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Chance Music is Best Not Left to Chance

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ABSTRACT

Background

Understanding random events is an ability which eludes humanity. Truly random events may be misinterpreted as conforming to a pattern, while events with a pattern may seem to have none. In most cases, people will assume that a "random" distribution should be more evenly distributed than it really is (Ladouceur et al., 1996). Meanwhile, highly complex patterns may be perceived as random if they're not understood (Falk & Konold, 1997). It is important to distinguish between random processes and seemingly random outcomes, however these are easily confused in perception. This has been demonstrated across many domains, but never when perceiving stimuli through sound, even though chance and serial composers of the mid-20th Century provided perfect study material for us.

Aims

This study aimed to test perception of randomness through sound, using the principles of chance and serial composition. It was hypothesised that participants would be unable to distinguish 12-tone rows from random sequences of 12 notes, thus scoring no better than chance on a forced-choice task.

Method

A battery of 16 chance composed melodies and 16 12-tone rows were composed, and presented to participants in a forced-choice paradigm. Chance melodies were composed using a random number generator in MATLAB, which picked 12 numbers as independent events, from a possible range of 1 to 12, corresponding to the 12 notes of the chromatic scale. Tone rows were composed by the experimenter, using principles of 12-tone music in which no note may be repeated. All notes of both melodies were of equal length at a constant tempo with no rhythmic variation.

Participants were presented with one chance melody and one 12-tone row in random order. They were then asked which of the two pieces sounded more "random". This was repeated over 16 trials, and participants were given a point every time they correctly identified the chance melody as being the more "random" of the two stimuli.

Results

Testing is ongoing, but the initial sample ($N = 16$) already suggests significant results on a Wilcoxon test, $z = 2.82$, $p < .01$, with nearly all participants performing worse than chance and worse than expected in the hypothesis ($Mdn = 6$, compared to expected 8 correct out of possible 16).

Conclusions

It was expected that participants would be unable to distinguish 12-tone from chance melodies as neither would form any recognisable pattern. If this were true, participants should have performed at chance level. This turned out not to be the case as participants seemed to consistently misidentify 12-tone serialism as being more "random".

This is possibly because no notes are repeated in a 12-tone row, thus achieving a perfectly even distribution, while chance music often results in repetitions or clusters of notes. This is similar in nature to the Birthday Problem, in which the probability of two people at a party sharing a birthday is remarkably higher than expected (Ball, 1960:45). Using the Birthday Problem equation, we can calculate the probability of having a repeated note in a random sequence of 12 notes drawn from the Chromatic scale. It is, in fact, highly probable that a random melody of 12 notes would contain at least one repetition; there is a probability 99.9% that at least one note will be repeated. Human ears may use the lack of tonal centre created through an even distribution of notes as a heuristic for gauging randomness, demonstrating an intuitive misunderstanding of probability.

These findings are consistent with the findings of Ladouceur and colleagues (1996), who suggest that an even distribution is often perceived as being more random. This expands upon our understanding of general principles in the perception of random events across sensory modalities. It also highlights the importance of establishing a tonal centre for the perception of structure in music. Although this study exclusively used 12-tone rows out of the context of a larger musical structure; it supports previous research that suggests the tone row structures in dodecaphonic music are imperceptible to listeners (Raffman, 2003). Thus, it is suggested that human perception should be considered when analysing chance and serial works, or assessing their historical success.

Keywords

chance music; serial music; music perception; probability

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