A virtual dance performance for attracting new audiences – preliminary results from a survey of audience experience

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Abstract

Opera and ballet organisations are exploring digital formats to develop artistic practice and reach audiences beyond the theatre. This working paper examines responses to *Portal*, an eight-minute virtual dance piece co-produced by Aalto Studios and the Finnish National Opera and Ballet. It featured two dancers whose motion-captured movements were animated in a virtual model of the main stage of Helsinki Opera house. The work was shown online, together with a questionnaire.

The questionnaire included 16 statements rated on a four-point Likert scale and questions on background and familiarity with ballet. Responses were received from 69 viewers. Most respondents were over 40 years old and familiar with ballet; 68% were women. The sample therefore does not answer our original question whether the work reached new audiences. Viewers responded positively to the virtual effects and the new perspectives that the work brought to ballet. They generally found the performance immersive, easy to follow and worth attending in the future. Ratings were lower for emotional impact, benefit compared with other performances and connection with the dancers. Respondents less familiar with ballet tended to evaluate the work more positively, although this subgroup was small.

The findings suggest that virtual dance can be an engaging artistic form in its own right. Its potential to attract new audiences remains promising but unconfirmed. Larger and more varied samples are needed, with closer attention to viewing technology and the social qualities of live performance.

Introduction

Opera and ballet are live art forms usually experienced in a shared space, where the audience sees the performers on stage and takes part in the atmosphere of the event. Much of their appeal relates to the skill, presence, and expressiveness of the performers. At the same time, opera and ballet institutions are looking for new ways to reach audiences. Digital and virtual formats offer one possible route, both for making performances more accessible and for trying out new artistic forms. [1]

Digitalization first enabled high-quality streaming of live performances of opera and ballet to remote audiences early 2000's. Since then, digital performance has become more than a temporary solution. It has raised broader questions about who can access opera and ballet, how audiences engage with them outside the theatre, and what kinds of experiences digital formats can offer.

Research on digital performance suggests that online formats can make it easier for some people to encounter the performing arts. They can reduce barriers related to distance, cost, time, disability, or unfamiliarity with opera houses and theatres. However, making a performance available online does not automatically mean that it reaches new audiences, or that viewers find it meaningful. This is especially important in ballet and dance, where the human body, movement, and presence are central to the art form.

One important question is liveness. In a theatre, the audience knows that the performers are present at the same time and in the same place. In digital performance, this is no longer self-evident. Still, audiences may experience a recorded or virtual performance as vivid, immediate, or engaging. They may sense the human work behind it, even if they are watching it on a screen. At the same

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[1] https://www.tandfonline.com/doi/full/10.1080/13569783.2022.2064214

time, some qualities of the live event may be weakened, such as the shared atmosphere, the feeling of being part of an audience, and the closeness of the performers.[2]

Virtual dance adds another layer to these questions. When dancers' movements are captured and placed in a virtual environment, the result is neither a traditional stage performance nor simply a recording of one. The viewer sees a digital work, but one that is still based on human movement and choreography. This kind of work can also do things that would not be possible on stage, such as changing bodies, spaces, and perspectives in unusual ways.

This working paper examines these issues through a case study of *Portal*[3], an eight-minute virtual dance piece co-produced by Aalto Studios and the Finnish National Opera and Ballet (FNOB). The piece was presented online together with a viewer questionnaire. The study does not treat the work only as a replacement for live ballet. Instead, it asks how viewers experienced it as a digital performance in its own right and which aspects of the work, demographic and cultural factors shaped their response.

Our main research question is

How do viewers experience a short virtual ballet piece as a form of digitally mediated dance performance?

Production

Virtual Stage[4] (formerly known as XR Stage) is a virtual model of the main stage of Helsinki Opera house. FNOB has been developing Virtual Stage since 2019, first for set design in virtual reality (VR), and further for operation of the stage, and eventually as a virtual performance

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[2] https://raley.english.ucsb.edu/wp-content/Engl800/Auslander-digital-liveness.pdf

[3] https://studios.aalto.fi/old-pages/portal-virtual-dance-piece/

[4] https://oopperabaletti.fi/en/virtual-stage/

space. The model is produced in Unreal Engine, based on lidar scanning of the hall, with the resolution of 0.2 mm.

Prior to this work, FNOB and Aalto Studios have co-produced two short demos featuring one dancer wearing a motion capture suit (Xsens) and real-time animation in Virtual Stage shown on-screen next to the podium. The demos were presented in Art and Tech demo day in Roihupelto studios in April 2022[5] and as part of the Nordic N5T universities' management meeting dinner program in Dipoli in May 2023[6]. These demos can be considered as a proof of concept to verify the feasibility of the production technology, which allowed us to plan the next steps in creating a fully digital performance.

A team combining Aalto and FNOB experts participated in Sitra Lab 5 program[7]. The purpose of the program, supported by The Finnish Innovation Fund (Sitra[8]) was to support the development of fair and sustainable Web 3.0 through case studies. The case studies varied from health care applications to distributed autonomous organisations (DAO), and cultural productions. In the joint project within the Sitra Lab 5 program, *Production and distribution of performing arts in a virtual environment*, Aalto Studios and FNOB co-produced an 8-min virtual dance piece *Portal*[9], featuring two dancers in Virtual Stage, in Autumn 2023. The dancers' movements were captured using motion capture suits (Xsens) and animated in post processing.

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[5] https://studios.aalto.fi/aalto-digital-creatives-art-tech-open-call-demo-day-2022/

[6] https://www.aalto.fi/en/news/aalto-university-hosts-annual-meeting-of-the-leading-nordic-technical-universities-and-assumes

[7] https://arkisto.sitra.fi/en/topics/sitra-lab/#what-is-sitra-lab

[8] https://www.sitra.fi/en/

[9] https://studios.aalto.fi/old-pages/portal-virtual-dance-piece/

Materials and methods

We asked the viewers to answer a short anonymous online survey to describe their experience, immediately after viewing the performance. We published the link to the online survey on the same webpage with the link to the performance. The questionnaire comprised 16 questions about different experiences the viewers felt during the play (1–4 on Likert scale). We published the survey in Finnish, Swedish (no answers), and English, and we present the questions in Finnish and in English in Table 1. In addition, we asked the respondents' gender (female / male / other / prefer not to disclose), age group (24 years or younger / 25–40 / 41–59 / 60 or older), their area of residence (Asia / Africa / Nordic / Europe / North America / South America / Oceania), and their familiarity with ballet (1–10 on Likert scale).

The audience data collection was conducted in accordance with the ethical principles of the Declaration of Helsinki and was approved by the Aalto University Research Ethics Committee (D/296/03.04/2022; updates in September 2023, and October 2023).

Table 1. Questions in Finnish and in English, and acronyms used below in describing the data and discussing the results.

Finnish	**English**
1. Pidin esityksestä	1. I liked the performance – **Liking**
2. Esitys on yksi parhaista näkemistäni esimerkeistä omalla alueellaan	2. The performance is one of the best examples I have seen in the field – **Exemplary**
3. Sain esityksestä enemmän irti kuin esityksistä yleensä	3. I got more out of the performance than usual – **Benefit**
4. Esitys sai minut haluamaan tietää enemmän baletista	4. The performance made me want to find out more about ballet – **Find out more**
5. Esitys tarjosi näkemyksiä tämän päivän maailmasta	5. The performance offered viewpoints to today's world – **New viewpoints to world**
6. Esitys herätti minussa voimakkaita tunteita	6. The performance aroused strong emotions in me – **Emotions**
7. Pidin virtuaalitekniikalla toteutetuista efekteistä	7. I liked the effects implemented using virtual technology – **Virtual effects**
8. Esitys voi kiinnostaa eri taustoista tulevia ihmisiä	8. The performance could interest people from different backgrounds – **Interest**
9. Esitys tarjoaa uusia näkökulmia ja elementtejä perinteiseen taidemuotoon, tässä balettiin	9. The performance offers new viewpoints and elements to traditional art forms, in this case ballet – **New viewpoints to arts**
10. Esitys voi vetää puoleensa uusia yleisöjä	10. The performance could attract new audiences – **New audiences**
11. Kokemus piti otteessaan alusta loppuun	11. The experience was gripping from start to finish – **Gripping**
12. Esityksen tekninen laatu oli hyvä	12. The technical quality of the performance was good – **Tech quality**
13. Uppouduin esityksen seuraamiseen	13. I was immersed in following the performance – **Immersion**
14. Oli helppoa seurata, mitä esityksessä tapahtui	14. It was easy to follow what was happening during the performance – **Plot**
15. Tunsin yhteyttä ja samaistumista esiintyjiin	15. I felt a sense of connection with the performers during the performance – **Connection**
16. Osallistuisin mielelläni samanlaiseen esitykseen uudelleen	16. I would attend similar performance in the future – **Return**

Description of data

We received a total of 69 answers to the questionnaire mostly between end of (27th) October 2023 and early (6th) January 2024, with the last answers submitted mid- (24th) November 2024. The data is available in Zenodo[10] Most respondents (80%) are above 40 years old (Figure 1a) and female (68%, Figure 1b), which can be said to represent a typical distribution of age and gender for ballet audiences. This age distribution does not, however, reflect that of the Finnish population, see Figure 1a. Based on this data we can't deduct we have reached new audiences.

Most viewers (81%) regarded themselves at least moderately familiar with ballet as an art form (Figure 2a). For further analysis, we grouped the respondents based on their self-assessed familiarity with ballet (on Likert scale from 1 to 10) into three groups: (1) very familiar (grade 8 to 10, 55% of respondents) with ballet, (2) moderately familiar (grade 5 to 7, 26% of respondents), and (3) not very familiar (grade 0 to 4, 19% of respondents).

All respondents but two are from Europe or the Nordic (Figure 2b). Practically all respondents are culturally of Finnish origin, as 62 out of total of 69 answers were given in Finnish, even though they might have indicated their area of residence Europe rather than Nordic. Thus, we are not able to evaluate the effect of the cultural background on the experiences, as was our original idea.

[10] https://zenodo.org/records/20815545

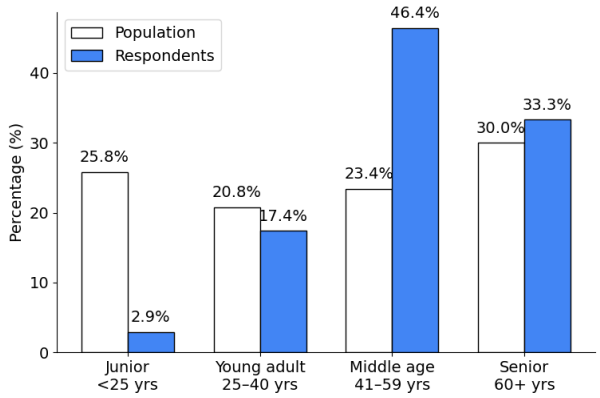
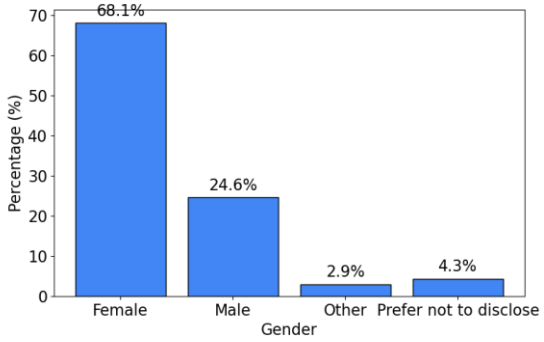
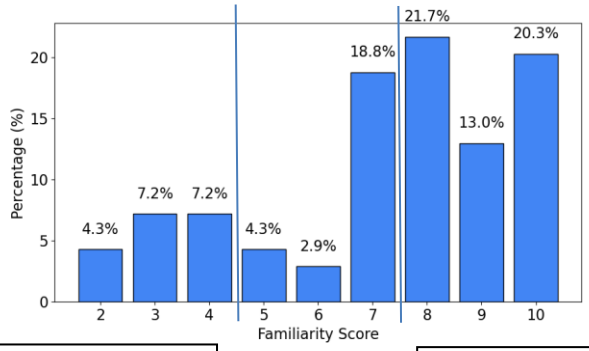


Figure 1. (a) Age distribution of respondents cf. that of the population



(b) Gender distribution of respondents.

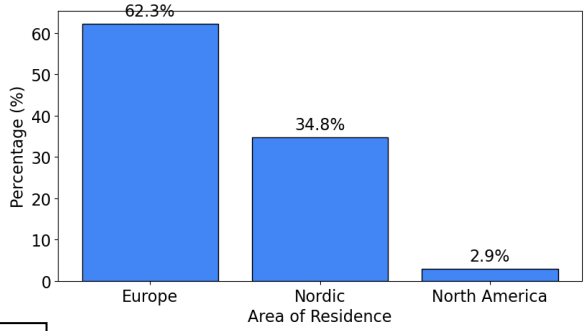


Not very familiar 19 %

Very familiar 55 %

Moderately familiar 26 %

Figure 2. (a) Distribution of respondents per familiarity with ballet.



(b) area of residence.

Results

The relative distributions of how spectators answered to the questionnaire are depicted in Figure 3.

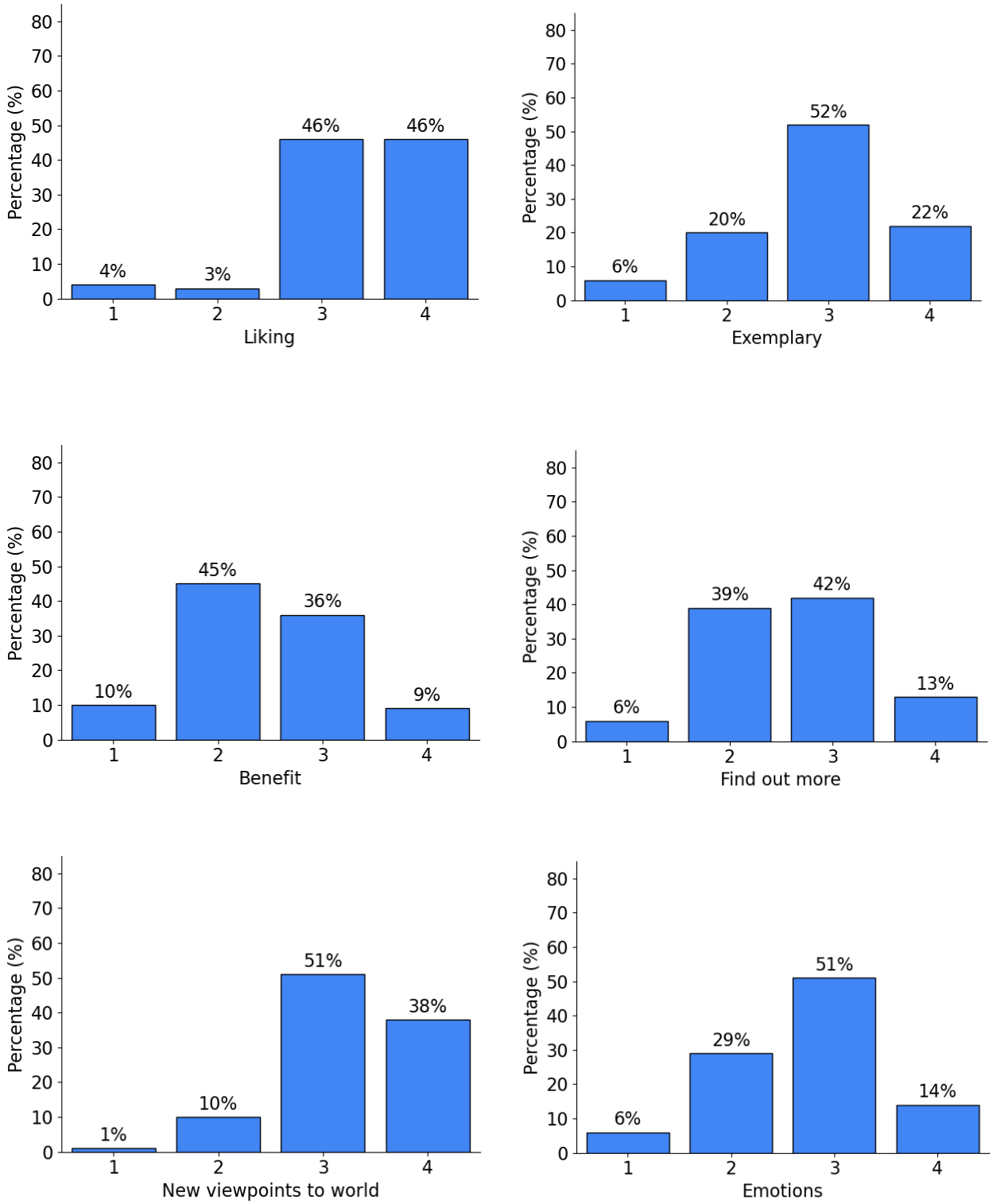


Figure 3. Relative distribution of all answers to questionnaire (over).

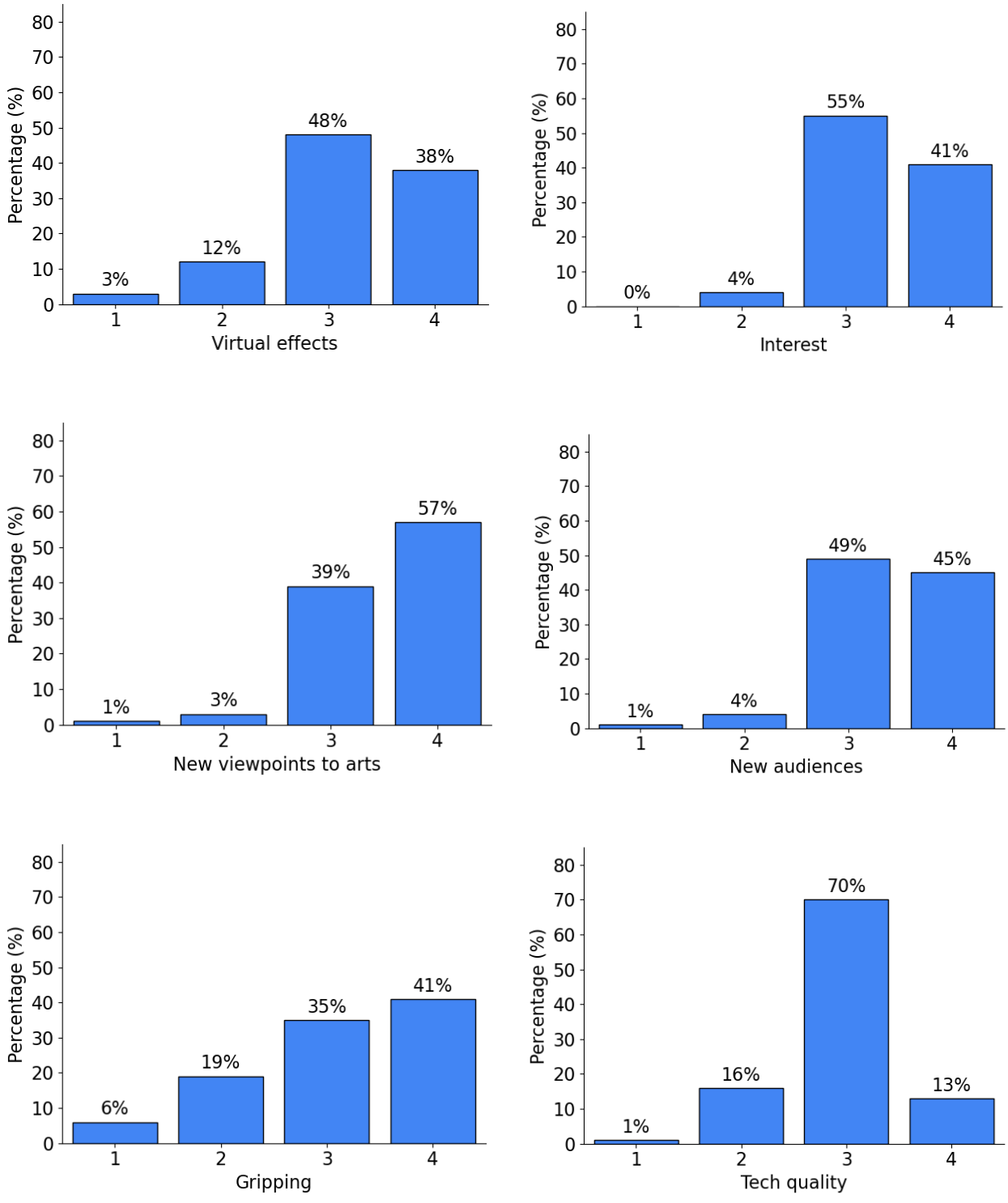


Figure 3. (cont.) Relative distribution of all answers to questionnaire (over).

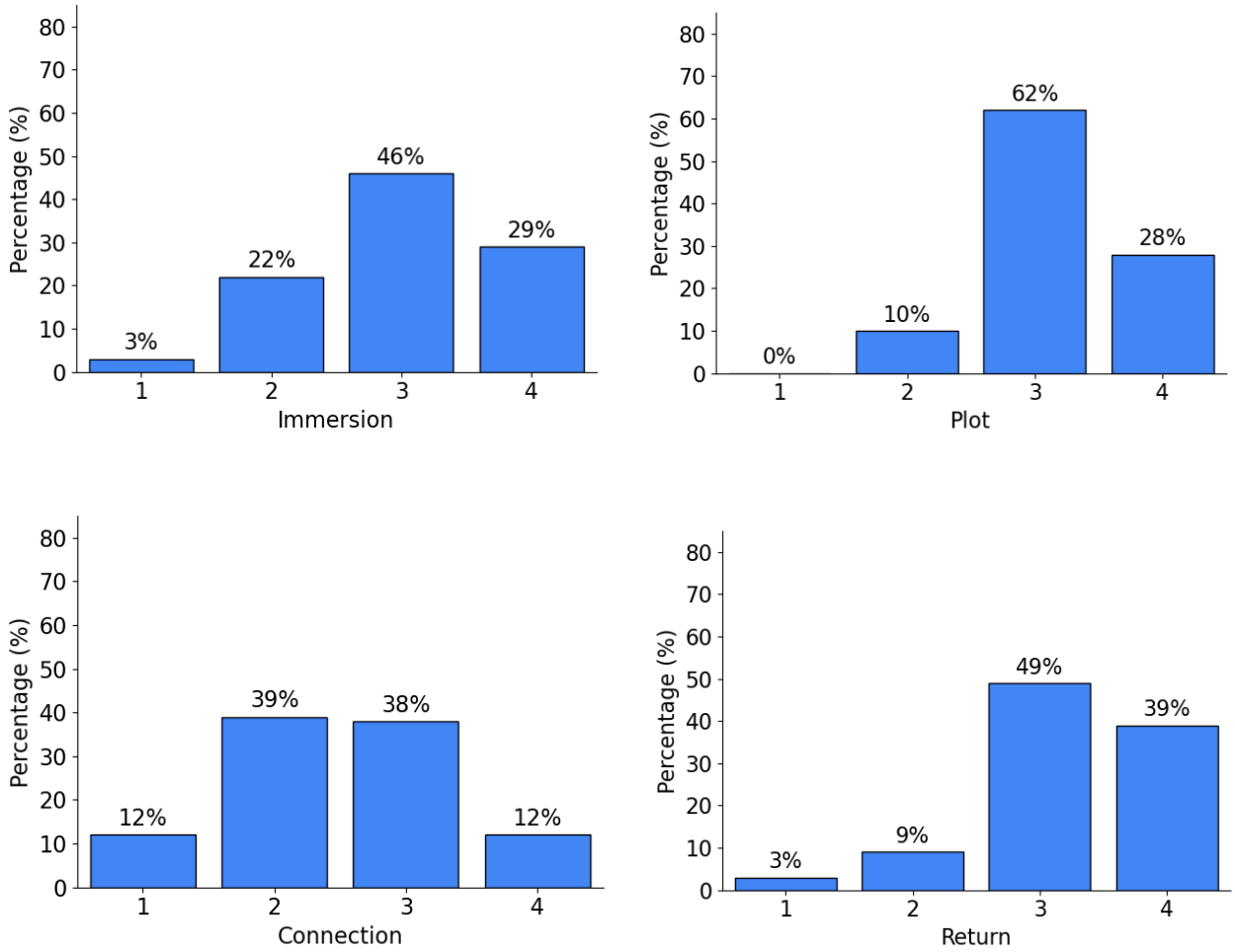


Figure 3 (cont.) Relative distribution of all answers to questionnaire.

Boxplots of all answers per question are presented in Figure 4.

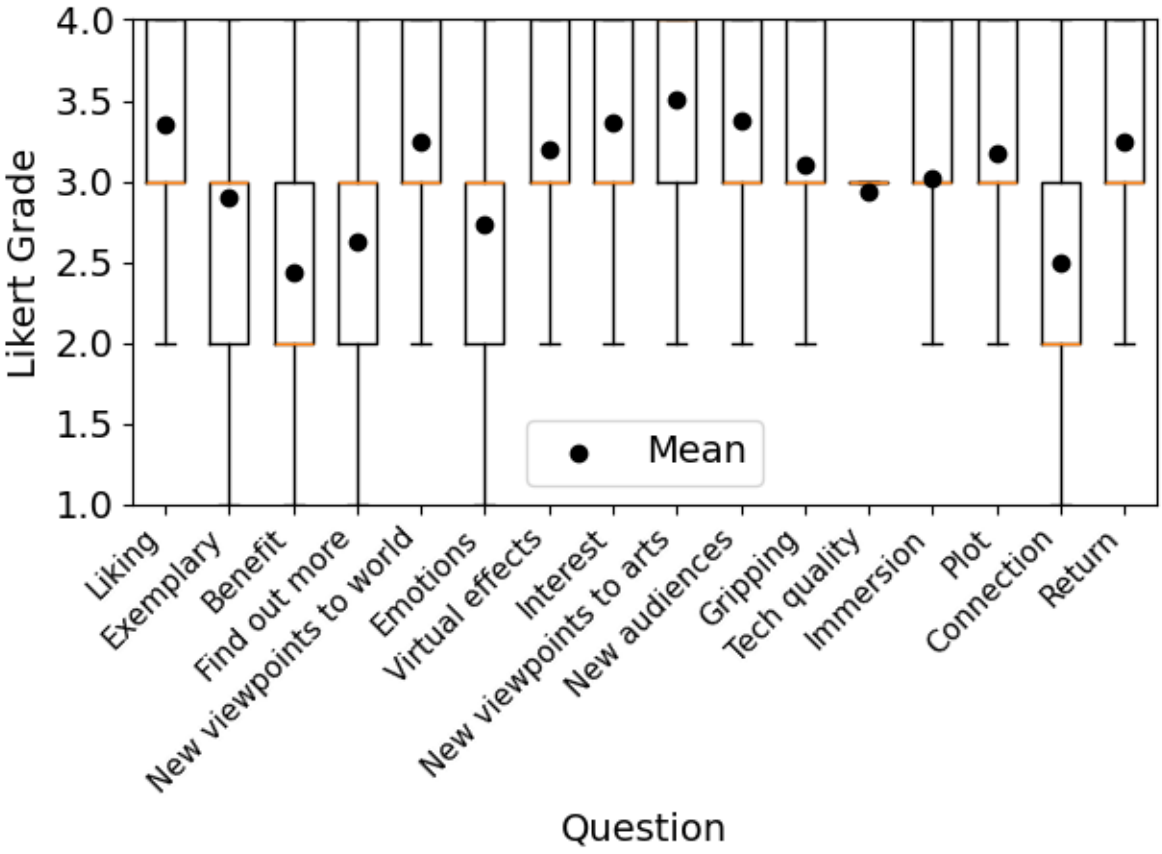


Figure 4. Boxplots of all answers per question, 16 questions: 4 – Strongly agree, 3 – Agree, 2 – Disagree, 1 – Strongly disagree. Each boxplot represents the spread of ratings for a questionnaire item across 69 respondents. The box edges show the 25th–75th percentile range, and the whiskers extend to the most extreme non-outlier values.

The correlations of answers to different questions are shown as a heatmap in Figure 5.

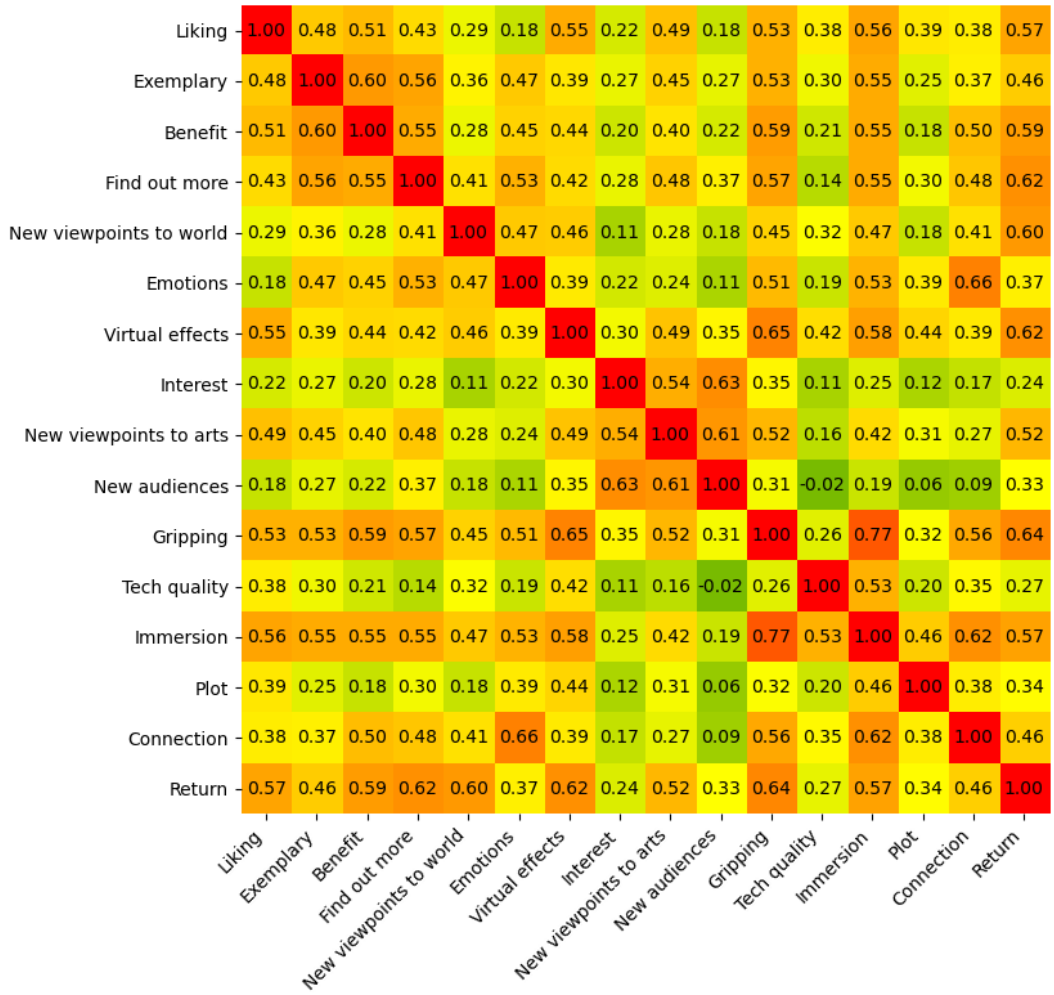


Figure 5. Heatmap of correlations to the 16 questions.

Discussion

The average of all respondents to each of the 16 statements shown in Figure 3 shows lowest agreement with statement 3 “I got more out of the performance than usual” [**Benefit**] and statement 15 “I felt a sense of connection with the performers during the performance” [**Connection**]. The average for those two statements (2.5) indicates neither agreement nor disagreement. Also, the performance did not seem to arouse strong emotions in viewers (statement 6 [**Emotions**]), nor make

viewers want to find out more about ballet (statement 4 [**Find out more**]). However, the response to statements related to the novelty of the performance received an average score between 3 and 4 (agree or strongly agree), statements 5 [**New viewpoints to world**] and 7-11 [**Virtual effects, Interest, New viewpoints to arts, New audiences** and **Gripping]**. The viewers felt the performance as immersive (statement 13 [**Immersion**]) and easy to follow (statement 14 [**Plot**]). Finally, most respondents agreed with statement 1 "I liked the performance" [**Liking**] and with statement 16 "I would attend similar performance in the future" [**Return**].

In general, viewers who regarded themselves not very familiar (1 to 4 on scale 1 to 10) with ballet, enjoyed the performance more than viewers who regarded themselves moderately (5 to 7) or very familiar (8 to 10) with ballet. In particular, the difference between the average of the three groups is prominent for answers to question 3 "I got more out of the performance than usual" [**Benefit**] (Figure 6). It has to be noted that the low number of responses, in particular among viewers not familiar with ballet, limits the validity of this conclusion. In any case, this seems to support our original idea of offering new kind of artistic experiences for new audiences.

For all viewers, regardless their experience in ballet, the performance does not seem to elicit strong emotions in them (question 6 [**Emotions**], Figure 6). Neither do they feel a sense of connection with the performers during the performance (question 15 [**Connection**], Figure 6). It is possible that viewing the performance on a flatscreen (laptop or mobile device) reduces these impacts. We did not ask the viewers the kind of equipment they were using, but as one of the viewers noted in open response, an immersive experience of the performance in VR would increase its impact.

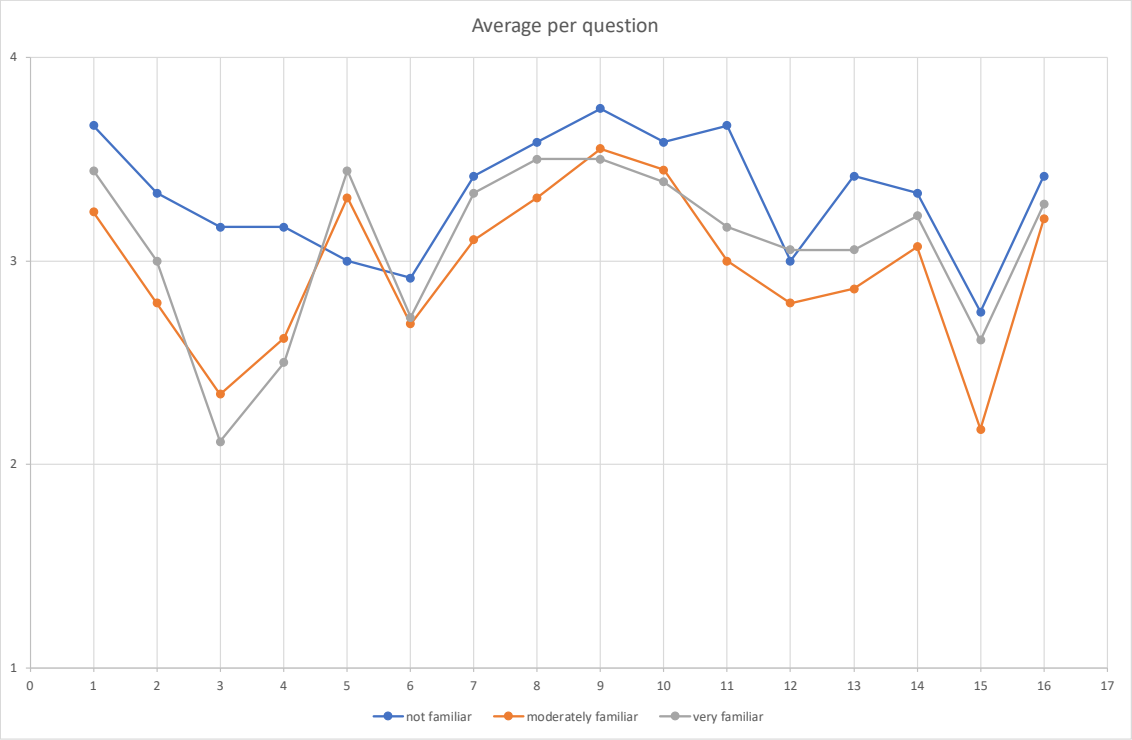


Figure 6. Average of all answers per question, grouped into three groups based on the respondent's familiarity with ballet: 16 questions: 4 – Strongly agree, 3 – Agree, 2 – Disagree, 1 – Strongly disagree.

Based on correlations higher than 0.5 between answers to different statements (Figure 5), it is possible that viewers liked the performance (statement 1 [**Liking**]), because they considered it **Gripping** (statement 11) and because they liked the **Virtual effects** (statement 7). Further, they were immersed in following the performance (statement 13 [**Immersion**]) and would attend a similar performance in the future (statement 16 [**Return**]).

Further, the heatmap of correlations shows that answers to several statements are highly correlated, indicating that the number of questions could be reduced without compromising the richness of the data. E.g., answers to statement 9 [**New viewpoints to arts]** are highly correlated (>0.5) with answers to statements 8 (The performance could [**interest]** people from different backgrounds, 10 (The performance could attract [N**ew audiences])**, 11 (The experience was gripping from start to finish [**Gripping**]) and 16 (I would attend similar performance in the future

[**Return**]). A principal component analysis would help in planning questionnaires of audience experience in the future, e.g. the one done using a more comprehensive data from *Measuring audience experience across 20 showings of the same theatre performance using customer feedback kiosks and a questionnaire* by Sams et al. [11]

Limitations of the study

The main limitation of this case study is the limited amount of data from audience that answered the survey. Thus, we cannot make conclusions in reception between different groups of people. Furthermore, the sample may well have been selective rather than completely random, as the link to performance and subsequent survey published in our website were promoted by word-of-mouth and targeted e-mail lists.

Watching recorded media does not produce feelings of connection with the performers as much as is the case when the audience is watching a live performance. In a live situation the members of the audience interact not only with the performers, but also between themselves, leading to shared (collective) experiences, which we were not able to study in this case.

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[11] https://osf.io/preprints/psyarxiv/mwsxc_v1