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TO KNOW IT IS TO LOVE IT?
A Psychological Discussion of the Mere Exposure and Satiation Effects in Music Listening

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Den vel nok mest oplagte grund til at lytte til musik er den glæde, aktiviteten bringer. Men hvad bestemmer, hvilken musik vi kan lide? En væsentlig faktor vises her, med evidens fra psykologisk og neurovidenskabelig forskning, at være musikkens grad af bekendthed. Jo bedre vi lærer en melodi at kende, desto bedre kan vi lide den – op til et vist punkt, hvorefter den subjektive vurdering flader ud eller daler. Årsagen til denne udvikling skal sandsynligvis findes i musikkens indvirkning på lytterens biologiske arousal niveau. Ukendt musik medfører en over-arousal hos lytteren, mens særdeles velkendt musik derimod resulterer i understimulering. Imellem disse yderpoler findes et optimalt punkt, hvor musikken forekommer lytteren bekendt, men uden at være totalt forudsigelig.

1. Introduction

As far as we know, humans everywhere have always produced and enjoyed music (see Mithen 2005; Wallin et al. 2000). One likely reason for this, is the very direct effect music has on our feelings. It seems that music has a privileged ability to adjust the emotional balance of the listener. This can come about as an enhancement of an already existing emotional state, or perhaps as a change of it, even to the point of turning the valence of the emotional balance around completely. Watching a movie, switching off or replacing the soundtrack will completely change the emotional tone of a scene, just on account of the score. Composers, of course, realise and exploit this, more or less consciously. As do listeners, who will seek to steer the input of music in the right direction, according to their needs in any given situation. By adjusting the volume, changing the track or the radio station, or simply by seeking out – or alternatively avoiding – places with music (concerts, discotheques, department stores; and just about every other place imaginable).

Music is probably the most pervasive of all art forms. Virtually everyone enjoys listening to music, sometimes for hours every day, although often

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while simultaneously attending to other matters. Music lends itself well to being enjoyed while thinking, talking, relaxing, driving, walking, running, dancing, shopping and more – almost any situation encountered in daily life. It also appears that many people tend to identify quite strongly with the music they listen to. Music is part of our personal identities.

While all these considerations about the importance of music in general are certainly of interest, a question springs to mind: What determines *which* music a person likes? What makes him like one piece of music, but not another? How can one person's favourite seem like noise to the next? There are many possible explanations for these phenomena, and the focus of this article will center on a particularly salient one.

At first glance, questions like these seem to be entirely down to subjective taste, and hence not suitable objects for scientific exploration. However, under closer scrutiny, it transpires that there may indeed be objective reasons behind the subjective preferences.

First of all, it is essential to realise that although the music itself is of course central to the listening experience, so is the person doing the listening! That is to say, the listener brings with him a background which sets the scene for the appreciation of any given piece of music. The former experiences of the subject consequently have a very important role to play when music is judged. To a large extent, a melody is not just »good« or »bad« per se – it makes more sense to say that it is judged as such by a particular subject, at a particular point in time. Focusing not on the music itself, but on the *interaction* between music and listener, moves the question out of the realm of musicology or aesthetics, and into the purview of the discipline of psychology.

If this seems like a novel idea, the reality is quite the opposite! Empirical investigation of aesthetic perception was one of the first topics to be given attention by the German psychophysicist movement that founded psychology as a separate discipline in the late nineteenth century. Fechner's 1876 book »Vorschule der Ästhetik« is a prominent example. Subsequently, aesthetic issues were largely neglected by mainstream experimental psychology, at least of the Anglo-American variety, under the behaviourist and cognitivist research agendas. Interest did prove somewhat more persistent within other psychological fields, such as personality – and social psychology. In the 1970s, Canadian psychologist Daniel Berlyne revived the field of aesthetics within the more experimentally and biologically oriented parts of psychology. This is seen most clearly in his book »Aesthetics and Psychobiology« (1971), and more generally in the foundation of the research field he termed the »new experimental aesthetics« (See chapter three). However, his program never became a central part of the psychology mainstream of the following decades.

At present it could be argued that we are in fact experiencing a renaissance of scientific interest in aesthetic issues. Part of the reason for this is the keen

interest the brain imaging, or cognitive neuroscience, community has taken in the matter.[1] In turn, this has rubbed off on the parent disciplines of cognitive neuroscience, such as psychology. Moreover, music is one of the areas receiving the most attention.

So, can modern science help answer our question of the origins of subjective taste in music, posed above? Of course, it would fall outside the scope of an article like this to attempt an exhaustive account of such a complex issue. As a consequence, a rather narrower approach is chosen here, highlighting an especially likely factor behind subjective preferences for music. This concerns the relationship between *knowing* and liking – a choice that seems appropriate, since music is a temporal art form, enjoyed over time, and often through repeated listening.

In chapter two, a number of empirical investigations relating knowing and liking are touched upon. Chapter three attempts to make sense of the empirical findings in a biopsychological framework. Further perspectives of the insights are addressed in chapter four, followed by a résumé and discussion of the boundaries for the explanations in the final chapter. It should be noted that the emphasis of the article is on seeking a common ground for, and fruitful ways of thinking about music preferences and psychology, more than on a meticulous analysis of the isolated parts involved therein.

2. Knowing and liking: Some empirical insight

We like what we know. This is a simple way of putting the conclusion from a large body of research on the so-called *mere exposure effect*. The term was introduced by American psychologist Robert Zajonc, who compiled previous studies on the subject, and elaborated upon them through further experiments (Zajonc 1968). By now the effect has been shown to be quite robust, as well as relevant for a wide variety of stimuli. The experiments usually involve subjects being exposed to a number of functionally equivalent stimuli, often while performing some task that is extraneous to the main point of interest. This being that the exposure frequencies (number of repetitions) of the different stimuli are varied systematically, unbeknownst to the participants. After this initial phase, the subject will have encountered a range of stimuli but, crucially, a different number of times. Subsequently, a subjective rating phase is introduced, where each item from the first phase is judged on some sort of Likert scale or similar preference criterion. New stimuli might be added at this stage to gauge how completely novel mate-

1 As evidenced by eg the field of »Neuroesthetics« advocated by British neurologist Semir Zeki (eg Kawabata & Zeki 2004). Within Denmark as well, researchers have contributed to the advancement of the neuroscientific understanding of music (eg. Vuust et al. 2006).

rial is rated in comparison. The finding in many studies of this type, is that people indeed tend to prefer items more familiar to them, merely on account of the degree of exposure – hence the name (see Bornstein 1989, for a meta-analysis). This holds for stimuli as diverse as faces and random geometric shapes, and even when the stimuli involved would not seem likely to inspire any liking one way or the other, such as in the case of Chinese characters displayed to non-Chinese proficient people (Zajonc 1968). Furthermore, it has since been found that the mere exposure effect also works, even more so actually, when stimuli are presented subliminally, ie outside the subject's awareness (eg Zajonc 1980). Realising something has been encountered before is not a prerequisite for the function of the mere exposure effect.

A refinement of the understanding of the mere exposure effect has since been proposed. It transpires that there may be two sides to the effect, one being the »classic« mere exposure effect as described by Zajonc; the other a »structural« mere exposure effect (see eg Gordon & Holyoak 1983; Manza & Bornstein 1995). The latter describes how, in a mere exposure experiment, a more general (:structural) understanding of the given stimulus type is acquired alongside the imprinting of each specific stimulus. In other words, viewing a number of Chinese symbols will not only increase liking for those particular symbols, but at the same for Chinese symbols in general, within certain limits. Implicit learning is commonly taken to be the mechanism involved in the structural mere exposure effect. Often, both types of exposure effects will complement each other, but have been succesfully teased apart in some studies.[2]

A second psychological effect relating knowing to liking needs consideration, namely the *satiation effect*, sometimes termed the boredom effect. The satiation effect works in the opposite direction compared to the mere exposure effect. It states that something can in fact become too familiar, entailing a drop in likeability. Although this is a less robust phenomenon, and harder to observe in a laboratory setting, a number of studies have corroborated its existence (see eg Bornstein 1990). Generally, these investigations find a flattening of, or indeed a decrease in, liking ratings following 10 to 20 repetitions. But in other experiments, no satiation effect at all is observed, which is why it is considered a somewhat elusive psychological phenomenon.

What about music? Does the mere exposure and/or the satiation effect exist here? Most studies of the effects use visual stimuli, not auditory. One might suspect the effect to be at least as strong for music, given that this type of stimulus is by definition spread across time, and perceived that way. Music flows along with time, rather than remaining static like a painting. Most

2 When nothing else is indicated, the term mere exposure effect is used in its broad sense for simplicity in this article, covering both the classic and structural aspects of the phenomenon.

compositions even employ widespread elements of repetition as an integral ingredient, which might indicate the importance of repetition for the listening enjoyment. Furthermore, it is evident that the behaviour of the listener, or consumer, as well as that of the media, is heavily based on repetitions of the same music. Just think of how the popular music industry functions – a pop hit is more or less defined by the massive airplay it gets for some period of time (before the next one supersedes it). So, how well does this circumstantial evidence hold up when put to the test?

Perhaps because of the seemingly strong connections between music and exposure effects alluded to above, it turns out that this subject has indeed been studied already well before Zajonc's landmark 1968 article (as described in eg Peretz et al. 1998). This at least holds true concerning the mere exposure effect, where a positive influence of exposure on liking ratings has been observed for many types of music, and also for random tone sequences (ibid.). On the other hand, studies of the satiation/boredom effect are far more scarce. This partly has to do with the aforementioned elusiveness of the effect, but also with an apparantly lesser interest in the negative versus the positive effects on liking. Here, two more recent studies are presented: One highlighting the mere exposure effect, followed by one which in addition aims to capture the satiation effect in more detail.

A recent study of the mere exposure effect in music

Peretz, Gaudreau, and Bonnel's 1998 article »Exposure effects on music preference and recognition« has 48 subjects, in what they call experiment 1, listen to melody lines from the popular repertoire. The total of 80 melodies have been chosen, such that half of them are familiar, and the other half unfamiliar to the subject population. They have a matched duration of 8-9 seconds, and use a computer recorded piano sound. In a study phase, subjects hear 20 of the familiar, and 20 of the unfamiliar tunes once each, and rate their familiarity. Afterwards, they hear the complete set of 80 melodies, including the 20 familiar and 20 unfamiliar ones they did not hear in the study phase, and give each a liking rating. First of all, the results show that the group of 40 familiar melodies are rated higher than the 40 similar, but unfamiliar ones, on the order of .7 in standard score terms – not too far shy of a full standard deviation. A finding that ties in nicely with the mere exposure effect, more precisely the classic rather than the structural kind, since both familiar and unfamiliar melodies were of the same general type, and should therefore not differ in structural terms. Secondly, the study shows an interesting difference in how subjects respond to familiar, respectively unfamiliar, tunes after just a single previous exposure. For the unfamiliar repertoire, there is in fact a modestly increased liking following this brief exposure of around .2 in standard score terms ($p<0.001$). The mere exposure effect works remarkably quickly in this instance. By contrast, the liking for the set of already (pre-experimentally) familiar melodies is not altered by

the solitary exposure. So, hearing something very familiar once more does not change your attitude towards it – which points to a satiation effect, where liking for the melodies has reached a plateau. The study furthermore includes a retest phase of the same subjects two to four months after the first experiment. Interestingly, all of the above mentioned effects still persist after this considerable timespan.

It could be raised as a criticism against the experiment that ideally a study of exposure effects should exclusively use stimuli that are verifiably unknown to participants – in order to have complete control of the level of overall exposure for all individuals. Moreover, there clearly is a natural limit on how much of a satiation effect that is attainable from only a single exposure, it might indeed be considered surprising to observe it at all in this study. The following investigation follows up on this lead.

A further study highlighting the satiation effect in music

»Liking and memory for musical stimuli as a function of exposure« is the title of an article by Szpunar, Schellenberg, and Pliner 2004. The authors note the relative lack of experimental evidence on the satiation/boredom effect – a situation they attempt to help remedy through their own study. Part of the reason for the scarcity of findings could well be due to the fact that studies on music have tended to employ only a few exposures of each stimulus, thereby lowering the chance of seeing any adverse repetition effect. In this study, then, care is taken to reach a significant number of repetitions. Szpunar et al. utilise a framework similar to the one described above. In what is called experiment 2, stimuli consist of excerpts of 15 seconds duration from 18 pieces of real orchestral classical music, lending the study a large degree of ecological validity. In a study phase, 40 subjects are exposed to two of the excerpts 2, 8, or 32 times each, respectively. Participants are unaware of the true goal of the experiment; their task during the study phase is to identify the occurence of certain instruments. Afterwards, they hear these tunes again once each, along with six new ones from the stimulus set, and rate their likeability on a 1-7 Likert scale. Finally, there is a second rating phase concerning the same stimuli, but this time subjects rate their recognition confidence for each excerpt. Results show a significant, positive effect of exposure on liking for 2 and 8 repetitions, but by 32 exposures, ratings saw a large drop (figure 3 in the article). These melodies were rated at the same, low level as previously unheard ones. Mean ratings for the melody groups range from around 3.5 to 4.5 on the seven-point scale, meaning that the exposure effects are fairly limited in strength. Nevertheless, the findings are statistically significant, and noteworthy especially for the clear satiation effect – even to the point of showing a large drop in ratings, and not just a flattening of them. It is indeed possible to become over-exposed to a piece of music. Turning to the recognition confidence (memory) rating, a clue to the mechanism behind the satiation is that while the memory rat-

ing rises for up to eight exposures, there is an almost complete tailing off at 32 exposures.[3] Szpunar et al. touch upon some other main aspects in their experiment, which will be mentioned briefly here. They find that the ecological validity of the stimulus material, and of the task given to subjects while listening, both have a pronounced mediating influence on the effect of exposure. Apart from the experiment using real world music, two other ones employ stimuli of a much simpler nature, namely MIDI tone sequences of 5-9 notes. The task in one of the experiments is a more artificial one in music terms: counting the number of notes in each sequence (the more musically valid task was to identify the type of lead instrument). Both of these adjustments of ecological validity resulted in a lessening, or even negation, of the mere exposure effect. Additionally a second, incidental, listening condition is investigated in each of the experiments (as opposed to the focused condition already described). In the incidental listening condition, subjects actually pay no attention to the music, played quietly in their left ear, but rather to a narrated story in their right ear. This had the effect of seriously hindering the memory for the melodies, slowing the learning curve markedly. Liking ratings were influenced by this, showing a modest positive linear trend of exposure, even in experiment two, where the sharp decline in liking was observed for 32 repetitions in the focused condition. This finding is reminiscent of the fact that the mere exposure effect works also on the subliminal level.

To sum up, these empirical investigations show the power of the mere exposure and satiation effects on liking for music. However, they (especially Szpunar et al.) also demonstrate the elusive nature of the satiation/boredom effect in particular. The following chapter delves into the question of why these relationships exist in the first place.

3. Digging deeper into the exposure effects in music listening: Arousal and expectancy

As we have learned, scientific psychology may indeed hold important clues as to the underpinnings of subjective, aesthetic experience. An important factor was chosen as the focus here, namely the effect of exposure on liking. The collective knowledge from several empirical investigations reveals the following: liking for a tune will tend to increase the more often it is heard, but usually only up to a certain point, beyond which liking will tail off or drop. Plotting this relationship in a coordinate system with exposure on

3 The interpretation of this is complicated by the fact that a ceiling effect for the memory rating may be present for the melodies heard most often – which is a point not addressed by the authors.

the x axis, and liking on the y, will describe a so-called inverted-U curve. Interestingly, and a throw-back to the early German psychophysicist forays into aesthetic perception mentioned in the introduction, a similar inverted-U curve was found by Wilhelm Wundt in the late eighteen hundreds to portray the relationship between stimulus intensity and pleasantness. (This curve is also known as the Wundt curve). Surely it can not be coincidental that these two insights corroborate so well with each other? It seems that they must speak of closely related psychological effects. In the following, this and other aspects central to the knowing-liking relationship in music listening will be discussed, centered around two key concepts: arousal and expectancy.

Music and arousal

The aforementioned psychologist Berlyne revisited the Wundt curve, and made it a major player in his »new experimental aesthetics« (here from Berlyne 1971). His terminology is slightly different, though. Berlyne uses the term »hedonic value«, which is to be understood in a broad manner, eg encompassing what is called liking in the studies above, or pleasantness by Wundt. More significantly, he posits that changes in hedonic value are a function of the stimulus' *arousal potential* for the subject. According to Berlyne, a stimulus can alter the arousal level of the person, which will affect his immediate hedonic status – and hence his liking rating for the stimulus. Arousal potential entails something more than the previously discussed concepts like exposure frequency, knowledge, or stimulus intensity. It can be thought of as an overarching concept, resulting from factors such as psychophysiological attributes like intensity, colour, or pitch, as well as ecological, and so-called collative attributes, such as novelty-familiarity (being especially noteworthy in this context). Berlyne proposes that a hedonic effect could result both from a lowering or a heightening of arousal level. For example, a positive effect might come about from a lowering of an unpleasantly high state of arousal, or from an increase in an unwelcome low level of arousal. Could the concept of arousal potential be the needed explanatory link between exposure effects and liking in music?

The concept of arousal itself is widely used in psychology and its neighbouring disciplines. Describing the phenomenon in detail, or evaluating its merits, falls outside the confines of this article. It is accepted, at least as a general way of characterising an important aspect of human psychology. Arousal is deemed a factor in such processes as attention, level of consciousness, emotions, and motivation. Arousal theories have always had a strong affinity with biological psychology. This is true for Berlyne as well, who relates his theory to »hedonic centres« in the brain, including lateral and medial hypothalamus, the reticular formation, and the limbic system (Berlyne 1971). From earlier studies in rats, certain brain areas have also been described as reward or punishment centres, guiding the animal towards the right future decisions. Berlyne explains how low- to medium arousal

stimuli activate the reward/pleasure centres, while high arousal ones also trigger the supposedly higher-threshold neurons in the punishment/aversion centres. The overall idea is the point of interest here, rather than the plausibility of the specifics (35 years is after all a long time in neurobiological research terms).

Is there any actual evidence supporting that music listening has an effect on arousal-related brain areas, or is it all purely speculative? It so happens that there is, related to the surge of studies on music within cognitive neuroscience. Of these, just a few shall be mentioned here.

Blood & Zatorre 2001, »Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward and emotion«, is one important study. 10 subjects were allowed to pick the music that gives them a maximally pleasurable listening experience, also called a musical »chill« (the »shivers down the spine« sensation). They then listened to these recordings, up against some non-chill inducing music, while being PET-scanned. The brain activations corresponding to the chill sensation stood out when compared to those of the non-chill inducing music. Musical chills correlated with increased blood flow in areas such as the ventral striatum, dorsomedial midbrain, thalamus, and the anterior cingulate, along with concurrent decreases in the amygdala, hippocampus, and the ventro-medial prefrontal cortex. The authors point to the implication of these areas in both reward processes and arousal regulation. Many of the same areas respond to euphoria-inducing stimuli, such as food, sex, and drugs, which goes to show the potentially profound effect of music on emotion and arousal.

In an earlier PET experiment, Blood et al. 1999 investigated the opposite end of the spectrum, namely brain regions specifically recruited by *unpleasant* music. This was realised by using dissonant musical stimuli, found by most to be highly unagreeable. The results show that the unpleasant, dissonant music activates the right parahippocampal gyrus and the precuneus. A study by Menon & Levitin 2005, »The rewards of music listening: Response and physiological connectivity in the mesolimbic system«, further elaborates on these findings. Here, 13 subjects listened to well liked classical excerpts versus scrambled versions of the same repertoire as a physically similar, but non-musical baseline. Using fMRI, Menon & Levitin are able to show, that listening to music modulates the activity in reward- and emotion related mesolimbic areas, including nucleus accumbens, the ventral tegmental area, hypothalamus, and insula. Furthermore, the observed connectivity patterns indicate, that the dopamine system is involved in the brain network activated by music listening. This is a salient finding, because of the central role of dopamine in the pleasure system of the human brain.

Apart from these neuroimaging studies, Carol Krumhansl and other researchers have shown arousal effects of music using various psychophysiological measures, like heart rate and skin conductance changes (see eg Krumhansl 1997).

In summary, it has been found empirically that music indeed has a biologically observable effect on arousal and emotion systems. This effect, in turn, seems bound to be a major factor in the likeability of a piece of music. But while it may well be true that arousal effects are key to understanding the subjective evaluation of music, it still needs to be explained wherein the precise connection with the described exposure effects consists. This is where the concept of *expectancy* comes in.

Expectancy, arousal, and music

How can repeated exposures to a piece of music, be it in everyday life or in laboratory studies as described above, alter its arousal potential? Well, it is safe to say that some sort of cumulative *implicit learning* takes place each time a tune is heard. This can be assessed directly in eg the results from Szpunar et al. 2004; subjects actually show a learning curve for the recognition of the melodies, based on the number of previous repetitions. In a way, a piece of music can be construed as a »riddle« consisting of temporal patterns (an analogy also hinted at by Sloboda 1985). It is up to the listener to untie the knots and make sense of the intertwining patterns. Although most listeners do not even remotely think of their music listening in such manner, the analogy is not necessarily that far-fetched. Anyhow, the implicit learning of a piece of music results in certain *expectations* the next time it is heard. Although this may seem an inevitable logical consequence, it is comforting that it has also been verified empirically, eg. by Schmuckler 1997. Subjects in that study at first rated how well the endings of a number of melodies accorded with their expectations. Memory ratings for the same melodies were in a subsequent test shown to correlate positively with the expectancy ratings made previously, displaying the intimate connection between expectations and recognition for music.

What is proposed here then, is that hearing a tune repeatedly lets the listener learn its content to an increasing degree, altering his expectations towards the stimulus – which in turn influences his arousal level, resulting in a more or less positive or negative evaluation of the music. Since music unfolds over time, it seems fitting to bring the concept of expectancy to the forefront in trying to understand liking for music. Appreciating music is about following the flow and dynamics of its melodic and rhythmic patterns; at some times being swept blissfully along, while at others being surprised by abrupt twists and turns. The amount of fulfilment of one's expectations towards the music is paramount for the musical experience. Bearing the insights from earlier chapters in mind, there is clearly more than one side to this relationship. The expectations of the listener could be completely thwarted, leading to a perception of the music as cacophonic and overwhelming. On the other hand, expectations could also be met so fully, that the listening experience becomes totally predictable, and consequently boring. A position of optimal interplay between the expected and unex-

pected hypothetically exists somewhere in the middle, keeping the listener in delightful suspense. This again describes an inverted-U relationship, between expectancy and liking, with the influence on arousal as the mediating process. Moreover, the factor which in the first place has a major impact on expectancy, is none other than the number of prior exposures.

It is no coincidence that emphasis is placed on expectancy with regard to music. The concept actually has a long history within musicology, and these theories fit well with the account given above. Notably, Leonard B. Meyer in his seminal 1956 work »Emotion and Meaning in Music« describes how much of music's emotional power revolves around its creation of expectations. An example of how this can be achieved, is the movement around the »gravitational centre« of the tonic in much of Western music. Or, in a broader sense, the expectations derived from rules of harmony and timing. Meyer explains how music is composed as a series of suspense-inducing uncertainties, followed by clarifications and return to order, which bring emotional gratification – until the next theme comes along and casts the listener into a new set of expectations. While Meyer is by no means oblivious to the role of psychological factors in understanding these phenomena, being a musicologist his focus is on how they can be explained on the basis of the music itself – an important, but somewhat different route than the psychological one taken in this article. Several others have followed the lead of Meyer, eg Narmour with his implication-realization model of melodic expectancy (Narmour 1990), which is very much based on the ideas of Meyer.

A further line of musicological analysis deserves mentioning when speaking of expectancy effects. Via his so-called historiometric approach, Simonton 2001 shows that themes from classical works of *intermediate* melodic originality are actually more prevalent – and by inference, more popular – than those of either low or high originality. This finding is computed from examining the uniqueness of two-note transitions of the first six notes in no fewer than 15.618 themes by 479 composers. Graphically, this describes yet another inverted-U type relationship, between melodic originality and popularity/prevalence.[4] This indicates at the same time that the expectancy-arousal link is not just a theoretical and laboratory-induced phenomenon, but also very visible (not to mention audible!) in the real world. The connection bringing the exposure issue into the equation appears straight forward: the amount of repetition of a piece of music will act as a mediator between the melodic originality and its effect on arousal, and thereby on its popularity. Put differently, hearing something more than just once will automatically alter the *perceived* melodic originality of the work.

4 In fact, it is rather an «inverted-J« in this instance, meaning that there is a slant in the curve, from the fact that themes low in melodic originality are less unpopular than those high in originality.

The same should hold true for other aspects of music, apart from melody, such as rhythmic originality.

4. Subjective liking: Exposure effects, arousal, and expectancy in perspective

While the discussion so far of empirical and theoretical studies have hopefully provided insight into the mechanisms involved in exposure effects on subjective liking for music, some of the general ideas actually have considerably older philosophical roots. In characterisations of beauty, there is a long tradition of speaking of the *avoidance of extremes* – going back to Plato and Aristotle. This conception is highly reminiscent of an inverted-U curve; the aesthetically pleasing lies somewhere in between the totally orderly, at one extreme, and the completely chaotic at the other. Many philosophers have since ascribed to a compatible understanding on this issue. In a similar vein, Leibnitz' description of the striving for »perfection« as the quest to »obtain as much variety as possible, but with the greatest order that one can«, inspired thinking on the nature of art and beauty (from Berlyne 1971, pp. 125-126). Later, Fechner introduced the commensurate »principle of the aesthetic mean«, and he was furthermore a leading figure in the endeavor to put these philosophical ideas to the test empirically.

As might be gathered from the above, these insights in no way pertain only to music. This is a fact that has only been addressed briefly (in chapter two), but nonetheless a crucial one. It significantly broadens the perspective, from a discussion about what makes us like the music we do, to the realisation that the same mechanisms might also be responsible for our subjective reactions to a great many other things. While the inherently temporal nature of music as a stimulus renders it particularly susceptible to exposure and expectancy effects, other stimuli are certainly also influenced by them. Remember that eg Zajonc's research on the mere exposure effect was actually primarily done on visual stimuli – there is no reason not to believe that many of the same parameters as for music should be responsible for exposure in this and other modalities. E. H. Gombrich, who is a well-known historian of the visual arts, describes how the human visual system functions through a »sense of order«, which *expects* regularity of the visual world (Gombrich 1979).[5] This point of view is reminiscent of the Gestalt school, where eg Koffka spoke of the mind as seeking certain patterns (gestalts) in perception; namely those with the best »goodness of configuration« according to the laws of Prägnanz. In literary theory as well, the reception aesthetics

5 Incidentally, Gombrich also sees many analogies between music and the visual arts, as described in the epilogue of the 1979 book.

of H. R. Jauss similarly stresses the importance of the expectations of the reader, his so-called »horizon of expectation«.

There is a further subject that might prove to have as strong, if not even stronger, ties to expectancy-arousal-liking effects than music does: humour. Humour very clearly plays upon the expectations of the recipient, namely by going against them with a surprising punch line, analogy or the like. Again, if the recipient is to »get« the joke and be amused, there needs to be just the right amount of unexpected content. The humour is often lost or greatly trivialised if everything unfolds totally predictably, and the same holds true if nothing in it makes any sense whatsoever. Berlyne describes the mechanism of humour as an »arousal jag« (Berlyne 1960). The punch line of a joke has this effect, first creating a rapid increase in tension owing to the surprise value and uncertainty it brings about, followed by a swift release when the meaning of the joke sinks in (hopefully). This brief tension rise and subsequent relief often has a pleasurable effect on arousal. So, the aesthetics of music as well as visual arts, literature, humour and probably many other phenomena, all seem to capitalise on some of the same expectancy-arousal processes.

Where does all this fit into the discipline of psychology in general? Is it at all relevant, or are these insights on subjective liking and exposure effects just a niche of limited interest to the mainstream? It will be argued here that this is certainly not the case, and that the account above is both compatible with and relevant for the wider field of scientific psychology. Nevertheless, as mentioned in the introduction, the study of aesthetic phenomena has not had a consistent role in psychology, and it certainly cannot be said to be a part of the mainstream. One reason for this omission could be the idea of »high art«, where artworks, including their creation and reception, are considered something truly unique, almost of another world. Art is made using divine inspiration, and the experience of beholding it is not to be explained using the sterile language of science, some might argue. While nobody would wish to take anything away from the profundity and beauty involved in art, no real insight into the nature of art and the aesthetic can come from such a stance. Part of the problem lies in the way in which the notion of high art severs the concept of the aesthetic from everyday life, and thus from being understood in general psychological terms. The view espoused here is a pragmatist one (see Dewey 1934)[6]: aesthetic phenomena do not just exist in museums and concert halls – they are everywhere and take on an infinite variety of forms. Subjective liking enters into much of what humans do, eg as a motivational factor or as a reason behind emotions – both of which could hardly be denied a central role in psychology. Progress in the

6 Interestingly, Baumgarten, who coined the term »aesthetics« in 1735, held a somewhat similar, broad view of the phenomenon (see Feagin 1995; Shusterman 2000).

scientific understanding of subjective liking has been hampered by another artificial division, between two concepts right at the heart of the discipline of psychology: cognition and emotion. A division that has in no way helped the understanding of either of them.[7] As can be gauged from the findings and theoretical ideas presented in this article, cognitive aspects like implicit learning and memory influence perception through expectations, which in turn have an impact on emotional aspects such as arousal and pleasantness. »Thinking« and »feeling« do not operate on separate planes after all. As a consequence, the science of psychology needs to include emotional factors such as subjective liking and aesthetics, just as much as the other way around.

Regarding the implementation of the interplay between these empirical and theoretical insights, a single further aspect shall be briefly mentioned here. Within the neuroscience community, a renewed interest has sprung up during the later years in a subject particularly aligned with ideas put forth here: how the brain is able to *predict*. The neurophysiologist Llinas sees the ability to foresee future events, at many different timescales, as perhaps the most important accomplishment of the human nervous system, guiding the exploratory behaviour of the organism (Llinas 2001). Furthermore, a prominent figure in neuroimaging, Karl Friston, has presented ideas on how the brain realises what he calls »predictive coding« (eg Friston 2002a; 2002b). These undertakings can be directly linked to the research on expectancy, with the promise of deeper knowledge of the relationship between liking, expectancy, arousal, and exposure effects – for music and other aesthetic stimuli, as well as for psychological processes in general.

5. Conclusions and closing remarks

In summary, it is indeed possible to study subjective liking for music using the objective measures of science. One particularly fruitful avenue of approach is to study how exposure effects influence liking. Empirically, it has been shown several times that the more you hear something, the more you tend to like it (the mere exposure effect). This only applies up to a certain point though, where after further exposures will not result in increased liking, and may even entail a decrease (the satiation/boredom effect). Taken together, these two effects describe an inverted-U, Wundt curve relationship between exposure and liking. The explanation behind this relationship is proposed to involve how well the expectations of the listener are fulfilled by the music, which will have an impact on his biological arousal level. This adjustment of arousal level can have a positive or negative effect on the lis-

7 It does, however, seem that eg the field of cognitive psychology is finally embracing emotional aspects more.

tener (as in over-, under-, or optimal arousal), greatly influencing his judgement of the music. These insights are not limited to the case of music; they are relevant for just about any type of stimuli, just as the processes involved should prove interesting to the discipline of psychology at large.

It is fitting at this point to draw attention to some limitations of the line of reasoning in this account, which should also serve to put the exposure effects in their proper perspective.

Firstly, the concepts of subjective liking and aesthetic value have been used more or less interchangeably. In fact, the relationship between them is a much debated philosophical issue in its own right. The main reason for not going into the discussion in this context, is that it might do more harm than good trying to separate the two, especially since the emphasis here has been on building bridges across disciplines, not on keeping them separated. It is nonetheless sobering to keep in mind that art can (some would say should) have more than a pleasing function, such as providing new insight or even shocking its audience. At any rate, the data presented here does in fact *not* support the notion that people always prefer the music with the most desire to please: such music might well fall into the too-predictable category.

An aspect that needs closer scrutiny is what happens at the peak of the Wundt curve, or rather, where it starts to tail off. Beholding the curve, it is all to easy to conceive the underlying processes as being unitary – as in »one curve; one process«. The elusiveness of the satiation effect in experiments is one poignant indicator that this is in fact dubious. Rather, it seems more likely that there is more of a qualitative, not merely quantitative shift in the attitude towards a tune when it is heard repeatedly. When trying to gauge this development in an empirical study, using just a single rating scale, one might run into trouble. The problem is related to the fact that one does not usually listen exclusively to one's favorite piece of music – not because it is not treasured for what it is, but because somehow an amount of variety is needed all the same. Researchers such as Berlyne do describe the Wundt curve as resulting from two opponent processes (reward and aversion systems; Berlyne 1971). This is an area of exposure effects research that needs more attention, both for the sake of theory building, but also in order to be able to devise the best possible experiments.

A more profound limiting factor for the importance of the exposure effects concerns the fact that it is after all just one of a range of reasons for someone liking a piece of music. This reservation does not take anything away from the above account; it should come as no surprise that subjective liking for music is a *multi-determined* phenomenon. Some of the other main determining factors, namely the music material itself, the listener, and situational factors will be presented here, in a way that is not meant to be exhaustive.

Some music is more complex than other (notwithstanding the difficulty that surrounds measuring this objectively – the method of Simonton mentioned above, could be one proposal). Some pieces of music contain just a

single, simple metre and a few melodic themes all in the same mode and key, while others may include numerous variations of these parameters. Differences in complexity are of course heavily, but not solely, dependent on music genre. The salient point being that music of different complexities will have different learning- and liking curves: the peak of the Wundt curve is reached with fewer repetitions, the less complex the music (but so is the point of satiation!). This is a possible explanation for the longevity, or lack thereof, of a tune.

Another variable that needs to be taken into consideration, is the listener himself. Repetition of a particular piece of music, the basis of the exposure effects discussed in this article so far, is one thing – but the listener also brings with him a broader understanding of music, acquired throughout his life. All the music he has ever heard is in some way stored, and makes up the basis upon which every new piece of music is understood. It is evident that there are both individual as well as cultural factors at play here.[8] The personal »back catalogue«, itself greatly influenced by one's culture, could be said to provide the »rulebook« for music listening. Krumhansl 2003 calls this »statistical learning«, which takes place implicitly. The distinction equals the one discussed in chapter two, between the classic and structural mere exposure effects. Still, personal preferences do not all have to be linked to exposure effects whatsoever. As mentioned in the introduction, the choice of music has a lot to do with personal identity and image as well. Someone might prefer certain types of music based on this and other similarly idiosyncratic reasons. Apart from these mostly personality-related explanations, intellectual ability can not be discounted as playing a role as well in music preferences (albeit not a deterministic one) – given that music perception is in fact a complex pattern recognition process.

Finally, situational factors affect the subjective evaluation of a piece of music profoundly. This aspect has been neglected for the sake of simplicity, but it should never be left out of a complete theoretical account. Music appropriate in one context might feel totally out of place in another, owing to the fact that music has many different forms of expression. From the very calm and contemplative to the highly energetic, or even downright aggressive, for instance. If the music does not match what the listener wants in a particular situation, it will not be positively received. Notice how arousal can again serve as an explanatory concept: the situation imparts a certain level of arousal in the individual, which the arousal potential of the music must sway in a direction desirable to the listener. In a real world situation, the listener is usually in control of the music – on the radio or some form of electronic media player (changing stations, tracks, adjusting the volume,

8 There might additionally exist *biologically* determined preferences, eg for harmony (see eg Tramo et al. 2001).

pausing the music and so on).[9] This is a considerable departure from how most laboratory experiments take place, where the music is more or less imposed upon the subjects (with their consent, naturally). One consequence for the Wundt curve exposure effects is that people would usually never go on listening after reaching a point of satiation; they would simply stop listening to that piece. In a real world setting, then, the effect corresponding to the decline of the curve would rarely occur, at least when the listener is in control of the music.

In conclusion, there can be little doubt that exposure effects form a large, though not exclusive, part of the explanation for why we like the music we do. Empirical investigation of the phenomena will continue, hopefully bringing further insight into both psychological as well as biological aspects of the human love of music.

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