2017

Audience Reactions to Repeating A Piece on A Concert Programme

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Participations
Journal of Audience & Reception Studies

Volume 14, Issue 2
November 2017

Audience reactions to repeating a piece on a concert programme

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Summary:
Repetition of a piece on a concert programme is a well-established, but uncommon performance practice. Musicians have presumed that repetition benefits audience enjoyment and understanding but no research has examined this. In two naturalistic and one lab study, we examined audience reaction to repeated live performances of contemporary pieces played by the same ensemble. In all studies, we asked listeners to rate their enjoyment and willingness to hear the piece again (Affective), and perceived understanding and predicted memory of the piece (Cognitive). In Study 3, we assessed immediate recognition memory of each excerpt. In all studies, Cognitive variables increased significantly. Affective reaction also increased except for one piece that was well liked at first hearing. Memory performance was low and not related to predicted memory, nor increased after a second hearing. Being informed or not had no systematic effect on reaction. Audience and performer reaction was mixed. We discuss the implications for musical directors when considering repeat performances.

Key words: repetition, contemporary music, enjoyment, understanding, memory

Introduction

On December 12, 1926, composer and pianist Dmitri Shostakovich took part in a performance of Igor Stravinsky's *Les Noces*, conducted by Mikhail Klimov. Unusually, the piece was repeated on that programme, a practice that Stravinsky would come to insist on later in his career. Perhaps inspired by that, Shostakovich premiered his Piano Sonata No. 1 in Moscow on January 9, 1927 by playing it twice in the evening concert. He had been contemplating how to carry out a repeated performance, musing to a friend:

> I want to play the sonata twice at my Moscow recital. Only I don't know how to do it. Either, after having finished with the first performance, I should begin the sonata for the second time right away, or after I play the sonata, they should play the octet, and then I should play the sonata again... (Moshevich, 2004, p. 48).

He eventually decided on the former option, as reported by Dmitri Kabelevsky:

> 'For the sake of a better understanding of this music I will play it once more', said the composer quietly and shyly when the applause subsided, and sat down at the piano again and, even more energetically and convincingly than before, repeated his first sonata…Those in the hall who were able to listen and really hear the music sensed that a powerful and original talent had come to our art. (Moshevich, 2004, p. 49).

It would be almost a truism to say that any substantive engagement with, understanding of, and appreciation of, a piece of music requires repeated hearings. Few pieces of music yield their full cognitive or affective dividend on just one hearing (Pollard-Gott, 1983). Indeed, evidence from naturalistic studies of music listening attests that repeated listening to the same piece, sometimes over an entire lifetime of many decades, is a central feature of music reception. Many people construct personal collections of recorded music (either physical or virtual – as in 'playlists') with a major motivation being the easy opportunity for regular self-administered re-hearing (Greasley, Lamont & Sloboda, 2013). Radio stations that broadcast music, whether live or recorded, devote a significant proportion of their airtime to repeated broadcast of the same piece.

However, in many if not most of the cases above, the repetitions are not within the same session or programme, but spaced out over time (Margulis, 2013, 2014). We do not know of any music radio station that would habitually play the same track twice within the same hour. For instance, even a commercial popular music station dedicated to chart hits would likely play the same 3-minute track no more than eight times in a 24-hour period, i.e. once every three hours on average (Newstead, 2014). Therefore, the specific benefits and outcomes of hearing the same piece of music twice within a very short space of time are not well understood or articulated.

The decision to repeat a piece within a programme seemed to have worked well for Shostakovich. Today, repeating a piece in a concert is an established, but not common, performance practice. Contemporary classical musicians sometimes plan a repeat in their concert programmes, or surprise their audience by playing a piece again in the concert. In fact, the UK-based PRS for Music Foundation hosts a New Music Biennial, in which pieces are repeated after some audience/composer discussions. Repetition is not confined to new music, however: When she was a student, the first author was introduced to this practice with Early Music, as the director of the Stanford Early Music Ensemble, William Mahrt, would sometimes repeat pieces that were unusual or that had been newly re-discovered and thus had not been heard in hundreds of years. (For further examples and analysis of this practice from the 19th century to the present day, see Anderson (this volume).)

What is the point of repeating a piece on a programme? Shostakovich referred to *cognitive* factors in his decision to repeat: to allow the audience to understand a new and potentially difficult-to-comprehend style by a second encounter. Another aspect of repetition that would seem to be a desirable goal for performers, composers, and audiences, is to increase the enjoyment of the piece, or what we term the *affective* reaction.

Interestingly, we could not find systematic research that addressed the effectiveness of this practice in improving audience reactions in either domain. Hence, we carried out two live audience studies, and one laboratory study, to assess audience reaction to repetition within a concert programme. We asked three basic questions. The first two refer to subjective aspects: Do the audience members enjoy a piece more when it is repeated? Do they feel they understand better? But we were also interested in a more objective test of cognitive success, namely memory of the piece, so we also asked whether audiences would recognise the piece better after a second hearing.

Prior research in experimental psychology or experimental aesthetics would seem to support positive answers to all three of these questions. Beginning with affective reactions, in 1968, Robert Zajonc coined the term 'mere exposure effect' (Zajonc, 1968). He hypothesised that when an individual is repeatedly exposed to any sort of stimulus, his or her preference for those items would be enhanced. Zajonc found this to hold even for neutral information that should not provoke any sort of immediate reaction. He asked his participants to listen to some nonsense words. He disguised the true purpose of the study by telling them that the experiment was about learning words with difficult pronunciation. The words were presented with different frequencies (0, 1, 2, 4, 10 and 25 times). Then they were asked to rate the 'goodness' of the words they listened to. Zajonc found that the participants' attitude towards the word became more positive as the number of times the nonsense word increased. He also found similar effects with Chinese-like symbols. This relationship between repeated exposure to a stimulus and an enhancement of attitude is called the 'mere exposure effect'. In other words, we like the things we have seen or listened to before.

The first documentation of the mere exposure effect for music was by Meyer (1903), who presented quartertone music multiple times to his Western listeners. He asked them to

provide an answer to an open-ended question about their experience. Meyer noticed a fairly common pattern amongst the answers: 'To sum up the results, let me say, that of the fourteen subjects, eight declare that the aesthetic effect is improved by hearing the music repeatedly'. (p.474). Meyer himself initially found his quartertonal composition 'highly disagreeable'; but after practising the piece for a couple of weeks, the disagreeableness was gone. 'It sounded simply commonplace,' he described (p.472).

Other early research found similar effects with music: Mull (1957) played two hours of music by Schoenberg and Hindemith to 16 participants. As the participants got more familiar with the music, their enjoyment of it increased, even causing some who disliked the music to like it. Krugman (1943) recruited students who preferred classical music over swing music, or vice versa, or who had no preference. After repeated exposure, participants with extreme preference for one genre over the other increased their liking for the less preferred genre. The same effect was found for music for an unfamiliar culture (Heingartner & Hall, 1974) and this has been replicated in more recent studies (Margulis, 2014; Tan et al., 2006). One caution is that multiple repetitions can backfire, with audiences disliking a piece after initial gains, as boredom or satiation (or even annoyance) kicks in (Morimoto & Timmers, 2012)

Other research has shown that the mere exposure effect can be strong, even when conscious memory of the piece is not very good, either in healthy or memory-impaired individuals (Johnson, Kim & Risse, 1985; Halpern & O'Connor, 2000). Thus the increase in preference seems to due to circuitry independent of explicit awareness of remembering or understanding the piece, which is consistent with neurological evidence that implicit and explicit processing are separable in the brain (Gabrieli et al, 1995).

Assessing an increase in understanding does not have as direct a history in aesthetics research. We know that all else being equal, repeated exposure enhances explicit or conscious memory (Cary & Reder, 2003), including music (Pollard-Gott, 1983). However, that outcome may or may not be consistent with an audience member's self-assessment (metacognition) that understanding or memory has been improved. People can be over or underconfident or simply not calibrated to their actual performance (Tiede & Leboe, 2009). Hence, the cognitive factors in our research looked at both subjective assessment (perceived understanding, and perceived ability to remember the piece), as well as one objective cognitive assessment, actual ability to recognize the piece after a short time.

One critical factor distinguishing our research from the prior studies, is that in almost all cases we could find, research on the mere exposure effect and on memory for repeated information used identically repeated information: the same recorded music for studies using music. However, in a concert situation, the repetitions are not identical. Even when the director or ensemble intends an exact repetition, all the variables of live performance can take on different values, from the presence of errors, to slightly different instantiations of expression, to the mental focus and energy of the performers. And of course, performers can elect to vary the interpretation of a repeated performance, from subtle to overt. We presume that audiences are aware of the variability in live performance.

Thus, our studies were intended to assess audience reaction using a combination of live/realistic situations, and a controlled/laboratory situation, but in all cases, using non-identical, actual repetitions from contemporary music concerts. We mostly assessed audience reaction (using quantitative and qualitative tools), but also interviewed the performers and directors of the ensembles. The live concerts took place at the Guildhall School of Music and Drama and audience reaction was assessed after the first and second playing of the repeated pieces:

Study 1: ***27 February 2014.*** A concert organised by Richard Benjafield, in which the Guildhall School of Music and Drama Percussion Ensemble performed Edgard Varèse's *Ionisation* twice. The repeat was not sequential and the audience was informed of the programming. This programme was planned independently of the research programme described here.

Study 2: ***11 July 2014.*** A concert organised and conducted by James Weeks, in which two student compositions in homage to Gesualdo were played by the Guildhall School's New Music Ensemble. One of them was repeated immediately after the first performance, while the other one was performed in the beginning of the concert, then repeated about 2/3 through the concert with other pieces in between. The audience in this concert was not pre-informed of the repetition; the repeats were only announced just before they happened. These repetitions were added as part of the planning for this research.

Study 3. The third wave of data collection was a laboratory study that took place in 2015 at Goldsmiths. We used the two live recordings of *Ionisation* and also two recordings of *The Bell That Never Rang* by Lau, played at the 2014 New Music Biennial. In that study, we varied systematically whether the repetitions were sequential or not, and also assessed memory for the pieces.

Our main hypotheses were as follows:

1. Affective reaction and perceived memory/understanding ratings increase when a piece is performed twice.
2. Memory for the piece improves when the piece is performed twice.
3. There would be a difference in audience reaction between audiences that know the piece will be repeated before the first hearing and those that do not know it until the point of repetition.

In respect of the third hypothesis, when listeners know in advance that they will hear a piece twice, they have the option of deploying differing metacognitive strategies than when the second hearing is a surprise. If these strategies are effective, then one might suppose that advance knowledge would increase memory for the second hearing, but no specific predictions for direction were made.

We were also interested in some biographical characteristics of the audience members and looked at whether people with lower familiarity with contemporary classical music would have increased enjoyment when a piece is performed twice, and whether musical training would be correlated with any factors, particularly memory for the pieces. We will describe the Methods for Studies 1 and 2 separately, but present the results together.

Study 1: Method ('Io')

Participants. The audience size was 26 (12 female), which included 15 people who rated themselves as not very familiar or somewhat familiar with contemporary music (Low) and 11 who rated themselves as very familiar (High). The median age was 19.5 (range 18 to 84; one person did not answer), most were enrolled in an undergraduate programme or had received a postgraduate degree and the median years of music lessons was 7 (range 0 to 20; one person did not respond). The large majority (17) were unfamiliar with *Ionisation.* Finally, 11 reported they had been at a concert where a piece was repeated and six had performed a piece twice on a programme.

Materials and Procedure. Students of the Guildhall School of Music and Drama performed Varèse's *Ionisation,* scored for percussion ensemble (Richard Benjafield, director), and lasting about 6.5 minutes. It was performed twice, with a piece intervening. The director deliberately varied some aspects of interpretation on the second playing and the repetition was announced in the printed programme.

Each audience member was given two questionnaires in an envelope with a code number on it, and was invited to fill them out after the first and second performance, respectively. They rated agreement on a 1 (strongly disagree) to 7 (strongly agree) scale on these items: 1. *I enjoyed the piece* 2. *I felt I understood the piece* 3. *If played some excerpts from this piece tomorrow, I am confident I would be able to recognize them* and 4. *I would like to hear this piece again in the near future*. Questions 1 and 4 were *Affective* items, and questions 2 and 3 were *Cognitive* items. We asked them not to look at their answers after filling out the first questionnaire, but to put the sheet back in the envelope.

After the second questionnaire, participants filled out the background information as described above, and were asked for any other comments about the experience of hearing or performing a piece twice on a programme. They then put the materials back in an envelope and returned the envelope at the end of the concert.

Study 2: Method ('Ge')

Participants. The audience size was 37 (14 female), which included 11 people who rated themselves as not very familiar or somewhat familiar with contemporary music and 26 who rated themselves as very familiar. The median age was 19.5 (range 16 to 67), most were enrolled in an undergraduate programme or had received a postgraduate degree and the median years of music lessons was 12 (range 0 to 42). As these were newly composed

pieces, we did not ask about pre-concert familiarity. Finally, 23 reported they had been at a concert where a piece was repeated and eight had performed a piece twice on a programme.

Materials and Procedure. The composers were members of a composition class taught by James Weeks at Guildhall School of Music and Drama, and performed by the New Music Ensemble. All the compositions on the programme were inspired by the Renaissance composer Carlo Gesualdo and scored for small chamber group. One piece was performed twice in succession about halfway through the concert (composer Oliver Leith). The other piece was performed at the beginning of the programme and then after several intervening pieces, about 2/3 through the concert (composer Daniel Harle) by GSMD New Music Ensemble. Each piece lasted about 4 min. Neither repetition was in the printed programme; Director Weeks simply announced that the piece in question would now be repeated.

The procedure was similar to that in the Ionisation concert. Because the repeats were a surprise, the audience was requested not to look at the items in their envelope prior to being asked to do so. We also interviewed a sample of the performers and asked about their responses to performing the same piece twice on a programme.

Studies 1 and 2: Results

Data analysis. We first conducted a preliminary factor analysis on the questionnaire responses for the larger sample in Ge. Results suggested that the *enjoyment* and *hear again* questions loaded on the same factor (and thus were indexing similar information) so these were averaged into a single Affective score; *understanding* and *remember* also loaded on the same factor, and were collapsed into a single Cognitive score. This allowed us to reduce the data and gain statistical power. We compared mean ratings for first and second hearing of each piece and included familiarity with contemporary music as a second factor. LowFam groups self-rated with a 1, 2, or 3 on that scale and HiFam included ratings of 4 and 5. For Ge we also looked at the consecutive vs. nonconsecutive repetitions. We coded the open-ended answers for mentions of Cognitive (C), Affective (A), and Musical (M) aspects of repeated listening or performance. The first and last authors coded these independently and then compared their rating schemes; differences were few and resolved by consensus. A few items were coded as belonging to more than one category. Major results are summarised in **Table 1** (see **Appendix**).

Quantitative Results. For Io (nonconsecutive playings, pre-announced repetition), mean ratings on the Affective factor were high and did not change on second hearing (means = 5.56 vs. 5.51); Low and High familiarity groups did not differ in their ratings, and the repetition result did not differ between Low and High familiarity groups (no statistical interaction). The mean ratings on the Cognitive factor did increase significantly from first (4.73) to second hearing (5.26; $F(1,22) = 8.51$; $p < .01$). Once again, familiarity made no difference and the repetition effect did not interact with familiarity.

For Ge (one consecutive and one nonconsecutive repetition, not pre-announced, which we call 'separation'), Affective scores were somewhat lower than for Io, and increased from first (4.12) to second (4.41) hearing ($F(1,32) = 5.48$; $p < .05$). Affective reaction was also higher for the consecutive (4.61) compared to nonconsecutive repetitions (3.92; $F(1,32) = 5.75$; $p < .05$), although of course these were different pieces. More critically, although High familiarity groups liked the pieces better (3.55 vs. 4.98; $F(1,32) = 8.09$; $p < .01$) neither type of separation nor familiarity interacted with the repetition effect. Considering the Cognitive responses, again repetition increased perceived understanding and memory prediction (3.91 vs. 4.43, $F(1,32) = 14.38$, $p = .001$) and High familiarity groups gave higher ratings than Low familiarity (3.03 vs. 5.31; $F(1,32) = 20.14$; $p < .001$). However the repetition effect again did not depend on familiarity or type of separation.

***Qualitative Responses*.** We coded 57 responses from both audiences, considering together remarks about listening and performing. All coding categories were represented: Cognitive, Affective, Musical, plus items that pertained to more than one category. A few items were coded Other, if the intent was ambiguous or simply remarked on an aspect of the performance ('I think it can be useful'). We coded more Cognitive than Affective comments for Io but vice versa for Ge. Both positive and negative reactions occurred; we give some examples below.

1. Comments on your experience of hearing a piece twice in the same concert programme.

Cognitive

a. Managed to notice certain aspects I didn't notice the first time on repeat as knew what was coming at these points. Noticed some new techniques on 2nd play as well (Io)

b. One listens more carefully the 2nd time (Ge)

Affective

a. I was annoyed. I found the piece boring (Io)

b. Good experience in general. Might depend on the place where you put it. In this case, the repeats here detracted me from the overall flow of the performances (Ge)

Musical

a. It will only work for complex pieces, and needs to be post-romantic (20th century) work (Io)

b. Invariably seems to detract from quality of performance, but is interesting to listen to, especially music one hasn't heard before (Ge)

2. Comment on your experience of performing a piece twice in the same concert programme, here or elsewhere.

Cognitive: we did not get responses clearly fitting this category

Affective

a. Enhances my experience usually. Positive response from audience to this. (Io)

b. (as an encore) I played/ sang with more enthusiasm. If the audience is enthusiastic I play/sing with more gusto (Ge)

Musical

a. Feel more part of the piece and can improve on performance a second time. Could be a more relaxed performance, feel more at ease with audience. (Io)

b. Detracts. Less spontaneity in performance (Ge)

We also had a post-concert discussion with some of the Ge performers. Overall they liked repeating a piece, giving them both a chance to improve and to try a different expressive profile the second time. There was no consensus on whether immediate or delayed repeats were better for performers. Finally the director of the Percussion Ensemble Richard Benjafield shared some of his thoughts in a note to us, with his very positive reaction to the repetition of Io, invoking all three types of comments (we have coded some of his responses).

> I appreciated the chance to hear Ionisation twice because of its density and brevity. There were some more clearly defined sounds in the second performance (M). There were also two passages that the players didn't play so well together, which is a reminder that despite a conductor, human miscalculation is always a present danger (M). Ionisation is a journey that is not so much emotional but one of assembly, with some relief in the closing passage (A). Hearing it twice enabled a finer appreciation of the journey, and I was able to identify more closely with the nuances of the pieces (C). Despite having played and conducted it several times, I still find that it bears a second hearing in a concert, as there are so many timbral layers and rhythmic nuances to be revealed. This performance was very finely nuanced and balanced, and in fact so sensitively done (M), that I look forward to hearing it again (A).

Studies 1 and 2: Discussion

For both pieces, audiences reported increased understanding, and perceived memory enhancement from first to second repetition. This was a robust effect as in addition to being true for two quite different sets of pieces, the increase did not depend on sophistication

with the contemporary classical idiom, nor, in Study 2, with whether the piece was repeated immediately or after intervening works. Change in affective responses (enjoyment, and desire to hear again) was more equivocal: we saw no enhancement for Io but did for both pieces in the Ge concert. It is hard to determine the reasons for this difference, as there are several candidates. The effect could be unstable, although a large body of research does generally support increased liking with exposure. However, another explanation is that *Ionisation* was generally well liked. This could be due to audience preference, but of course that piece is a well-regarded masterpiece from an established composer, whereas the student compositions were likely not at that level. It is notable, however, that preference did not on average go down for the initially well-liked piece, even though some individuals did react that way. In addition to the comment cited above about being annoyed, we received a negative comment for Io that referred more to a perceived decline in performer enthusiasm: 'It never seemed so good the second time around. First time – it's full of tension and enthusiasm'.

We wanted to initially collect data in a live audience situation, to really capture what it is like to hear and see performers repeat a programme, and in company of others. However, inevitably some aspects of the studies were not well controlled. Although we sampled situations in which the audience was informed vs. not informed of the repetition, and whether pieces were repeated immediately or not, these conditions involved different pieces. We cannot therefore tell whether some effects would appear (or disappear) if the actual piece were held constant. We also had no objective measure of the perceived cognitive mastery.

We therefore conducted a third study in a laboratory setting. We used high quality audio recordings of the Io performance, and another set of recordings of a piece from the New Music Biennial. We systematically varied whether the participants were informed, or not, about the repetitions. These non-repeated pieces served as practice, provided a baseline for the memory task, and to reduce memory of the ratings given to the first playing of a repeated piece. We also tested recognition memory after the first and second hearings of the repeated pieces.

Study 3: Method

Participants. We recruited 24 participants (13 females), median age 23 (range 19 – 30); 16 of them were university students from Goldsmiths, University of London and the remaining participants were community members. All but three participants held a university degree, and nine of them had completed postgraduate study. On the Goldsmiths Musical Sophistication Index musical training subscale (Müllensiefen, Musil, Gingras, & Stewart, 2014), the median score was 27 (max = 49). Only five participants said they had high familiarity with contemporary classical music. Nine participants had been at a concert where the same piece was played twice (1 participant had been to more than 5 of such performances); 5 participants had performed a piece twice on the same concert programme.

Materials. Four excerpts of contemporary classical ensemble music were played to each participant. The second and fourth excerpts were recordings of the same piece that had been played twice in a live concert, whereas the first and third excerpts were not repeated.

To minimise the effect of the individual characteristics of the music, two pieces were used in the repeated condition. Both pieces were performed and recorded twice in the same concert by the same musicians. Participants were randomly allocated to listen to one pair of the two.

1. *Ionisation* by Edgard Varèse
   These were high-quality audio recordings from the concert in Study 1.
2. *The Bell That Never Rang* by Lau and the Elysian Quartet
   The recording was from its premiere at the New Music Biennial on 30 January 2014. It is an 18-minute piece written for Lau (a folk band), string quartet and voice. The vocal line is only present in the middle of the piece and was not used in this experiment.

The two non-repeated recordings were chosen so that they had similar style to the repeated performances:

1. *Night* by Yip Ting is a 6-minute piece written for percussion quartet by Hong Kong-based composer Yip Ting. It was the winning piece at the New Generation music composition competition in Hong Kong in 2003. The recording was performed by students from the Hong Kong Baptist University, and was used with the permission of the composer.

2. *Andante con tenerezza* from the Trio for Violin, Horn and Piano by György Ligeti. Andante con tenerezza is the first movement from the 4-movement trio. It was played by the Luna Nova New Music Ensemble. The recording is freely available at the following website:
   http://www.lunanova.org/podcasts/Ligeti1.mp3

We used the first 3'20" of these pieces for initial presentation. We chose this length so that a. the excerpts were long enough to have context and sense of unity, b. there was enough material in the unused parts to construct the recognition test, and c. all the tracks had a natural stopping point at about that point in the music to give a sense of completion. Music after the first 3'20" were used to produce foils for the recognition test.

Procedure. The participants were invited into the laboratory in groups of 2 to 6. Testing was done in small groups because concerts are rarely attended by just one person. After signing consent forms, participants were told that they would then listen to four pieces of music,

and they would complete two tasks after each piece (ratings and memory task). In the 'informed' condition (N = 12), participants were notified that the fourth piece they would hear would be a repeated performance of the second piece; participants in the 'uninformed' condition did not get this information at any point. Participants were allowed to ask questions before the start of the experimental tasks.

The recordings were played through a pair of Teac PowerMax 80/2 stereo speakers. After each piece was played, participants were given 30 s to complete the same four rating questions as was used in Studies 1 and 2. In addition, they were the given a recognition test where participants were played four fragments of music, and asked to identify whether the fragments came from the piece that was just played. They also rated confidence in their answer on a 1 (low) to 7 (high) scale. There was a 5-second gap between each fragment. Half were old items and half were excerpts that came from the unplayed portion of the piece.

The order of the ratings and memory task was counterbalanced over participants. Participants were advised to refrain from answering the rating questions while listening to the music or during the memory task. The order of the tasks was both announced by the experimenter, and shown on a computer screen during the session.

After all four pieces were played and the corresponding experimental tasks were completed, participants were asked to complete their personal information and debriefed. Participants in the 'uninformed' condition were told about the repetition at this point.

Study 3: Results

Ratings. There were no significant differences in participants' ratings with respect to whether they were informed or not about the repetition, so data were collapsed across both groups. Affective ratings increased from first (4.00) to second (4.45) hearing, $t(47) = 3.45$, $p < .001$. The Cognitive ratings also increased (4.06 vs. 4.50, $t(48) = 2.42$, $p<.01$). However, in this sample the two items comprising the Cognitive ratings behaved differently. Ratings for the item 'I felt I understood this piece' increased from 3.88 to 4.33 ($t(23) = 2.20$, $p < .05$); however, there was no change in perceived ability to remember the piece after the second hearing (4.25 to 4.67; $t(23) = 1.39$, NS).

Memory. We calculated the memory test performance in two ways: 1) using signal detection theory and deriving a d' score (MacMillan & Creelman, 2005) for each participant for each of the four memory tests, and 2) using the confidence ratings (from 1 to 7), provided by the participants. This confidence rating score (CON) for each test was calculated by adding up the confidence score for each of the four questions: positive points for a correct answer, and negative points for an incorrect answer. So for instance, a hit or correct rejection, with confidence score of 7, would earn 7 points for that question; a false alarm with confidence score of 4 would earn -4 points for that question. As each memory test comprised four items, the highest possible score was 28, and the lowest was -28.

The memory task proved to be difficult for most participants. The mean d' score for the memory test after the first listening of the repeated piece was 0.76 (SD = 0.538), and 0.93 (SD = 0.519) for the test after the second listening. Although the d' score increased from first to second test, the increase was not statistically significant ($t(23) = 1.45$, $p = 0.08$, one-tailed). The mean CON score was 12.42 (SD = 7.86) for the first test and 14.50 (SD = 8.26) for the second test. Once again, although there was an improvement in the CON score, the improvement was not significant (t(23) = 1.26, $p = 0.11$, one-tailed).

Prediction Accuracy and Training. As a measure of metacognition, we correlated self-ratings on the item about 'I feel I would recognize the piece' with memory performance. For neither the first nor second repetition were these scores correlated for d' or CON (r's ranged from -.21 to .01). We also found no correlation between memory performance and the Gold-MSI training score with values of Pearson's correlation coefficient *r* of .11 and .07 for the d' and CONS scores, respectively.

Consistency of Memory Performance. To assess whether individuals showed consistent memory performance over the first and second hearing/testing cycle of the piece, we correlated memory scores for those two tests. Indeed, correlations were significant using both d' ($r(22) = .42$) and CON ($r(22) = .50$, $p < .05$. This consistency was not due to overall memory skill, as memory for the non-repeated pieces was not correlated (*r*-values of -.08 and -.05 for d' and CON, respectively).

Combining Studies 1, 2, 3. All three of the studies used the same questionnaire. We decided to increase the statistical power for the questionnaire results by analysing the data from all three studies combined. In addition to comparing first to second hearing, we also considered familiarity with contemporary classical music (FCM) as a binary between-participants factor.

For the Affective items, average ratings increased significantly from 4.53 to 4.78, F(1,122) = 8.95, p = .003, partial eta squared = .068. In addition, FCM had a significant effect on affective ratings (F(1,122) = 5.49, p = .021, partial eta squared = .043) and also interacted with repeated listening (F(1,122) = 7.13, p = .009, partial eta squared = .055), meaning that the increase from first to second hearing was larger for people with more familiarity with contemporary classical music. Cognitive ratings also increased across hearings. The average increase was from 4.20 to 4.70 (F(1,122) = 29.51 p < .001). Participants with high FCM gave significantly higher cognitive ratings (F(1,122) = 34.15, p < .001, partial eta squared = .219), but there was no significant interaction between repeated listening and FCM (F(1,122) = 2.81, NS).

Finally, we correlated affective and cognitive ratings given after the first as well as after the second presentation of the repeated piece and found strong positive correlations at both time points (1st listening: r = .631, p < .001; 2nd listening: r = .613, p < .001).

Study 3 and General Discussion

The main finding from Study 3 confirms that audience reactions become increasingly positive after the second hearing. It is notable that across studies four different pieces were presented, with the repetitions either consecutive or not, with audiences being aware or not aware of the upcoming repetition, and using live performance (Studies 1 and 2) or audio recordings in a laboratory setting (Study 3). On average perceived understanding and self-assessed memory increase in all studies and across all conditions; the enjoyment and desire to hear the piece again increases in most cases, with the exception of the piece that was quite well liked at initial listening (*Ionisation*). This study has shown that even when two performances are not identical, audiences react cognitively and affectively in a similar way to that suggested by previous studies on repeats of identical recordings. This is a clear demonstration that exact repetition is not a necessary condition for these effects. Kroger and Margulis (2017) showed a similar result in a study where non-musician listeners heard pairs of short excerpts of piano pieces. Judgements of enjoyment and assessment of performer skill increased at second hearing, regardless of whether they heard identical performances, or performances by two different pianists, and whether the pianists were of similar or differing performance skill.

It is also worth that although the change in ratings from first to second listening was not identical for cognitive and affective ratings, ratings at both time points were highly correlated. This seems to support an interpretation suggesting that we like what we can understand, and we make more efforts to understand what we like (Stalinksi & Schellenberg 2013; Szpunar, Schellenberg, & Pliner, 2004). The relation between knowledge and affect was also shown by the fact that hearers who reported more familiarity with contemporary classical music showed larger gains in enjoyment upon second listening (although this larger gain was not shown in the cognitive self-assessments). Some listeners could perhaps have increased their ratings because they thought they ought to on second hearing, although we think this is likely a small contributor. For one thing, no findings were influenced by whether the audience knew a piece was going to be repeated. Also, audiences were not informed they would perform a second set of ratings, the prior ratings were not accessible during the second set of ratings, and in most cases, considerable material and time had intervened between the two sets of ratings, reducing the likelihood of accurately remembering the first rating.

The Affective and Cognitive items of course differ in one important way: whereas one's enjoyment or desire to hear a piece again is by definition captured in self-report, the self-assessment of understanding and memory may or may not be accurate. In Study 3, we tested participants' memory objectively and found that listeners' self-assessment was mainly not accurate and actual memory performance was not related to the subjective ratings. This was not a result of general overconfidence, which could have still resulted in significant predictive accuracy.

However, the memory test was not as sensitive as we had hoped, as the participants' performance level was low across all conditions; hence a floor effect. There were only four

items in each memory trial because of the requirement to make each item (i.e. musical fragment) long enough to establish a meaningful musical context; on the other hand, it was necessary to take the new excerpts from the same recording of the piece, which limited the number of probes to be extracted from these short pieces. It is interesting that musical training was not correlated with scores on the memory test, although this finding is not uncommon in the literature (Halpern & Bartlett, 2010).

One limitation of the current experimental setup was that objective understanding of the piece was not assessed, which might be related to memory scores. However, it is not immediately clear what a valid test of understanding of contemporary music would look like and careful experimentation and piloting would be needed to construct such a test. One option would be to present listeners with an excerpt from a novel piece. They would then hear the passage that really follows in the piece, or an excerpt that does not immediately follow (or is even from a different piece). They could rate the likelihood that the second passage really followed the first. Success on this task could be interpreted as reflecting implicit understanding of compositional structure and style.

Despite overall increases in participants' ratings upon second hearing on average, not all participants conformed to this statistical trend. As seen in both ratings and comments, some people reacted negatively or at least not positively to the repetition. Some performers felt the same way, and to the extent that performer attitude is reflected in their playing, that could of course engender a less enthusiastic audience response.

The present research has raised a number of issues for musical directors considering double programming. The length of the piece is important. The musical directors consulted at the outset of this project noted that in most cases, a repeated piece needs to be short. In addition to the potential annoyance factor, directors need to consider the balance of the entire programme as well as technical considerations (such as the possible strain on performers). During a post-concert discussion at one of the research concerts and in response to an audience member's comment that she would like to have heard the piece twice, a principal player responded that this would have been impossible, as it would have resulted in 'lip exhaustion'.

Another consideration is whether the director wishes to present, as nearly as possible, an identical performance, or to deliberately present an interpretation that is notably different. The complexity of the music might be important in the case: a very complex piece might benefit from a more exact repetition. This decision might also depend on the musical sophistication of an audience given that people more familiar with contemporary classical music liked repeated presentations more than those less familiar with this particular kind of music. However, we should also note that the live concerts that were part of this research took place in a conservatory environment, with a small and possibly highly self-selected audience. It would be interesting to replicate this study with a larger, more general audience in a mainstream concert venue. We remain interested in contact with concert programmers who might like to participate in such a venture.

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Acknowledgments:

We thank the PRS for Music and the BBC for providing the recordings used in Study 3. Andrea Halpern was partly supported by a Leverhulme Visiting Professorship during her sabbatical year when this project was conceived. Finally we thank Julian Anderson for valuable musicological consultations, and Richard Benjafield and James Weeks for providing the live concert opportunities in Studies 1 and 2, as well as for their insights into this performance practice.

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Appendix:

Table 1: Mean Ratings on Affective and Cognitive Self-Report, and Memory Performance for First and Second Presentations

	Presentation	
	First	Second
Affective (1 to 7 Scale)		
Study 1	5.56	5.51
Study 2	4.12	4.41*
Study 3	4.40	4.45*
Combined	4.53	4.78*
Cognitive (1 to 7 Scale)		
Study 1	4.73	5.26*
Study 2	3.91	4.43*
Study 3	4.06	4.50*
Combined	4.20	4.70*
Memory (Study 3)		
d'	0.76	0.93
CON	12.42	14.50

* Statistically significant increase from first to second hearing