DL838 Year 4 Creative Music Production

Professional Project Thesis

What is the role of sound design in professional sports broadcasting?

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Contents

Abstract

The objective of this project is to examine the role of sound design as it relates to sports broadcasting. Drawing on principles of sound design for film and current research into remote production models, the supporting artefact challenges the participant to perform the role of audio mixer for the 2020 FAI Cup Final football. A quantitative survey is used to support assumptions of the research, confirming the modern multi-screen experience of watching a match from home. Further research could examine how spectator attention might be managed using aural cues.

Introduction

The sports broadcast industry is one of the most popular forms of entertainment on the planet. Television networks have continually developed techniques for increasing the entertainment value of in-game action. Sound design is an often-overlooked element of the production. Since the earliest days of film, sound was used to enhance visuals and increase an audiences' sense of immersion. Sound effects in film have gone on to inspire viewer expectations. When we see an Olympic archer taking a shot, we expect to hear the arrow flying through the air and hitting the target with a loud impact. The objective of sound design in sports is to support the expectation of the viewer. When a football player scores a goal, we expect to hear the roar of the crowd.

But in 2020, with the outbreak of COVID-19, fans were not allowed inside stadiums to support their favourite club. Investment into artificial crowd solutions was almost immediate upon the return of play. Broadcasters were not happy to present an incomplete product to fans. You can cover seats with banners, but you cannot do the same with sound. This project explores why this is the case and what improvements can be made to such systems.

Literature Review

The purpose of this section is to examine scholarly, authoritative sources as they relate to this project. This is an evaluative critique of the body of literature around this topic. It is important to note that this project is a synthesis of skills and knowledge learned throughout four years of the Creative Music Production course as much as it is an attempt to assess the impact of recent technical innovations. In this light, we will attempt to extract those methods used by academic research as well as the techniques of artists in their medium to help form an answer to the research question which is, as follows:

What is the role of sound design in professional sports broadcasting?

Sport broadcasts are highly produced media events in which decisions are made to heighten the entertainment value of in-game action. The importance of sound and music has long been understood by film producers. In his 2001 text, Sound Design: The Expressive Power of Music, Voice, and Sound Effects in Cinema, authour David Sonnenschein draws on his expertise in the field as a neurobiology undergraduate, director and sound designer to deliver a comprehensive overview of the role of sound in film. He explains how by "[giving] meaning to noise, sound becomes communication." This is relevant to the current topic because the sounds we hear while watching sports are coded with meaning, e.g. buzzer/shot clock in basketball. In his chapter on perception, Sonnenschein defines the difference between hearing (passively receiving auditory information) and listening (actively focusing, filtering and responding to sound). Our brain analyses aural information using mechanisms we are not consciously aware of and this can be an effective tool in sound design.

Sonnenschein draws much from French film theorist Michel Chion's 1990 text Audio-Vision. Specifically, the notational concept of 'listening modes.' This states that in the moment that we begin to perceive a sound it is filtered by our sensory system and processed by our brain through three types of listening modes: reduced, casual and semantic.

Reduced listening refers to the observation of a sound itself, not linking it to any particular source or meaning. **Casual** listening assists in determining the source of a sound. This form of listening is aided by visual information. The manipulation of casual listening is what allows sound designers to make an audience believe that a sound is connected to what is on screen, think that when a ball is struck on screen, we expect to hear an impact. **Semantic** listening is related to language and how the same

information or meaning can be held despite variations in sound. When paired with casual listening our brains can quickly decode and process incoming information more accurately.

When considering how these principles of sound design apply in a real-world scenario, we might look to veteran audio engineer Dennis Baxter's 2007 text 'A Practical Guide to Television Sound Engineering.' Audio, Baxter explains, requires in-depth technical knowledge alongside creative decision making under difficult and subjective conditions. Given the prevalence of digital technology, the importance and complexity of audio production is more apparent than ever. With more devices than ever capable of displaying live sports, Baxter presents an easy-to-follow reference handbook filled with relevant information regarding the situations faced by live mixers. He gives a general overview on the role of *outside broadcast* (OB) vans. In the early days of television, network producers realised that live events such as news, sports and entertainment can fill a lot of air time. As a result, the need for more efficient productions drove innovation in recording equipment e.g., smaller, high-resolution cameras and multi-track audio with higher resolution. This job is performed by the sound mixer/designer. In the 1980s, Baxter explains, there was a boom in televised sports in America which led to a labour dispute following which skilled freelance technicians set up independent remote broadcast facilities in large, converted trucks. With a high demand for on-location production, the OB van quickly emerged as standard practice in the industry. High-definition broadcast and surround sound have become the norm. Surround sound offers engineers a chance to advance beyond reproduction and into sound design. Production has gone from coverage with few natural effects and little atmosphere to a medium that puts the viewer into the athletic experience. Baxter explains the difference, sound reproduction is the process of capturing the expected, such as the crack of a bat, while sound design is the technical and creative use of available tools. In his 2012 interview with National Public Radio, Baxter describes using pre-recorded sounds for Olympic rowing, where engine noise from camera crews following the action would drown out the natural sound of the sport itself. In the present text, Baxter reviews the specific techniques and hardware used to capture and convey the real-world action, be they ambient, omnidirectional crowd microphone techniques or contact microphones placed under the floor for basketball games to capture the bouncing of the ball. The selection and proper placement of microphones according to a pre-arranged plan is a principle tool of sound design for sports.

This investment into better audio shows how a production can influence spectator's response. Studies have demonstrated the effects of aural cues on our perception of competition. In their 2019 paper, Sight versus Sound: The Differential Impact of Mediated Spectator Response in Sport Broadcasts, researchers Cummins, Berke, Moe and Gong perform an experiment to demonstrate how controlled spectator response (represented as crowd noise) could lead to participants having *'enhanced perceptions of the exciting nature of broadcast sport.'* They go on to suggest that aural cues may be key to directing attention to game events when the spectator at home may be making use of multiple screens. In-person spectators experience an unedited version of competition, whereas home viewers are exposed to a 'media event' produced by a team of professional 'embellishers.' Terms such as 'intra-audience' (Hocking, 1982) have been coined in relation to aural effects, this denotes how the volume and intensity of a crowd influences the individual's response to competition. In a modern environment where many devices and venues can present a product to the spectator, this paper provides valuable insight into the impact of visuals on spectator's perception of competition. Cummins quotes Hagood and Vogan (2016), who argued that "fan noise constitutes a powerful reverberation that can feed back into the game that inspires it, serving as a sonic signature for fan groups and the cities they represent, affecting on-field events, becoming a character in media coverage, and shaking up—literally and figuratively—the built environments of league play." Crowd noise fills game coverage with authenticity and excitement. This has been known to producers for many years. At the advent of radio, the first baseball broadcasts were recreations of games, which were based on condensed bits of information sent to the studios via telegraph. Baseball announcers were the first to use sound effects and imaginative language to manufacture the impression that they were actually on location and describing play-by-play action as it unfolded. Production elements are used to heighten the sense of excitement, through commentator narrative and sonic decisions made to translate in-game action into entertaining television as well as, increasingly, refocus attention away from a second screen at key moments to maximise spectator engagement.

Yair Galily's 2014 article for Television and New Media focuses on this translation from watching a game or sport in the field to the viewing experience through a medium. He argues that recent technology-driven developments provide not only a sophisticated view of the action, but a new creation with unique characteristics. Galily, like the previous article, draws on examples where television coverage embellishes the less entertaining moments of coverage to imbue them with some greater meaning. It is natural to compare the experiences of being at a game and watching it on television, but the authour calls this into question. There are many benefits to watching at home that could be said to outweigh live attendance. Instant replay and superimposed graphics provide stimulating ways of capturing audience attention. These systems are highly complex, analysing every movement and

parameter of the camera (tilt, zoom, focus, etc.) to insert a real time 3D element into the environment as though it were a real physical object (think 1st down lines in the NFL or the dynamic world record line at Olympic swimming events). Although modernisation of stadiums has brought with it a hybrid experience, giant LED screens easily seen from even the worst seats, Galily concludes that live attendance might be less important than the opportunity to share an enhanced communal experience and that this points to a suggestion that the traditional form is changing because of technical innovation.

In a 2007 essay, researcher Michael Weed examines the evolution of the pub into the primary venue for football spectatorship. Like Galily's conclusion, he suggests that sport spectator's primary desire is to share the viewing experience with others rather than to be physically near the event. This idea underpins the Irish context, there is a lack of native major televised *professional* sports. Going to a Premier League or NBA game as a foreign fan alters the experience. It could be argued that this is the norm in Ireland.

Michael Goldman and David Hedlund wrote a piece in 2020 examining the novel content strategies developed by the U.S. televised sports industry during the period of hiatus as a result of COVID-19. This commentary, Rebooting Content: Broadcasting Sport and Esports to Homes During COVID-19, explores the new, mixed and rebroadcasted content across broadcast and streaming platforms available to quarantined-at-home fans. The authors discuss the impact of esports as content. Esports are defined as *"a form of sports where the primary aspects of the sport are facilitated by electronic systems; the input of players and teams as well as the output of the esports system are mediated by human-computer interfaces"* (Hamari & Sjöblom, 2017, p. 213). The NBA embraced esports to provide new and live content in 2020. The Phoenix Suns hired a professional NBA 2K (video game) player to simulate a virtual season which was livestreamed on popular hosting service, Twitch.tv. Later the same year a group of 23 teams, each led by an active NBA player, competed in an NBA 2K tournament which was streamed live across multiple platforms. Goldman and Hedlund call this category 'new content.' 'Mixed content' they say, is content like interviews and behind-the-scenes clips that give fans a view into the league. 'The Last Dance' is a docu-series about the 1997-1998 Chicago Bulls and Michael Jordan's career was made up of previously unseen archival footage interspersed with interviews and anecdotes on Jordan's career. This kind of mixed, sports-related content speaks to the previously discussed idea of modern sports fandom extending beyond the traditional game. Goldman and Hedlund explain that the last type of programming, rebroadcasted content, took the majority of air-time due to the convenient nature of ready-to-broadcast archival footage.

Roxane Coche and Benjamin J. Lynn's 2020 article from the International Journal of Sport Communication further comments on the effects of the COVID-19 global crisis on sports production. The REMote Integration (REMI) production model has supplanted the traditional on-site model of production. They argue this transition was hastened as a result of economic factors over the pandemic and is changing the sports broadcast industry. Networks continually try to reduce their operating costs as a principle of economics. The main advantage of the REMI model is that while the technical crew travels with the microphones, cameras and cables, the actual control room can remain at a centralised location capable of inserting graphics and providing replays. Before COVID-19 restrictions, networks had been averse to a new production model for fear of alienating their audience. But the pandemic provided an opportunity for a shift in production with minimal risk of audience complaint due to a much lower expectation of quality considering the situation. Coche and Lynn also draw parallels between conditions in a remote production van and those of a commercial airliner. Passengers seated around an infected person have an 80–100% chance of becoming infected too (McKeever, 2020). The REMI production model is scalable, if a single control room is too small for its crew they can simply make use of available space to maintain social/physical distance. The authours conclude with the message that the pandemic provided scholars with an opportunity to test mass communication theories on a scale that was unimaginable prior to COVID-19.

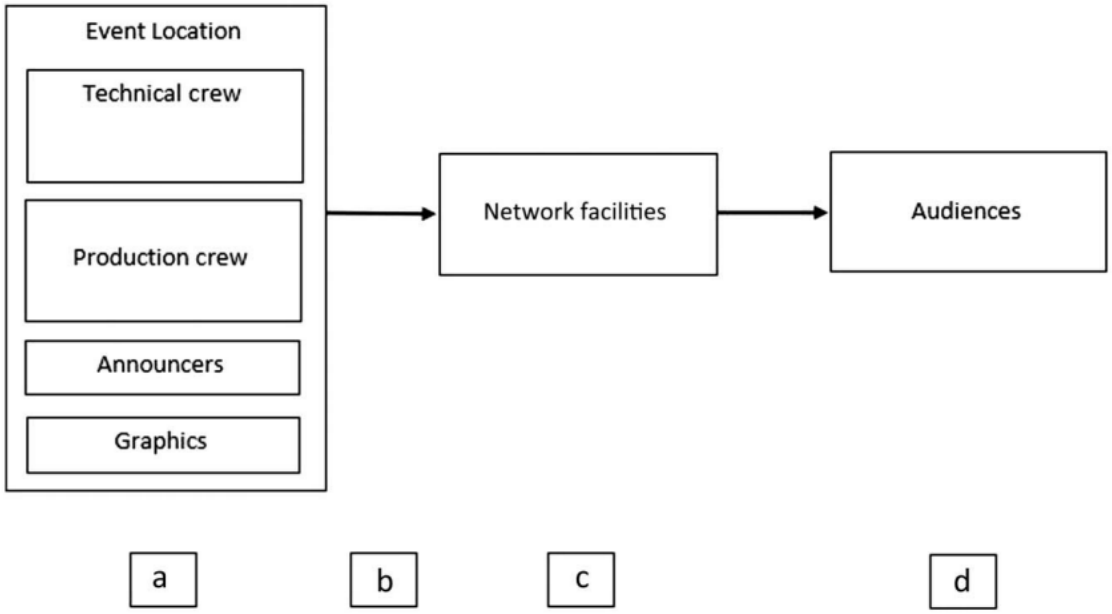


Figure 1 — Signal flow in the traditional mobile sports production workflow. With technical and production crews on-site together, the content is captured and packaged (a), then sent to the network facilities via satellite (b). The networks insert final graphics (c) and pass the signal on for mass distribution (d).

Image courtesy of Coche & Lynn (2020)

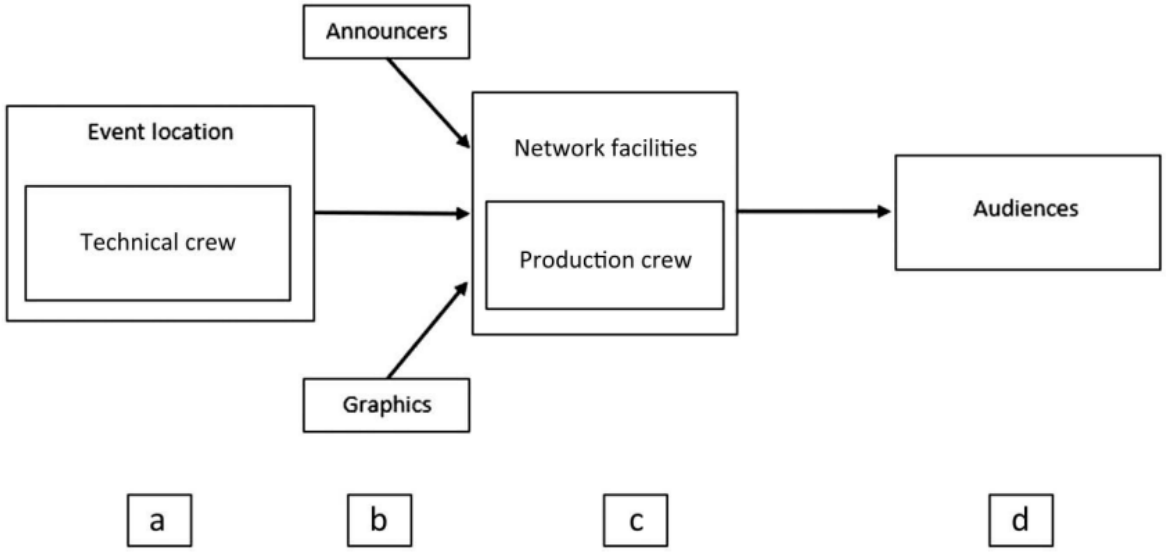


Figure 2 — Signal flow in the REMI (REMote Integration) sports production workflow. The technical crew is on-site at the event, sending signals back to the network facilities (a). Announcers and other personnel may be at home, sending additional signals to the network facilities (b). The production crew, now located in the network facilities (c), combines the incoming signals to create a finished product that is passed on for mass distribution (d).

Image courtesy of Coche & Lynn (2020)

Methodology

The aim of the exhibition piece is to challenge the participant to place themselves in the role of the sound designer/mixer during the period following the COVID-19 crisis when professional televised sport was being played behind closed doors. A straightforward way to represent this is by setting up a system with which to play dynamic crowd noise (Lemmer, 2020). The participant must make real-time creative decisions and explore a system/setup similar to those being used in centralised broadcast hubs.

In order to gain an insight into the expectations and experience of the spectator it is necessary to review the processes by which our brain parses new auditory information. Drawing on Gestalt theory, Sonnenschein's 2007 work introduces the concept of 'figure and ground.' In the context of the current project this could refer to our ability to pick out a voice (figure) in a crowd (ground) atmosphere. In a live television broadcast with the crowd being recorded, the mixer must control the levels such that no individual's voice is apparent. Similarly, differences in sound quality (frequency/timbre) can cause one sound to appear as a figure among the ground. This comes into play when extracting crowd noise samples. Keeping these psycho-acoustic tenets in mind when selecting samples reduces the amount of post-processing required on individual tracks.

Understanding where microphones are placed is a key component of a good sounding mix. Certain sounds are absolutely expected in a mix. Capturing the sound of voices or impacts on the pitch as if you were there in person. This is known as sound **reproduction.** This is achieved through microphone placement techniques that capture a wide range of sound, they might be fixed onto handheld cameras which the director can switch to on request. **Sound design** are those sounds which enhance the spectator's experience. Placing microphones in specialised and creative locations, think contact microphones under the floor to capture the sound of a ball bouncing during the NBA bubble (Daley, 2020). **Sound supplementation** is the most relevant to the current topic; certain sounds are difficult or impractical to capture. The use of a sampler to create a realistic artificial crowd would be an example.

There are three basic layers of production sound in a good television mix. The voice of the announcer/commentator, the atmosphere/ambience (crowd) and production specific events, such as a tennis racket striking the ball (Baxter, 2007). Sculpting the production sound section with post-processing effects e.g., compression, equalisation and stereo-imaging is done to maintain a consistency of tone and timbre. The overall energy/sound-level should rise and fall with the action on-screen, guiding spectators' attention. Sound mixing is the skill of blending audio to create an appropriate sound field (stereo image) that enhances the visuals. The mixer has the ability to manipulate the soundscape; Baxter explains *"the creative challenge in television is to create*

movie quality soundtracks live." It is important that the soundtrack does not distract from the visuals but supports them.

'Sculpting the sound' is a phrase used to describe the use of post-processing effects to electronically manipulate elements. Ableton is a digital-audio-workstation capable of powerful manipulation of sound using such effects. Creative use is made easier with knowledge of how our brain processes new sonic information. Spatial processing using digital delays/reverbs can create the illusion of a sound being placed in a room or another suitable acoustic space. Multichannel processors can be used to space sounds into a surround sound mix using advanced room simulation. Equalisation is used to adjust the frequency content of a sound source, thereby altering its tone or timbre. Through careful listening and use of EQ, a sound mixer can prevent the build-up of overly loud or harsh frequencies that arise when combining multiple sounds (David & Jones, 1989). Compression is a tool to control dynamic range (the difference between loudest and quietest moments). This is a key tool for crowd noise; compression should be used sparingly to create a subjectively exciting moment. An audio mixer playing artificial crowd noise for the fans at home is an interesting case because their goal is to accurately reflect the reaction from thousands of spectators following a game event.

Dynamic range is an important concept because of the limitations and standards imposed by television/streaming networks. EBU R 128 is a recommendation issued by the European Broadcasting Union (revised in 2020) for the purpose of measuring and controlling loudness across programming. Loudness is a term used to describe the subjective perception of sound pressure or apparent volume of a sound. LUFS is the measurement of integrated (average) loudness over the whole duration of the programme. According to EBU R 128, the overall loudness of the program should be targeted towards -23 Loudness Units Full-Scale (LUFS) and not exceed -1 dBTP (decibel true peak).

For each action and situation in-game there are specific crowd samples deployed (Allen, 2020). In the context of football, this could be a goal for the home team, a yellow card or a penalty, etc. While games were being played behind closed doors, television networks made partnerships with the various leagues to use crowd noise recordings, the Bundesliga in Germany used previously recorded match sounds to make their crowd noise. The Premier League has a long-standing relationship with video game publisher Electronic Arts, creators of the FIFA series. They made use of EA's massive library of stadium sounds that are usually reserved for virtual gameplay only.

Artificial crowd noise is a specific sub-mix position where the audio operator has two audio 'beds' that are constantly running, one each for the home and away team. The volume of both tracks is monitored and adjusted to fit the visual. Supplemental audio is played on cue with specific related game events and mixed live by the operator such that the levels reflect the action.

Understanding public response to live sport broadcasts and especially fake crowd noise is integral in making improvements to such systems. Using a quantitative method of questioning (public survey) researchers gather concrete data suggesting the range of preferences among a random sample of televised sporting event spectators.

SurveyMonkey is a service that enables users to create surveys. It also creates helpful graphics and provides exports of the information so that correlations in the data can be made via spreadsheet analysis.

The aim of the 14-question survey is to establish the demographic responding to the questionnaire and examine how sports consumption/fandom is changing (by relating the results to age). The primary questions being asked by the survey are as follows:

Q.7 *To what extent do you agree with the following statement "Watching sports is often a social engagement?" (1-5)*

> Do most people watch for individual entertainment or could it be true that sharing the experience is almost as important as the event itself?

Q.8 *How likely are you to use your phone to check stats or find information about a game while also watching it live? (1-5)*

> How prevalent is the dual-screen model suggested in the literature previously?

Q.9 *Which of these do you find plays the biggest role in creating a sense of atmosphere when watching a live sports broadcast? (Commentators/Crowd/Players)*

> Which sonic aspect of a match do most people consider the most obvious?

Q.10 *In 2020, when given the choice, did you watch matches with or without fake crowd noise? (With/Without/No choice)*

> Did people like fake crowd noise?

Q.11 *How often did you notice that fake noise did not match your expectation or seemed out of place? (1-5)*

> Was it a seamless experience?

Analysis

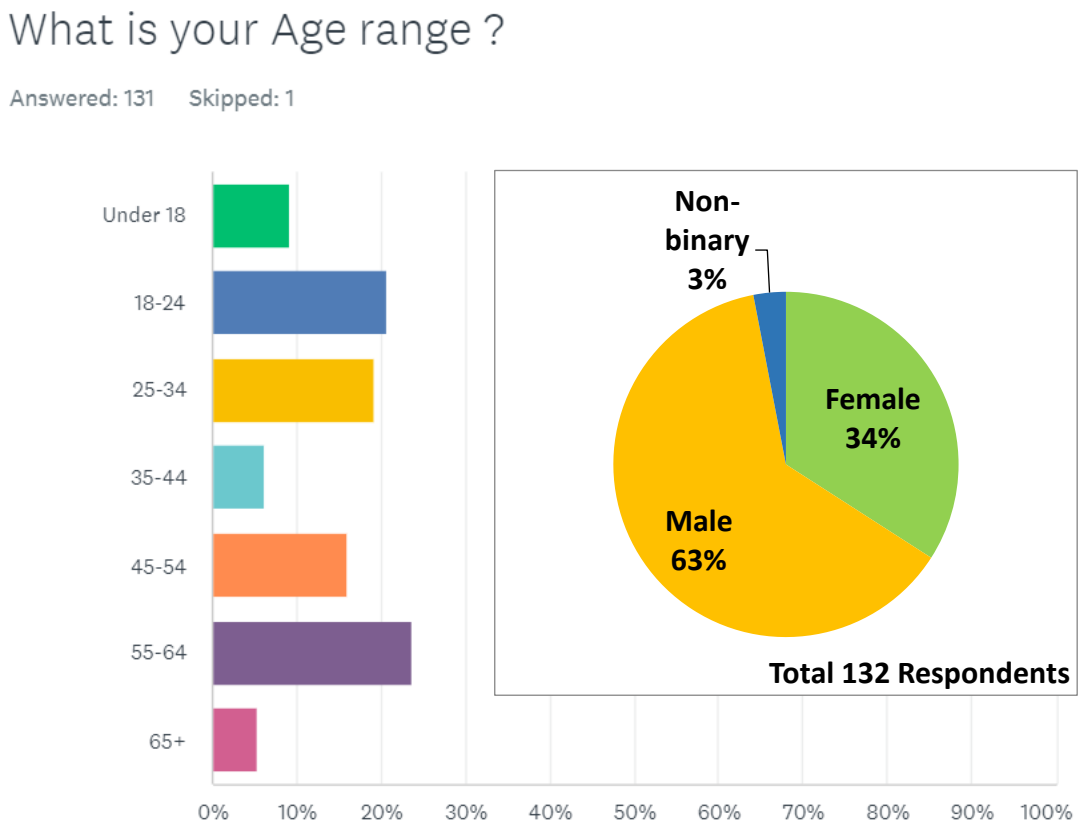
Creating an Ableton setup similar to those documented in the articles by Lemmer (2020) and Allen (2020) participants are invited to play the role of audio mixer for the 2020 FAI Cup final match played in The Aviva Stadium in Dublin, Dundalk F.C. versus Shamrock Rovers F.C. at which no fans were permitted. An Akai MPD218 and Korg NanoKontrol 2 were used as the MIDI interface for the activation and control of samples. For the showcase, these are labelled and arranged with a loop of the match open in Ableton.

Audio taken from past matches played in the Aviva (2021 FAI Cup final) as well as other high energy matches (El Classico 2011, F.C. Barcelona versus Real Madrid C.F.) proved effective in providing atmosphere/ambience to an otherwise empty stadium. The effect of having no crowd is obvious if we listen to the commentary team. When we compare the 2020 and 2021 cup final the energy in their voices is a lot more restrained and calm despite what is a fairly entertaining match with multiple goals. This is a negative example of social mimicry, whereas the atmosphere in the 2021 final between St. Patricks Athletic F.C. and Bohemians F.C. is contagious and can be heard in the commentators' voice as they try to hear themselves over the roar of the crowd.

Part of the challenge for the participant is deciding when to use chants or whistling to provide dynamic response to the action. It was not as easy to isolate these specific subjective responses from the overall audio through available clips. Using various post-processing effects to craft sounds for some specific game events was effective in simulating the dynamic response.

It is possible that as an artefact of showcasing, minute glitches in audio at loop points can be noticed where otherwise passive spectators would not be aware of. Having longer, more varied samples with elements of pseudo-randomness could be implemented.

The survey was distributed for 48 hours before results were downloaded. In that time there were 132 respondents from ten counties and four different countries, most respondents were based in Dublin. 63% of respondents were male, 34% were female and 3% identified as something other than male or female. There was a fairly even distribution of ages, notably lower however are those in the 35-44 age range.



ANSWER CHOICES	RESPONSES	
Under 18	9.16%	12
18-24	20.61%	27
25-34	19.08%	25
35-44	6.11%	8
45-54	16.03%	21
55-64	23.66%	31
65+	5.34%	7
TOTAL		131

Fig. 1

By parsing the data in Microsoft Excel correlations between the questions and age can be drawn. These six questions were designed to establish the demographic answering the survey. Most respondents watch live sports broadcast a few times a week. 7 respondents in the 25-34 age range said they watch every day compared to ~2 for every other age group.

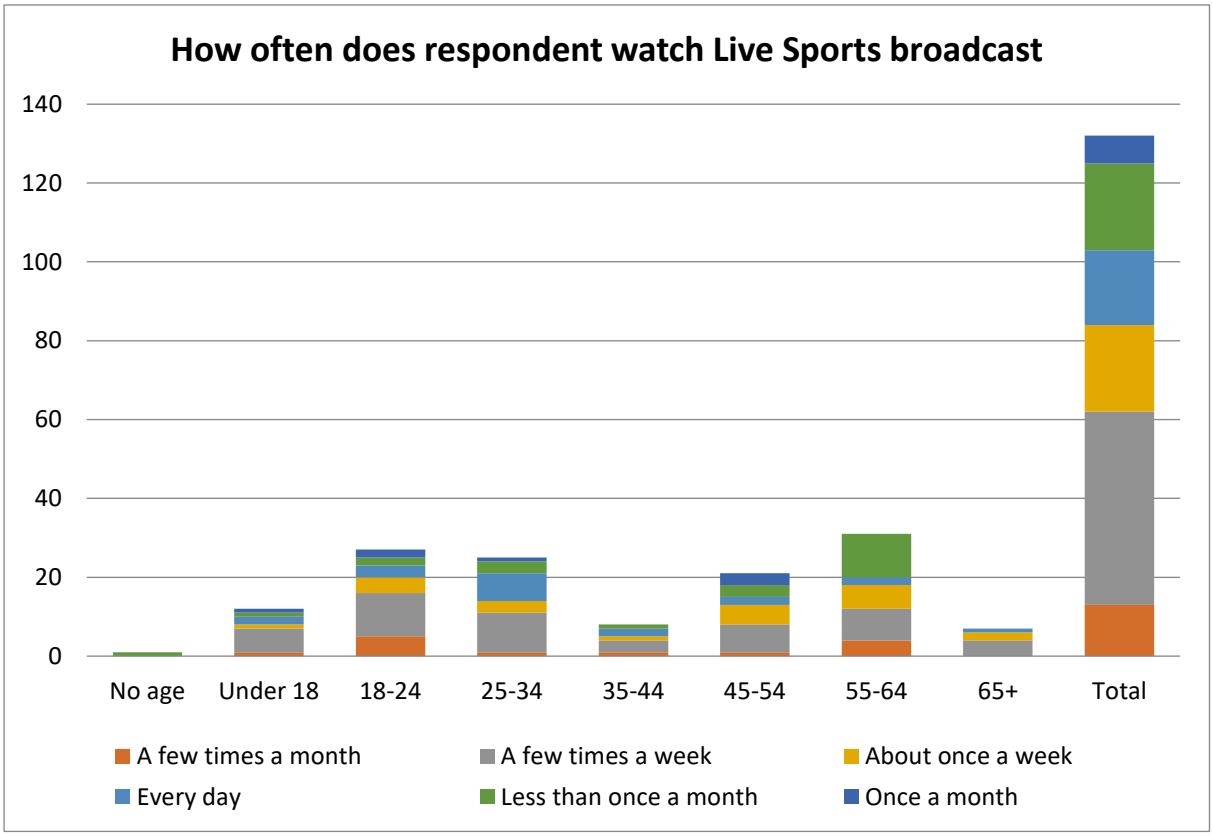


Fig. 2

Age range	A few times a month	A few times a week	About once a week	Every day	Less than once a month	Once a month
No age					1	
Under 18	1	6	1	2	1	1
18-24	5	11	4	3	2	2
25-34	1	10	3	7	3	1
35-44	1	3	1	2	1	
45-54	1	7	5	2	3	3
55-64	4	8	6	2	11	
65+		4	2	1		
Total	**13**	**49**	**22**	**19**	**22**	**7**

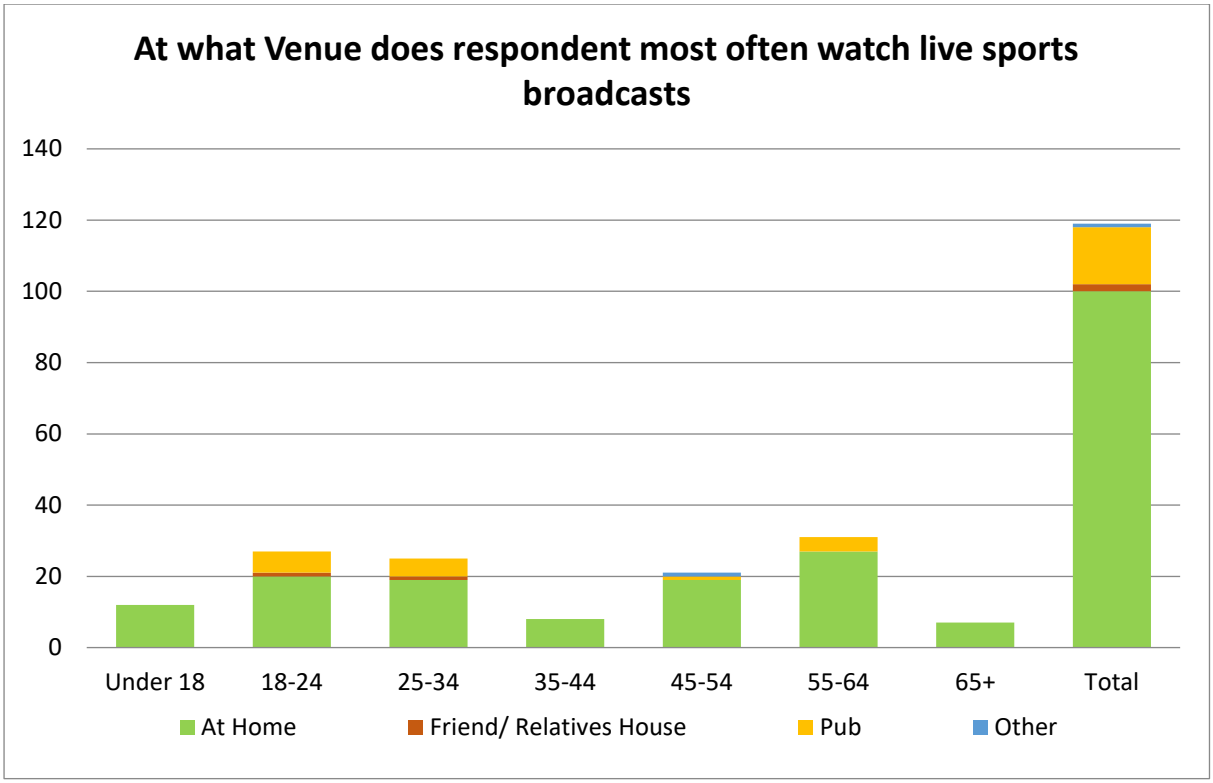


Fig. 3

Age range	At Home	Friend/ Relatives House	Pub	Other
Under 18	12			
18-24	20	1	6	
25-34	19	1	5	
35-44	8			
45-54	19		1	1
55-64	27		4	
65+	7			
Total	**100**	**2**	**16**	**1**

Given that there have been various lockdown restrictions in place over the last year it is not surprising to see most respondents watch at home and younger age ranges are more likely to watch in the pub. It could have been interesting to ask where they prefer to watch rather than rely on respondents to accurately estimate their location. It could be that people are more likely to go out to the pub for more meaningful/competitive games.

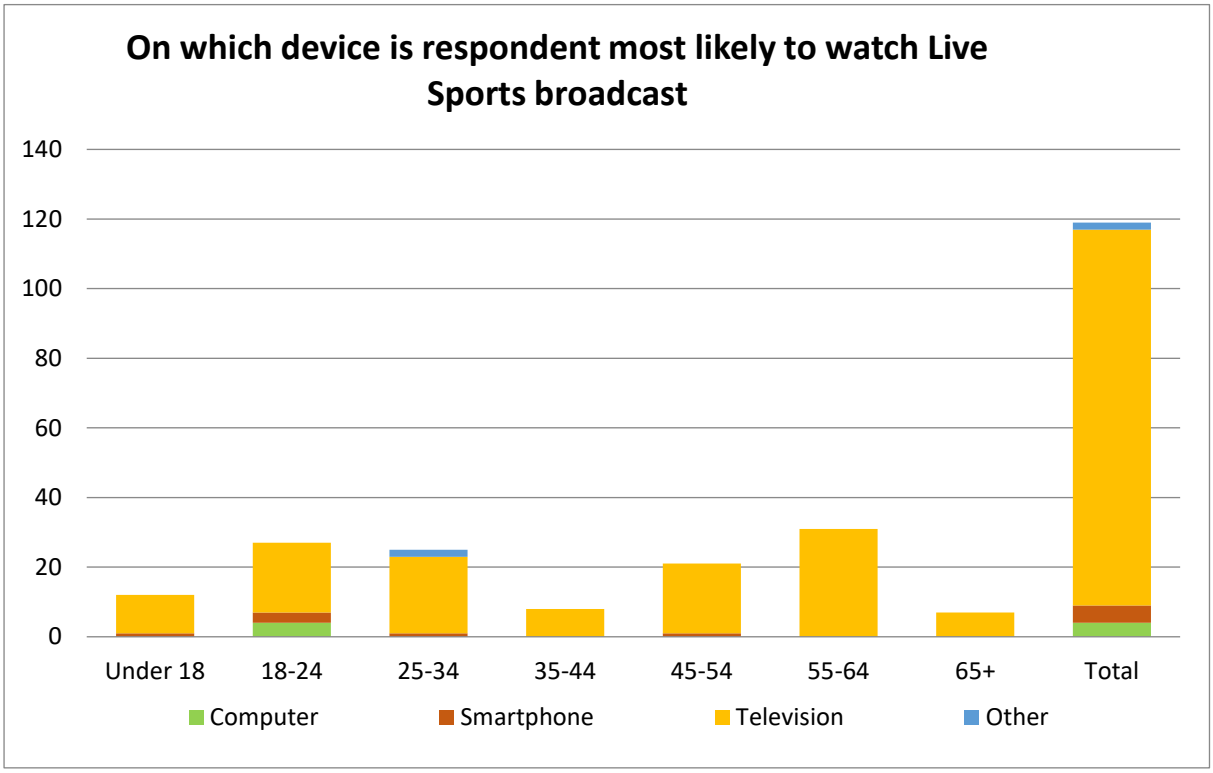


Fig. 4

Age range	Computer	Smartphone	Television	Other
Under 18		1	11	
18-24	4	3	20	
25-34		1	22	2
35-44			8	
45-54		1	20	
55-64			31	
65+			7	
Total	**4**	**5**	**108**	**2**

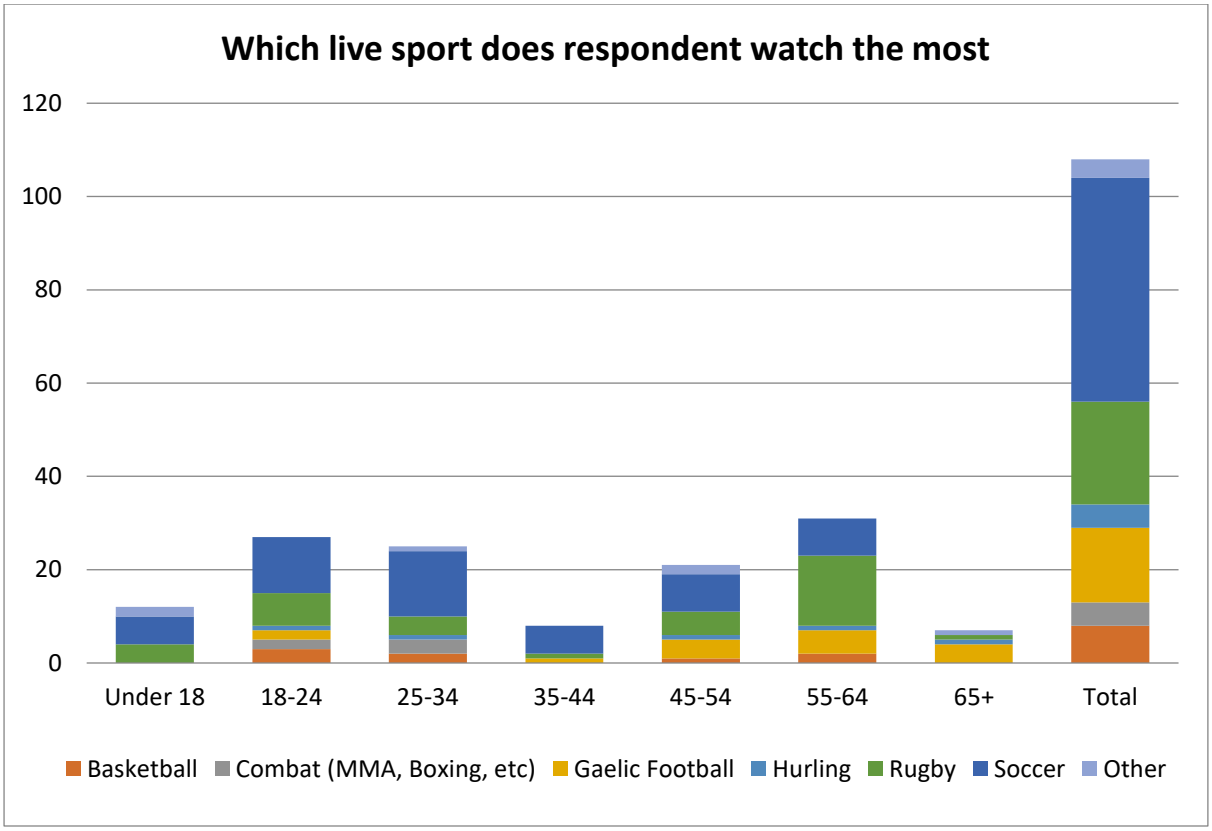


Fig. 5

Age range	Basketball	Combat (MMA, Boxing, etc)	Gaelic Football	Hurling	Rugby	Soccer	Other
Under 18					4	6	2
18-24	3	2	2	1	7	12	
25-34	2	3		1	4	14	1
35-44			1		1	6	
45-54	1		4	1	5	8	2
55-64	2		5	1	15	8	
65+			4	1	1		1
Total	**8**	**5**	**16**	**5**	**22**	**48**	**4**

Soccer was by far the most popular sport across all age ranges although rugby proved popular among respondents aged 55-64. There is a point to be made about the authour's bias when selecting the sports to go on the list, but it did not seem to create any unexplainable outliers.

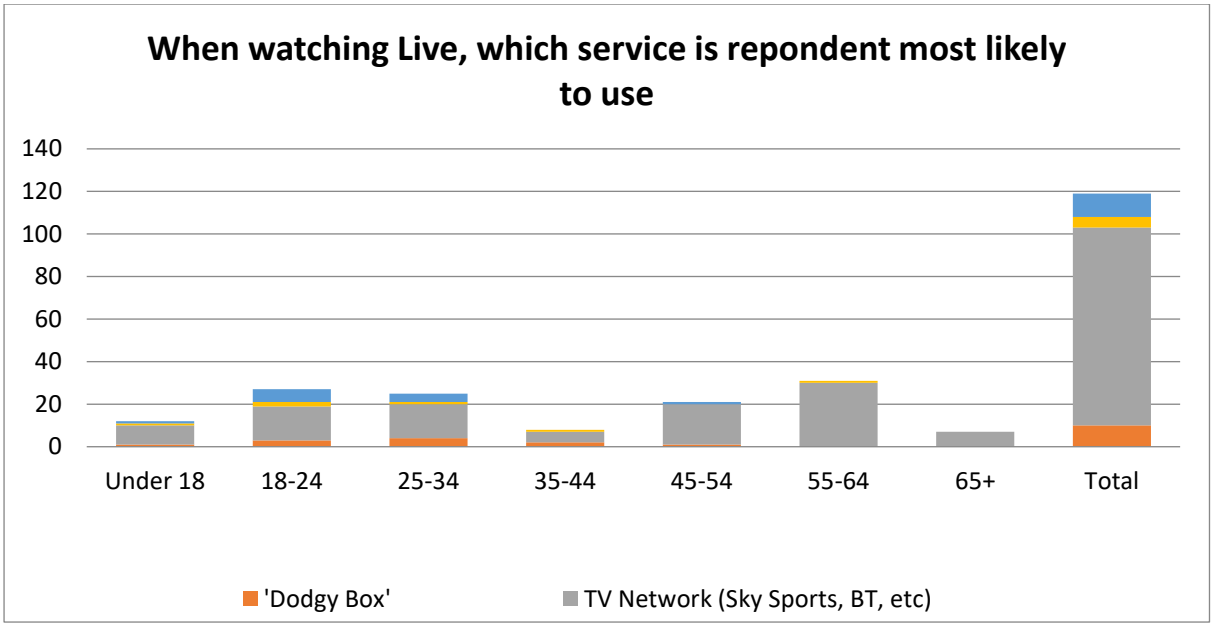


Fig. 6

Age range	'Dodgy Box'	TV Network (Sky Sports, BT, etc)	Webstream - Legal (YouTube, Sky Go, etc)	Webstream - illegal
Under 18	1	9	1	1
18-24	3	16	2	6
25-34	4	16	1	4
35-44	2	5	1	
45-54	1	19		1
55-64		30	1	
65+		7		
Total	**10**	**93**	**5**	**11**

Traditional television networks were the most popular among all ages. However, it cannot be determined whether the younger age ranges pay for the service.

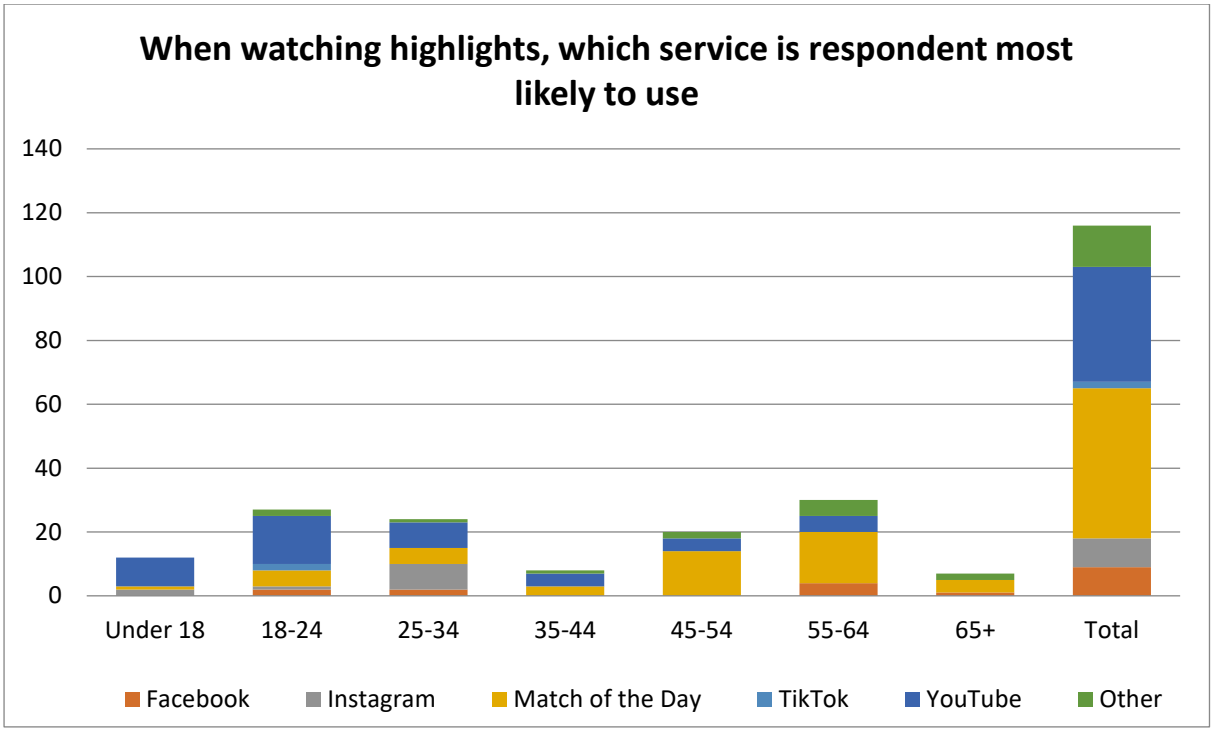


Fig. 7

Age range	Facebook	Instagram	Match of the Day	TikTok	YouTube	Other
Under 18		2	1		9	
18-24	2	1	5	2	15	2
25-34	2	8	5		8	1
35-44			3		4	1
45-54			14		4	2
55-64	4		16		5	5
65+	1		4			2
Total	**9**	**9**	**47**	**2**	**36**	**13**

Considering traditional television networks were the most popular form of live sports consumption among older age groups it is no surprise that Match of the Day style programmes were their most popular form of consuming highlights. Conversely, younger age groups were far more likely to watch highlights on YouTube or social media.

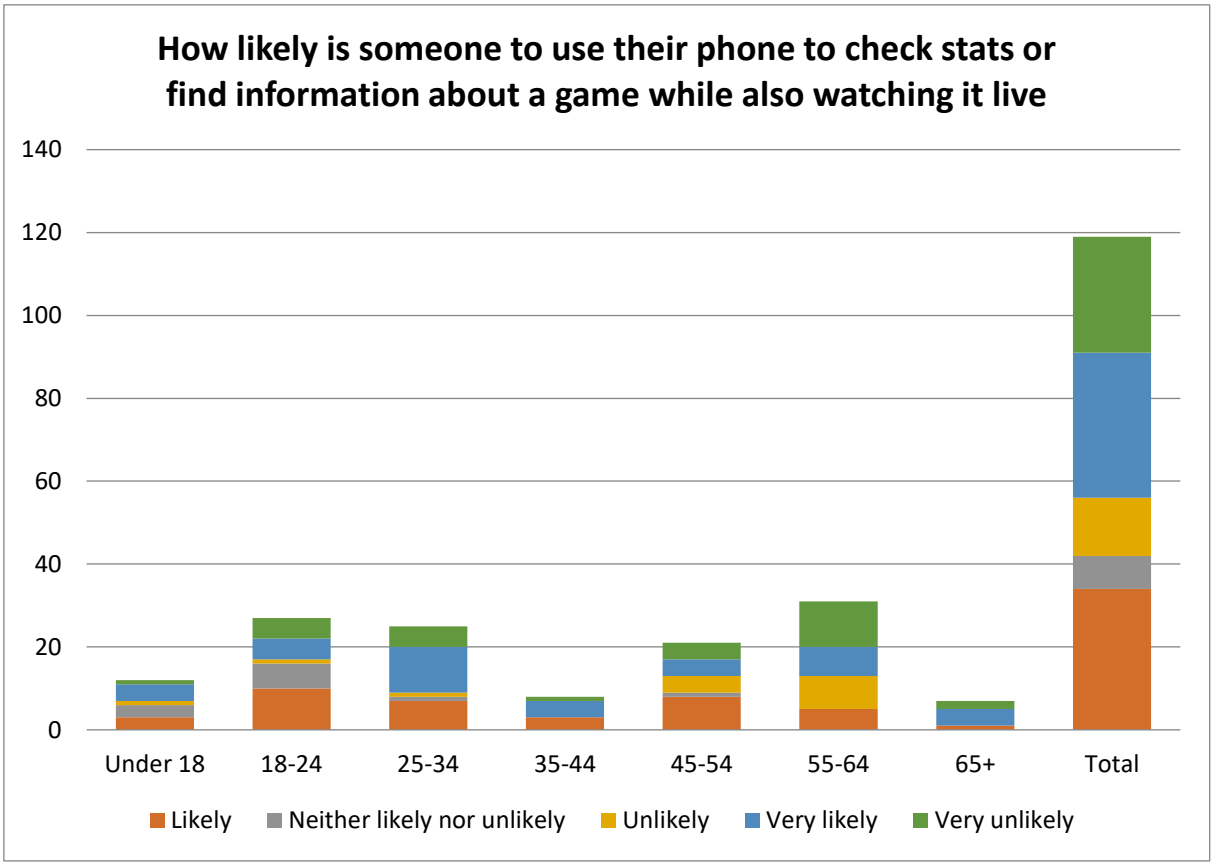


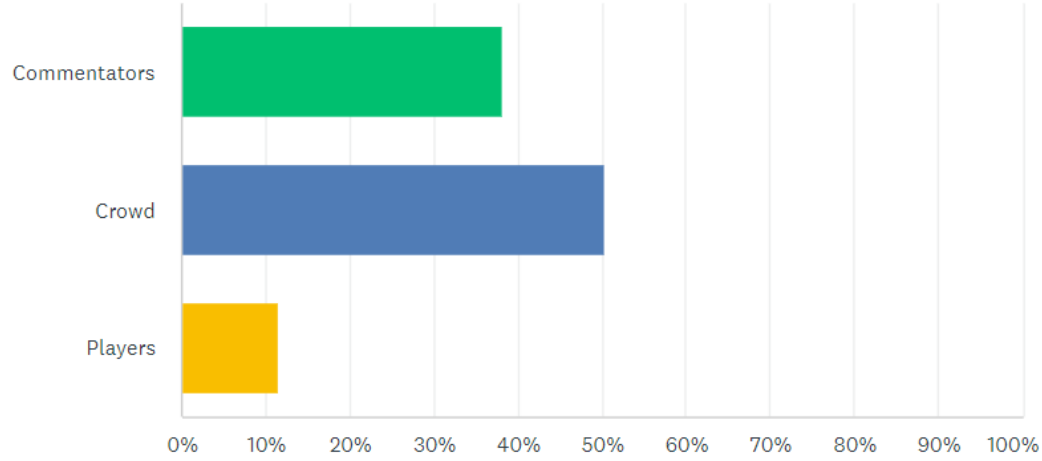
Fig. 8

Age Range	Likely	Neither likely nor unlikely	Unlikely	Very likely	Very unlikely
Under 18	3	3	1	4	1
18-24	10	6	1	5	5
25-34	7	1	1	11	5
35-44	3			4	1
45-54	8	1	4	4	4
55-64	5		8	7	11
65+	1			4	2
Total	**34**	**8**	**14**	**35**	**28**

Strong correlation between age and dual-screen usage. Younger ages were far more likely to check their phone during a match, whether for stats, more information or to engage in social interaction as suggested by the literature. It is also important to consider the effect of sports betting. Many bookmakers allow users to 'cash-out' before the end of a game to receive partial winnings. This promotes checking your phone at key points in a game to see whether the odds have changed in your favour. Younger people were also more likely to use their smartphones to watch sports in general (fig. 4) suggesting a correlation. This case would not support the modern dual-screen experience mentioned in the literature.

Which of these do you find plays the biggest role in creating a sense of atmosphere when watching a live sports broadcast ?

Answered: 131 Skipped: 1



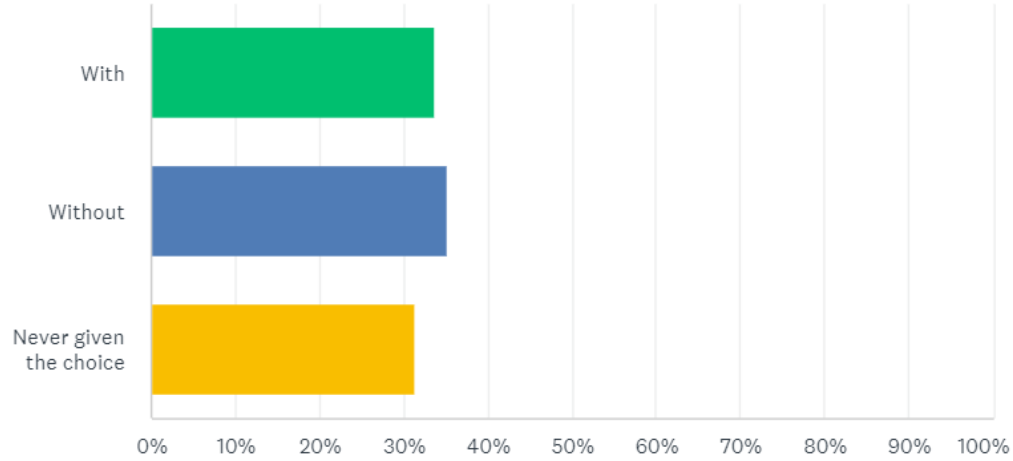
ANSWER CHOICES	RESPONSES	
Commentators	38.17%	50
Crowd	50.38%	66
Players	11.45%	15
TOTAL		131

Fig. 9

Over 50% of respondents consider the crowd to play the most important role in creating atmosphere in a live sports broadcast. It could be argued that the commentator's role is that of narrative and directing attention, such that they make the most boring parts of a game more exciting, whereas a lull in game action also results in a lull in the crowd (Cummins, 2019).

In 2020, when given the choice, did you watch matches with or without fake crowd noise ?

Answered: 131 Skipped: 1

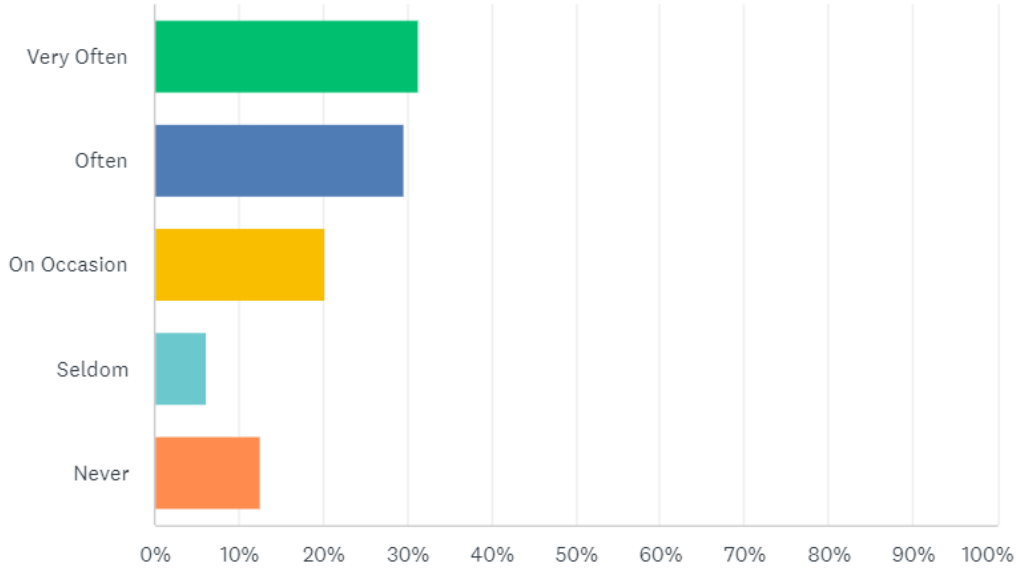


ANSWER CHOICES	RESPONSES	
With	33.59%	44
Without	35.11%	46
Never given the choice	31.30%	41
TOTAL		131

Respondents were slightly more likely to watch without fake crowd noise. However, the results could be misleading. 31.30% of responses stated they were never given the choice. Sky Sports offered spectators the option to turn off fake crowd noise but it is possible viewers were simply not aware of this feature or that the option was only given for a limited period. Considering that fake crowd noise became the default presentation for a number of months, it is likely that 'never given the choice' actually skews the results. It is probable that most spectators actually did watch with crowd noise. The high number of responses for without suggests that 1/3rd of respondents do indeed prefer to watch without artificial crowd noise.

How often did you notice that fake noise did not match your expectation or seemed out of place ?

Answered: 128 Skipped: 4



ANSWER CHOICES	RESPONSES	
Very Often	31.25%	40
Often	29.69%	38
On Occasion	20.31%	26
Seldom	6.25%	8
Never	12.50%	16
TOTAL		128

~ 61% of respondents noted errors artificial crowd noise versus their expectation. Approaches to fake crowd noise were developed very quickly and tested over public channels. Operators' skills improved and the playback systems were quickly iterated upon.

Discussion

Broadcast sports are going through rapid and profound changes because of the COVID-19 pandemic. The period of restrictions following the initial outbreak has given the industry a free pass to experiment with modernisation. The proliferation of high bandwidth technology like 5G makes remote integration not only possible, but an inevitability. Broadcasters will always seek to lower operating costs as an economic principle (Coche and Lynn, 2020). Dennis Baxter's 2007 review is comprehensive, but the industry has gone through a sudden shift such that the 20-30 person teams working at multiple on-site broadcast vans looks very outdated. The industry, in the U.S. at least, has gone from re-enacting baseball games via telegraph to camera operators wearing earpieces taking direction live from a centralised studio hundreds of kilometres away.

Sports audio has been moving beyond simple reproduction and into the realm of sound design for years. The investment by television networks into artificial crowd noise solutions is a testament to the impact of atmosphere on the remote spectator's engagement with sports broadcast as a product. 'Sensory marketing' is based on the science behind our brain's make subconscious associations between products and their effect on our senses (Lemmer, 2020). The noise of the crowd is an integral part of sports as a product for the home viewer.

Attendance at a match is an act that is much more than just witnessing the action. Some people consider themselves active participants at a game, that cheering for their club is an act that could influence the outcome of referee's decisions while others desire the right to say that they were in attendance at a historic event. But considering we live in an increasingly digitised world, fans today can feel personally close to teams and players. They can receive news and injury updates at any time and even have a virtual version of themselves appear in the crowd at a game (Powell, 2020).

Further research into the field of sound design as it relates to sport is inevitable as broadcasters try to find ways of enhancing the product. Given the multi-screen nature of modern sports spectatorship, exploring how aural cues can manage attention would be an intriguing topic.

Transfer of information through sound is fundamental to human communication, the ways in which this impacts our daily life and interests will continue to become more sophisticated as we shape the sounds of an increasingly digital world.

Conclusion

During the pandemic fans were effectively banned from entering stadiums to support their favourite clubs. Watching from home once play returned they were met with eerie scenes of empty seats in colossal stadia. Commentary teams tried to carry the burden, but it was clearly missing something. The dynamic nature of crowds is hard to replicate so broadcasters decided to take old recordings of fans so that they could feel like they were still sharing in a part of the action.

Sound design is often a second thought to a production or only brought in at the final stages. This project has explored how integral it is to spectators' engagement with the product. The bottom line is that sound needs to be considered at the inception of any sports television production.

The sports broadcasting industry is among the most popular forms of entertainment in the world. Live, dynamic competition performed by the greatest athletes in the world should be supported with sound design that effectively puts you there in the action.

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