Ohrwurms." *Musikpsychologie*, 20, 184–207.
- Honing, H. (2010). Lure(d) into listening: The potential of cognition-based music information retrieval. *Empirical Musicology Review*, 5(4), 146–151.
- Hosken, F. (2020). The subjective, human experience of groove: A phenomenological investigation. *Psychology of Music*, 48(2), 182–198. <https://doi.org/10.1177/0305735618792440>
- Hume, A. (2017). Hook, line and sinker: How songwriters get into your head. *PORESO 2015: Redefining the Boundaries of the 'Event.'* Leeds Beckett University. <https://ojs.leedsbeckett.ac.uk/index.php/PORESO/article/view/4535/4353>
- Huron, D. (2006). *Sweet anticipation: Music and the psychology of expectation*. MIT Press.
- Hyman Jr, I. E., Burland, N. K., Duskin, H. M., Cook, M. C., Roy, C. M., McGrath, J. C., & Roundhill, R. F. (2013). Going gaga: Investigating, creating, and manipulating the song stuck in my head. *Applied Cognitive Psychology*, 27(2), 204–215.
- Jakubowski, K., Finkel, S., Stewart, L., & Müllensiefen, D. (2017). Dissecting an earworm: Melodic features and song popularity predict involuntary musical imagery. *Psychology of Aesthetics, Creativity, and the Arts*, 11(2), 122–136.
- Janata, P., Tomic, S. T., & Haberman, J. M. (2012). Sensorimotor coupling in music and the psychology of the groove. *Journal of Experimental Psychology. General*, 141(1), 54–75. <https://doi.org/10.1037/a0024208>
- Jefferies, L. N., Smilek, D., Eich, E., & Enns, J. T. (2008). Emotional valence and arousal interact in attentional control. *Psychological Science*, 19(3), 290–295. <https://doi.org/10.1111/j.1467-9280.2008.02082.x>

“The relationship between catchiness and groove”

- Katz, L. D. (2016). Pleasure. In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy: Vol. Winter 2016 Edition*. <https://plato.stanford.edu/archives/win2016/entries/pleasure/>
- Korsmit, I. R., Burgoyne, J. A., & Honing, H. (2017). If You Wanna Be My Lover ... A hook discovery game to uncover individual differences in long-term musical memory. In Van Dyck, E. (Ed.), *Proceedings of the 25th Anniversary Conference of the European Society for the Cognitive Sciences of Music*. Ghent University.
- Kramarz, V. (2014). *Warum Hits Hits werden*. Transcript Verlag.
- Kronengold, C. (2005). Accidents, hooks and theory. *Popular Music*, 24(3), 381–397. <https://www.jstor.org/stable/3877525>
- Krumhansl, C. L. (2010). Plink: Thin slices of music. *Music Perception*, 27(5), 337–354. <https://doi.org/10.1525/mp.2010.27.5.337>
- Kwasnicka, D., Dombrowski, S. U., White, M., & Sniehotta, Falko F. (2015). Data-prompted interviews: Using individual ecological data to stimulate narratives and explore meanings. *Health Psychology*, 34(12), 1191–1994. <http://dx.doi.org/10.1037/hea0000234>
- Labbé, C., & Grandjean, D. (2014). Musical emotions predicted by feelings of entrainment. *Music Perception*, 32(2), 170–185.
- Léveillé Gauvin, H. (2017). Drawing listener attention in popular music: Testing five musical features arising from the theory of attention economy. *Musicae Scientiae*, 1029864917698010. <https://doi.org/10.1177/1029864917698010>
- Levitin, D. J., Grahn, J. A., & London, J. (2018). The psychology of music: Rhythm and movement. *Annual Review of Psychology*, 69(1), 51–75. <https://doi.org/10.1146/annurev-psych-122216-011740>
- Lexico.com. (2022). Definition of catchy. In *Lexico.com*. Oxford University Press. Retrieved March 25, 2022. <https://www.lexico.com/definition/catchy>

“The relationship between catchiness and groove”

- Liikkanen, L. A., & Jakubowski, K. (2020). Involuntary musical imagery as a component of ordinary music cognition: A review of empirical evidence. *Psychonomic Bulletin and Review*, 27(6), 1195–1217.
- Littig, B. (2009). Interviews mit Eliten – Interviews mit ExpertInnen: Gibt es Unterschiede? In A. Bogner, B. Littig, & W. Menz (Eds.), *Experteninterviews – Theorien, Methoden, Anwendungsfelder* (3. grundlegend überarbeitete Auflage, pp. 117–133). Verlag für Sozialwissenschaften.
- Madison, G., & Schiöde, G. (2017). Repeated listening increases the liking for music regardless of its complexity: Implications for the appreciation and aesthetics of music. *Frontiers in Neuroscience*, 11. <https://doi.org/10.3389/fnins.2017.00147>
- Madsen, C. K., & Geringer, J. M. (2000). A focus of attention model for meaningful listening. *Bulletin of the Council for Research in Music Education*, 147, 103–108.
- Malbon, B. (1999). *Clubbing: Dancing, ecstasy, vitality*. Routledge.  
<https://doi.org/10.4324/9780203026458>
- Meyer, L. B. (1956). *Emotion and meaning in music*. University of Chicago Press.
- Mayring, P. (2010). Qualitative Inhaltsanalyse. In G. Mey & K. Mruck (Eds.), *Handbuch Qualitative Forschung in der Psychologie* (pp. 601–613). VS Verlag für Sozialwissenschaften.
- Meuser, M., & Nagel, U. (1991). Das Experteninterview—Konzeptionelle Grundlagen und methodische Anlage. In S. Pickel, G. Pickel, H.-J. Lauth, & D. Jahn (Eds.), *Methoden der vergleichenden Politik- und Sozialwissenschaft: Neue Entwicklungen und Anwendungen* (pp. 465–479). VS Verlag für Sozialwissenschaften. [https://doi.org/10.1007/978-3-531-91826-6\\_23](https://doi.org/10.1007/978-3-531-91826-6_23)

“The relationship between catchiness and groove”

- Mey, G., & Mruck, K. (2010). Grounded-Theory-Methodologie. In G. Mey & K. Mruck (Eds.), *Handbuch Qualitative Forschung in der Psychologie* (pp. 614–626). VS Verlag für Sozialwissenschaften.
- Moeck, E. K., Hyman, I. E., & Takarangi, M. K. T. (2018). Understanding the overlap between positive and negative involuntary cognitions using instrumental earworms. *Psychomusicology: Music, Mind, and Brain*, 28(3), 164–177.  
<https://doi.org/10.1037/pmu0000217>
- Monson, I. (1996). *Saying something: Jazz improvisation and interaction*. University of Chicago Press.
- Orr, M. G., & Ohlsson, S. (2005). Relationship between complexity and liking as a function of expertise. *Music Perception*, 22(4), 583–611. <https://doi.org/10.1525/mp.2005.22.4.583>
- Pawley, A., & Müllensiefen, D. (2012). The science of singing along: A quantitative field study on sing-along behavior in the north of England. *Music Perception*, 30(2), 129–146.  
<https://doi.org/10.1525/mp.2012.30.2.129>
- Pfleiderer, M. (2010). Dimensionen der Groove-Erfahrung: Eine empirische Studie. *Popscriptum*, 11. [http://www2.hu-berlin.de/fpm/popscrip/themen/pst11/pst11\\_pfleiderer.html](http://www2.hu-berlin.de/fpm/popscrip/themen/pst11/pst11_pfleiderer.html)
- Pressing, J. (1999). Cognitive complexity and the structure of musical patterns. *Proceedings of the 4th Conference of the Australasian Cognitive Science Society*, 4, 1–8.
- Roholt, T. C. (2014). *Groove: A phenomenology of rhythmic nuance*. Bloomsbury Publishing.
- Rösing, H. (1996). Was ist ‘Populäre Musik’?: Überlegungen in eigener Sache. In *Regionale Stile und volksmusikalische Traditionen in populärer Musik* (pp. 94–110). CODA-Verlag. <http://geb.uni-giessen.de/geb/volltexte/2008/5349/>
- Russell, P. A. (1987). Memory for music: A study of musical and listener factors. *British Journal of Psychology*, 78, 335–347.



“The relationship between catchiness and groove”

- Scherer, K. R. (2000). Emotion. In M. Hewstone & W. Stroebe (Eds.), *Introduction to a Social Psychology: A European perspective* (3rd. ed., pp. 151–191). Blackwell.
- Schlemmer, K., & Hemming, J. (2018). Alltagsphänomene und Sonderleistungen bei der Musikwahrnehmung: Absolutes Hören, Ohrwürmer und Synästhesie. In A. C. Lehmann & R. Kopiez (Eds.), *Handbuch Musikpsychologie*. Hogrefe.
- Scott, D., Berry, D., & Bobbett, K. (2020). *How earworms are born: An EEG study of original melodies that may come to stick in the brain*. Brain. Cognition. Emotion. Music. Conference, University of Kent.
- Seabrook, J. (2015). *The song machine*. Vintage.
- Senn, O., Bechtold, T., Rose, D., Câmara, G. S., Düvel, N., Jerjen, R., et al. (2020). Experience of Groove Questionnaire: Instrument development and initial validation. *Music Perception*, 38(1), 46–65. <https://doi.org/10.1525/mp.2020.38.1.46>
- Senn, O., Kilchenmann, L., Bechtold, T., & Hoesl, F. (2018). Groove in drum patterns as a function of both rhythmic properties and listeners’ attitudes. *PLOS ONE*, 13(6), e0199604. <https://doi.org/10.1371/journal.pone.0199604>
- Senn, O., & Kopiez, R. (2018). Musikalisches Entrainment: Rhythmus – Microtiming – Swing – Groove. In A. C. Lehmann & R. Kopiez (Eds.), *Handbuch Musikpsychologie* (pp. 543–568). Hogrefe.
- Senn, O., Rose, D., Bechtold, T., Kilchenmann, L., Hoesl, F., Jerjen, R., et al. (2019). Preliminaries to a psychological model of musical groove. *Frontiers in Psychology*, 10(1228), 1–5. <https://doi.org/10.3389/fpsyg.2019.01228>
- Sioros, G., Miron, M., Davies, M., Gouyon, F., & Madison, G. (2014). Syncopation creates the sensation of groove in synthesized music examples. *Frontiers in Psychology*, 5, 1–10. <https://doi.org/10.3389/fpsyg.2014.01036>

“The relationship between catchiness and groove”

- Smith, J. A., & Osborn, M. (2008). Interpretative phenomenological analysis. In J. A. Smith (Ed.), *Qualitative psychology—A practical guide to research methods* (2nd ed., pp. 53–80). SAGE Publications.
- Stupacher, J. (2019). The experience of flow during sensorimotor synchronization to musical rhythms. *Musicae Scientiae*, 23(3), 348–361. <https://doi.org/10.1177/1029864919836720>
- Törrönen, J. (2002). Semiotic theory on qualitative interviewing using stimulus texts. *Qualitative Research*, 2, 343–362. <https://doi.org/10.1177/146879410200200304>
- Traut, D. (2005). ‘Simply Irresistible’: Recurring accent patterns as hooks in mainstream 1980s music. *Popular Music*, 24(01), 57–77. <https://doi.org/DOI:10.1017/S0261143004000303>
- Van Balen, J., Burgoyne, J. A., Wiering, F., & Veltkamp, R. (2013). An analysis of chorus features in popular song. In A. de Souza Britto Jr., F. Guyon, & S. Dixon (Eds.), *Proceedings of the 14th Society of Music Information Retrieval Conference* (pp. 107–113). ISMIR.
- Van Balen, J. M. H. (2016). *Audio description and corpus analysis of popular music*. Utrecht University.
- Williamson, V. J., Jilka, S. R., Fry, J., Finkel, S., Müllensiefen, D., & Stewart, L. (2012). How do “earworms” start? Classifying the everyday circumstances of involuntary musical imagery. *Psychology of Music*, 40(3), 259–284. <https://doi.org/10.1177/0305735611418553>
- Witek, M. A. G. (2009). Groove experience: Emotional and physiological responses to groove-based music. In Louhivuori, J., Eerola, T., Saarikallio, S., Himberg, T., & Eerola, P. (Eds.), *Proceedings of the 7<sup>th</sup> Triennial Conference of European Society for the Cognitive Sciences of Music* (pp. 573–582). University of Jyväskylä.

“The relationship between catchiness and groove”

- Witek, M. A. G. (2017). Filling in: Syncopation, pleasure and distributed embodiment in groove. *Music Analysis*, 36(1), 138–160. <https://doi.org/10.1111/musa.12082>
- Witek, M. A. G., Clarke, E. F., Kringelbach, M. L., & Vuust, P. (2014). Effects of polyphonic Context, instrumentation, and metrical location on syncopation in music. *Music Perception*, 32(2), 201–217. <https://doi.org/10.1525/mp.2014.32.2.201>
- Witek, M. A. G., Clarke, E. F., Wallentin, M., Kringelbach, M. L., & Vuust, P. (2015). Correction: Syncopation, body-movement and pleasure in groove music. *PLOS ONE*, 10(9), e0139409. <https://doi.org/10.1371/journal.pone.0139409>
- Witek, M. A. G., Popescu, T., Clarke, E. F., Hansen, M., Konvalinka, I., Kringelbach, M. L., & Vuust, P. (2017). Syncopation affects free body-movement in musical groove. *Experimental Brain Research*, 235(4), 995–1005. <https://doi.org/10.1007/s00221-016-4855-6>
- Zbikowski, L. M. (2004). Modelling the groove: Conceptual structure and popular music. *Journal of the Royal Musical Association*, 129(2), 272–297.

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#### **Footnotes**

<sup>1</sup> H used the word “frohemut,” which means debonair. Buoyancy (German: “Frohmut”) or “a buoyant spirit” seemed to fit better in this case, as H lamented a lack of positive mood.

<sup>2</sup> German “rauslupfen,” also means “being yanked.”

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Table 1

Participant Data

Siglum	Age	Gender	Main Styles	Main Instrument
M	36	M	Pop, Folk, Jazz, Rock, Punk	Drums
H	69	M	Rock, Fusion, Jazz	Electronic Bass
N	38	M	(Electro-) Pop, Rock, Fusion, Jazz, Schlager	Guitar
B	49	M	Funk, Jazz, Minimal, Contemporary	Keyboard Instruments
F	43	F	Pop, Jazz, Soul, Electro	Vocals

Note: Main Styles include self-identified as well as publicly available attributions.

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Table 2

Researcher-Selected Stimuli and Their Presumed Interpretations

	High Groove	Low Groove
High Catchiness	The Meters “Cissy Strut” Deep Purple “Smoke On The Water”	Eric Clapton “Wonderful Tonight”
Low Catchiness	Rose “Waterfall”	The Shaggs “It’s Halloween” Brian Eno “Music For Airports 1/1”

*Note:* Full discographic information is in the Supplementary Files accompanying the online version of this paper at mp.ucpress.edu. We do not publish discographic information on expert-selected stimuli as some experts brought their own music, thus allowing their identification.

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Table 3

*Feelings During Groove Experiences as Described by the Experts, Categorized as Bodily Experiences and Affective Phenomena by the Authors*

<b>Bodily experiences</b>	urge to move, relaxation, coolness, laid back, brute force, flowing, flying, sticky, being raised/elevated <sup>2</sup> , physical tension, nervousness, like a sway in the wind, pushing, pumping, forward movement, simultaneous forward and backward movement, drive, pulsation, earthy, entrainment to a beat, perceiving the music in the gut, going directly to the liver, being blown away, going into the feet
<b>Affective experiences</b>	joy, thrill, excitement, tension, surprise, happiness, being moved, being touched, the music does something to you, makes you feel good, feels tremendously good, creates a vibe, feeling of freedom

*Note:* The boundaries of these are fluent in some cases, e.g., tension, relaxation, or thrill.

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Table 4

*Counts of Segments*

<b>Core Components</b>	<b>Groove</b>	<b>Catchiness</b>	<b>M</b>	<b>F</b>	<b>N</b>	<b>H</b>	<b>B</b>
Bodily Experience	92	21	18	23	14	20	23
Positive Affect	44	29	27	19	-	9	9
Memorization & Recognition	10	55	14	9	12	16	6
<b>Intended Factors</b>	<b>Groove</b>	<b>Catchiness</b>	<b>M</b>	<b>F</b>	<b>N</b>	<b>H</b>	<b>B</b>
Affect	67	49	16	53	5	24	9
Attention	35	58	10	28	18	8	10
Accessibility	29	32	8	5	8	5	22
Participation	33	19	8	10	3	12	16
Distinctiveness	9	52	11	8	12	9	17
<b>Moderators</b>	<b>Groove</b>	<b>Catchiness</b>	<b>M</b>	<b>F</b>	<b>N</b>	<b>H</b>	<b>B</b>
Listener	42	51	16	26	16	13	8

*Note:* Segments are coded as core components, intended factors, and moderators, how often these relate to groove and catchiness, and how often they appeared in each interview.

Statements made about groove and catchiness appear in both columns.

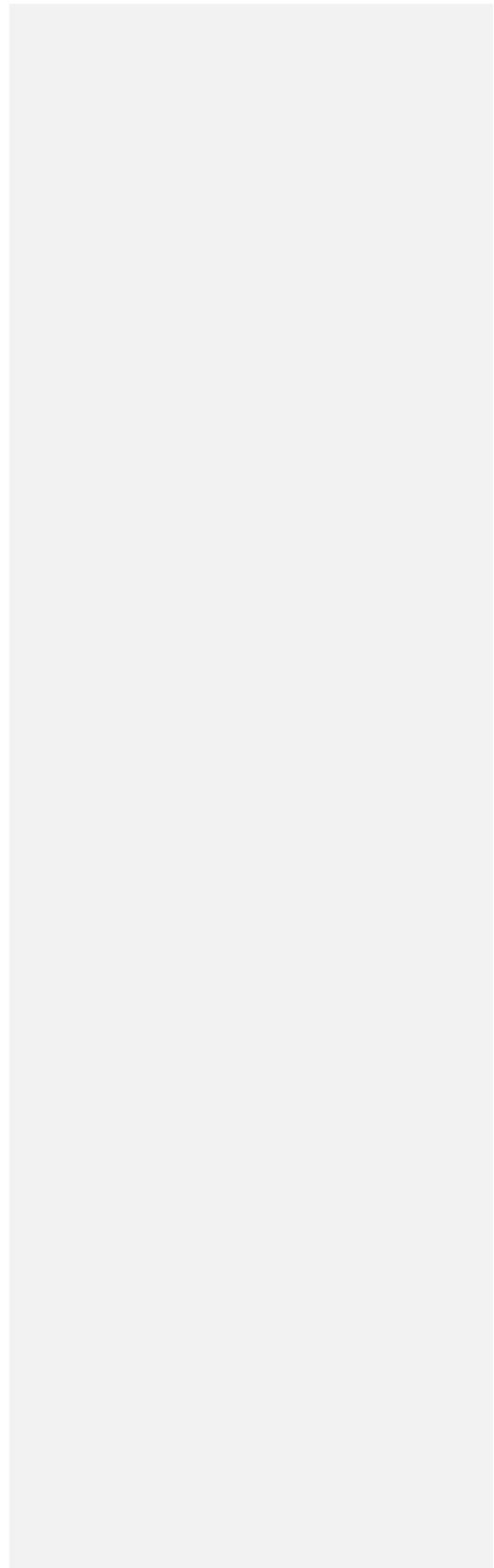


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### Figure Captions

Figure 1. Schema of the code structure showing the three stages of promoting groove and catchiness, and the relationship between the later stages, on which our analysis focused.

Figure 2. Three different forms of interaction between groove and catchiness in polyphonic music.



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