

Is Independent Creation Likely to Happen in Pop Music?

Klaus Frieler,^{*1} Frank Riedemann,^{*2}

^{*}Musikwissenschaftliches Institut, Universität Hamburg, Germany

^{*}Hochschule für Musik und Theater, Hamburg, Germany

¹klaus.frieler@uni-hamburg.de, ²riedemann@gmx.de

ABSTRACT

In this study we try to address the question, if independent (re-)creations are likely to happen in pop music. The interest in this topic stems from the fact that the claim of an “independent creation” is a common defense strategy in copyright infringement law suits. We conducted a main experiment in which subjects were asked to invent short, “catchy” pop melodies to a given backing track over a very common chord sequence (I VI IV V). Additionally, we incorporated 5 melodies from hit songs over the same chords in a comparable tempo. The collected melodies were examined for similarities, between participants’ melodies and hit songs on the one hand and in between participants’ songs on the other. In each case at least two melody pairs with high similarity were found. A deeper analysis of these cases revealed that indeed independent (re-)creations might have taken place.

I. INTRODUCTION

Plagiarism is a well-known phenomenon within the realm of pop music (cf. Cronin 1998). One strategy for a defendant being accused of plagiarism is to claim that an “independent creation” (“zufällige Doppelschöpfung”) had happened. A recent example for this is the case of Joe Satriani’s “If I could fly” vs. Coldplay’s “Viva la Vida”, where Coldplay’s Chris Martin stated that, “when this things happened it’s a coincidence”¹.

However, the defendant then still has to prove that he/she had in no ways access to the alleged original material, since an unconscious borrowing is treated as a copyright infringement in legal practice (Homann 2007).

An example for this is the case *Jud’s Gallery vs. Gary Moore*, where Gary Moore was finally convicted of plagiarism by the District Court of Munich in 2009² despite his assertion that his song “I still got the Blues” was an independent (re-)creation of Jud’s Gallery’s “Nordrach”, which was never released on record but got airplay and was played live in Germany in the mid-70ies. Finally decisive for Moore’s conviction was a witness account that Gary Moore *could* have heard the original song by Jud’s Gallery during a stay in Germany in 1974.

If a melody resembles another, older melody, there are three possibilities for what could have happened:

- a) The later melody was deliberately created to mimic the older one. This is the case of plagiarism proper.
- b) The later melody was (re-)created unconsciously by recalling the older melody from memory without awareness. This is the case of unconscious borrowing.
- c) The later melody resembles just by accident the older one. This is the case of a true independent creation.

Moreover, in cases b) and c) the whole process could have happened by virtue of a third source melody, from which both melodies originate (either deliberately or unconsciously).

Unfortunately, the whole field of re-creation is a “grey area”, as there are always serious problems by proving which of the three mentioned possibilities has taken place (unless there is no plea of guilt in a case of plagiarism proper.)

Especially the intricate cases of dependent and independent (re-)creation raise deep questions about nature and conditions of creative processes and, finally, about the canonised appraisal of creative achievements as copyright laws incorporate it.

The old, “romantic” view of creativity as something such special, unique, and almost god-given that it deserves adequate protection by the law, (which assigns the sole right for receiving monetary revenues from a creation to the creator), can, of course, be subjected to criticism on philosophical and psychological grounds. Yet, the elaboration of these deep and interesting issues cannot be pursued here, though we will return to them occasionally while discussing the results of our study.

The concept of a “divine” creativity is adopted by most of the Continental legal systems, whereas the U.S. and U.K. copyright laws are based on the principle of “sweat of the brow”, which does not require originality but merely sufficient skill, labour and judgement for a work to be protected by law. However, the U.S. courts have dropped this doctrine in 1991, whereas it is still in effect in the U.K.

According to this view, a proper re-creation, which includes knowledge but excludes copying of material, is no copyright infringement at all and can even be credited copyright itself. Thus, no problems should arise with the cases b) and c) above, if it can be proven, that no copying process was involved. Yet, to gain copyright, a “sufficient” amount of skill, labour, and judgement has to be expended by the creator. This, in turn, raises the question, how to assess “sufficient” expenses of skill, labour and judgement in the case of pop song writing.

One common counter-argument against the plausibility of the process of a true independent recreation without knowing the original song is the asserted high improbability of re-creation of even a short melody. On strictly combinatorial grounds this claim seems to be justified. E.g., by considering only 12 pitch classes and a rest distributed over 16 possible semi-quaver positions in a bar, there are 13^{16} combinations which roughly equals $6.7 \cdot 10^{17}$ possible one-bar melodies. However, the vast majorities of these combinations are not

¹ <http://www.nme.com/news/coldplay/41559> (accessed 1st April 2009). Interestingly, just at the time of writing, Yusuf Islam (Cat Stevens) pointed out that Coldplay borrowed instead from Satriani from his song “Foreigner Suite” from 1973 (<http://tinyurl.com/dcghnu>, accessed 7th May 2009). Moreover, several other possible predecessors were proposed in the blogosphere, e.g. Jimmy Ball’s “If you wanna be happy” from 1963.

² File number 21 O 23120/00

genre-conform or musically meaningful entities. If you think of a four-bar pentatonical pop melody with typically about 16 notes in length, the number of estimated melodies drops down to $1.5 \cdot 10^{11}$, which is still a very large number. So even by only considering four-bar units of melodies, the probability of a true independent (re-)creation appears to be fairly low.

However, there might be more cognitive or genre-related constraints, which might force the a priori probability into a practically relevant regime. But these constraints, though their existence can be taken for granted, are largely unknown, so no better estimation of the a priori probability of an independent (re-)creation can be given at the present.

In order to approach these problems, we designed an explorative empirical study, since no suitable methodology for this kind of question was available. We conducted a main experiment using a production paradigm and subsidiary listening experiments to corroborate and confirm findings from the main experiment.

Besides the main objectives, we gathered some interesting insights into the creative processes and into stylistic constraints involved in pop song writing in general.

II. METHOD

A. Participants

A total of 16 subjects participated in the experiment (mean age 35.2, $SD=12.6$). The spectrum of musical expertise was very diverse, including one professional musician and songwriter, two semi-professional musicians and songwriters, 7 amateur musician with and without songwriting experience, and 5 non-musicians with no musical training at all. Years of active musical experience ranged from 0 to 45 years with an average of 17.63 years ($SD = 14.73$). Likewise, the number of hours spent weekly actively with music was widespread with an average of 7.88 h ($SD = 10.74$). All participants were familiar with pop or rock music. Thus, the spectrum of participants was rather broad with every level of music involvement being present.

The distribution of sexes was with 7 females and 9 males quite even. All participants took voluntarily part in the experiment and were recruited among students, befriended musicians, friends and family.

B. Stimuli

The basic idea was to bring subjects into a typical (pop) song writing situation, where often a chord progression comes first to which a suitable melody needs to be created. To this end, we decided to provide the subjects with a short backing track in a comfortable tempo of 120 bpm, which employed one of the most widely used chord progressions in pop music (I VI IV V, which yields G Em C D in G major). The whole set-up was chosen to be as most typical for mainstream pop as possible. The backing track was produced with a standard rock/pop instrumentation of acoustic guitar, electric bass and drums. It started with a count-in of four beats, after which the four-bar chord progression was played twice, totalling to eight bars, followed by a short 3-4 bars fade out as a smooth ending.

The task given to the subjects was “to invent a typical, catchy pop melody” fitting to the backing track. There were no constraints imposed on how much time or which approach the subjects should use to accomplish the task. Particularly,

no lyrics were provided, because the inherent metrics of speech are likely to push subjects into certain directions. Interestingly, 6 out of 16 participants invented some (mostly nonsensical) lyrics along with the melody. The only restriction given to the participants was, that they should invent and record a true vocal, i.e., sung melody, because melodies created with the help of instruments and melodies created by singing are likely to differ significantly in character.

C. Procedure

The experiment was actually carried out in two ways.

1. We prepared a website³ with detailed instructions, telling that the subjects could take part in an experiment in creativity research (named “KreativKaraoke”). No further information was given, especially not on the true objective of the experiment. On the web site a download link was provided, where participants could retrieve the backing track. They were asked to create and record a pop melody with a recording device of their choice and to send the recorded vocal or full tracks afterwards to the investigators. On the same website, they were asked to fill in an online-form containing questions regarding musical background and feedback options about the experiment. A mail with an invitation to participate was sent to about 40-50 persons, mostly students from the Musicological Institute of the University Hamburg and befriended musicians. We received a total of 15 melodies from 10 subjects this way, all of them personally known to the authors.
2. For six subjects, who were no musicians and particularly not familiar with the techniques of recording, the investigators acted as recording engineers. The participants were seated in front of a laptop running Audacity, a free hard disc recording tool, and were given a headset with a microphone. The backing track was played as a loop while the subjects had time to come up with a melody. After the participants had the feeling that they found a suitable melody, it was recorded and played back to them. If the subjects were not satisfied with their recordings, they were given as many subsequent trials as they liked.

After all tracks had been collected, the melodies were transcribed manually by the investigators and converted to MIDI and other digital file formats for further analyses.

D. Collecting hit songs

Additionally, we searched for popular hit songs containing the same chord progression (moving in the same bar-wise fashion) and in about the same tempo as the backing track used in the experiments. Finally, we chose a set of five four-bar melodies from songs, which were international or national hits. This set comprised the songs “Wonderful World” (Sam Cooke, highest chart position no. 2 in Germany, 1986), “Liebe ist” (Nena, highest chart position no. 1 in Germany, 2005), “Just like a pill” (Pink, highest chart position no. 2 in Germany, 2002/2003), “Fred vom Jupiter”

³ Accessible under <http://www.mu-on.org/kreativkaraoke> (in German).

(Andreas Dorau und die Marinas, highest chart position no. 21 in Germany, 1981), and “Ich bin ich” (Rosenstolz, highest chart position no. 2 in Germany, 2006).

Again, these melodies were manually transcribed and brought into digital formats.

III. RESULTS

A. Participants feedback

Except for one participant, all subjects used less than one hour to accomplish the task, often even less than half an hour. All participants reported that the task was “easy” or “very easy”, and that they had “fun” or “big fun” while doing the experiment. This is already an interesting result, as this was true even for those participants who never consciously created a melody before and who had no active musical experience whatsoever.

The one participant who used between one and two hours to accomplish the task reported that he spent his time in constructing a “really special and unique melody”.

9 of 16 participants assessed their singing abilities at a “medium” level, 4 attested themselves “good” or “very good” singing skills, and only 3 subjects reported minor skills.

B. Raw data

Including the five hit songs a total of 25 melodies were gathered, as two participants delivered more than one melody. One melody was discarded because it was, contrary to the instructions given, played with an electric guitar showing some features not likely to be found in sung melodies. At the end 24 melodies were kept for analysis.

There were 10 submissions with eight-bar melodies and 14 with four-bar melodies. From one hit song (Sam Cooke’s “Wonderful World”) only the first four bars of the original eight-bar melody was taken. Seven of the eight-bar songs consisted of two repeated four-bar melodies with only minor variations in the repetitions; only three of the eight-bar melodies had two distinct four bars antecedent and apodosis. For most of the following analyses the melodies were split into four-bar parts, resulting in a total of 34 melodies. For some analyses we further removed nearly identical repetitions of antecedents to arrive at a reduced set of 26 melodies.

C. Descriptive statistics of melodies

The number of notes in the melodies ranged from 7 to 28, with an average of 16.17 (SD = 6.19), which corresponds to an average number of notes per bar of nearly exactly 4. Using a two-step cluster analysis the melodies could be classified with regard to the number of notes in three clearly distinct clusters: The “slow, relaxed” cluster (centroid 9.85, 13 instances), the “medium pace” cluster (centroid 16.74, 15 instances) and the “fast, motoric cluster” (Centroid 25.38, 8 instances). Interestingly, the averaged note-per-bar-densities of these clusters equates nearly exactly 2, 4 and 6 notes, respectively.

The distribution of pitches classes of all melodies is shown in Fig. 1. No chromatic pitches outside the G-Major scale were used. The tonic is the most frequent pitch class followed by the third and the second step of the major scale. This is in accordance with pitch class distribution found in other corpora of pop melodies (e.g., Frieler, unpublished).

Additionally, melodic contours were analysed by utilising Huron’s nine contour types (Huron, 1996). For these the height relations between the first pitch and the averaged middle pitch and averaged middle pitch and the last pitch are considered. The twofold combination of the three possible relations (less, equal, greater) results in 9 possible contour classes. Huron (1996) found for phrases of folk melodies that convex contours, i.e. melodic arches, are prevailing. Likewise, Frieler et. al. (in press) found roughly the same distribution of contour types for pop song phrases. However, here we arrived at quite different numbers showing a strong prevalence of descending contours (17 out of 26 melodies) with convex and concave contours with three instances each only on second rank. This deviation might be due to the fact, that the falling character of the chord sequence strongly suggests this kind of melody contour.

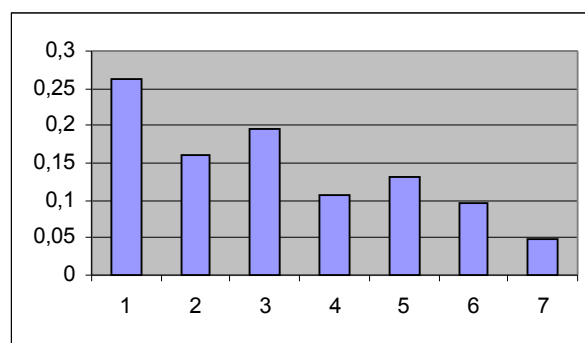


Figure 1. Relative frequencies of pitch classes. Bins on x-axis show steps of the major scale. No chromatic pitches were used.

B. Formal analysis

A paradigmatic analysis of the melodies with respect to phrase and motif content was carried out by the authors according to their music analytical expertise. One must bear in mind that perceived phrase structure is quite inter-subjectively variable (Müllensiefen & Pearce REF), particularly with regard to the hierarchical depth of segmentation, i.e., if grouped notes are regarded as phrases or sub-phrases. We took a coarse-grained approach with only one hierarchical level of segmentation with no further distinction between phrases and sub-phrases.

The number of phrases in the four-bar melodies ranged from one to four, four phrases being the most frequent (15 cases) followed by two phrases (10 cases), three phrases (6 cases) and single phrased melodies (3 cases).

By taking the similarities of phrases into account, we assembled a list of form classes in our corpus. One observation drawn from this is a relatively great variety of formal constructions. The complete list of 12 different form classes taken from the reduced set of 26 melodies can be found in Tab. 1. Sequenced phrases (e.g. phrases with the same interval-durational structure repeated on a different pitch) were counted as identical.

The most frequent form class, AB, consists of two distinct phrases, mostly of two bars each. The second most frequent class is the model AAAB, which comes in two flavours: one where the first motif is repeated exactly and one where the first motif is sequenced according to the chords.

The AAAB class is perhaps most naturally suggested by the chord sequence, as the first three chords mutually share two tones with the neighbouring chords and one tone across

all chords, i.e., the tonic, which is hence a candidate for being the central tone of a three times repeated pattern. Moreover, the dominant chord at the end suggests a cadential turn in this place, leading back to a repetition of the whole four bars.

A repeating motif over changing chords is a very common pop pattern (Riedemann, in press) with an almost guaranteed strong aesthetic effect. Consequently, three of the five hit songs in our analysis utilised this form pattern. Only one of our participants employed this model as well, (interestingly enough the full-professional), whereas the sequenced AAAB form was used by two of five non-musicians.

The AAB model is related to the AAAB form and is the well-known “bar form” often found in blues music. A melodic idea is repeated and then followed by a conclusion, which fits perfectly well to the dominant chord at the end.

Table 1. List of formal models found in genuine four-bar melodies. Sequenced phrases (e.g. same interval-durational structure but repeated on a different pitch) were classified as identical.

Form class	Count
A	2
AB	7
AAB	2
ABC	2
AAAA	1
AAAB	6
AABB	1
AABC	1
ABA'B'	1
ABA'B	1
ABBC	1
ABCD	1

C. Tonal analysis

Next, we carried out a tonal analysis of the melodies in two ways. First, we manually assigned a central tone to each bar, which was most prominent within the bar in terms of presence, repetition and accentuation/metric stress. Afterwards, the central tones were related to the tonality G major and to the underlying chords, thus arriving at tonal on one hand and chordal reductions on the other hand. These reductions were notated with strings of numbers referring to steps with respect to the tonic G major or the underlying chords, respectively. A small number of bars (20 out of 136) had no reasonable central tone at all; for these we assigned the symbol “*”. For instance, the sequence of central tones “GGGD” for the hit song PINK (Fig. 2a) resulted in “1112” in tonal reduction and in “1351” in chordal reduction, whereas for TK9683-1 (Fig. 2b) the chordal and tonal reductions were “135* “ and “111*”, respectively.

As a result, no significant clusters could be found by manual inspection either ways. The maximum number of identical tonal resp. chordal reductions was 2. By considering only the first three bars slightly better results could be obtained. Under chordal reduction the classes “111” and “135”, corresponding to a sequence of chord roots and a repetition of the tonic, respectively, occurred each four times out of 26. The next common class “553” occurred three times.

Concluding, no clear trends in tonal organization of the melodies were found, though it could be stated that some melodies were more oriented toward the chord roots, some more towards the thirds, and some more toward the fifths, but mixtures also occurred frequently. Only but a slight tendency to follow the root tones of the chords or, alternatively, to stay on the tonic for the first three bars could be observed.

D. Similarity analysis

In the next stage of our investigation we conducted a similarity analysis of the four-bar melodies. To this end, we used the program Simile (Müllensiefen & Frieler, 2004), which provides a large number of algorithmic similarity measures from which a small set of measures was chosen which had proven the best performance in modeling similarity judgements of experts in earlier studies. The use of the program was done to rather easily arrive at a pre-selection of melody pairs with possible significant similarities. This set was then further manually analysed by the authors ruling out most of the pre-selected pairs.

1) *Similarities between hit songs and subjects’ songs.* In this case we arrived at two pairs with significant similarities: PINK vs. TK9683-1 (cf. Fig. 2a and 2b) and COOKE vs. TK9683-2 (cf. Fig. 2c and 2d). Interestingly, the two four-bar melodies originated from one single subject (TK9683), an experienced musician and songwriter, who had delivered an eight-bar melody with two clearly distinct four-bar parts, that entered the analysis as different four-bar melodies.



Figure 2. Four melodies: a) PINK, b) TK9683-1, c) COOKE, d) TK9683-2

The formal and tonal structure of PINK and TK9683 is indeed quite similar. The main idea of both melodies is a repetition of the tonic G in change with the leading tone F#, which is done three times in PINK and twice in TK9683-1, each followed by a cadential turn in the last bar. However, there are certain significant dissimilarities as well. The change from the tonic to the leading tone is elaborated in PINK with a mordent-like melodic figure (F#GA), where in TK9683-1 it is a simple evasion and return. The anticipated ones on the tonic are, however, found in the first two bars of both melodies. The cadential turns start similar with a rising figure GAB up to the third of G-Major, but in TK9683-1 a full cadential ending is employed where a final leap up from the fifth to the tonic elicits a clear impression of closure, whereas in PINK the phrase ends on the fifth of G-major which is more open in character.

The similarities of COOKE and TK9683 are somewhat striking with regard to note content: The first six pitches of the first phrases are identical except for one repetition of a

note in TK9683-2. Likewise, in the second phrases the first four pitches are identical when neglecting repetitions. However, besides this astonishing congruency in pitch structure, the metro-rhythmic circumstances are quite different. The first phrase of TK9683-2 can be viewed as a rhythmically augmented and syncopated version of the first phrase of COOKE, whereas the second phrase of TK9683-2 seems to be a shortened version of the second phrase of COOKE. Moreover, the second phrase of TK9683-2 shows a full cadence, ending on the tonic, whereas the COOKE melody ends more open (the original COOKE melody is actually continuing after the four bars considered here).

These two cases are indeed very interesting with regard to the question of unconscious vs. independent (re-)creation.

On enquiry, the participant TK9683 stated that he knew both original songs, though only vaguely. Unfortunately, this fact does not settle the matter, as still both possibilities persist. Yet, at least the case of true plagiarism can be ruled out, as there is no reason not to believe the participants information. Despite those obvious similarities, there are clear differences in the melodies that speak against a true plagiarism, well besides the fact that the participant would have no advantage from any plagiarism in this context.

To collect more evidence, we ask an expert for copyright infringement to give a short statement on plagiarism in these two cases. He confirmed in fact a high value of similarity, but particularly from metric-rhythmic differences and the different handling of the cadences, he did not believe in a conscious borrowing.

To corroborate the assessed similarity further, a short subsidiary listening experiment was carried out, in which 23 musicological students of the University of Hamburg took part. The concerned melodies were re-synthesised from the transcriptions and rendered as deadpan MIDI files with a Grand Piano sound. The task for the participants was to judge the similarity of the two melody pairs on a rating scale from 1 to 10, with 1 meaning lowest and 10 meaning highest similarity. The results are shown in Tab. 2. For the pair PINK-TK9683-1 the mean similarity rating was 6.17 (SD=1.99), so only in mid-range, which is in concordance with the analysis. For the pair COOKE-TK9683-2 a high mean value of 8.17 (SD=1.07) was found, which is well justified by the analysis but in slight contrast to the opinion of the aforementioned copyright expert.

Table 2. Average similarities of selected melody pairs as rated in a subsidiary experiment on a scale from 1 to 10 with 10 meaning highest similarity.

Pair	Mean	SD
PINK – TK9683-1	6.17	1.99
COOKE – TK9683-2	8.17	1.07
JOE28 – MAR17	7.30	1.40
JAG23 – MAR17	6.09	1.62

2) *Similarities in between participant's songs.* The same analysis steps as before were undertaken to find candidates for similar melodies submitted by the participants. Again two pairs of participants' melodies with sufficient high similarities (JOE28-MAR17 and JAG23-MAR17, cf. Fig. 3) were chosen.

The similarities between these two pairs stem mainly from the fact that each melody is constructed by following the

chord roots showing prominent accents on the second beat of the bars, which occur systematically in the first three bars of JOE28 and JAG23 and in the first two bars of MAR17. No proper melodic movement is used in all three melodies except for a few change and passing tones.

Nevertheless, there are certain dissimilarities as well. Formally JOE28 belongs to the ABCD form class, though it is based on one single rhythmic pattern. JAG23 belongs to the sequenced AAAB class and MAR17 to the AB class. On the dominant chord at the end, both MAR17 and JOE28 reach the root D, whereas JAG23 reaches the fifth A. JOE28 is moreover part of the "slow, relaxed" cluster, where MAR17 and JAG23 belong to the "medium paced" cluster, which a slight tendency of JAG23 to the "motoric" cluster.

Again, to corroborate the similarity analysis, the melody pairs were assessed in the same listening experiment as before. The results can be found in Tab. 2. The pair JAG23-MAR17 received only a medium similarity rating of 6.09 (SD=1.62), whereas the pair JOE28-MAR17 reached a significantly higher value of 7.30 (SD=1.4). These results basically confirm our analysis.

For possible cases of independent (re-)creations these quite similar pairs of melodies make a good point. Yet, no final conclusion can be reached, as these similarities could be explained by the simple process of following the roots of a given chord sequence. Thus, it could be argued that these melodies lack originality, particularly with hindsight to the context as set by the backing track, so the evident similarities could be deemed trivial.



Figure 3. Three melodies by participants: a) JOE28, b) JAG23, c) MAR17

IV. CONCLUSION

In this study we tried to address the problem of independent (re-)creations in pop music. The preliminary answer that can be drawn from our findings is "definitely maybe". Since this was an explorative study, more evidence needs to be gathered in further research, though we believe that some first interesting points can be made.

The striking case of participant TK9683, who delivered two melodies with sufficiently and suspiciously high similarity to two different hit songs, provides evidence for both possibilities of independent (re-)creation or unconscious borrowing. In light of the fact, that the borrowed-from hit songs were at least vaguely known to subject TK9683, unfortunately neither case can be definitely ruled out. In our view, the way the similarities are constructed speaks more for cases of independent (re-)creation than for cases of unconscious borrowing. The main point here is, that in the latter the differences should have been fewer and of a more superficial, less subtle kind. According to this, we might conjecture that these similarities are due to stylistic and

schematic and not due to veridical knowledge of the original songs.

The three quite similar melodies found in the subjects' songs give another hint that independent (re-)creation is not completely unlikely to happen, though the point is weakened by the rather trivial nature of these melodies. However, since no possible fourth source melody is known which could explain unconscious borrowings (if we exclude the roots of the chords as a melody)⁴, and by considering the details of the similarities, the evidence speaks again for cases of independent (re-)creation.

But one major caveat needs to be mentioned. It is the presence of a given chord sequence. The full process of song writing comprises of course the creation of a chord sequence as a central and important part, and again, even for four bars the combinatorial possibilities for chord sequences are legion, though again constrained by stylistic and cognitive conditions. Hence, even if we had proven (in a strict sense) a rather high probability for independent (re-)creation of melodies for a given chord sequence, this probability would drop considerably by taking the creation of the underlying chord sequence into account.

Maybe one last remark should be made concerning the question of "sufficient" skill, labour and judgement to create a short pop melody. One side result in this study is that even people without any musical training and no experience in song writing at all - notably two participants of 12 and 14 years - were able to invent four-bar or eight-bar pop melodies to a given chord sequence in less than half an hour. These melodies did not reach an extraordinary high level of originality, but they were in any case comparable in complexity and construction to some of the hit songs included in this study. To draw any deeper conclusions from this observation, however, is left to the reader.

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⁴ One possible source might be the well-known modern church hymn "Laudato Si, O Mi Signore" showing a repetitive root following melody with syncopated accents at the beginning of each bar. However, it is based on a eight-bar chord progression, hence, with chords being twice as long as in our experiment, which constitutes considerable difference in the melodic