

## Experiments in real-time hybrid performance

Innovating in the capture of  
facial expressions for  
live hybrid performances  
for the metaverse

### MetaMirror R&D Case Study

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Creative producer: Piotr Nierobisz, MunchingSquare

Audience  
research

**"I want to see live gigs. This form of media leaves us all able to see great performances from home even if we were in lockdown again.**

**There is no better feeling than being in a venue seeing a talented performer's art and the absolute thrill of being around other like-minded people who also came to see a great show."**

- male remote attendee, survey feedback

**StoryFutures** /ACADEMY/

National Centre for Immersive Storytelling

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This project has received funding from:

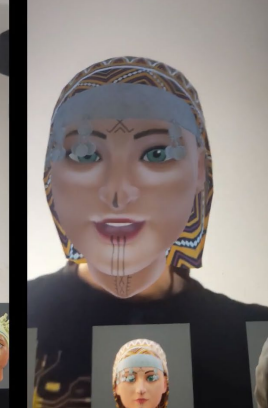
AHRC-UKRI Creative Industries Clusters Programme. Grant Ref: AH/S002758/1

AHRC-UKRI Audiences of the Future Programme. Grant Reference AH/S003622/1

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# Introduction

Increasing numbers of people are seeking to attend concerts in virtual spaces. Several high-profile virtual concerts have captured the public imagination since 2019, and the isolation during the COVID lockdowns also increased interest in the ability to access live performance from home. With PwC projecting UK live music sector revenues to recover fully from the COVID crash and surpass pre-COVID annual revenues by 2024, they also anticipate that innovations in live digital concerts will be additive to revenues as new consumers are drawn into the market (PwC, 2021). Increasing adoption of live virtual concerts will be one factor contributing to overall growth in the live music industry, with projected 2024 global revenues at nearly USD\$30bn (PwC, 2023). In fact, a 2023 study has demonstrated that 10% of the UK population has already attended a virtual music event, and that although people are glad to be back at live music venues, they are more interested in virtual events than ever (Whittaker and Wagner, forthcoming).

## What is a hybrid performance?

A hybrid performance is one that takes place live in a real venue with an audience present in person, and at the same time an audience gathers in a virtual environment where a virtual version of the event is simultaneously taking place. The artist may be represented in the virtual space by an avatar, an animated 3D representation of their body. This figure needs to be brought to life via motion capture or some other form of digital twinning, such as the Gorillaz's digital puppetry.

## What is MetaMirror?

MetaMirror is a technical framework created by Piotr Nierobisz at the creative technology studio, MunchingSquare, which was implemented through a collaborative research project in late 2022. The MetaMirror tool improves artists' ability to communicate nonverbally to in-person and virtual audiences. MetaMirror projects a performer's real-time facial expression on to an avatar in the virtual space, delivering improvements over flat 2D video representations or expressionless avatar figures moving in the space.

The MetaMirror prototype is an experiment in allowing artists to perform in two spaces at once – a live performance venue and a virtual performance venue, accessed via Quest 2 headset or browser.

## Why now?

High-profile virtual concerts in game environments, by artists such as Travis Scott and Lil Nas X, have claimed to draw audiences of millions. While these events have been spectacular, they have been prohibitively expensive to create and have required partnerships between well-funded artists, backed by management teams and industry capital, and successful virtual world platforms, such as Fortnite or Minecraft. These concerts have also typically involved animated or abstracted representations of the performer, and in some cases were not truly 'live' as they have involved 360-degree video of prerecorded performances imported into game environments for the 'live event'.

Hybrid events have been unattainable for small-scale events and independent artists, due to the cost, expertise and personnel required. The goals of the MetaMirror project were to show that it was possible to use affordable consumer-level technology to bring artists and audiences together in virtual spaces, to innovate in the ability to convey facial expression in digital spaces, and to find out what the audiences and artists thought about this type of event.

The project thus had a dual focus:

- Technological systems that make a hybrid concert with improved facial expressions possible;
- Cultural experiences of artists and audiences, and the value they found in the hybrid event.

## About this report

This report presents the research conducted with the performers and audiences of the MetaMirror concert by Dr Laryssa Whittaker, StoryFutures Senior Audience Researcher.

For further information on more technical aspects of the project, please see the following videos, produced by MunchingSquare:

- <https://bit.ly/metamirrorcreative>
- <https://bit.ly/metamirrorbrief>

# Research project at a glance

## The technical challenge:

- Facial expression is an essential communicative and emotive element of musical performance
- Live virtual music events tend to use either 2D video stream (lacks feeling of presence in the venue) or use motion capture that focuses on the limbs of avatars (affordable but missing facial expression)
- More sophisticated face-capture has until now required more expensive, specialised equipment and setup



## Possible technology solutions:

- The LiDAR scanning technology available since the 2021 iPad Pro and the iPhone 12 Pro offer motion tracking capacity without need of expensive, complicated mocap equipment

## Technical research challenge:

- Develop a technical framework to capture performers' facial expression in real time, to be streamed and rendered virtually on to custom performer avatars

## Research questions - artists:

- What does this type of hybrid event offer performers creatively?
- Does hybrid performance facilitate greater reciprocity between the artist and a virtual audience than a live YouTube stream?

## Research questions – audiences:

- What do audiences value in a live hybrid performance?
- How is the virtual performer's avatar-based facial expression perceived?

## Project partners:

- **Piotr Nierobisz** is the director of Munchingsquare LTD and founder of VJLondon.com, a community of VJs, live video artists, projectionists, creative coders, musicians and audiovisual performers.
- **Laryssa Whittaker** is a Senior Audience Researcher at StoryFutures. She has a PhD in ethnomusicology, and as part of her StoryFutures research on immersive audiences, she has explored the kinds of immersive musical experiences VR headset owners seek and consume.

## Funding programme:

This project was funded by StoryFutures Academy through an Early Career Researcher R&D Bootcamp, which brought together academics with SMEs interested in embedding research practice in their immersive productions.

Through the Bootcamp's structured networking and idea generating process, Piotr and Laryssa joined forces with their mutual interest in music to develop the concept for this prototype.

# The MetaMirror event

Live at IKLECTIK, London, 1 November 2022

## Defining the challenge:

The project aimed to address some key shortcomings in virtual music experiences that we had identified in our prior work.

Laryssa's earlier research had uncovered an appetite for live virtual performances:

- people using VR headsets in their homes wanted a way to access live performance versus recordings;
- they were mainly uninterested in 2D video livestreams in virtual spaces because these didn't take advantage of the spatial and creative potential of VR;
- they wanted to be able to have live music experiences with others in the audience - to be able to make it a social experience.

Piotr noted that while it was theoretically presently possible for an avatar to perform virtually:

- artists lack meaningful ways to visually transmit the emotionality of their performance via facial expression into a real-time virtual performance without expensive motion capture technology;
- discoverability of events and access to virtual platforms was a real stumbling block – often requiring a lot of complicated sign-up, avatar creation and setup.

We worked from July 2022 to create an event that addressed these shortfalls, leading to the 1st November 2022 concert.

## Partner roles:

### *Piotr Nierobisz*

- Worked with the management of IKLECTIK to create a 360 volumetric scan of the concert venue to render an identically-proportioned virtual space, hosted in Mozilla Hubs
- Led a creative team to develop three custom avatars for each performer
- Developed programming pipeline to capture performers' faces and translate into the avatars in Mozilla Hubs
- Invited artists from his professional network who were enthusiastic about the experiment
- Produced and staffed the live event
- Reported on the technical aspects of the project

### *Laryssa Whittaker*

- Developed research framework for gathering data from audience members
- Coordinated audience sign-up for the event and communicated with in-person and remote audience members about attendance and access
- Interviewed performers before and after the concert about their artistic practice, the process of preparing for this performance and the MetaMirror experience
- Analysed survey responses (27 pre- and post-event survey responses)
- Conducted post-event focus groups (including remote and in-person attendees) (11 participants)

## 1st November 2022



The MetaMirror concert is held at the IKLECTIK Art Lab, a nonprofit independent creative space in central London.



## ~40

in-person attendees

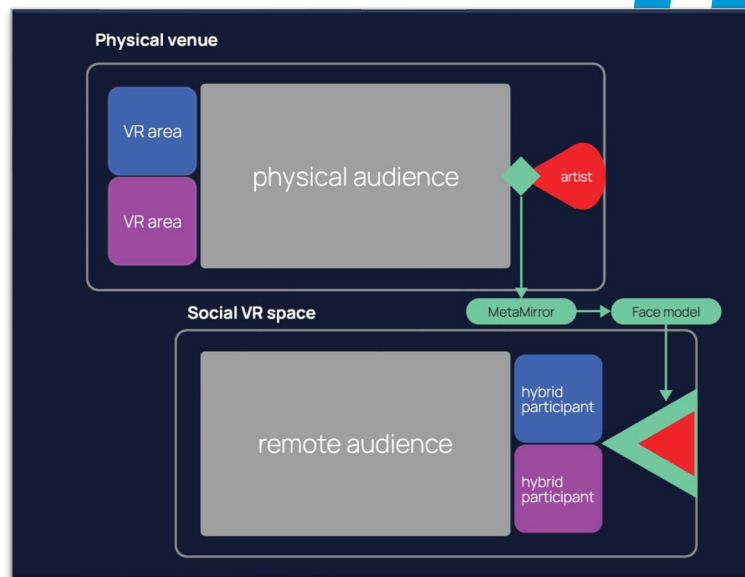


## ~50

remote attendees from across the UK



# Hybrid event spaces



MetaMirror event space arrangement

## In person at IKLECTIK

The performance space at IKLECTIK was set up traditionally, with the performers in front of a seated audience. In front of the artist, alongside the microphone, was an iPad on a stand at face level. Audience members were encouraged to adjust their seating position so that the iPad would not obscure the view of the artist. At the back of the venue were two seats with VR headsets so that audience members could go explore the virtual space. The volume on the headsets was turned down as the lag between the venue and the live space would have created an unpleasant clash. The microphone was also muted, to prevent live sound from the venue entering the virtual space via any means other than the sound system. A video feed of the avatar onto a screen behind the performer showed the superimposed avatar over the live video.



## Remotely in the social VR space

The physical environment replicated the dimensions of IKLECTIK but reproduced them in an abstract simplified version to minimise strain on bandwidth. Remote audience members could move around within that space, and could see the avatar as a larger-than-lifesized face hovering over the stage. Behind the avatar they could see the video feed of the live stage, including the avatar superimposed on the body of the performer in the real space. They were unable to see any members of the live audience.



# Artists

Through the VJLondon networks, three diverse artists were invited to feature in the hybrid concert:

- Bellatrix (beatbox, double bass, bass guitar, vocals)
- Miss Yankey (spoken word)
- Bunty (vocals and vocal looping)

The performers reflected on their artistic practice and careers in a pre-concert interview, and on the experience of performing in a hybrid concert with the MetaMirror technology afterwards.

## ARTIST CHARACTERISTICS

There were several notable common characteristics between the artists who agreed to participate, which suggest a certain profile of performer that may be open to this type of performance model:

### Portfolio careers, multidisciplinary, and experimentation

Each of the artists had diverse streams of work and forms of artistic expression.

- Bellatrix became a professional beatboxer while undertaking classical training at Guildhall; their career has subsequently encompassed both production and performance.
- Miss Yankey divides her time mainly between writing commissions and commercial work, poetry performance and competitions, and activism.
- Bunty is a vocal looping pioneer and improviser whose music career has encompassed many genres of vocal performance, including dub reggae, art folk & EDM. She is also creative director of The Rose Hill art centre/studio/label.

All three artists had previously taken part in various livestream experiments and saw MetaMirror as a potential model for another form of artistic work. They have strong experimental track records and engage in a playful improvisatory practice.

### Collaborative track records

All three artists spoke about the prioritisation of collaboration in their careers. They cited numerous examples of previous collaboration with diverse collaborators, from other performing artists to technology collaborators.

### Multiple identities

The artistic practice and personal experience of all performers featured a significant consideration of identity. This included:

- experiences of their own shifts in identity
- feeling as if they had multiple concurrent identities
- identities that they experienced more intensely at some times than others
- identities with which they didn't necessarily identify, but wished to try on.

This concert format seemed to appeal to a large degree because the avatars provided an important vehicle for exploring these issues and fuelling their creative expression.



Bellatrix



Miss Yankey



Bunty

## Commitment to diverse leadership

All three artists embraced and deeply valued the fact that this was a female and non-binary only lineup; they expressed appreciation about working with a female researcher and noted the exceptionally capable female sound tech at the venue. All three seek to carve out spaces in the industry for those not traditionally thriving there. It was significant to them that this experiment was not dominated by men, but that the MunchingSquare team's innovation facilitated an event that could be fronted and led creatively by women and non-binary people.

They saw this as an opportunity to shape practices that might otherwise crystallise without concern for their perspectives or the perspectives of a diverse audience, and it was important to them that as women/non-binary musicians they were seen as leaders in experimental practice.

While all three embraced the MetaMirror format and found it a fruitful venture, their approaches were considered and grounded in a cautious optimism about the technology.

**"We're here at the beginning of these technologies and we can help shape what that looks like and what it gets used for – because it is going to get used and it is going to get shaped and it feels really important that we be part of that conversation."**

- Bunty, in post-concert interview with Bellatrix and Laryssa, 7<sup>th</sup> Nov 2022

## WHAT DOES THIS TYPE OF HYBRID EVENT OFFER PERFORMERS CREATIVELY?

### Expressing themselves digitally: Identity

The primary appeal of the MetaMirror concert format to the artists was being able to translate themselves into digital beings. This had representational potential directly connected to their ability to tell the stories they wanted to tell – to bring these to life visually as well as audibly.

## Gender identity

As a nonbinary artist, Bellatrix valued the opportunity to experiment with identity through their three avatars. Bellatrix saw the first avatar as the most similar to a female identity, rendered faithfully from an old photograph, a sort of past self with whom they no longer strongly identify. The second avatar, with prominent eyebrows and facial hair, was inspired by an image of themselves in drag that they had submitted to MunchingSquare's designer; before the concert, Bellatrix was very excited about the possibility of embodying the more masculine-presenting avatar, as an extension of the personal exploration of gender and identity in which they had engaged over recent years.



In performance, Bellatrix intentionally paired the final avatar, a hairless alien with mottled skin based on images of mushrooms, with a stripped-back rendition of "Wild is the Wind," accompanied only by double-bass. The alien acted as a juxtaposition to the arrangement, which felt to Bellatrix "like the most human or earthy" track, with no other technology or beatboxing.

The visual rendering of the artist became a creative thematic exploration as well as an expression of self-identity, an opportunity to experience gender euphoria or even abandon gender altogether. Wanting to use clips for their social media, it was important to Bellatrix that they identified (at least some of the time) with the avatars.

**"It feels quite exciting... to be a part of something that can exist within that space, and to be me... And I guess in the future to be able to bring myself and bring my work into that space."**

- Bellatrix, pre-concert interview, 26<sup>th</sup> October 2022





## Identity play

For Bunty, the avatars were an opportunity to play with identity, to inhabit other personalities. This was linked to her desire to avoid being creatively pigeonholed, a reaction to a university education that tried to steer her into a particular niche: "I've always tried to combat that because I really think that we don't have one voice." The three avatars, then, represented for her an opportunity to creatively project three different voices, and she had hoped to embody them in different ways, to feel lost and transformed into their identities and find a new perspective from which to improvise.

She thought of them more like creatures or characters than necessarily expressions of her own identity, although that possibility was also present; the avatar creation process, she reflected, could afford enormous amounts of creative expression, and the relationship between the graphic designer and the artist would be a rich area for research.

**"There are so many questions like, do we want to be who we are in real life? Is this virtual space an opportunity to be whatever you want? ...like, you don't even have to be human. If you don't want to be like sexualised, for instance, you can just not be sexualised."**

- Bunty, pre-concert interview,  
25<sup>th</sup> October 2022

Bunty also described ways that the technology might be used with further development, such as to produce visual effects such as lights shooting out her mouth or eyes disappearing into black holes. She talked about developing a language, or a sort of 'choreography' of facial expressions that could be picked up by the iPad software and translated into a "palette" of effects.

A waning iPad battery on the evening hindered Bunty's opportunity to "lose herself" in the avatars as she wished. However, her playfulness intrigued the audience: disrupting the iPad tracking deliberately with her finger to make the avatar flicker produced a comic effect that made the live audience laugh.



## Cultural and ethnic identity

Miss Yankey was delighted with her avatars, which reflected both her Ghanaian roots and her Afrofuturist projections, and she found the process of creating them quick, "really quite wonderful" and "seamless". She acknowledged that it seemed like the avatar may have initially been based on a Caucasian model, but when she fed back to the designer about skin tone and facial features, this was quickly rectified.

The second avatar featured a symbol from her Adinkra culture, the spider – a storyteller, word weaver, and creator – which she identifies as her "spirit animal." Her third avatar was an Afrofuturist one that entirely fulfilled her vision and allowed her to embody it. This fulfilled a long-held desire to have a "moving and speaking" avatar that expressed "a version of me that has already been created in a text and verbally" so closely that it allowed her to step into that skin.

Miss Yankey had perhaps the clearest rendering of motion capture, as her performance practice permits her to stand at a microphone rather than hold one up to her mouth. After some initial "glitches" with the tracking, she was able to settle into her performance: "By the time I got to the final poem and there were pretty much either there were no glitches or I'd got to the point where I was over it, so I wasn't worried about the glitches. At that point, it was a fully immersive experience for me as an artist. I might as well have been in a, physically inside a virtual body" (post-concert interview).

**"...The futuristic one... I love her. Like, I really do. And it's just that particular avatar that suddenly I 'became'... My friend messaged me -- I put up a post, bits of video from it -- and she said, 'That is YOU!' And I said, 'I know! When I'm talking about being this multi-dimensional time travelling being, that's literally how I envisage her.'"**

- Miss Yankey, post-concert interview,  
2<sup>nd</sup> December 2022

## DOES HYBRID PERFORMANCE FACILITATE GREATER RECIPROCITY BETWEEN THE ARTIST AND A VIRTUAL AUDIENCE THAN A LIVE YOUTUBE STREAM?



### Reaching remote audiences: Engagement

The artists were curious about how audiences would perceive their personas and performances. Afterwards, all three reported feeling somewhat uncertain about the audience experience. This was due to the combined effect of a disrupted level of focus (more below) and inability to receive feedback from the remote audience.

For Bellatrix, performing is communication and connection, and includes stories and copresence to produce a shared space. The MetaMirror format offered a step toward creating virtual performances that “really bring the vulnerability and the, the like soul moving, touching stuff that can happen in the room, which can happen online” (pre-concert interview). However, it also presented a potential challenge of trying to curate and inhabit two spaces, creating a somewhat split consciousness (more below).

Miss Yankey felt the engagement of the remote audience would hinge upon the avatar’s ability to convey emotion: “If you guys can successfully match facial expression, then I think it’s going to bring the emotion of performance into the virtual space in a way that I don’t think exists at the moment” (pre-concert interview). Her prior livestreams had left her unconvinced that the audience was having a fully satisfying experience. She reflected on the energy derived from feedback from a live audience, and wondered about the effect of its absence.

Bunty saw multiple possibilities, but the one that she was most able to explore was playing toward the on-location audience, imagination fuelled by her view of her avatar, which was her surrogate to the virtual audience. She noted that the avatar projection also enlivened the live venue, making the audience ‘tune in’ to the performer due to mirroring and exaggerating movements.

The projection permitted Miss Yankey to experience this division of labour between herself and the avatar as well. She was conscious that at times she was looking at the iPad to gauge her performance rather than at the audience; thus eye contact was delivered by the avatar to both in-person and remote audiences.

### Performative challenges of MetaMirror format:

- Running up against the capacity of a performer’s attention:
  - another level of technological interaction layered over the performance
  - simultaneously noticing the response of the in-person audience – less attention available for the live feedback
  - trying to ‘check in’ with the virtual audience
- Worry about ‘neglecting’ one of the audiences

### Performative opportunities of MetaMirror format:

- Creating a sense of shared space through evocative storytelling and communication
- Infusing a virtual space with emotion
- Enlivening an already live space
- A division of labour between artist and avatar
  - Allowing the avatar to look at/play to the audience while the performer’s attention is elsewhere

## Projecting into a digital environment: Inhabiting a virtual space

The performers agreed that they felt they had only partially inhabited the virtual space. The factor that had the greatest impact on successful presence within this space was the performers' own cognitive performative positions – their perceptions of how conscious or unconscious they normally were during performance, and how this should translate onto the MetaMirror format.

- Bellatrix and Bunty both spoke about their **performance technique**, particularly regarding their embodied muscle memory regarding the microphone position, normally held directly at or on the mouth. In the heat of performance, both experienced a lapse in consciousness that their mouth needed to be unobscured for the iPad to track their lip movements. Additional opportunity to rehearse in front of the iPad was needed, to **retrain themselves to hold the microphone lower** to improve tracking during performance.
- For all performers, the **view of their avatar** on the iPad was useful as a "check-in" (Bellatrix, post-concert interview) or as way to monitor their virtual appearance (Bunty, post-concert interview), and provided useful moments of embodiment; but it **simultaneously disrupted their normal practice**, challenging them to constantly remember what was essentially **an audience of one – the iPad camera**.
- Miss Yankey describes her usual cognitive position in performance as one of **artistic dissociation**. She thinks several lines ahead of the line she's delivering, giving herself over to the poetry: "Once I'm performing... mentally, I've left, I check out..." (post-concert interview). The MetaMirror concert did not feel like this, at least not in the beginning – **held to the here and now and the physical audience by the awareness of glitches**, Miss Yankey's sense of presence was not away with her thoughts and the stories in her poems, but rather in the performance space.

"[I briefly thought] if I look in the screen too much, I'm neglecting the audience that are here. But having the avatar behind me on the screen actually means, even if I'm not physically looking at the audience, the avatar is."

– Miss Yankey, post-concert interview,  
2nd December 2022

## Impact of the hybrid format on performance



### Changes to performance technique



### Performing to an audience of one – the iPad



### Feeling tethered by technology to the physical performance space



# Audiences

## AUDIENCE PROFILE

Audience participants were recruited via:

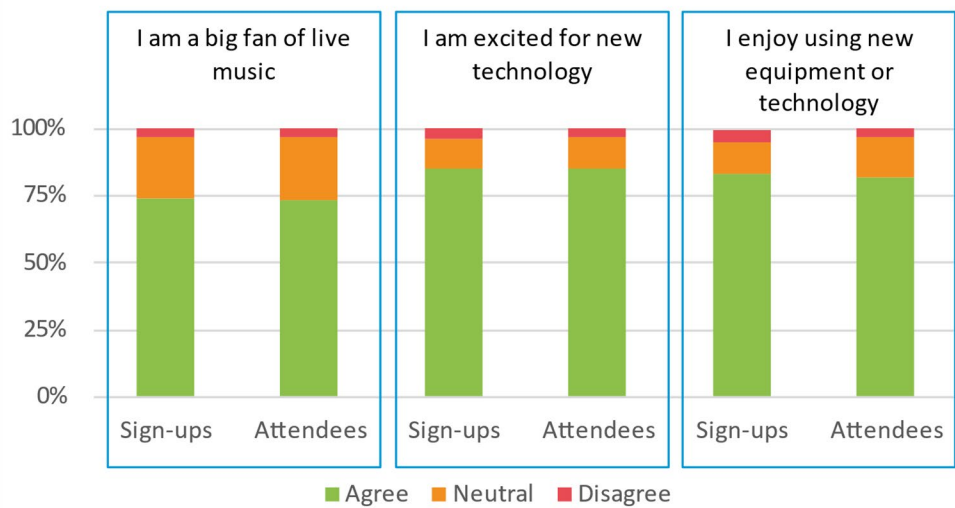
- VJ London’s social networks
- the [StoryFutures TestXR](#) panel, a platform for testing immersive technologies and experiences
- promotion by the artists on their social media channels.

Prospective attendees were asked to complete a sign-up form and a pre-concert survey, collecting basic demographic data. Those who attended were also asked to complete a follow-up survey.

There were 66 prospective audience members who completed the pre-concert survey; 34 on-location and remote audience members completed the post-concert survey.

Participants were asked about their attitudes toward music and technology, revealing that the event appealed to those with strong tendencies toward live music and technology adoption (Table 1).

Table 1. Attendee profile  
(sign-ups n=66; attendees n=34)



Participants were also asked to provide a profile of their musical background:

- whether they considered themselves to be amateur or professional musicians
- whether they had any previous music education, either formal or informal.

This was to check how broad the appeal of this type of event was, to determine whether it would draw mainly an 'insider' music industry audience or would appeal to music fans.

Roughly one-third of both sign-ups (21, Table 2a) and actual attendees (11, Table 2b) self-identified as musicians.

Table 2a. Music profile (sign-ups)  
(n=66)

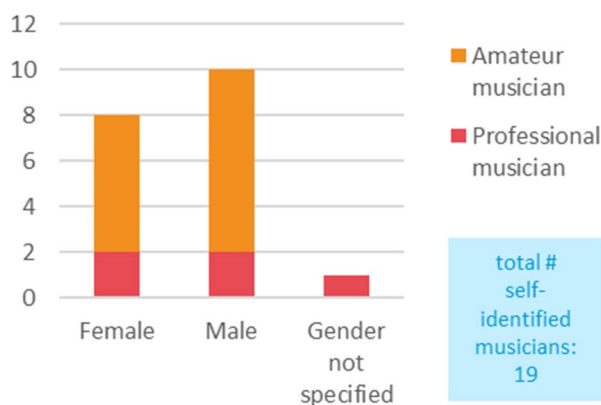


Table 2b. Music profile (attendees)  
(n=34)

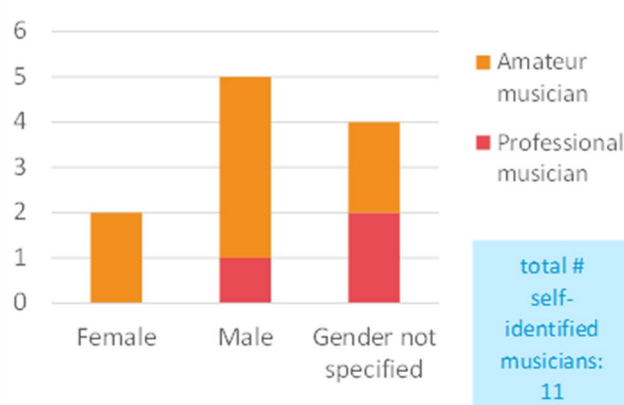


Table 3a. Musical background  
(sign-ups)  
(n=66)

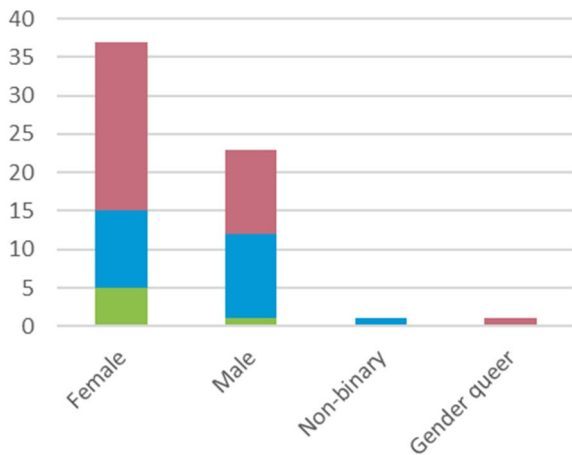
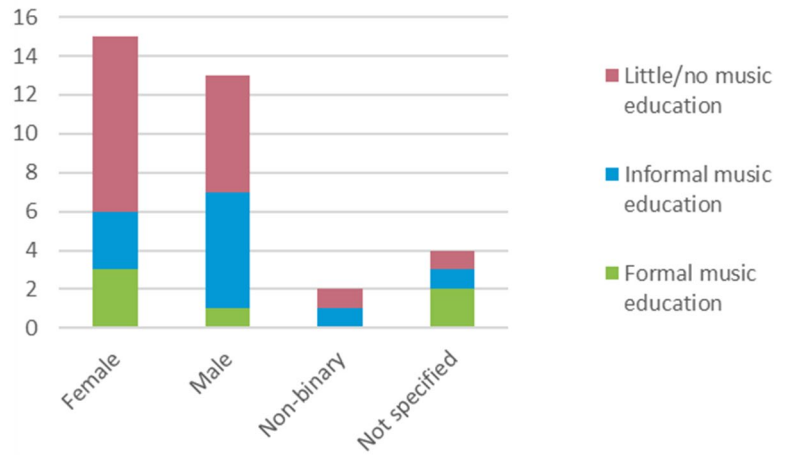


Table 3b. Musical background  
(attendees)  
(n=34)



In terms of training, approximately 44% of sign-ups (29, Table 3a) and 50% of attendees (17, Table 3b) reported some formal or informal musical training. These numbers suggest there was strong appeal to music industry insiders, but that the event also had appeal for non-musicians.

The ethnic diversity of attendees was greater than that of the overall UK population (Table 4).

The age distribution of attendees was similar to those who expressed interest, with a concentration of attendees aged 26-39, followed by the 49-54 age group. These demographics likely reflect, at least in part, our recruitment mechanisms.

Table 4. Ethnicity of participants as a proportion of all sign-ups (n=66) and attendees (n=34)

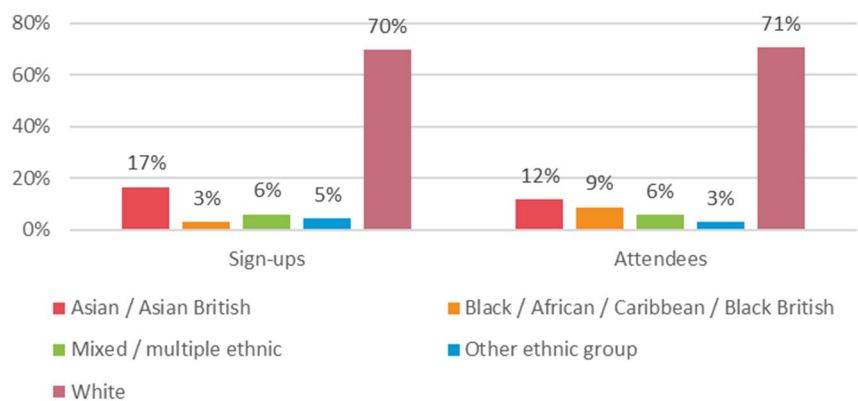


Table 5a. Age groups by gender  
(# sign-ups, n=66)

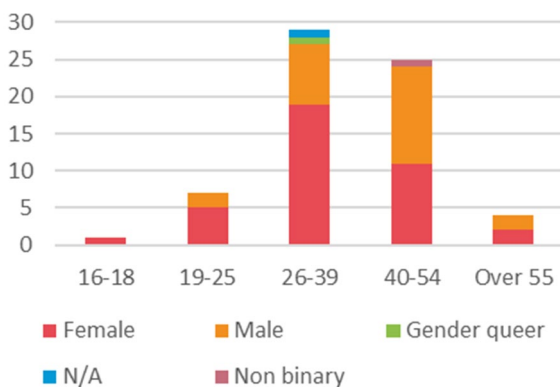
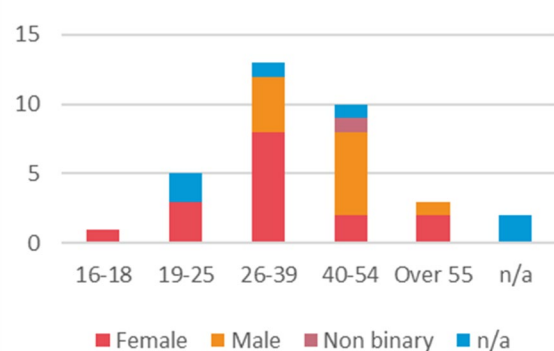


Table 5b. Age groups by gender  
(# attendees, n=34)



Attendees seemed to be drawn from a reasonably active concert-going demographic, with 51% reporting they attend a live concert or performance at minimum every other month (Table 6). This leaves 38% of attendees who infrequently or never attend live concerts, suggesting that this hybrid format may also appeal to those who would not normally attend live events.

Participants were also asked about their previous attendance of digital livestream events. Those who completed the pre-concert survey were also asked whether they had ever created their own live events on a virtual platform, and whether they felt part of a particular community on a virtual platform (Table 7).

Table 6. How often do you attend live concerts or performances? (attendees, n=34)

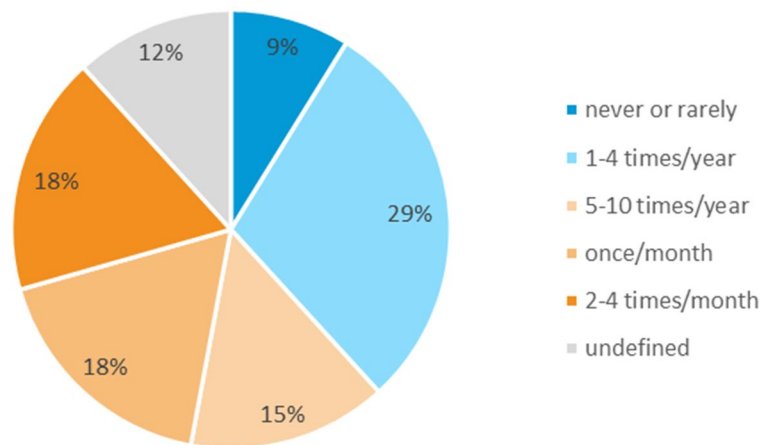
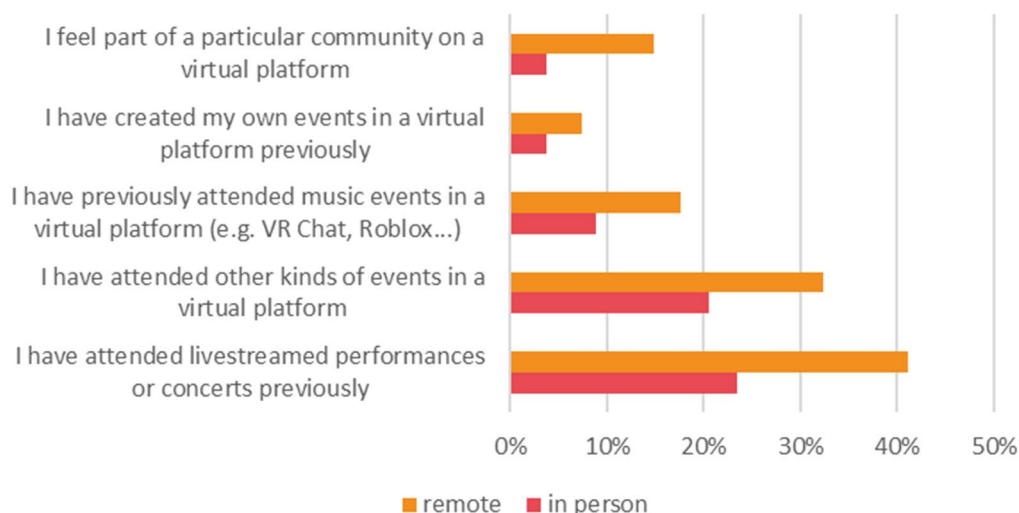


Table 7. Prior livestreaming participation



#### Audience expectations:

We also asked sign-ups what they understood by a "hybrid" event. Of 62 responses:

- 4 mentioned live performance, on-location and remote audiences, avatars and real-time streaming
- 5 said that they were familiar with or had previously experienced hybrid events without elaborating
- 13 did not speculate, simply said it was new and/or unknown
- 32 gave partial predictions, generally involving live and remote audiences and digital spaces; of these, 5 expected some kind of interaction, several expected that the remote feed would be a video feed, 1 expected some kind of 'holographic' effect and 1 expected the performance would actually be recorded

We asked in the pre-event survey whether they had any worries, doubts or concerns about the event:

40: no worries or concerns

6: concerns about the technology being adequately immersive

2: stability of their network

2: potential safeguarding /data issues

1: inadequate interaction

1: reticent about the musical styles

1: confused about the timings of the remote event

#### Technological doubts/concerns:

2: robustness of browser vs VR experience

2: couldn't imagine how a virtual avatar could convey "liveness"

2: VR might be tiring or heavy

1: becoming disoriented



Table 9. "To what extent do you agree with the statement: In the virtual world I had a sense of 'being there'?"

13

# WHAT DID IN-PERSON ATTENDEES VALUE?

## New forms of experience:

Several in-person respondents indicated they wanted:

- "To experience trippy visual effects"
- "To see my favourite DJs up close and experience trippy venues"
- "To feel the atmosphere and share the emotions with other audience members"
- "To see these artists and to experience new cutting-edge performances"

## More exploration of virtuality

There were a few comments suggesting that people at the live event expected to be transported to a space that was more distinct from the real event space, e.g.:

- "I thought that, by putting on the headset, I might be **transported to an outer space venue** or be viewing the avatar head from a desert scape. I would be interested to see the development of the VR surroundings."

Because the MetaMirror prototype focused on facial expression, several participants missed the body in the virtual space and **wanted to add body tracking**. Others noted that while some facial expression was conveyed, it could still be more nuanced: "A furrowed brow, a glaring eye... pursed lips... !"

In person audiences ranked novelty and interest highest, but were also positive about comfort and expressed feeling a sense of awe and captivation (table 11).

"I got quite attached to the avatars. When they disappeared, I realised I was quite attached to them and I wanted them to come back."

- female in-person attendee, focus group  
15<sup>th</sup> November 2022

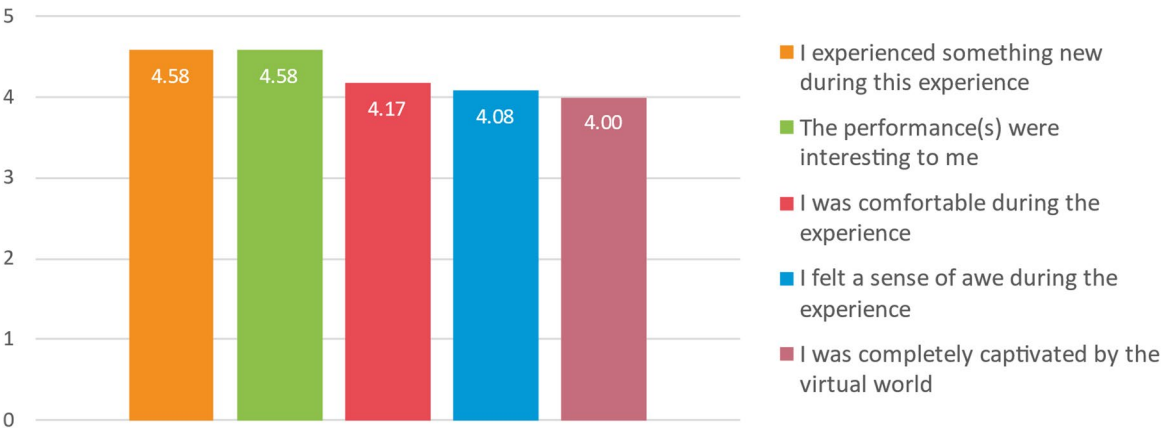
## Value proposition of a hybrid event

One person remarked that it was **nice to "dip in and out" of the VR headset** in the venue; she wasn't sure it would be as satisfying to be in VR for the entire duration. Another said that if he was joining virtually, he would not want other audience members to be able to talk over the performer; he would at least want the **ability to mute other attendees**. They felt that with a bit more "polish" and stability of the technology, they would consider paying £5 or more for a ticket to a virtual event; another felt that for a virtual event with very high production value and innovative performance, she would be willing to spend £50 on a ticket.

"One of the things I quite liked about going into the VR was that... it seemed like the virtual audience were kind of quite chatty and interacting with each other and... you could see them sort of sending messages and... kind of figuring out how to kind of break the system a bit. That was really fun."

- nonbinary in-person attendee,  
focus group 22<sup>nd</sup> November 2023

Table 11. "To what extent do you agree with each of the following statements about the virtual experience (in the VR headset or browser)?"  
(mean of ratings, in-person attendees, n=12)  
(1=fully disagree; 5=fully agree)

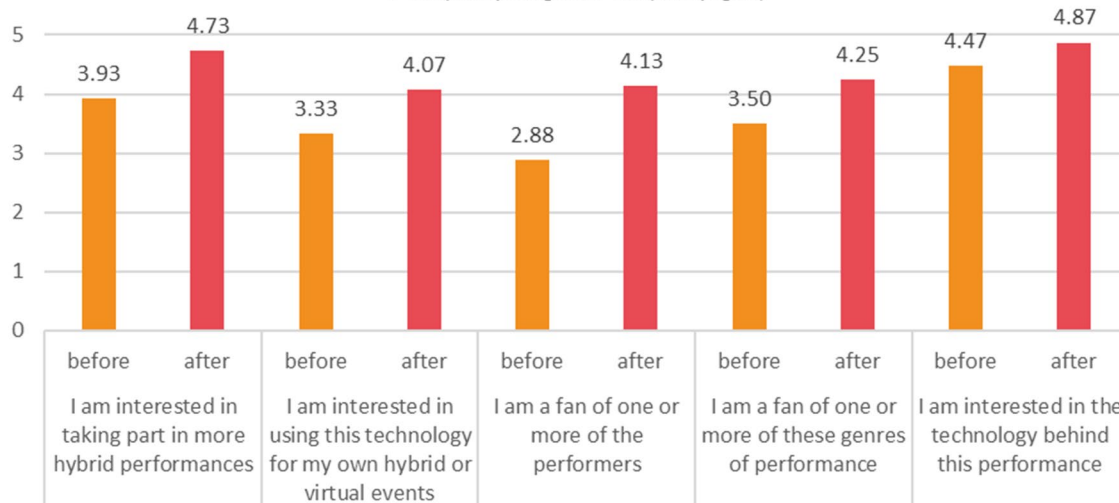


Participants responded to a set of questions before and after the experience to understand their reaction to the event. The MetaMirror concert experience has increased interest in each of these elements. Of particular note:

- a **25% increase in "fandom" of the artists**, suggesting that this type of concert format, at least for live participants, can successfully introduce artists to new audiences
- a **16% rise in interest in taking part in more hybrid performances** (with no individual responses ranking lower after the concert)

Table 12. "To what extent were the following statements true for you **before** and **after** the concert?"

(mean of ratings of in person attendees, n=15)  
1=completely disagree; 5=completely agree)



## Audience experience: Remote attendance

There were 19 survey responses from people who attended the event remotely, mainly by browser. Overall, some glitches in the technology on the day meant that the remote experience was somewhat less enjoyable for attendees, whose sense of presence indicators were mainly low.

**"We ended up drawing together our little avatars in the same spot, all stood in a little triangle talking to each other, and moving together to different places... Even though I was just seeing a duck nod their head, it made it feel like, okay, we're having a connection..."**

- female remote attendee, focus group  
16<sup>th</sup> November 2022

Table 12. "To what extent do you agree with the statement: In the virtual world I had a sense of 'being there'?"  
(remote attendance, n=19)  
(1=not at all; 5=very much)

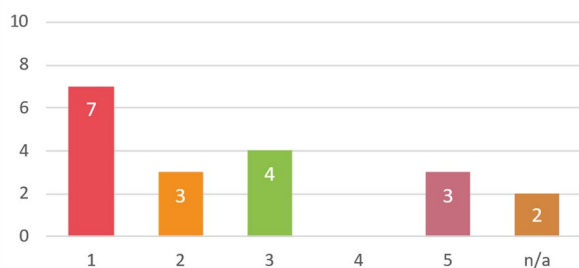
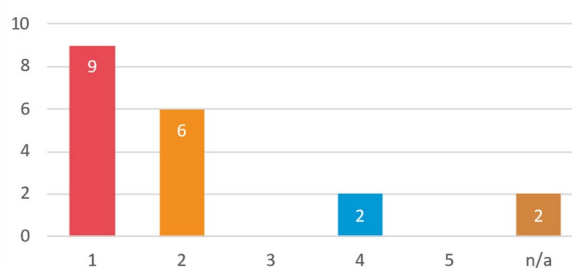


Table 13. "How real did the virtual world seem to you?"  
(remote attendance, n=19)  
(1=not at all; 5=very much)





As a result of frictions on the day, audience perceptions of the experience ranked lower than for in-person attendees, but novelty, comfort and interest still ranked the highest.

While the audience response seems to have been somewhat hampered by technical difficulty, there was still much enthusiasm about the concept. Additionally, we learned a great deal about the unique logistics of the remote event.

### What were the frictions?

Understanding the 'frictions' of the event helps to contextualise the responses, and points to further development and refinement of the technical design and event management.

#### Virtual event logistics - Joining

Only one attendee attempted joining via VR headset, but could not get a stable connection and joined by browser. One attendee reported WiFi problems that prevented joining, and another's broadband speed was too unstable. There were 7 attendees who joined at the beginning and stayed for most of the event that had the most stable experience.

#### Invitation instructions

- Some people were confused about the start time of the virtual event as opposed to the in-person event.
- Participants were invited to join at a specific time and we anticipated they would stay for one artist; however, several participants joined at the beginning and stayed for the entire event. This meant that the Mozilla Hubs venue was at capacity (approx. 15-20 people) and people were unable to enter until someone left the room. The prototype event did not have capacity for spawning multiple instances of rooms, which would be the ideal scenario in future.

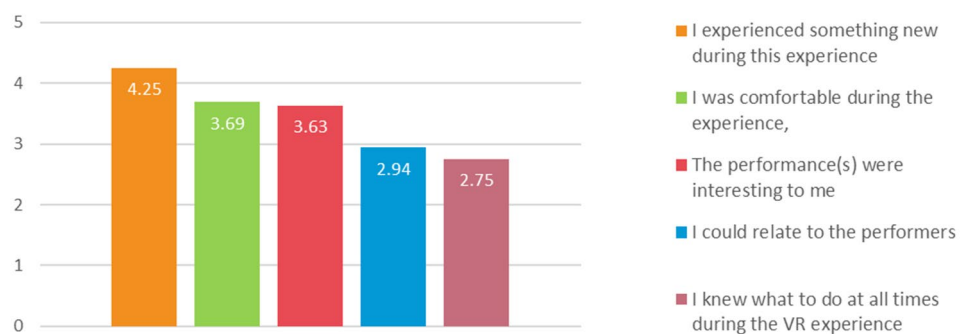
#### Sound 'overlap' from the venue

- Volume on the in-venue VR headsets was not disabled, only turned down; some participants inadvertently turned the sound back on, resulting in unintended voices and sounds being heard in the virtual space.

#### Technical stability

- A last-minute technical problem meant elements had to be reprogrammed, resulting in some unanticipated instability in the technical structure.
- Some participants described a 'choppy' rendering of the audio and the avatar. In focus group, participants described the experience of the same point in the concert very differently, suggesting that there is also significant variation in participants' own devices and bandwidth.

Table 14. "To what extent do you agree with each of the following statements about the virtual experience (in the VR headset or browser)?"  
(mean of ratings, remote attendees, n=16)  
(1=fully disagree; 5=fully agree)



## WHAT DID REMOTE ATTENDEES VALUE?

One person found herself 'enthralled' during a very stable part of Miss Yankey's performance. At times when the experience was more 'iffy', she enjoyed **exploring the space and talking to other attendees**. The participants discovered flying, a setting in Hubs left on as an easter egg for them to discover, and enjoyed flying around and through the avatar.

Others had mixed feelings about the ability to converse. Some felt a bit intimidated that everyone in the room could hear them; others were irritated because they wanted to listen to the performer. One remarked that it would be good to mute other users or have a moderator who could mute the room during performances.

However, in the focus group the **ability to forge a strong sense of sociality** became clear. Two focus group participants in the Zoom session recognised each other's voices from their conversations during the event, and it became clear that they felt they had truly shared the experience. This had several benefits:

- **learning from each other** how to navigate the event –how to move, how to mute other users, how to get into the garden, and how to fly around the virtual space
- one long distance couple attended the virtual event together from their separate households as a sort of '**virtual date night**'
- enjoying how the **interaction mimicked real-world interaction**, noticing they could gather closer together and replicate 'eye contact'
- experiencing a **sense of connection with the artist** when the tech was working well

## HOW IS THE VIRTUAL PERFORMER'S AVATAR-BASED FACIAL EXPRESSION PERCEIVED?

There was agreement amongst remote attendees that although they appreciated all three performers' avatars, the avatars worked best with Miss Yankey's performance. They could work out by seeing the video feed of the projection that this was because she was the artist who was not using additional instruments, and more focused and still. One noticed that Miss Yankey's performance practice also included pauses and head movements and that these **translated emotion** better than more subtle, nuanced facial expressions.

Audiences **perceived the identity expressions of the avatars** as well, characterising Bellatrix as a “non-binary, genderless performance” and recognising the Afrofuturist design elements of Miss Yankey’s third avatar.

By contrast, the environment itself, simplified to increase stability in the technical system, did not quite live up to their expectations.



### *The avatar*



## ***The environment***

## Value proposition of a hybrid event

The primary benefits seen by remote attendees of this type of event included:

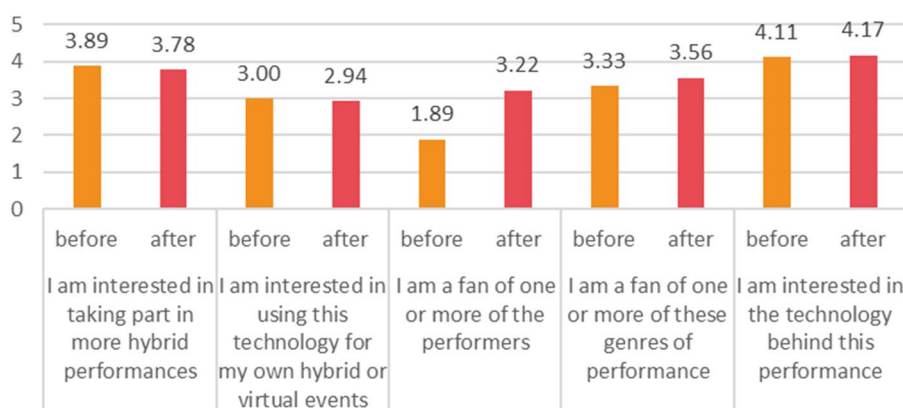
- ability to explore new artists and types of performance
- ability to have a social experience from home

In the prototype concert, remote attendees did note that they felt slightly neglected, particularly between acts, with the main focus being in the venue. Beyond what the artists have said about their difficulty imagining or interacting with the virtual audiences, both the audience members, the artists and we noted a **need for a person based in the venue to be a 'compere' for the virtual attendees**, to achieve better connection between these two environments.

"...it felt like the live audience got priority and we were just there without any type of interaction..."

- female remote attendee, survey

Table 15. "To what extent were the following statements true for you **before** and **after** the concert?"  
(remote participants, n=22)



## Impact on attitudes

In contrast with the in-person attendees, scores for the measures on likelihood to attend future hybrid events or use the technology for their own purposes declined slightly after the event. Likely a more stable experience would improve these.

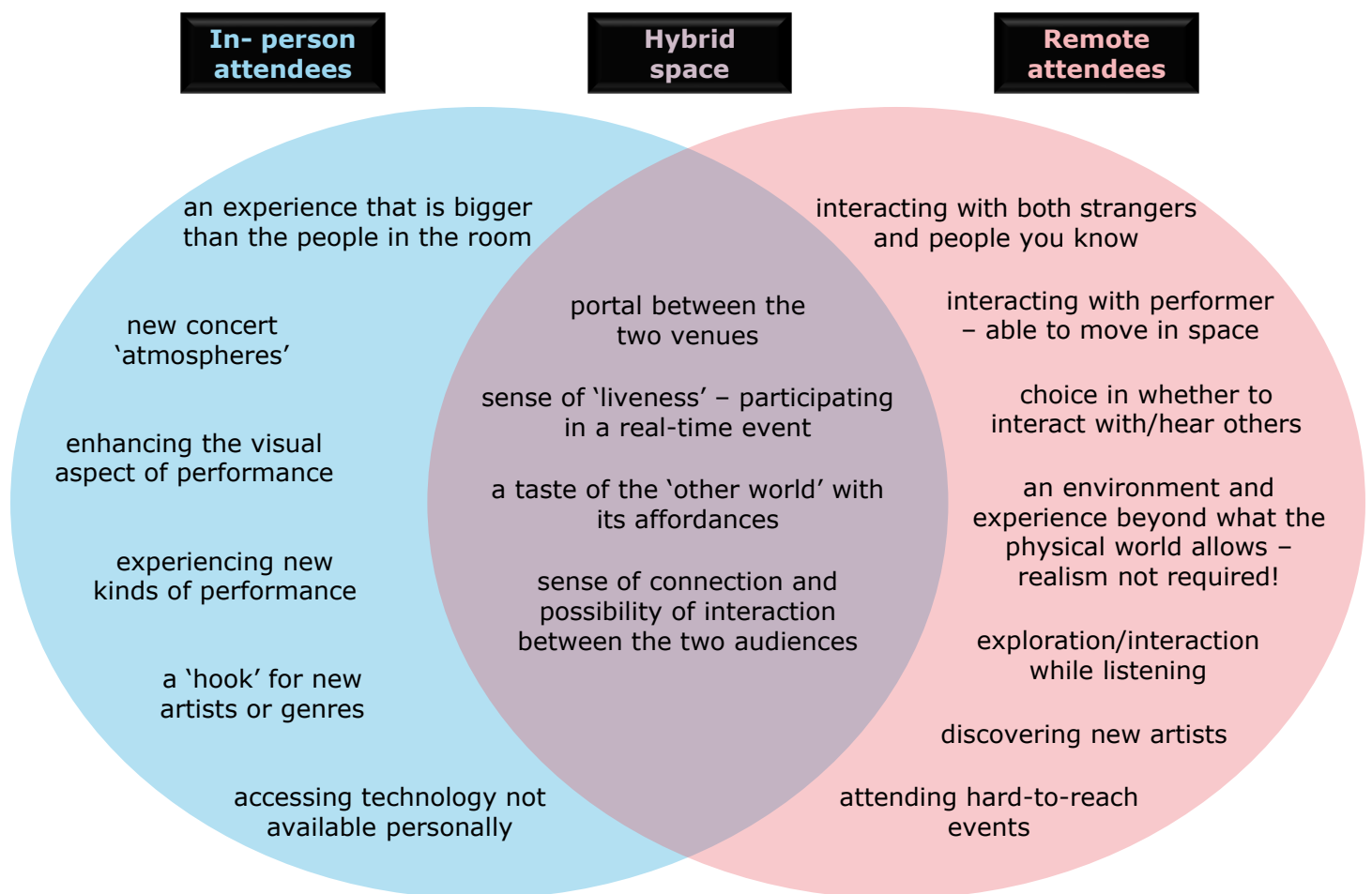
However, the pattern of **increasing fandom holds, with a remarkable 27% increase** of the mean rating; despite limitations, the virtual MetaMirror experience did seem to provide a new mechanism for these artists to connect with new audiences.

# Hybrid affordances

It might seem that the opportunity for hybrid performance is to give remote audiences *the same experience* as in-person audiences. However, this report points toward a different conclusion:

**in-person and remote attendees  
do not necessarily want  
the same experience.**

Hybridity offers something unique to each audience, and the possibility of contact between them. Each environment affords different possibilities, and the hybrid space creates a portal between these possibilities for audiences. This might be understood in the following way:



## Affordances of hybrid performances for audiences

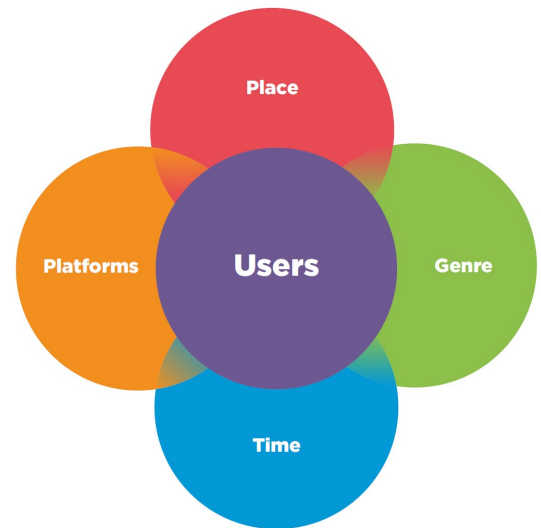
Looking at the diagram from the performer's perspective, the kinds of creativity spawned by experiments with hybridity have as much value for the in-person audience as the remote audience. With further development, hybrid events can offer performers a better sense of the remote audience and a way to engage with people who would like a different experience or who are unable to attend the event. Thoughtful planning of meaningful interaction between the two audiences may provide a new and valued type of experience.



# Research Findings Summary

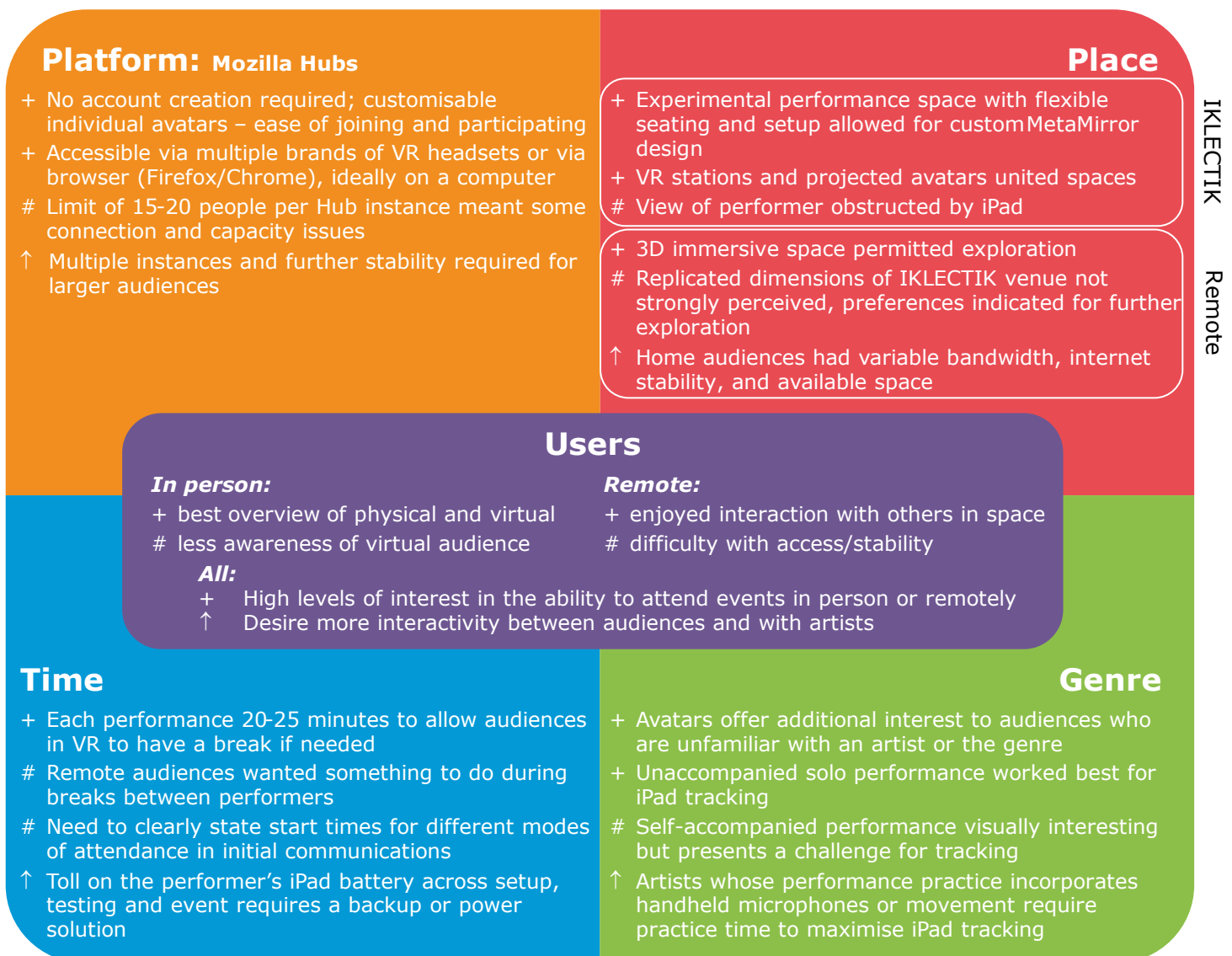
## The Hybrid Event

The immersive audience toolkit, right, developed by the StoryFutures Audience Insight team (Bennett et al, 2020) is used here to summarise the research findings of the MetaMirror event. Each of the five dimensions represented are crucial elements of planning, researching and analysing immersive events. The user is at the centre of the experience, both affecting and affected by the other dimensions. Together, the framework maps the user experience of an immersive event or activity.



The expanded framework below:

- + distils the key affordances of the MetaMirror event
- # uncovers certain frictions or challenges that are encountered in this type of format
- ↑ points to areas for development



IKLECTIK

Remote

# Summary

The MetaMirror concert provided a rich insight into the practices, behaviours and values of both artists and audiences. Where the future of hybrid performance is concerned, it's all to play for.

## PERFORMING ARTISTS

### The hybrid event opportunity

- Fresh realms of creative expression – the ability to play with their own identities, or adopt and project other identities, to support the creative, thematic, aesthetic message of their performance
- The ability to introduce themselves to new audiences in a way that results in people wanting to follow them

#### *Future developments:*

- Tech is accessible but still requires specialist setup
- Refinement of system that allows artists to focus on performance is needed; time to perfect performance technique (similar to the way artists have honed and embodied their mic technique) is required to ensure the best possible tracking of facial expression
- Facial expressions can be further refined for more nuanced communication of emotion
- Full-body tracking can permit more movement and a more human-like avatar
- Event production methods need to be standardised, and specialised roles and procedures developed

### Connecting to virtual audiences

- In person audiences did sense a strengthened connection to the performers; when the technology was working well, remote audiences also felt this connection
- All audience members increased in their 'fandom' of all three artists suggesting this format provides an effective method of engaging new audiences

#### *Future development:*

- Mechanisms for artists to receive feedback from the remote audience
- Mechanisms that allow interaction between and amongst performers and remote audience members will create a stronger sense of communication, connection, and playfulness

## AUDIENCES

### What do audiences value in a live hybrid performance?

- The novelty of seeing a digital image with the ability to convey emotion and expression in real time – seen as entertaining and thought-provoking
- The enhancement of the in-person performance with the avatar overlay projection captivates audiences, drawing them to unfamiliar artists and genres of performance
- The playfulness of the virtual venue; the opportunity to explore, discover easter eggs, experience different points of view, interact and chat with others
- The sense, for in-person audiences, that the experience is bigger than the people in the room, and for remote attendees, that it is possible to meet in a virtual space with both strangers and people you know to access a live event that would not otherwise be accessible

### How is the virtual performer's avatar facial expression perceived?

- The MetaMirror system surprised audiences with the range of expression it permitted; artists and audiences both felt that the avatar was more than animated by performance: it was at times inhabited by the performer
- The head movements and mouth movements in particular seemed most authentic with Miss Yankey's performance, with moments in the other two performances that also conveyed the uniqueness of the performers' styles
- For remote attendees, the sense of captivation and absorption is perhaps currently more prominent than the sense of presence; it may be worth experimenting with other aesthetics for the environment and the avatar. It may also be worth exploring less literal interpretations of people and places, as these might yield more exploratory or imaginative experiences

# References

- Bennett, James, Polly Dalton, Olga Goriunova, Chloe Preece, Isabelle Verhulst, Laryssa Whittaker, and Andy Woods. 2021. 'Audience Insight Report: The Story of Immersive Users'. Egham, UK: StoryFutures.  
<https://www.storyfutures.com/resources/audience-insight-report>.
- PricewaterhouseCoopers. 2023a. 'New Ways of Consuming Music and the Impact on Music Rights Valuations'. *PwC* (blog). 8 June 2023.  
<https://www.pwc.co.uk/industries/technology-media-and-telecommunications/insights/new-ways-of-consuming-music-and-impact-on-music-rights-valuations.html>.
- . 2023b. 'Global Entertainment and Media Industry, Spurred by Advertising and Digital, to Hit \$2.8 Trillion Market in 2027 Even as Growth Rate Decelerates: PwC Global Entertainment & Media Outlook'. *PwC* (blog). 27 June 2023.  
<https://www.pwc.com/gx/en/news-room/press-releases/2023/pwc-global-entertainment-media-outlook.html>.
- . 2021. "'Listen": Music, Radio and Podcasts Ride out the Pandemic – but Rights Remain Key and Structural Change Will Continue'. *PwC* (blog). 20 October 2021. <https://www.pwc.co.uk/industries/technology-media-and-telecommunications/insights/music-radio-podcasts.html>.
- Whittaker, Laryssa, and Tom Wagner (forthcoming). 'Emerging Patterns of Participation in Virtual Live Concerts: An Initial Study of UK Audiences Post-COVID'. In *The Intellect Handbook of Global Music Industries*, edited by Chris Anderton, Martin James, Daniel Nordgård, and Sergio Pisfil. Intellect.

# Acknowledgments

Laryssa wishes to thank:

- **Piotr Nierobisz** for his partnership in the project and his ability to deliver on ideas through enthusiasm, expertise, and ingenuity.
- **All three artists – Buntzy, Miss Yankey, and Bellatrix** – for fearless experimentation and for openness and deep reflection about the experience.
- **The staff at IKLECTIK** for expert and professional support.
- **All the audience members**, especially those who participated in the research, who also approached the experience with an attitude of experimentation and exploration and offered invaluable reflections.
- **StoryFutures**, particularly director Prof James Bennett for supporting me with the time for this project, and Prof Amanda Murphy, Grace Baird and Lauren Quinn for support through the StoryFutures Academy 2022 Early Career Researcher Bootcamp scheme.



