

Skip the Pre-Concert Demo: How Technical Familiarity and Musical Style Affect Audience Response

S. Astrid Bin
Centre for Digital Music
School of EECS
Queen Mary U. of London
a.bin@qmul.ac.uk

Nick Bryan-Kinns
Centre for Digital Music
School of EECS
Queen Mary U. of London
n.bryan-kinns@qmul.ac.uk

Andrew P. McPherson
Centre for Digital Music
School of EECS
Queen Mary U. of London
a.mcpherson@qmul.ac.uk

ABSTRACT

This paper explores the roles of technical and musical familiarity in shaping audience response to digital musical instrument (DMI) performances. In an audience study conducted during an evening concert, we examined two primary questions: first, whether a deeper understanding of how a DMI works increases an audience's enjoyment and interest in the performance; and second, given the same DMI and same performer, whether playing in a conventional (vernacular) versus an experimental musical style affects an audience's response. We held a concert in which two DMI creator-performers each played two pieces in differing styles. Before the concert, each half the 64-person audience was given a technical explanation of one of the instruments. Results showed that receiving an explanation increased the reported understanding of that instrument, but had no effect on either the reported level of interest or enjoyment. On the other hand, performances in experimental versus conventional style on the same instrument received widely divergent audience responses. We discuss implications of these findings for DMI design.

Author Keywords

Performance studies, audience, DMIs, style, familiarity, transparency

ACM Classification

J.5 [Computer Applications] Arts and Humanities—Performing arts (e.g. dance, music); H.5.2 [Information Interfaces and Presentation] User Interfaces—Evaluation/methodology

1. INTRODUCTION

This paper investigates the factors shaping the audience experience in digital musical instrument (DMI) performances, comparing the relative effects of familiarity with the operation of the instrument and familiarity with the musical style of the performance.

Visual factors play a central role in how a spectator perceives a performance [23, 22, 5, 17, 11, 14] for both traditional and digital instruments (see [9] for a detailed discussion of instrumental interaction from the spectator perspective). DMI performances are often criticised for being visually opaque [22, 5]. Fels et al. [6] proposed the principle of

transparency, suggesting that the instrument design should allow the audience to understand the performer-instrument interaction. Since DMIs need not follow traditional instrumental modes of interaction [9], considerable effort has been spent on DMIs which deliberately seek to expose the interaction to the audience. Recent work has proposed physical metaphors [3] and visualisations of control processes [1, 19], and audience experience is increasingly a part of the DMI evaluation process [16].

Fyans et al. [7] conducted a study of audience perception of error in DMI performance under different information conditions. Amongst the findings was that, with regards to the Tilt-Synth (an unfamiliar DMI), explaining the instrument before the performance improved the accuracy of the spectators' mental models of the instrument (though it had no significant effect on understanding the performer's intention in playing the instrument). Several participants suggested "that they enjoyed the performances more because the performer explained the the instrument first. They commented that it helped them understand the interaction and performance."

This suggestion has yet to be confirmed, as no study has measured whether understanding how a DMI works improves audience enjoyment of a performance. The pre-concert talk or demo is a staple of many performances, and it seems plausible that greater familiarity with the operation of the instrument might help a spectator relate to the actions of the performer and thereby facilitate greater enjoyment of the performance. The study presented in this paper examines this question in a concert setting by giving each half of the audience a technical introduction to one of the two instruments used during the performances.

1.1 The Instrument and the Piece

Any investigation of familiarity and audience experience must confront a significant confounding factor: musical style. DMIs can be found all along the artistic spectrum, from traditional instrumental models to interactive compositions. At one end of the spectrum, the DMI is often inseparable from the musical idiom and even the specific piece [5, 15] (see also Jorda's discussion of macro-diversity [12] as a measure of stylistic flexibility).

This close bond between technology and musical ideas may be inherent in the design of some instruments, though in other cases it may relate more to the fact that the instrument's designer is its primary (or only) performer. Musical history is replete with cases where instruments developed for one community found distinctive use in another (e.g. saxophone, bandoneon, electric guitar, Hammond organ). On DMIs, diversity of style is also an emergent property of even the most reductive designs when given to many different players [10, 26].

In any case, a note of caution is warranted in audience



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studies. Given a DMI which is tightly linked to a musical context, effects on the audience which appear to be due to technical design may instead be effects the style of the performance (or vice-versa). In this paper, in addition to examining technical familiarity, we study the effect of musical style along the spectrum of experimental to conventional or vernacular.

1.2 Aesthetic Origins of NIME

There is no single NIME musical aesthetic, but certain historical traditions have had stronger influences than others, with electroacoustic free improvisation perhaps the most significant. The origins of this tradition far predate digital technology. Though early electronic instruments like the Trautonium, theremin, ondes martenot and Electronic Sackbut might be the natural technical forebears of NIME [18], the aesthetic origins may owe at least as much to Russolo’s futurism [21] and the modernist, timbre-focused tradition of Varèse and his followers. For Varèse, as for present-day NIME, new musical forms and new instrument technology were closely intertwined: “Our musical alphabet must be enriched. We also need new instruments very badly ... which can lend themselves to every expression of thought and can keep up with thought” (1916, quoted in [25]).

A complete discussion of the aesthetic history of NIME is beyond the scope of this paper, though Demers [4] provides a detailed analysis of aesthetic considerations in recent experimental electronic music. The path to NIME runs through Schaeffer’s *musique concrète* and the experimentalism of Cage, who brought about a radical shift in the role of the score from a musical ideal to a space of possibilities or recipes relying on chance and contributions from the performer (and sometimes the audience) for completion. Cage is noted for inventing and re-purposing musical instruments, most famously the prepared piano, but he was also a technical pragmatist, remarking “technology essentially is a way of getting more done with less effort” [13]. (Gurevich [8] provides a more extensive account of Cage’s aesthetics in relation to NIME by way of recreating several of his works with modern digital technology.)

In parallel with the experimental electroacoustic tradition, electronics have become deeply integrated in the musical vernacular, with early examples ranging from Wendy Carlos’ 1968 *Switched-On Bach* to the international success of Kraftwerk to the ubiquity of the Minimoog [20], Yamaha DX-7 and other synths in rock music of the 1970s and 80s. DJ practice has led a trend toward loop-based music, now often entirely electronic in origin. Hundreds of micro-genres exist within the domain of electronic dance music (EDM), with widely varying aesthetic concerns [4].

1.3 Implications

It is worth highlighting the parallel experimental and vernacular streams of digital music because the lack of visibility of performance gesture affects *both* sets of genres. Ableton Live performers can encounter as much criticism as experimental DMI creators for visually disengaging performances; live generative visuals are also found across many electronic genres. But NIME and EDM performances engage the audience in different ways and invite different modes of listening, and the popularity of live EDM performances with or without visual accompaniment suggests that instrumental transparency is not a strict prerequisite to an enjoyable performance.

The prior listening experience of the audience is another consideration. Audiences outside the NIME community are less likely to be familiar with electroacoustic improvisation. Even within NIME, most practitioners wear many

Perf. 1	Perf. 2	Perf. 3	Perf. 4
Dianne Experimental	Tim Experimental	Dianne Conventional	Tim Conventional

Table 1: Order and format of performances.

hats: composer, performer, instrument designer, audience member. In many cases, the musical genres that a NIME community member listens to in their leisure time may only partly overlap with the genres they participate in in their professional practice.

Understanding and instrumental *transparency* may have cultural as well as technical dimensions. The musical experience of the audience may affect their understanding of a performance whether or not they have encountered a particular DMI before. In the next section, we describe a study aimed at disentangling some of these effects, with the goal of providing design advice for future DMI creators.

2. STUDY DESIGN

This study was carried out as part of an evening concert on the theme of Innovative Interfaces, as part of the C4DM Concert Series at Queen Mary University of London.

2.1 Performers

The study involved two performers who each play a novel, self-built electronic instrument: Dianne Verdonk on the Di-antenne [24], and Tim Exile on the Flow Machine¹ (Figure 1). Both performers had significant live performance experience with their instrument, and both had previously played their instruments in contrasting musical styles.

To create the familiar/unfamiliar contrast for the musical style, we asked each musician to prepare 2 performances, each around 5 minutes in length. The first was freely experimental, and the second more stylistically conventional (or vernacular). We invited the performers to interpret “experimental” and “conventional” in the context of their own musical practice.

2.2 Pre-Concert Presentations

The investigator first gave a short introduction to the audience on the purpose of the study. The audience (n=64) was then randomly divided into two groups, and each group saw one of two instrument tutorials. The tutorials each explained the technical aspects of one of the instruments and how it creates sound. One group (n=34) received the tutorial on Tim Exile’s Flow Machine, and the other (n=30)

¹<http://techcrunch.com/video/create-live-edm-with-tim-exiles-flow-machine/519373211/>

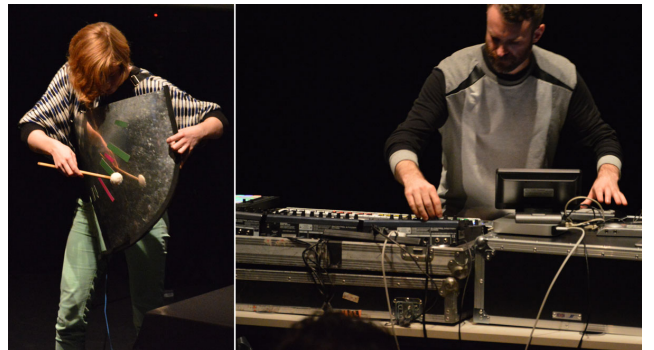


Figure 1: Performers Dianne Verdonk on the Di-antenne (L) & Tim Exile on the Flow Machine (R)

received the tutorial on Dianne Verdonk’s Diantenne. The tutorials were presented by a member of the research lab to address any bias from meeting the performer prior to the concert.

2.3 Concert Order

No single concert order can entirely address order bias effects (see Section 4.5 for further discussion), but for consistency, we chose to place the experimental performances together at the beginning, followed by the conventional performances. Both instruments were amplified, but since Dianne’s was designed to be quieter than Tim’s, Dianne performed first. The order is detailed in Table 1.

2.4 Data collection

The data for this study was collected in two ways: By 5 written questionnaires², and by real-time audience feedback via a custom-made web app. (For space reasons this paper only considers data from the written questionnaires; a future paper will consider the real-time data.)

2.4.1 Post-Performance Questionnaires

4 of the 5 questionnaires were short surveys that were filled out immediately after each performance (3-4 minutes were given for this), and asked the participants to reflect on what they had just heard. The participant was asked to rate their Enjoyment, Interest and Understanding of the performance they had just seen on a scale of 1 (least) to 5 (most).

There were also three qualitative questions with space provided for about two sentences. These asked what the participant liked, didn’t like, and how they might describe the performance to a friend.

2.4.2 Post-Concert Questionnaire

After the final performance and questionnaire, participants were asked to fill out a longer post-concert survey. This asked the participants to reflect on the performances as a whole; to rank the 4 performances in order of preference from 1 (favourite) to 4 (least favourite); to rate how well they understood each performer’s instrument, and then to rate if they would be able to play it.

This survey also collected demographic detail. This data allowed us to further subdivide the audience, as discussed in Section 4.3.

3. RESULTS

3.1 Ratings of Performances

First, we looked at the ratings of Enjoyment, Interest and Understanding for each of the four performances. These were rated in each of the 4 post-performance questionnaires on a scale of 1 to 5.

For insight into the influence of instrument familiarity (Figure 2) we examined average ratings across all performances by the group that saw the tutorial before the performance versus the group that did not. The ratings for Interest and Enjoyment were nearly identical for both groups. However, we observed a larger difference in Understanding: those who saw the instrument before the concert rated Understanding an average of 0.53 points higher.

We then examined the ratings for each performance as a function of whether the audience was familiar or unfamiliar with the instrument (Figure 3). Refer to Table 1 for performance numbering. For Interest and Enjoyment, the group *not* familiar with the instrument rated Interest and Enjoyment slightly higher for P1 ($\Delta I=0.21$, $\Delta E=0.27$), and rated the same aspects slightly lower for P2 ($\Delta I=0.20$;

²Blank questionnaires available at: <http://bit.ly/1QYBIik>

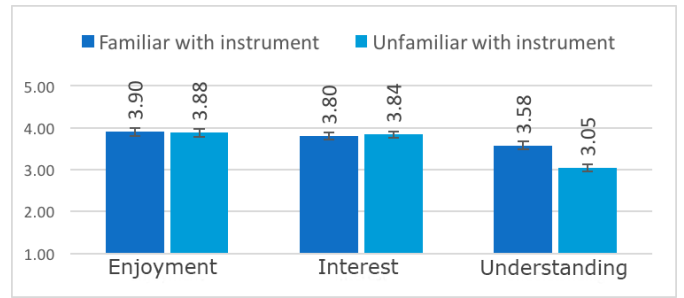


Figure 2: Average audience ratings across all performances. Each audience member will be counted in the “Familiar” group for one instrument and the “Unfamiliar” group for the other. (Error bars indicate standard error on this and all other plots.)

$\Delta E=0.28$). For P3 and P4 the ratings of Enjoyment and Interest were virtually identical. For all four performances, the group familiar with the instrument consistently rated Understanding higher ($\Delta U = 0.7, 0.61, 0.55, 0.27$ for P1 to P4 respectively).

Next, we analysed this rating data with respect to musical style (Figure 4). We found that Enjoyment was rated substantially higher for the two conventional performances ($\Delta E=1.05$) and that Interest and Understanding showed smaller increases for the conventional performances ($\Delta I=0.31$, $\Delta U=0.34$).

We then contrasted the overall ratings of Enjoyment, Interest and Understanding to compare the experimental and conventional performances by each performer. For both performers, Enjoyment showed the biggest positive change (0.71 for Dianne, 1.39 for Tim). The meaning and implications of these values are further explored in Section 4.

3.2 Rank Ordering of Performances

In the final post-concert survey, participants were asked to rank the performances in order of preference (1=favourite, 4=least favourite). We compared these values overall, as well as with respect to instrument familiarity. (Respondents who did not fill in all four ranks are excluded from our analysis.)

The ranking showed a preference for the conventional style performances, ranked from favourite to least favourite:

1. P4 (Tim, Conventional: 1.5, SD=0.73)
2. P3 (Dianne, Conventional: 2.19, SD=1.05)
3. P1 (Dianne, Experimental: 2.90, SD=0.93)
4. P2 (Tim, Experimental: 3.40, SD=0.69)

We then examined these rankings with respect to receiving a tutorial on the instrument (Figure 5). The rank order remained the same for both groups, but the strength of preferences changed: the experimental performances were ranked marginally higher by the group receiving the tutorial (differences: P1=0.21; P2=0.18). The opposite was true for the conventional performances: those *not* familiar with the instrument preferred these more strongly than those who were familiar with it (differences: P3=0.34; P4=0.33).

3.3 Thematic Analysis

In addition to the quantitative data, we analysed the qualitative data using an inductive method [2] that identified themes emerging from responses. These themes were then grouped together until saturation. We found that that of the responses that contained at least one word ($n=665$), 97% could fit in at least one of four categories:

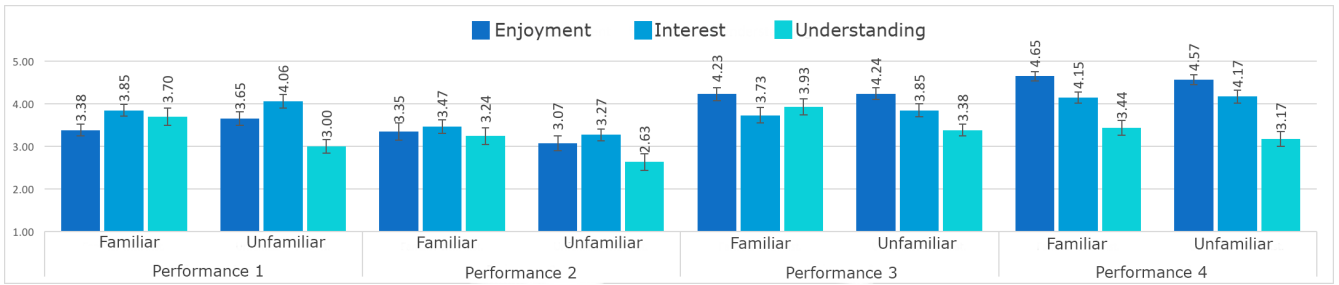


Figure 3: Ratings by performance, by those who saw the instrument and those who did not

1. The Performer: the input; how the interface is used
2. The Instrument: the interface; how the sound is made
3. The Sound: the output, describing the sounds heard
4. The Experience: the respondent's perception/value judgment of what they have heard

The remaining 3% of responses could not be categorised. The majority of these were responses such as “Nothing” when the participant was asked to detail what they disliked.

Responses were categorised as Performer, Instrument and/or Sound if they specifically described one of these aspects. The categorisation of Experience was used if they did not describe specifically the Performer, Sound or Instrument, but described the effect on the respondent's experience or personal judgment. The Experience categorisation was also added if the respondent described one of the three former categories as well as how it affected them or a value judgment about it. For example, describing a performance as “it sounded like a drum” would be categorised as Sound, while “it sounded like a drum and made me want to dance” would be categorised as both Sound and Experience.

We counted the number of categorisations made for each of the three questions for performance. The majority of responses (71%) cited one categorisation, and 27% of responses cited two categorisations. We examined the categorisations that respondents used by considering the proportion of the audience that cited each categorisation in their “like” and “dislike” responses. No patterns stood out with respect to familiarity with the instrument, but several suggestive features emerged in relation to musical style, which are discussed further in Sections 4.4 and 4.5.

4. DISCUSSION

4.1 Influence of Instrument Familiarity

Our results strongly suggest that being familiar with the instrument (when this means prior technical knowledge) does not have any appreciable impact on audience interest or enjoyment. We did, however, observe a difference in the rating of understanding between the group who was familiar with

the instrument and the group that was not, with the familiar group consistently rating understanding higher than the unfamiliar group.

However, it is important to reflect on what that rating of “understanding” might mean in this context, and how it relates to Fels's notion of transparency [6], described as “a quality of a mapping ... transparency provides an indication of the psychophysiological distance, in the minds of the player and the audience, between the input and output of a device mapping.” By this definition, transparency is a deeper, nuanced understanding of an instrument, its physical and psychological aspects, and how it creates sound; for this study, we gave each group a technical tutorial on one instrument, which provides familiarity, but does not necessarily impact transparency.

This is further evidenced when, in the final questionnaire, we asked participants to rate their overall understanding of each instrument as well as their ability to play it (Figure 6). Those receiving a tutorial rated their understanding as higher than those who did not. However, there was no difference between the two groups in their rating of their ability to play the instrument, which was lower than both ratings of understanding. It may be that believing one can play an instrument indicates a deeper intuitive understanding of how it works, reflecting more than passing technical knowledge.

4.2 Influence of Musical Style

While instrument familiarity appeared to have no effect on reported Enjoyment, performances in a conventional musical style were rated more highly for Enjoyment whether or not the audience received a tutorial on the instrument. To a lesser degree, Interest and Understanding were also rated higher for the conventional performances.

The same style-dependent effect was evident in the rank ordering of the performances, but with subtle differences between groups: being unfamiliar with an instrument that is played in a familiar style, and being familiar with an instrument played in an experimental style, have positive effects. This suggests perhaps that one axis of familiarity

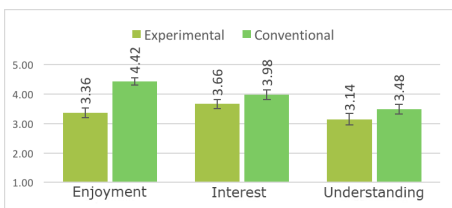


Figure 4: Average difference in ratings, experimental vs conventional performances

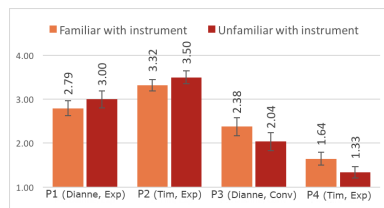


Figure 5: Rank ordering by those familiar/unfamiliar with the instrument (1=favourite 4=least favourite)

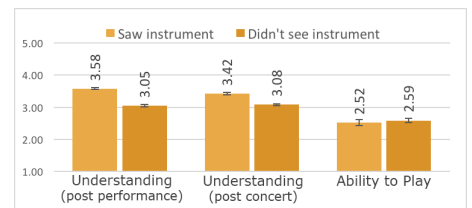


Figure 6: Rating of understanding & respondents' ability to play the instrument (familiar vs unfamiliar)

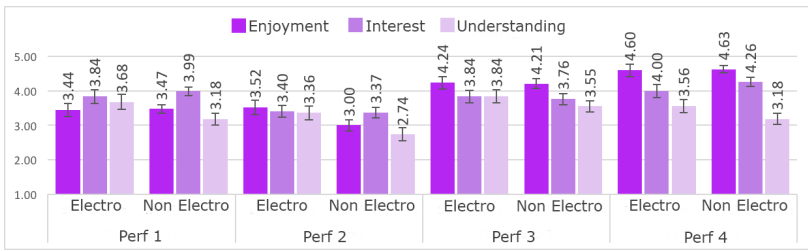


Figure 7: Average difference in ratings, those who do vs do not listen to electronic music

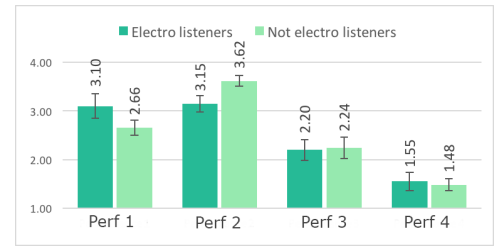


Figure 8: Rank ordering by those who do/do not listen to electronic music

is most effective, and this is perhaps a fruitful direction for future study.

4.3 Influence of Listening Preferences

The demographic data in the final questionnaire collected information on the audience’s listening habits. Using this data were able to further subdivide the audience into those who were listeners of electronic music (n=25) and those who were not (n=39). Figure 7 shows the individual performance ratings with respect to these listening preferences.

For all four performances, those who listened to electronic music rated Understanding higher than those who did not. The difference between groups was larger for the experimental performances. This might indicate intrinsic familiarity with electronic musical instruments through prior listening or concert attendance.

We had hypothesised that electronic music listeners would also rate Enjoyment and Interest higher, as they may be more likely to be familiar with the experimental playing style. However, this effect was not observed. For P2 (Tim’s experimental performance), electronic music listeners rated Enjoyment 0.52 points higher than their counterparts, but no overall effect is evident.

The rank ordering by listening preference (Figure 8) shows that the conventional performances (P3 and P4) were preferred to the experimental ones (P1 and P2) for both groups. However, electronic music listeners ranked Tim’s and Dianne’s experimental performances nearly identically, where the other group showed a clear preference for Dianne’s experimental performance. These results suggest that audience listening habits do have an effect on perception, but the precise nature of that role requires further study.

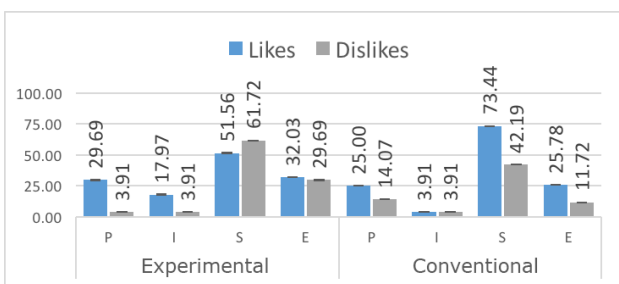


Figure 9: Proportion of audience to mention each categorisation; contrasting answers to questions of likes and dislikes

4.4 Qualitative Data and Salience

The thematic analysis offers a high-level view of which aspects of each performance were salient to the audience. Examining which aspects appear more frequently in positive (“like”) or negative (“dislike”) comments offers some insight

into the reasons behind the quantitative results discussed in the previous sections.

Figure 9 shows the overall proportion of the group that mentioned each category (Performer, Instrument, Sound, Experience) in Likes and Dislikes. A notable result is the role of sound, which is mentioned more often as a Like for conventional performances and as a Dislike for experimental performances. The instrument is rarely mentioned as a Dislike in any performance; in fact, in the second (conventional) performances it is rarely mentioned at all (though this may be a precedence effect, discussed in the next section). The proportion of the audience citing the performer as a Like is also lower in the conventional performance. These results reinforce our earlier finding that musical style plays a stronger role than instrument design (or even how the instrument is played) in shaping the audience experience.

4.5 Order Effects

With only one concert, it was impossible to completely separate the order of presentation from the differences in musical style. Therefore it is reasonable to ask whether effects apparently due to style are in fact byproducts of the fact that the experimental performances came first.

The precedence effect may underlie the increased Understanding rating for both instruments from the first to the second performance of each, though it is also possible that if the style was more familiar to a particular audience member, they would find it easier to understand the instrument.

The Interest rating of P3 (Dianne’s conventional performance) dips compared to P1, with a larger drop for the group that did not see her instrument before the concert. This may suggest a mild novelty effect for P1. However, this novelty effect did not reduce Enjoyment, as ratings went up for both P3 and P4 compared to P1 and P2.

A final effect attributable to precedence is that the instrument is hardly discussed at all in the qualitative data for P3 and P4 (Figure 8), where it was discussed in 18% of the Like responses for P1 and P2. This suggests that audience members made their comments on the instrument in the first performance and did not repeat them.

On the other hand, the change in Enjoyment ratings is unlikely to be from precedence alone. Likewise, the fact that sound is described proportionally more in Like for the conventional performances and in Dislike for the experimental performances is unlikely to result from the concert order.

5. CONCLUSIONS

Contrary to the suggestion of participants in Fyans’s study [7], we found that familiarity with the instrument had no impact on audience interest or enjoyment of these performances novel DMIs. However, the difference between conventional and experimental musical styles had a significant impact on enjoyment. Further, this study found that audience listening habits had an effect on experience, suggesting

that the context an audience brings with them plays a part in how they experience the performance (though more study of this is needed to make solid conclusions). Our qualitative data further reinforces these conclusions, and raises interesting possibilities of salience in performance, suggesting that audiences may have remarkably consistent experiences when observing performances (though, again, specific examination is needed).

Further, this study offers insight into the limits of transparency in DMI design [6], showing that insofar as transparency is important to the audience experience, it cannot be addressed simply by explaining the instrument. We also emphasise that this study does not directly address the question of whether an intuitively obvious relationship between gesture and sound improves the audience experience. Gurevich and Fyans’s work comparing the theremin and Tilt-Synth [9] provides some hints in that direction, but further studies are needed to confirm how transparency is achieved and whether it has a meaningful effect on audience enjoyment, and to understand the design choices that support it. We also emphasise that although these effects appear significant for this particular audience and these performers, they may not extend uniformly to all performers and all instruments.

Finally, our purpose in this study is not to suggest that one musical style is “better” than another, or even to suggest that self-reported audience enjoyment ought to be the guiding factor in the DMI design process. Different musical works engage the audience in different ways, and some of the most profound music can also be the most challenging to listen to. We do, however, suggest that these findings provide valuable insight into the audience experience of novel DMI performance, and that time spent making the audience understand the technology is misplaced. Though many DMIs are often tightly connected to the music they are used to produce, there is value in considering which aspects of audience experience are influenced by technology, and which by aesthetic factors.

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