

Asynchronous Small Group Ensemble: An Exploration of Technology-Mediated Chamber Music Making in Higher Education

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1. Introduction

This chapter discusses asynchronous small group ensemble music making, with a specific focus on virtual duets, and shares the findings of an exploratory practice-led study carried out at a university music department in the UK. In a higher education (HE) context, participation in chamber music activities is key to an understanding of classical music performance as a collaborative and inclusive practice as well as to the development of a positive musical identity (Krivenski 2018, pp. 171–72, 205). Additionally, HE music ensemble activities are central to performance students' engagement with deep learning (Burt-Perkins and Mills 2008) and the development of teamwork and "collective listening" skills (Slette 2019). Ensemble music making is generally understood as an activity "in which all components, including individual performers, their instruments, the audience, the performance space, are interdependent and dynamically interacting" (Bishop 2018, p. 4). In a classical chamber music context, there is an assumption that these musical interactions take place live and synchronously. However, are these conditions always necessary for ensemble music making to take place?

The relatively recent phenomenon of online virtual ensembles (Cayari 2015, 2018; O'Leary 2017) would suggest that is not the case. Thanks to the emergence and development of "digital, interactive, and participatory media" (Hartley 2012, p. 2), the practice of creating multitrack split-screen video recordings of ensemble performances and sharing them on social media platforms has become popular in recent years (Cayari 2020). To create these virtual ensemble performances, each musician video records their own part remotely and asynchronously, following a "reference recording" or "anchor" so that all parts can eventually be synchronised and displayed together with the help of video editing software (O'Leary 2017; Cayari 2020).

With the cancellation of musical events and the suspension of in-person music teaching as a response to the COVID-19 pandemic during parts of the academic year in 2020 and 2021, there was a veritable explosion of online virtual ensembles around the UK and other parts of the world (Daubney and Fautley 2020). Yet, virtual ensemble music making has not been unanimously welcomed by musicians, audiences

and educational institutions. This type of online collaborative music making has been criticised for being an inadequate replacement for live ensemble work. The labour-intensive and technologically mediated nature of virtual ensembles has been blamed for the poor performance quality of some of the virtual classical ensemble content created during the COVID-19 pandemic (Datta 2020). Additionally, in educational contexts, although some music teachers have continued to teach groups by combining “pre-recordings, resources and live teaching” (Daubney and Fautley 2020, p. 109), many performance-based ensemble teachers “have felt ill-prepared to facilitate meaningful musical experiences through online interactions” (Cayari 2020, p. 2).

During the spring and summer terms in 2020, I witnessed the same reticence towards virtual ensemble performances in the context of my activities as a music performance lecturer at a UK university. Following the mandatory shift to online teaching and learning in HE institutions in the UK and around the world brought about by COVID-19 social distancing requirements (Times Higher Education 2020; IHE Staff 2020), all ensemble performances in my Music Department were either cancelled or postponed till further notice. There seemed to be a general consensus among performance staff and students that technology-mediated ensemble music making would be too challenging—in terms of the equipment and technological know-how needed to make it possible—to adopt at such short notice. Most importantly, there was a widespread belief that because asynchronous virtual ensemble performance could not give musicians the same type of collaborative and creative experience that live, in-person ensemble music making does, adopting this practice would be too much of a compromise.

However, what affordances would virtual ensemble performance yield if we approached it with a spirit of curiosity and exploration, and viewed it as a *different mode* of ensemble music making, a technology-mediated collaborative practice that expands—rather than (unsuccessfully) replaces—traditional chamber music artistic and pedagogical practices and keeps them relevant in the 21st century (cf. Capulet and Zagorski-Thomas 2017, para. 15; Cayari 2016, p. 370)? Could such an approach to virtual ensemble afford HE classical performers a musically and pedagogically meaningful chamber music experience? Additionally, could it be adopted by performers who had no previous experience with this type of practice, using technology readily available to students and staff? The practice-led research project I discuss in the rest of this chapter explores these questions and suggests some possible answers.

2. The Research Study

The aim of the study was to capture my own (as practitioner-researcher) and other classical performers’ experience of virtual ensemble music making while exploring the musical and pedagogical affordances of this form of technology-mediated chamber

music in the context of HE music studies. To gain an in-depth and multi-perspective understanding of this collaborative music practice and its potential affordances and constraints, I ran five parallel virtual duets for a period of six weeks in June–July 2020. All the performers participating in these projects were geographically distant from one another and could interact with one another exclusively through the mediation of technology.

I took part as one of the performers in three out of the five virtual ensembles, while in the remaining two, I contributed to the ensembles as a coaching tutor. For all of the ensembles, I also acted as editor and mixing engineer of the video recorded material. This entailed using video editing software to assemble the individual video tracks recorded for each duet to create a split screen video of a virtual ensemble performance. My active participation in the virtual ensembles' music making activities enabled me to take on the role of practitioner-researcher and, as such, "to make known the insider's expert perspective" (Doğantan-Dack 2015, p. 32) on virtual ensemble music making. At the same time, my subjective experience and understanding of the whole process were balanced and enriched by those of the other participants, providing multiple perspectives on the virtual ensemble music practice investigated.

To fulfil the research aim of the study, I adopted a qualitative multiple-case study design (Mills et al. 2012), which combined a range of auto-ethnographic (Chang 2008, pp. 89–102) and ethnographically informed (Leavy 2014, pp. 2–4) data construction strategies: audio-visual documentation of the various video recorded ensemble performance stages (from early "drafts" to final "products"); written (self-)feedback; practitioner-researcher's written memo that included activity descriptions, self-reflections and self-observations; participants' self-reports through written (self-)feedback and semi-structured interviews.

All the data were analysed through Thematic Analysis (TA) (Braun and Clarke 2006). After familiarising myself with the data, I conducted initial coding, being careful to keep it grounded in the data. I gradually synthesised larger segments of the data into potential themes, which I then refined. Subsequently, I identified the main themes and sub-themes and how they fit together in the "overall story they tell about the data" (ibid., p. 92). The final phase of the analysis took place during the writing-up of the findings, in which I refined the themes and sub-themes further through a process of dialogue with relevant literature. During this phase, I also used data extracts to illustrate and support my analytical narrative while keeping it grounded in the data.

The participants who collaborated with me on this study were sought from a pool of performance students and staff from my institution, which helped me build a good rapport with them and created an atmosphere of trust during the research

process.¹ In order to represent a range of (traditional) ensemble performance abilities, participants were sampled so as to include undergraduate- and postgraduate-level students as well as performance staff.

A further sampling criterion was whether students and/or staff already knew one another and had collaborated together before the beginning of the study, based on the consideration that “[e]xisting relationships between musicians can help with the interaction, as performers trust, respect and support their fellow musicians while playing online” (Iorwerth and Knox 2019b, p. 10; see also King 2013). The participants joined the study on a voluntary basis and gave their verbal and written informed consent to their participation. I advised them that they could withdraw from the study at any point if they so wished and that if they decided to do so, there would be no negative consequences. This was a point which I felt was particularly important to highlight in the context of my own institution, where the existing power-relation dynamics between myself and potential participants might have been of concern and prevented students and/or staff either from participating or from leaving the study if they so desired (cf. Mercer 2007, p. 4). To protect my participants’ anonymity, I have used pseudonyms when quoting or referring to them in this chapter (see Table 1).

Table 1. Overview of research participants.

Overview of Research Participants		
Participants *	Type	Specialism
Yuqi	1st year undergraduate	Piano
Minnie	2nd year undergraduate	Piano
Jeff	1st year postgraduate	Piano
Tim	2nd year postgraduate	Voice
Kat	2nd year postgraduate	Piano
Mel	Professional performer	Violin
Ellie	Professional performer	Piano
Maria	Practitioner-researcher	Piano

* Pseudonyms have been used for all participants, with the exception of the author (practitioner-researcher). Source: Table by author.

3. The Virtual Duets Project

When choosing the ensemble size for this study, I pragmatically opted for the smallest, the duet, given that all the participants had very little, if any, previous experience of virtual ensemble music making. As I designed the five virtual duets

¹ In a qualitative research context, where the researcher is the “instrument” through which data is gathered and interpreted (Lichtman 2014, pp. 12, 36–37), cultivating a relationship of trust between researcher and participants is key to an effective research process.

project, I aimed to put the focus on the music making and prevent the ensembles from becoming technology projects. I sought to avoid a situation in which the technology would be experienced as “the object of study” rather than “the means to an end” (Dack 1999, p. 4). Furthermore, I believed it was important that the virtual ensembles be as inclusive as possible from a technological perspective (cf. Daubney and Fautley 2020, pp. 8–9). Therefore, I designed the projects so that the performers could use “domestic” equipment and internet connections (Iorwerth and Knox 2019b, p. 8) already available to them. When inviting potential participants, I stressed this point and explained that performers would require a pair of headphones, a smartphone to video record their part and a laptop or tablet for playing-back purposes. The instrument combinations involved in these duets were: voice and piano, violin and piano, electric keyboard and piano and two pianos (Table 2).

Table 2. Type of duet project, participants and repertoire.

Type of Duet Project	Participants	Repertoire
Four-hands (2 grand pianos)	Yuqi and Minnie	Gabriel Fauré: Le jardin de Dolly, from Dolly op. 56
Four-hands (grand piano + electric keyboard)	Kat and Maria	Claude Debussy: En bateau, from Petite Suite
Four-hands * (2 grand pianos)	Ellie and Maria	Claude Debussy: Menuet, from Petite Suite
Tenor-piano	Jeff and Tim	Franz Schubert, Auf dem Flusse from Winterreise D. 911
Violin-piano *	Mel and Maria	Lili Boulanger, Nocturne

* Newly formed ensemble. Source: Table by author.

Additionally, at the beginning of the study, I provided all performers with some basic guidelines on how to use a mobile phone to record their tracks to facilitate the best possible results. Firstly, I asked performers to ensure that the audio/video settings on their mobile phones (more specifically, video frame rates per second, audio sample rate, stereo/mono and video orientation settings) matched those of their ensemble partner’s mobile phone. Secondly, considering that performers could not set the audio recording level on their phones, I invited them all to experiment with the positioning of their mobile device and find a distance from the sound source (their instruments) that would result in the best possible sound quality (i.e., minimal amount of noise, no distortion and an effective balance between direct and diffused sound) without compromising the image of the video.

To further help the performers focus on the music making, I also decided to take on the roles of video editor and mixing engineer for all the virtual ensembles, even though my know-how about editing and mixing were very limited at the beginning

of the study. For the post-production of all the duets' individual tracks, I used Adobe Premier Pro, which was freely available to me via my institution.

A key aspect of the virtual duets' design is that, contrary to what appears to be common practice in the creation of virtual ensembles (O'Leary 2017; Cayari 2020; Galván and Clauhs 2020), I did not provide the performers with an "anchor" track. Anchors are intended to help musicians stay in time and record their parts consistently so that the tracks can be easily synchronised in the resulting virtual ensemble video; but by providing a "guide", anchors also tend to lock performers into a specific interpretation of the piece (Cayari 2016, p. 372). In the case of the virtual duets project, I asked each performer to start the virtual ensemble process by recording their own part without any external "guide", giving them the opportunity to exercise their artistic freedom. I referred to this recorded performance as the "leading track". Subsequently, ensemble members swapped "leading tracks" and now each performer was asked to first listen to/rehearse with it, and subsequently video record their own part while listening to it, thus creating a "response track". At this stage of the project, ensemble members were invited to perform their own part so that it would sound musically coherent and convincing when put together with the leading track.

Throughout the duration of the virtual projects, I edited each pair of leading and response tracks to create draft versions of the ensembles' work in progress which performers could use to reflect on in order to further develop their performances. The additional leading and response tracks that emerged from this process were used to create virtual ensemble performances that the participating ensemble groups could share with a (virtual) audience. The reason for creating a virtual ensemble design with leading and response tracks was twofold. Firstly, through the process of recording a leading track (without a "guide"), I aimed to give each performer the opportunity to contribute with their own creative approach to the ensemble piece while maintaining an awareness of how their part would come together with their partner's part (Slette 2019, pp. 36–37). Secondly, through the process of recording a response track, I aimed to encourage each performer to be receptive and responsive to the musical intentions of their partner so that they could contribute to the creation of the whole ensemble in a musically effective and convincing manner. Thus, each duet member would (potentially) have equal opportunities to contribute to the shaping of the overall virtual ensemble.

When designing the virtual duets project, I also considered the fact that I would need to facilitate verbal interactions between performers. Even though recent investigations on collaborative music making have drawn more attention to embodied and pre-reflective forms of interaction between ensemble members (Bishop et al. 2019; Salice et al. 2019; Schiavio and Høffding 2015; Volpe et al. 2016), there is widespread evidence that verbal forms of communication—both oral (Burt-Perkins

and Mills 2008, p. 30; Seddon and Biasutti 2009; Cho 2019, p. 12) and written (Haddon and Hutchinson 2015)—play a key role during ensemble rehearsals. Given the asynchronous nature of the virtual ensembles, I adopted an online platform called Music Circle to enable asynchronous verbal communication. This platform allows users to upload media (such as audio and video recordings), share and discuss them with selected users via asynchronous, written comments left along a timeline (Yee-King et al. 2014, p. 245). A key feature of this platform is that comments are linked to whichever portion of the media one wishes to discuss. In the context of the study, this facilitated the performers' exchange of specific and detailed feedback on the multitrack videos of their work in progress and, eventually, of their "final performance". As the coaching tutor of two student duets, I used Music Circle to give students written feedback, which, together with the students' (self-)feedback, was used as the starting point of the online coaching sessions.

Even though synchronous music making was not an option for the type of classical chamber music repertoire performed by the virtual ensembles in this study² because of latency issues (Iorwerth and Knox 2019b), I was keen to facilitate some synchronous social and musical interactions as part of the ensemble process. Therefore, I invited the virtual duet performers to use a web-based video conferencing platform, Zoom, for their discussions with one another (and, in the case of the student ensembles, with me, their coaching tutor) about the repertoire being learnt and any aspects of their work in progress. While carrying out this study, Zoom was generally considered to be the best video conferencing option for musicians because of its "original sound"³ and "computer sound" sharing⁴ features (Timson 2020). Even though participants could not perform at the same time during Zoom meetings, these sound features allowed each participant to (verbally) share their interpretative ideas with their ensemble partner (and/or me, their coaching tutor)—as well as (musically) demonstrate them—in real-time, during what I referred to as "online live rehearsals" and "online live coaching sessions".

4. Discussion of the Findings: Key Themes

In this section, I discuss and illustrate the key themes that have emerged from the analysis of the data. The themes are organised according to the main components of the virtual duets process: the individual tracks (leading track and/or response

² See Table 2 for a breakdown of the repertoire.

³ The audio setting Original Sound disables Zoom's noise suppression and high pass filtering and removes automatic gain control.

⁴ During screen share, the Share Sound option allows the sound from a file with audio to be shared directly from one's computer with all remote attendees.

track) (Section 4.1); the overall virtual ensemble performance (Section 4.2); and the interactions (asynchronous and synchronous) via online platforms (Section 4.3).

4.1. *The Individual Tracks*

4.1.1. The Leading Track and the Absence of the Co-Performer

In spite of the artistic freedom that the lack of an anchor track (potentially affords,⁵ all performers found the early stage of the virtual ensemble process somewhat constraining. Findings indicate that during the initial drafts, the absence of the co-performer challenged the participants in two different ways. Some performers reported struggling to maintain a sense of ensemble, which led them to approach their leading track parts as if they were “solos”. Others spoke of feeling lonely when engaging with the leading track stage and missing the social and interactive aspects of making music in a traditional chamber music context, which affected their musical confidence.

Maintaining a Sense of Ensemble

The participants who struggled to maintain a sense of ensemble when performing their part as leading track were, generally speaking, the least experienced (ensemble) performers. This was the case for the two undergraduate piano students. In spite of the fact that they had already done some work together on the very same four-hands piece before the 2020 lockdown, these participants reported that they found it challenging to maintain an awareness of their own part as co-constituent of the whole ensemble performance during the creation of the first leading track drafts. As a result, they approached this stage of the project as if they were performing a solo piece.

In an in-person ensemble context, musicians perform and listen to one another simultaneously, which allows them to have both “an individual (personal) and a collective (ensemble) focus” (Slette 2019, pp. 36–37) and, thus, maintain a sense of how all the parts come together to create the whole ensemble performance. During the leading track stage of the virtual duets, however, to achieve this type of collective focus participants had to learn to use what Bishop refers to as “musical imagination” (2018, pp. 5–6). In other words, they had to learn to listen to their own performance as it unfolded in time while actively imagining (i.e., listening with their mind’s

⁵ In the context of western art music (WAM) performance (solo and ensemble), the concept of performers’ artistic freedom is relative. As Daniel Leech-Wilkinson has eloquently argued (Leech-Wilkinson 2020), WAM “gatekeepers” (such as teachers, examiners, musicologists, concert managers, critics, etc.) (ibid., chp. 7) tend to strongly limit the potential creativity of classical music performers by upholding and/or enforcing norms which strictly regulate musical practices and behaviour (2020, chp. 10). In the current study, although the elimination of guide tracks from the virtual duets project did not in itself free up co-performers from such musical norms, it aimed to prevent the addition of a further normative layer.

ear to) their co-performer's part, with an understanding of how the two parts would come together to form the whole performance. This is illustrated by the two participants' words:

I [would play] thinking . . . I was soloing. And then I would start imagining what my partner would play I felt like I was very present in that moment when I was imagining I was playing with Yuqi right beside me. (Minnie)

In the beginning it felt like I was working alone [But in the following stages of the project] I [would] sing the main melody—that is, Minnie's part—in my mind. (Yuqi)

Findings indicate that the shift in the musical experience of these participants—from solo to ensemble music making—was promoted by the synchronous/asynchronous verbal dialogue (see Section 4.3) that performers started engaging with after their first draft was completed. Listening to the early multitrack drafts of their ensemble project and reflecting together on their musical intentions allowed these participants to gradually develop and refine their “musical imagination” skills, pointing to the key role that verbal communication has in facilitating the creative process of ensemble members.

Evaluating the Effectiveness of One's Leading Track

Although more experienced performers did not struggle to maintain a sense of ensemble, some reported feeling lonely when engaging with the creation of the early leading track drafts. They found themselves missing the social and interactive aspects of participating in an in-person chamber music project:

It's always the leading that feels lonely, definitely . . . it's just me alone in a room, throwing my musical ideas out into space. (Ellie)

This feeling of loneliness could have far-reaching consequences on the performer's musical confidence. In Ellie's case, the lack of immediate musical feedback from me, her co-performer, fostered in her concern regarding how I would receive and “judge” her leading track performance from an artistic perspective. This concern with “musical appropriateness” appeared to be exacerbated by the fact that Ellie was working in the context of a newly formed ensemble, within which she and I had not yet had the opportunity to get to know one another on a musical and personal level. Haddon and Hutchinson's study (2015) on the link between co-performers' interactions and musical creativity in ensemble performance has highlighted the importance of trust-building and empathy for facilitating spontaneity, risk-taking and for “open[ing] up interpretative possibilities which might otherwise stay closed

off" (ibid., p. 150). The findings in this study complement Haddon and Hutchinson's in that they show how the lack of an established personal and musical relationship can result in fear of being judged negatively and, thus, prevent the performer from projecting their musical intentions freely. Ellie's words illustrate this clearly:

[W]hen you're leading [in a virtual ensemble], you're not responding to anything at all and so you might be presenting musical ideas which somebody else thinks are really rubbish, but you've got no way of knowing that I think what happened for me . . . [was that] the first recording [was] a bit tentative, a bit inhibited, because there hadn't been an opportunity for that trust to build up yet. (Ellie)

My experience as co-performer echoed Ellie's. My musical confidence was affected, too, during early drafts of my leading tracks, although in a slightly different way. My discomfort was due to my inability to evaluate the extent to which my video-recorded communication efforts were coming across and were intelligible to my co-performers. Thus, at the beginning of the study, I found myself overly concerned with making my musical intentions as clear as possible. For example, in my first leading track draft of Lili Boulanger's *Nocturne* for violin and piano, even though Mel, my co-performer, had given me *carte blanche* in terms of tempo flexibility, I became excessively focused on clarity of pulse, which resulted in my staying quite close to the tempo changes that Boulanger herself indicates in the score. As such, this first draft of my part was somewhat less imaginative and engaging than I would have liked it to be.

Other participants in this study reported experiencing similar concerns with communication clarity. For example, Tim, a postgraduate student performer, reflected that in his early leading track drafts his uncertainty about how his own musical ideas would come across to his partner led him to take an "overly expressive" approach, which (in his own evaluation) made his recorded performance sound "forced":

Obviously, the first time doing this kind of project I wanted [to send] something really clear to Jeff I felt like I was trying too hard to be very clear in what I was trying to express. And I think it came across a little awkward in singing style, watching it back now. I think I was trying to be too expressive: it was a bit forced. (Tim)

A possible reason for the performers' lack of musical confidence in the early stage of the virtual duet projects can be inferred by considering the interactions that take place among musicians in live, in-person ensemble performances. In this context, musicians always get (some degree of) real-time aural and visual feedback on their own music making. This feedback takes the form of the co-performers' immediate response "through playing and through gesture, [as well as] facial expressions"

(Haddon and Hutchinson 2015, p. 149), which immediately feeds into their own performance (cf. Bishop et al. 2019, p. 3) and, in turn, allows them to respond to their co-performers' music making. As a result of these simultaneous musical interactions, ensemble musicians are able to produce a coherent musical performance (Iorwerth and Knox 2019a, p. 289). On the other hand, in the context of a video recorded performance, there are no simultaneous interactions, but rather two separate music-making stages—leading and responding—that take place one after the other. As such, when creating the leading tracks performers could not immediately gauge whether what they did would make sense to their co-performers and enable them to provide a coherent and effective musical response.

Interestingly, the feeling of loneliness and lack of confidence that some participants experienced when creating the first draft of their leading tracks was overcome once co-performers had the opportunity to watch the early drafts of the multitrack split screen virtual performances and share (self-)feedback with their co-performers. I will discuss this phenomenon later (Section 4.3).

4.1.2. The Response Track and the Mediated Presence of the Co-Performer

Being Receptive to the Co-Performer's Musical Ideas

All performers reported that the creation of the response track was a more enjoyable musical experience than working on the leading track, especially in the early stages of their virtual duet project. This is because they felt most connected to their ensemble partners while working on the response track. Some student participants described this experience as being "easier" and more "relaxing" due to the fact that listening to their partner's leading track while performing their own part helped them get a better overall understanding of the piece from rhythmic and harmonic perspectives. This, in turn, facilitated the creation of their own response track. On the other hand, advanced performers reported that the enjoyment they experienced during this component of the virtual ensemble came from responding to a performance that had been "fixed" by the recording process, something they found artistically stimulating:

I appreciate constraint. Always. [...] [C]onstraint is creative and fun [...] it's like, "Okay, I'm just going to do [...] this version this time", you know? So, I don't get any say in it, but I get to put myself in somebody else's version. And that's fun. (Mel)

My own experience as co-performer echoed Mel's. My aim during this stage of the project was to create a response that would best "complement" my partners' leading tracks and, thus, contribute to the creation of virtual ensemble performances that could be perceived as musically coherent and effective. To fulfil this aim, I had to leave all my musical preconceptions to one side and, at times, even ignore some

aspects of the musical score—such as dynamic markings and shaping—so that I could fully tune into my partners’ performance and be entirely receptive and fully responsive to their musical ideas. This was a creative process that, artistically speaking, both stretched and fulfilled me. Bishop (2018, p. 6) argues that in a traditional ensemble context, listening to one’s co-performer(s) with “open ears”, being open to new musical ideas and ready to change one’s interpretation is key to achieving a creative performance. The findings in the current study indicate that this is also the case in the context of virtual ensemble music making.

Developing Sound- and Image-Monitoring Skills

Although this component of the virtual duets project was generally experienced as being very enjoyable and artistically fulfilling, creating the response track was not without its own challenges. This is because it required all participants to learn a different way of tuning into their co-performers’ musical intentions.

In an in-person ensemble context, co-performers share the same space and, thus, they can communicate their musical intentions directly via their sound and physical gestures. Ensemble performers are immersed in each other’s sound, and not only do they have the opportunity to listen to one another simultaneously, but they can also *feel* each other’s sound and experience what Salice et al. refer to as an “intercorporeal dimension of playing together” (2019, p. 204). Furthermore, in an in-person context, the musical interactions of ensemble members are supported by visual communication. This enables co-performers to continuously adapt to each other’s musically meaningful gestures, and (potentially) promotes “creative thinking and risk-taking” (Bishop 2018, p. 19). Additionally, visual communication fosters a sense of cohesion between co-performers (Haddon and Hutchinson 2015, p. 141).

In a virtual ensemble context, however, co-performers’ sound and body language are mediated by technology. As two recent studies (Rofe et al. 2017; Iorwerth and Knox 2019a) on synchronous networked music performance (NMP) indicate, the use of sound- and image-monitoring devices requires musicians to go through a process of adaptation to the new way of perceiving their co-performers’ musical intentions. Findings in the current study indicate that this is also the case for asynchronous virtual ensembles, particularly in terms of the use of headphones and screens to listen to and watch co-performers’ leading tracks.

All participants reported that they had to learn how to listen to their co-performer and monitor their own sound at the same time to be able to create effective response tracks:

I tested both these in-ear ones and over-ear [headphones]. I found over-ear headphones work better for me. I felt like I couldn’t monitor myself as well with the in-ear [headphones]. (Tim)

I find it almost impossible to play with headphones on. It's very hard. The earbuds are better [than over-ear headphones] because they don't block your entire ear. I really do need both of my ears to play in tune. (Mel)

My experience as co-performer echoed that of other participants. I, too, had to explore using different types of headphones (over-ear and in-ear) and ways of wearing them (on one ear only or on both ears) "rehearsing" with my partners' leading tracks so that I could obtain the most effective volume balance between the sound of my partner's track and my own. In some particularly delicate passages of Debussy's Menuet from Petite Suite (which required the synchronisation of semiquaver triplets between the two parts as well as attention to balance and shaping), I even resorted to rehearsing my own part one hand at a time to ensure I could clearly hear every little detail of both my partner's part and mine.

Interestingly, one of my co-performers prioritised listening to my leading track over monitoring herself, as she relied on her embodied knowledge of her own part to create her response performance:

I had a pair of noise-cancelling headphones so I could hear you really clearly and I just played by feel actually, pretty much. (Ellie)

As a result, however, Ellie found that her response tracks were a bit too loud in relation to my leading tracks. This resulted in the balance between the two tracks needing to be adjusted during the multitrack editing process.

Most significantly, findings show that this component of the virtual duets had a profound impact on student participants, as the process of exploring technology-mediated ways of listening to their co-performer's leading track fostered in them a deeper understanding of the role of active listening skills in an ensemble context. Minnie, a second-year undergraduate performance student who had already participated in several in-person chamber music projects, reported that:

I've learned so much about active listening compared to when I was playing with Yuqi live I don't think I was really listening . . . [one] hundred percent. [Now] I think listening is a really big part in ensemble and I was missing out on that. (Minnie)

From a pedagogical perspective, this suggests that virtual ensemble projects (that do not make use of anchor tracks) can provide HE performance students with an effective music-making context for developing their listening skills further and with greater awareness.

Even though recent studies suggest that visual cues can facilitate ensemble synchronisation (Schiavio and Benedek 2020, para. 28) and that, because of the multi-modal nature of perception, musicians hear their co-performers better if they are able to see their physical gestures (Zagorski-Thomas 2020), the extent to which

participants in the current study relied on screens during the creation of response tracks varied considerably:

I absolutely relied on the image and I felt frustrated that I wasn't able to see it bigger and in front of me. (Ellie)

I had the video there. I didn't use it tremendously. (Mel)

I've got to say that in the first [virtual] performances, I didn't really watch [my partner]. (Tim)

Findings indicate that during the early drafts of the response tracks, student participants in particular tended to ignore the image of their co-performer's leading track video and relied mostly on the audio for co-ordination purposes. From my perspective as their coaching tutor, I believe this was due to the fact that these students had not yet internalised the score sufficiently and, as such, did not feel comfortable when looking away from it. Interestingly, Iorwerth and Knox (2019a) report that even in the case of professional classical musicians playing together while physically separated, musicians tend to keep their eyes mostly on the score instead of looking at their co-performer via the video monitors. The authors suggest this is because in an in-person ensemble context, musicians mostly use their peripheral vision to keep track of one another's physical gestures, thus "feeling" each other's presence rather than looking at one another directly, something which is not possible with a two-dimensional screen. Findings in the current study show, however, that as student participants progressed through the virtual duets project, they increasingly paid explicit attention to their co-performer's video recorded image. The participants reported that this made a qualitative difference to their music-making experience, particularly in terms of synchronisation during rubatos or whenever the co-performer was leading at the beginning/end of a phrase or section:

That [visual] interaction definitely helped because I think there were some musical cues I wasn't picking up before, like Tim's breathing in before coming in. And that really helped, that awareness through the progression of this project. (Jeff)

[As] the project went on, I got used to this concept of a [co-performer] on video I think it ended up becoming more real, as if Jeff were actually in the same room I made a conscious effort to watch Jeff . . . so I could take my breath with Jeff and then come in together [The ensemble] was more successful when I consciously thought like that. (Tim)

In my experience as co-performer, getting used to watching the two-dimensional moving image of my partner felt like learning a new skill. Initially, I struggled to find

the right balance between watching my partners—which undoubtedly helped me with the synchronisation of entrances and rubato passages—and listening intently to the expressive qualities of their sound. Two things helped me gradually adapt to the mediated nature of my partners’ sound and body language and achieve a balance between image- and sound-monitoring that worked for me: full internalisation of my own part, to the point that I could perform it from memory; and in-depth knowledge of my partners’ musical intentions through a process of rehearsal with the leading tracks and of synchronous/asynchronous dialogue with my partners.

A surprising finding related to the recording of the response track is that participants reported experiencing their performance as being “spontaneous” and “in the moment” even though they would record multiple takes of their part to achieve a response track they were satisfied with:

I feel like it was a creative process. I would be in the moment . . . I was still experiencing “music”, if that makes sense, like you would in a live performance. (Kat)

In Kat’s experience, having the opportunity to record multiple takes meant that she could take more risks than in an in-person ensemble performance. This was because if she “messed it up”, she had the option to make a new recording.

A key finding from this component of the virtual ensembles is that the only reliable way for the participants to evaluate the effectiveness of their response tracks (and of their use of the relevant technology) was to watch the multitrack split screen video that resulted from combining the leading and response tracks together. As such, the video editing and mixing processes were a necessary precursor to participants’ (self)-reflection on their overall work in progress.

4.2. The Overall Virtual Ensemble Performance

4.2.1. The Creative Role of Postproduction

As mentioned in the section about the design of the virtual duets project (3), I took on the role of video editor and mixing engineer for all the virtual ensembles to facilitate the participants’ focus on the music making. The process of editing/mixing the multitrack split screen videos, however, highlighted the fact that postproduction is very much a creative activity that significantly contributes to an ensemble’s overall creative process (cf. Zagorski-Thomas 2020). Several musical aspects of the virtual ensembles were finalised during this stage of the duet projects: the overall sense of ensemble (through the synchronisation of the tracks), the balance between parts and overall texture (through volume adjustment of the individual tracks), as well as the ensembles’ visual communication (through the creation and positioning of the split screens).

An important finding emerging from this stage of the project is that for the “final product” (the multitrack split-screen video) to reflect the performers’ musical intentions successfully, the performers themselves need to be closely involved in the postproduction process. This means that, if the performers are not editing/mixing their own tracks, they need to take on the role of producers, thus directly shaping the outcome of the video recording (McIntyre 2012). I enabled the participants to shape the postproduction process by discussing the editing and mixing of each multitrack video draft with them and asking them for feedback on the musical effectiveness of the virtual ensemble. This feedback process helped me adjust aspects of the multitrack videos so they would best represent the performers’ musical intentions. It also helped the musicians themselves to reflect on whether they would need to change any aspects of their individual (leading and/or response) tracks in later drafts in order to achieve the desired ensemble performance “feel”.

One of the postproduction aspects I found most challenging was the synchronisation of the leading and response tracks for projects in which I was not performing and for versions of virtual ensembles for which I had created the leading (rather than the response) track. In these instances, the difficulty I came up against was that I could not immediately tell whether some minor ensemble issues I could hear while editing the multitrack video were due to timing issues in the response performance (in other words, to the fact that the musician had not performed their own part consistently together with the leading track during the recording of their response track) or to a slight misalignment of the tracks on the timeline of the video editing software.

When I edited videos for which I had created the response track, I could rely on my recording experience to diagnose the reason for the issue. If I had experienced particular moments of my performance as being very well co-ordinated with my partner’s recorded performance, but this was not reflected in the multitrack version, then I knew that I had to keep adjusting the alignment of the tracks further. When editing all the other multitrack videos, however, I had no such reference points. Thus, to find the most “organic” fit between parts I had to adopt a painstakingly slow process of trial and error during which I would check the synchronisation of the two tracks at different points of the performance, tweaking the alignment one frame at a time until the overall sense of ensemble became convincing. I would then “seek verification” (McIntyre 2012, p. 158) of my editing work from the performers, to make sure it reflected a sense of ensemble with which they were satisfied. Ideally, to speed up the postproduction process, the synchronisation of tracks should be carried out by the co-performer creating the response track.

As one of the goals in the current study was to find out whether it would be possible to create musically effective virtual ensembles with minimal technology and editing know-how, I intentionally did not do any sound editing beyond adjusting

the volume levels of the leading and response tracks. I adopted this approach even though there were some clear differences in sound quality between tracks. These were primarily due to the differences from co-performer to co-performer in recording conditions (such as the size/shape of the recording space, the type of recording device used, its distance from the sound source). In the case of the four-hand duets, there was also the additional condition of the co-performers using two different instruments. A unique characteristic of this type of duet is that in an in-person context, the musicians share the same instrument. This, however, was not the case for the pianists participating in this study. As such, the differences in timbre and volume between the instruments used by the co-performers were noticeable, especially in the case of the grand piano-electric keyboard duet.

In spite of the lack of extensive sound editing, the findings indicate that the virtual ensembles “worked well as performances” (see Krivenski 2018, pp. 205–6, 239–40), in the sense that the multitrack video recordings created an enjoyable and effective musical experience. This is illustrated by participants’ comments on their experience of watching the final drafts of their own and/or other participants’ virtual ensembles:

I was totally immersed in [the video]. I wasn’t thinking about the technological stuff . . . I was just enjoying that performance. (Minnie)

I think [the video] works well as an ensemble and there are really lovely moments where we are together and have a good dialogue. (Kat)

The experience of watching [the multi-track video] is really pleasing. (Ellie)

Even if the use of domestic technology and limited editing know-how allowed the creation of effective virtual ensembles in the case of this study, the professional performers who participated stated that, if they were to engage with virtual ensembles regularly as part of their professional activities, they would upgrade their recording equipment and refine their recording techniques. On the other hand, by the end of the study both professional and student performers reported that, in their opinion, the type of technology and editing process used for this study would be highly effective from a pedagogical perspective in the context of HE musical performance, particularly at undergraduate levels. However, they also pointed out that there might be limitations to the types of repertoire that could work for HE virtual ensemble performances due to the fact that colour nuances in sound could not be effectively captured without professional equipment.

4.2.2. Co-Performers’ Creative Collaboration

In spite of the mediated and asynchronous nature of the ensemble music making, participants reported that they experienced the overall virtual ensemble process

and outcomes (i.e., the multitrack split-screen videos) as a creative collaboration. Findings in this study indicate that what enabled this experience was the fact that co-performers took turns to create drafts of both leading and response tracks. This turn-taking process allowed participants to share creative ideas that were generated while working on their own part by themselves, and to develop them together with their co-performer through successive leading/response track drafts and ongoing (synchronous and asynchronous) dialogue, thus supporting Slayton et al.'s (2019) hypothesis regarding the key role of an "iterative, interactive feedback loop" in group creativity:

Jeff got ideas from me. I got ideas from Jeff. As the project went on, we ended up implementing both of each other's ideas in our [leading track] versions. I think the shared creativity was huge. (Tim)

Tim's words resonate with my own experience as co-performer in three virtual duets. As the virtual collaborations progressed, I found that my ensemble partners' leading tracks, and our conversations about musical intentions, encouraged me to explore different musical approaches in subsequent versions of my own leading tracks. Additionally, vice versa, my leading tracks fostered a similar reaction in them. Personally, I enjoyed being inspired by my co-performers' creative ideas and embraced the opportunity to take my own leading track performances in different directions compared to my earlier drafts. Thus, the process of creating leading tracks as experienced by myself and other participants in this study supports Schiavio and Benedek's (2020) conception that "solo" creative activities can be "inherently participatory" because they often involve "a felt presence of others based on the creative re-enactment of a shared repertoire of practices or an anticipated experience of music making in context" (ibid., para. 30).

A further consideration is that taking turns in creating leading and response tracks facilitated the participants' adoption of "decentering". Seddon and Biasutti (2009) describe "decentering" as musicians' ability to see musical ideas and approaches from their co-performers' perspectives, which the authors correlate to co-performers' ability to interact creatively in an in-person ensemble context. Interestingly, the findings in this study indicate that, in a virtual context, decentering coupled with the turn-taking process described above can lead co-performers to create "divergent" virtual ensembles. In other words, multiple virtual performances (each one "led" by a different ensemble member) may reflect different interpretative approaches to the same piece. This was the case for one of my four-hand duet projects, as my co-performer's words illustrate:

So [our final multitrack videos] turned out very differently and both of them—and this is the interesting thing—they are both convincing. They both have a feeling of validity about it [sic.]. (Ellie)

This suggests that a virtual ensemble performance can be a fruitful context for co-performers to explore the effectiveness and validity of different interpretative approaches to the same piece(s).

4.3. Online Asynchronous and Synchronous Interactions

The virtual duets project was supported by two technology-mediated communication modes: asynchronous, in the form of written comments, via Music Circle; and synchronous, in the form of face-to-face conversations and musical demonstrations, via Zoom. Findings indicate that both communication modes facilitated a dialogue between co-performers about their understandings of the piece they were working on together and their musical intentions. Additionally, both online platforms enabled co-performers to construct a “shared conceptual space” (Slette 2019, pp. 35–36) where they could negotiate musical meaning and engage in collaborative problem solving. Each communication mode (and associated platform), however, offered different interactional and learning affordances, something which I discuss and illustrate in the following section.

4.3.1. Asynchronous Interactions and Critical Listening Skills

While watching their multitrack video drafts on Music Circle, participants had the opportunity to post written (self-)feedback (shared with their co-performers) on how leading and response tracks “interacted” together and whether the overall virtual ensemble sounded coherent and musically convincing. In my role as coaching tutor of the student virtual ensembles, I facilitated the (self-)feedback process through questions addressed to both co-performers (such as, “How do you find . . . ?”, “What do you think of . . . ?”) and also offered my own thoughts on the progress of the virtual duets.

Comments that participants posted on Music Circle were wide-ranging and covered both technical and musical aspects of the ensemble performance, such as pitch/rhythmic accuracy, intonation, phrasing, dynamics, use of rubato, balance between parts, etc. Analysis of these written comments and of participants’ self-reports about their experience with Music Circle shows that this type of verbal communication facilitated both “cooperative” interactions (“related to activities facilitating cohesive performance of the music”) and “collaborative” interactions (“related to activities facilitating creative developments in the interpretation of the music”) (Seddon and Biasutti 2009, p. 10) between co-performers. In other words, the (self-)feedback that co-performers shared with one another enabled an in-depth dialogue around observable ensemble issues (and how to overcome them in later video drafts) related to both cohesive and creative aspects of their virtual ensemble music making, as illustrated by the following two extracts from Music Circle:

(Example of written comments promoting cooperative interaction)

Maria: Was the pulse clear enough for you? Our two parts don't sit together as comfortably as they do in the first section.

Kat: I was not quite sure of the pulse in this section . . . perhaps it was the rubato in places? Although your part plays on every semiquaver, so it shouldn't have been a problem for me to follow.

(Example of written comments promoting collaborative interaction)

Tim: I like the suddenness of [the pp] as the words read "my heart". I just feel that the sense of reflection is elevated a little more with the "subito".

Jeff: I think if we're going to subito [pp], it should be better defined.

Most significantly, the majority of student participants reported that the asynchronous written nature of the (self-)feedback process encouraged them to exercise their critical listening skills and jointly reflect on their musical choices to a much greater extent than they had previously experienced in an ensemble music making context:

I absolutely love the amount of detail we've gone in through this [asynchronous approach] [. . .] we could think about [the feedback] in a different way, which is not sometimes achieved in a normal in-person rehearsal; in a live [in-person context] [. . .] that type of detail gets lost. (Jeff)

Thus, findings in this study provide new evidence to support the idea that asynchronous forms of interactions in the context of virtual ensembles can afford "unique pedagogical advantages" (O'Leary 2017, p. 11) that may not be (as easily) available to (student) performers in a "typical" in-person rehearsal.

4.3.2. Synchronous Interactions for a Positive Interpersonal Relationship

The Zoom synchronous sessions constituted a key complement to the asynchronous interactions discussed above. These online live sessions provided co-performers with the "multimodal features such as posture, gesture" (Ezen-Can and Can 2018, p. 162) and "sense of immediacy" which lack in written communication and are fundamental to establishing online interpersonal relationships that feel safe and supportive (Garrison 2016, p. 26).

Findings indicate that, particularly in the case of newly formed duets, these online face-to-face interactions enabled co-performers to build a sense of trust that helped them feel at ease when sharing their own musical ideas with one another. This was the case for me and Ellie, the professional pianist I collaborated with. Although we were colleagues, we had never performed together or socialised outside of work. As such, our Zoom meeting (during which we shared with one another metaphors

that captured our understandings of the four-hand piece we were working on) helped us feel more closely connected on a personal and artistic level. The impact of our face-to-face synchronous interactions on the virtual ensemble music making that followed our Zoom meeting is clearly illustrated by Ellie's words:

[F]or me . . . the first recordings were a bit tentative, a bit inhibited, because there hadn't been an opportunity for that trust to build-up yet . . . [Thanks to] the conversation we had on [Zoom], there was an opportunity to build-up a musical relationship that was more spontaneous. For that reason, the second time through, [recording the leading and response tracks] felt completely different for me because I felt I knew you better personally as well as musically. (Ellie)

The online synchronous sessions also afforded participants the opportunity to share and negotiate their musical ideas through live music making, thus further supporting a positive relationship between co-performers. Although the standard internet connection available to participants did not allow for synchronous ensemble music making, co-performers were able to strengthen their musical relationship by clarifying their own written (self-)feedback posted on Music Circle through brief musical demonstrations. This enabled co-performers to jointly refine their musical goals for the following version of their leading/response tracks:

[W]e could really consolidate what we wanted to do and really try and get a mutual understanding of each other's leading and response [tracks]. (Tim)

Thus, findings in this study provide further evidence for the importance of high-quality personal and artistic interactions between ensemble members for achieving successful and fulfilling artistic collaborations (Gaunt and Treacy 2020, pp. 17–18). Most importantly, they show that virtual ensembles do afford high-quality interactions between co-performers when they are supported by regular online synchronous face-to-face interactions.

5. Conclusions

The practice-led study discussed in this chapter aimed to explore the creative and pedagogical affordances of asynchronous small group ensemble in a HE context. Moreover, it aimed to facilitate a more in-depth and multifaceted understanding of this form of technology-mediated collaborative music making, one that transcends the narrow view of a virtual ensemble as "just" a response to the social-distancing measures triggered by the COVID-19 pandemic.

Within the limitations of this study, findings indicate that the "virtual ensemble model" proposed and discussed here (with no "guide" and in which co-performers take turns to create leading and response tracks with the support of

asynchronous/synchronous dialogue) is an artistically meaningful and pedagogically valuable form of chamber music. It affords unique opportunities for deep learning, joint creativity and artistic fulfilment. Additionally, it promotes the development of musical and technological literacies that can facilitate (student and professional) performers' participation in online music communities and access to online collaborative music-making opportunities. The most important practical implication of this study for HE music programmes is that the inclusion of virtual performance in post-pandemic curricular activities can play an important role in enabling performance students to acquire the experience, skills and mindset they need to embrace the evolving roles and identities of the 21st-century classical musician and, thus, build sustainable and fulfilling careers.

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