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# Supporting Interaction in a Virtual Chorus: Results from a Focus Group

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**Abstract.** To get effective participation in a virtual chorus is particularly difficult because there is the need of artificially creating that common sense of union among all the group members. This paper aims at understanding how technology may enhance virtual chorus members' interaction through a focus group involving three chorus masters with experience in conducting virtual chorus. We used the Thematic Analysis Template (TAT) for planning and analyzing the results. Results revealed that three types of interaction modalities have been employed: asynchronous audio/Video multi tracking recording grouping the participant single tracks, synchronous teleconferencing with one participant speaking, and social gaming. These activities are surrogates of F2F choir rehearsals because present technology is not adequate for real synchronous interaction. While waiting for connection empowerment, participants expressed their needs for enhancing present videoconferencing tools, including simultaneous recording of participants in an individual way and integration of the various environments.

**Keywords:** virtual chorus · multimedia interaction · focus group · requirements · Multi-User Interaction / Cooperation.

## 1 Introduction

Singing together on a chorus has many health benefits [12]. Unfortunately, pandemic restrictions are very heavy for chorus activities. In many countries, as in Italy, singing in groups in presence modality is forbidden. One of the main challenges is to avoid the chorus dispersion, that is avoiding that the group identity is wasted by the perduration of the pandemic situation and the consequent desegregation of the contacts. Many choir masters in all the world decided to adopt distance technology to keep on the singing group. But singing in a chorus is an activity that benefits participants far more than the other social activities, by enabling them to perform a shared creation of music through the coordinated physical action of singing together within the same physical space [4]. For this reason, to get effective participation in a virtual chorus is particularly difficult, because there is the need to artificially creating that common sense of unity among all the group members.

In this paper we try at answering the following research questions:

- **RQ1:** *Which are the virtual chorus interaction modalities adopted during the pandemic period?*
- **RQ2:** *How technology may improve the interaction experience of the virtual chorus?*

In this study, we aim at understanding the chorus masters opinions on the support offered by the technology solutions they adopted in the pandemic period for conducting the chorus activities; what features provide an effective value, how and why, and what aspects may be improved. We conducted a focus group with three chorus masters collecting impressions on their virtual chorus experience, on the support offered by technology, and on their needs. We used the Thematic Analysis Template (TAT) for planning and analyzing the recordings of the focus group session.

This paper is structured as follows: Section 2 introduces the background concepts, while Section 3 details the planning of the focus group. Section 4 discusses our findings. Finally, Section 5 concludes the paper.

## 2 Background

It is widely recognized that to be part of a chorus has many health and social benefits [5] [12]. But Face-to-Face chorus interaction has been strongly impacted by the covid-19 pandemic and many chorus masters organized virtual sessions for keeping on their activities. The experiences, activities, and reflections of choir singers during lockdown are reported by Daffern et al. [4] who conducted a user study involving 3948 choristers. Unlike them, we focus our attention on the support offered by the software platforms and on the chorus masters' technological needs.

Many applications require Internet connectivity for communication and data exchange and do not suffer from latency problems. The case of the virtual chorus is different, because an application for multi-user singing synchronously in Real-Time belongs to a specific type of applications, named Networked Music Performance (NMP) systems [9]. One of the major challenges for NMP systems is to maintain the synchronization of the group, due to high latency [7]. A solution may use an audio connection using software such as Soundjack [2], a teleconferencing software for the video, such as Zoom or Skype. Soundjack requires deep technical knowledge of networks and is difficult to use.

There exist some applications supporting virtual chorus activities aiming at simplifying some problems. For example, choristers when recording audio/video have to use the PC to listen to the base and the phone for registering their voice. The Gala application [1] enables choristers to listen to the guide track with their headphones on, and record themselves with their audio/video camera. Gala integrates also video recording and editing features.

### 3 The focus group

In this paper, we follow the guidelines proposed by Kontio *et al.* [8] concerning the planning and execution of the focus group.

#### 3.1 Defining research question

A focus group involves a small group of carefully selected participants that are representative of the target population. The goal is to interact with the participants and collect their opinions on a specific subject [10]. Our study aims at understanding how technology has been exploited by virtual choruses for supporting the interaction among the chorus members in the pandemic period and how interaction may be improved. We investigated the following research questions:

- **RQ1:** *Which are the virtual chorus interaction modalities adopted during the pandemic period?*
- **RQ2:** *How technology may improve the interaction experience of the virtual chorus?*

#### 3.2 Selecting participants

We conducted a focus group involving three chorus masters, namely M1, M2, and M3. M1 and M2 were both masters of a gospel chorus, size 40 and 36 members, respectively. M3 was the master of a pop chorus with 53 members.

All the participants have actively conducted distance sessions for keeping on the chorus activities. During this period they have performed virtual rehearsals and organized various group activities. Participants were volunteers.

#### 3.3 Planning and conducting the focus group session

The focus group was held in about one-hour session. It was held the on April the 9th 2021 on the platform Microsoft Teams. It started at 10.05 a.m..

The first author explained the aim of the study and the discussion rules. We also assured that the discussion would be anonymous and confidential. The discussion was conducted in Italian and recorded for further analysis. The first author acted as facilitator and checked that all the topics were considered while encouraging the participants to express their ideas. Another author took the discussion notes. We defined the topics of the discussion but did not formulate specific questions. In this way, during the discussion all the relevant arguments were addressed, leaving participants free to dialogue.

We transcribed and anonymized the focus group recordings and notes, on which we conducted our analysis. These data have been analyzed by exploiting the thematic analysis templates (TAT) [3]. It is based on a qualitative method, the thematic analysis, which is adopted to determine patterns, themes, and to understand data [13]. TAT performs thematic analysis by following a template,

which provides a set of initial discussion themes that can evolve while the analysis goes ahead. The templates we adopted in this study were designed by considering our previous experience in conducting focus groups for the Software Engineering field [6].

The template was manually filled in by all the researchers, which were all agree to the selected themes. In Table 1, we show the template we created.

## 4 Results

This section presents the results from the identified themes.

### 4.1 Virtual chorus experience

*Positive points.* Participants appreciated the distance activity because it allows them to work in a more in-depth way on listening. It is possible to individually work and to have more time to prepare the material. Also, the use of audio/video during the rehearsal was considered a very positive aspect.

There is a new possibility: putting together musicians of any places in the world or inviting special guests. Also to avoid traveling is a good advantage for people living far from the rehearsals meeting point.

*Negative points.* All participants agreed that the main drawback is not being able to play/sing in sync with the choristers. Not having the opportunity to leverage

**Table 1.** Template for TAT analysis.

ID	Theme	Discussion
1.1	Virtual Chorus Experience	Reveals what were the positive and negative points encountered when managing a chorus at distance
1.2	Participation	How do you describe the participation (also in terms of presence) of your chorus members?
2	The adopted Interaction modalities	Reveals appreciations and bias of the adopted interaction modalities
3	The supporting software	a) helps in the interaction between the chorus members b) does not help in the interaction between the chorus members c) Which features a supporting tools should offer to improve chorus interaction?

the "network" of emotions that the group generates in presence. The repertoire to be proposed is very limited. There is no executive interactivity. Maintaining attention is much more difficult. Having a medium/high quality standard of the test is tiring.

Many choristers had serious problems with the use of technology.



Fig. 1. Asynchronous interaction modality.

## 4.2 Participation

All the participants lamented a reduction in the choristers' participation. In particular, for M1 more than half of the choristers remained assiduous to the rehearsals, but there is a 25-30% who is less constant, even in the delivery of the assigned parts. 8 singers neither longer log in, nor are active in the choir chat. Also, 40% of M2 participants abandoned the activities, while M3 lost the 45%.

## 4.3 RQ1: Which are the virtual chorus interaction modalities adopted during the pandemic period?

The answers to RQ1 are summarized in Table 2, where we report the results of the discussion on the adopted interaction modalities. They may be grouped in three categories:

- *asynchronous interaction*, where the master collects audio (or separated audio and video) produced singularly by participants. From them, she produces audio (resp. video) performance in which the chorus members seem singing

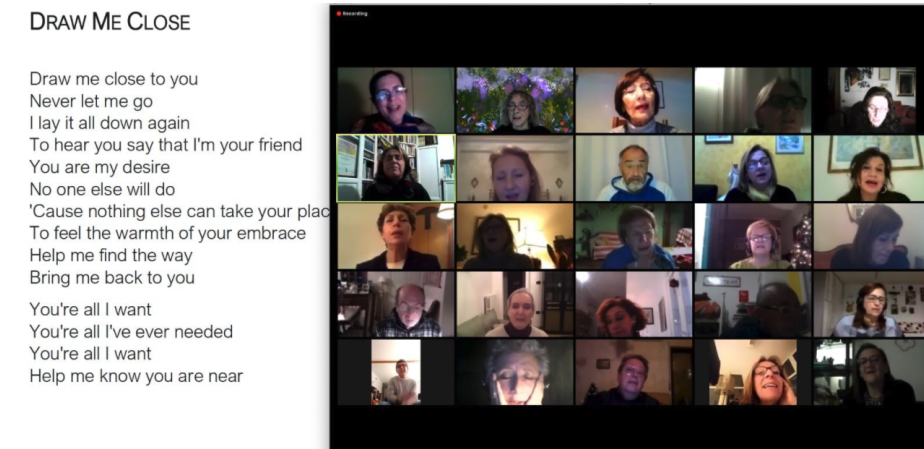
**Table 2.** Adopted virtual chorus interaction modalities and their characteristics.

	<b>Asynchronous</b>	<b>Synchronous</b>	<b>Socialization</b>
<b>Output</b>	Audio/Video multitracking recording grouping the participant single tracks	None	none
<b>Master Preparatory work</b>	reparations of the separate parts for voices. Realization of backing tracks	Creating scores and musical pieces	Preparation of the game, collection of sources, photos, images, videos. Creativity and the ability to be ironic
<b>Master work during the session</b>	Edit the video/audio by composing the single participant tracks	Managing the online meeting, playing accompaniment or sharing the base, Checking technology working appropriately	none
<b>Software</b>	teleconferencing (Zoom), audio editing (mixpad) video editing (moravi/video pad editor/wondeshare filmora) musical notation software (finale/musiscore/sibelius) Google drive	Music notation software (finale/musiscore/sibelius)	Wardwall, google form, Prezi, Powerpoint, powtoon
<b>Requirements</b>	good participants microphone and camera, good master technical skills	good internet connection, medium master's technical skills	medium internet connection, medium master's technical skills
<b>Required scheduling</b>	One registration every 15 days	fixed deadlines, scheduled meetings	none
<b>Participants' preparation work</b>	Audio (or separate audio and video) to prepare and send	none	none
<b>Commitment required of participants during the session</b>	Follow the directions given for each exercise. Commitment of about 20/30 minutes	Pay attention to reading. Take notes for the execution to be carried out later remotely	A few minutes of attention
<b>Optimal number of participants</b>	20/25	20/25	no limit

together (see Fig. 1). This requires a great effort of the master and high technological skills.

- *synchronous interaction*, conducted by using a video-conference tool, such as Zoom (see Fig. 2). When singing, they have the microphone muted and listen to the music base played by the master. It is not possible to sing together because the platform makes one person sing at a time. This produces a sense of frustration but enables the people to have the sense of being together.
- *social interaction*, where the master creates games by using gaming applications, or quizzes, or organize activities on a social network, such as "post the image of a painting that has a particular meaning for you and say the reason".





**Fig. 2.** Synchronous interaction modality.

#### 4.4 RQ2: How technology may improve the interaction experience of the virtual chorus?

*Help in the interaction between chorus members.* Through audio and video editing chorus members get the impression of singing together. Even if the preparation is singularly performed, the final result is very satisfying. Another positive aspect is the attitude of many choristers to feel more relaxed when they are online. This lets them express themselves more freely than they are in presence.

*Does not help in the interaction between chorus members.* Some singers have difficulty in using Zoom, the platform adopted by all the three interviewed, because of their low technological skills. Many of them often have difficulty in basic operations such as turning on the microphone, activating the camera, zooming in, etc., and need family support.

Other difficulties occurred when making the audio recording. The audio produced is rarely of good quality: rustling, background noises, electric shocks, etc. are often heard. Of course, no chorister has instruments and/or software that allow high-quality recordings.

*New features.* Needs of an integrated environment for non-expert users. Switching between all the various systems is too complicated for them.

In addition to the requirement of reducing latency time, one of the main features may be to have a software platform that lets participants listen to a common base while singing and, at the same time, records the single voices, which are muted for the others. This may be very useful to create an audio track with all the voices.

The chorus activities are full of social aspects: choristers spend time together before, during, and after rehearsals. They meet in many social activities unrelated to the music, often they create personal relationships with some chorus

members, and also may generate conflict among them. Thus, social aspects have to be included in the virtual chorus activities. This may be done by integrating the platform with a social environment, which may use also immersive technologies. Creating a virtual music room where, in virtual reality modality, choristers may sing together.

Having at disposal a common archive where all the chorus material (sheet music, video and audio registration, social-cultural contents) are available and easy to search by the chorus members. It would be nice to have a platform with which one does not have to stay rigidly in the squares assigned to each user, but in a way that can visually simulate, as much as possible, the real one of "being together" in an interactive environment, a little as it happens in virtual reality through visors, gloves, and headphones. Also, Loveridge [11] suggests using virtual reality for conducting virtual chorus activity because it enhances the "presence" sensation.

## 5 Final remark

In this paper, a focus group study has been conducted with the involvement of three chorus masters performing virtual chorus activities. We used thematic analysis template (TAT) when discussing the adopted interaction modalities, the support offered by the adopted software, and how the interaction may be improved with the technology support.

During the pandemic period, the choral activities have been completely transformed by forcing the groups to hold remote rehearsals. The seal of the group, as well as on the proposed musical activities, is based on the friendships that exist between the participants. The chorus masters have exploited all their creativity and technical skills to let the chorus members keep on social interaction. Virtual chorus masters use different communication modalities that try to offer some aspects of in presence experience and that are accepted because of the persisting needs of socialization and singing. To this aim asynchronous technologies have been adopted, such as multitracking audio/video recording and production, synchronous videoconferencing platforms for singing in the group, and social technologies for maintaining the group identity.

The digital aspect to which the choir was forced to use to perform activities, aroused first resistance in most of the choristers and, only later, week after week, a gradual overcoming of the many difficulties that had arisen.

Our results revealed that the first need is to have a tool for real-time multi-user singing, which is not supported by actual technology. Several further interesting suggestions implementable by using present technology are related to the integration of the various tools for providing a single and easy-to-use interface suitable for not expert users, and tools for singular recording the performance of each participant during videoconferencing. The use of multi-user, immersive reality may also be investigated.

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