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The Sonic Imagery of the Covid-19 Pandemic

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Abstract. The Covid-19 pandemic catalysed disruptions and disturbances in ways of living across the globe. Many of these changes in daily life were felt through stark changes to our soundscapes, particularly those in urban centres. Might we better understand the effects of the Covid-19 lockdowns through sonic analysis? This chapter explores how sound analysis methods, including concepts of the sound-motion object and sonic image, might aid in understanding the environmental soundscapes of the pandemic lockdowns. The discussion focuses on the Sounding Covid-19 project—an initiative involving a series of field recordings carried out during Covid-19 pandemic-related events in the urban environments of Belfast, Northern Ireland (2020–2022) and Montreal, Canada (2020–2021). The project presents the sound archive through various listening experiences, including soundscape compositions, sound mapping and narrative-based radiophonic work. We consider how the pandemic may have invited us to pause and reconsider how we document and archive the present to look back and better understand the future. Sound may be vital in understanding our environment and the sociocultural shifts over time. This chapter argues that documenting, preserving, and analysing the soundscapes of the pandemic lockdowns may help us reflect on our shared histories in several ways.

Keywords: Pandemic Soundscapes · Covid-19 · Sound-Motion Objects · Sonic Images · Mental Presence

1 Introduction

In a multi-sensory world, sound provides an essential set of temporal and spatial information about the activities occurring in one's surroundings and helps us understand the phenomena of everyday life. The lockdowns of the Covid-19 pandemic significantly altered the activities and patterns in everyday life for many and subsequently transformed how one's sense of normality might be perceived through sound. Kang (2014:43) describes urban soundscapes as perceptions based on societal and environmental conditions, which include aspects such as culture, history, and politics. With this in mind, the soundscapes of pandemic lockdowns indeed reflect the conditions of the time through the fluctuating sonic identities of urban spaces. This chapter considers how we might reflect on our experiences of the pandemic lockdowns via a sonic perspective—listening to sonic activities in urban spaces across the varying stages of lockdowns, exit strategies, and lifted restrictions.

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The chapter aims to reflect on the pandemic through modes of listening and sonic analysis. It is hoped that listening "through" the pandemic may allow us to connect to sonic properties from past and present experiences and offer a method of reflection on the changes that occurred throughout the pandemic. This listening can highlight how restrictions impacted the sonic state of the urban places. Changing patterns in the sounds activated by the elements, animals, machines, and humans may all be read as indicators of the transformative nature of the lockdowns.

The sonic material analysed in this chapter was produced through the *Sounding Covid-19 Repository*—a field recording and soundscape composition project initiated by the first author. This project collected field recordings during pandemic lockdowns in Belfast (2020–2022) and Montreal (2020–2021). Information and documentation on the *Sounding Covid-19 Repository* can be found on the project web page.

(https://georgiosvaroutsos.com/covid-19/) or on Zenodo (https://doi.org/10.5281/zenodo.8245035).

This chapter will analyse these pandemic lockdown soundscapes through several approaches, focusing on Godøy's concepts of sonic images (2010) and sound-motion objects (2019). While Godøy defines these concepts primarily in the realm of musical composition and perception, we consider how these concepts can be applied more broadly to understand soundscapes by introducing Wittmann's theory of mental presence (2011).

In considering the importance of soundscapes in shaping our lived experience, we might look to Udsen and Halskov's (2022) ideas on the soundscape's role in placemaking, and Radicchi et al. (2021), who explain that sound facilitates communication and spatial orientation whilst serving as an emotional source of direction for us, whether consciously or unconsciously.

Through the sonic analysis of the *Sounding Covid-19 Repository*, we attempt to explore the possibilities of understanding the shifting societal changes of the pandemic lockdowns through the medium of sound.

2 An Overview of the *Sounding Covid-19 Repository*

The *Sounding Covid-19 Repository* used soundwalking as a methodology to actively engage with urban spaces, collecting audio material using a handheld field recorder during individual soundwalks throughout various stages of the pandemic. The field recordings were edited and presented in soundscape compositions, which were then published as a website audio archive, online soundmaps, and an interactive location-activated soundwalk experience. The project also involved recorded interviews where participants relayed their personal experiences during pandemic lockdowns. These voices were presented in combination with the field recordings in the radiophonic work *Covid-19 Sound Stories* presented on the project web page.

In early 2020, as countries around the globe introduced lockdowns, the first author was based in Belfast, Northern Ireland. Here, social distancing and Stay-At-Home rules were introduced, with restrictive measures fluctuating at various stages of the lockdown. These changing restrictions palpably transformed the interactions between urban and natural environments and separated people from one another. As travel restrictions were

lifted, the project broadened beyond Belfast to include Montreal, Canada. The two places were chosen based on circumstances and opportunities. Most of the attention is focused on Belfast because that is where the first author undertook their PhD during Covid-19 lockdowns. On the other hand, Montreal was where the research was done when the first author was allowed to go home for home visits.

The audio recordings in Belfast and Montreal were created as part of soundwalks, a methodology for actively listening while navigating an environment (Adams et al. 2008; Paquette and McCartney 2012; Drever 2011; Carras 2019). Urban sites were chosen as the locations for active listening and recording exercises. The sites were chosen based on tourist maps of Belfast and Montreal, considering areas that might typically exhibit either familiarity, visitation density, or dynamic social interaction for both locals and tourists. This was also a tool for self-study of how one's emotional, psychological, and physical proximity to the source of the sound affects how one perceives and reacts to it (International Organization for Standardization 2017). Subsequently, the chosen sites were linked together to form soundwalk routes that would comply with government restrictions.

The act of field recording in the *Sounding Covid-19 Repository* aimed to highlight the intrinsic value of recording urban soundscapes and listening back to glean useful information. The recording processes aimed to fulfil a conservational function, a common aspect of many field recording projects (Western 2018; Freeman et al. 2011; Demers, 2009). The project also aimed to document and share the sounds of pandemic lockdowns in ways akin to what Cusack describes as 'sonic-journalism' (2012)—considering all sound activity (not just verbal) to be informative and offering communication and understanding of a moment in time at a specific place.

The recorded soundwalks were carried out each time local government restrictions were changed during the lockdown and exit strategy phases. This reiteration drew on Gorichanaz's (2017) ideas of auto-hermeneutics as a way of embracing and reflecting upon phenomena through repeatable methods. Field recordings were made following the initial restriction guidelines, and to maintain consistency between each lockdown in both cities, used the same constraints to construct a comparative recording framework. Using only accessible equipment, a portable handheld recorder, the Zoom H6 with an X/Y capsule set at 120° recording in stereo, recordings were typically for a duration of five minutes. Subsequently, post-production focused on usable material from the recordings, removing clipping or distorted material. These soundscape compositions were time-compressed to two-minute soundscape compositions following Truax's (2022: 287) concept of focusing on the key features of the recordings. There are 91 pandemic soundscape compositions: 78 for Belfast and 13 for Montreal, with the majority based on two-minute durations and only a few exceptions that are considered other recordings that are not based on urban locations being four minutes (focused on local cultural events such as St. Patrick's Day, The Twelfth, or Christmas Market). This chapter only focuses on the two-minute soundscape compositions that create the comparative nature of the research.

The audio editing processes involved in creating the soundscape composition aimed to produce creative listening experiences, as is often the intention in soundscape composition (Sarwono et al. 2022; Truax 2002; Westerkamp 1999). In this case, the soundscape

compositions form a reflective repository to identify particular sounds or sonic activities. The soundscape compositions form an aural chronological overview of the changing urban environments throughout the pandemic lockdowns, exit strategies, and lifted restrictions. Thus, the soundscape compositions somehow document the distinct sound spaces created when government restrictions acted as the invisible agents of change in our urban spaces.

3 Analysing Soundscapes

The sounds of urban environments are a collection of perceptual experiences that create a sensorial link between the listener and space. Soundscapes can be viewed as contextual perceptions, representing many variables occurring within an environment (Brooks et al. 2014). Here we consider varying methods of soundscape analysis that may aid in better understanding the audio archive of the *Sounding Covid-19 Repository*.

Considering urban soundscape analysis, Léobon (1995) and Lebiedowska (2005) describe six types of sonic sources with varied perceptual responses within an urban acoustic environment: i) Background noise, ii) Mechanical, iii) Human activity, iv) Nature, v) Human presence, vi) Speech and communication. Parmar (2022) uses four categories: Earth sounds (wind, water etc.), Human sounds (voice, action), Animal sounds (cries, calls, etc.), and Technological sounds (alarms, motors, etc.). The International Organization for Standardization (2017) distinguishes categories for the urban acoustic environment as either: (1) human activity or facility-generated sounds, including transport, human movement, electromechanical, voice and instrument, other human, and social communal, or (2) non-generated human activity which includes nature and domesticated animals. With a classification system, we can start to quantify the sounds present in the environmental mix and, for instance, observe the changes in human presence over the course of pandemic lockdowns.

Temporal measurements of broadband noise levels can provide amplitude data that might be useful in comparing soundscapes, though spectrograms mapping changing amplitudes of specific parts of the frequency spectrum may be more helpful in identifying the sound level and tonality of specific sounds. However, we might also consider augmenting these quantitative measurements with qualitative descriptions of the individual sounds. These might highlight particular perceptual moments and, as Axelsson et al. (2010) suggest, relate sensations beyond noise levels and speak to broader contexts and considerations such as human well-being. On an unconscious level, we may perceive some sounds as signalling comfort and security, whilst others may trigger anxiety or insecurity.

3.1 Sound-Motion Objects

To comprehend the components of lockdown soundscapes, examining the sonic properties that make up the sonic event using Godøy's theories of sound-motion objects enables the investigation of sonic images. In musical and perceptual contexts, Godøy (2019) explains that sound-motion objects are short durational sound fragments between

0.3 and 3 s that are focused on gesture and have limited perceptual attention. This durational constraint would allow the recognition of prominent dynamic musical features, as well as perceptual motion and feelings towards the sound. Figure 1 shows, for example, a bell from the Albert Memorial Clock that can be heard in Exit Strategies 2020 at 1 m 31 s into the piece, and the chime lasts 2.81 s, providing both a sonic feature of the landmark and awareness of the sound source.

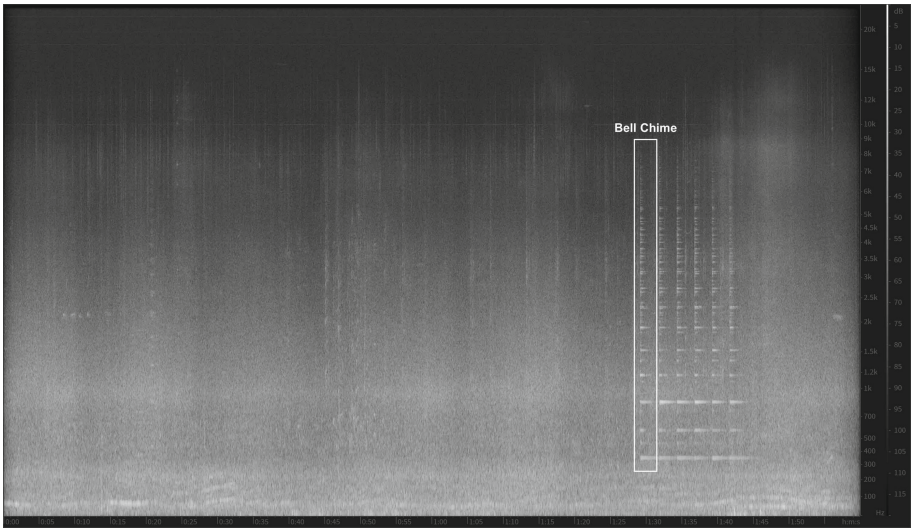

Fig. 1. Spectrogram of Bell Chime of 2020-07-04-Albert Memorial Clock-Exit Strategies 2020.

Much of Godøy's research stems from Schaeffer (1966), who coined the "sound object" and referred to it as the minimal perceptual representation of a sound's features concerning spectral dynamics and focused attention. Organic or artificial sounds provide the ability to hear and perceive the characteristics of one sound from an acousmatic position. Chion (2009) builds on Schaeffer's approach and explains that a sound object is isolated from visual perception, removing context and allowing for a reduced listening approach focused on that sound itself. For example, in 2021-01-02-Place Jaques Cartier-Montreal Lockdown-Part 3, Fig. 2 displays the vocalisation of a yell at 49 s lasting for ~ 1.9 s, depicting the range and a possible response to its sound being heard.

The singular sound listening experience highlights a sound's qualities, not its relationship to a space or place. However, the sound–motion object proposed by Godøy (2019) relays a set of spatial and temporal cues to the listener regarding durational sound fragments, extending from the sound object with consideration of sound and bodily motion.

When we consider sound–motion objects with recorded or listened-to soundscapes, each with its limitations of individualised sound-object listening, we can perceive individual sounds to understand sonic properties and designs without meaning. Gaver (1993) would refer to this approach as "musical listening," a perceptual observation of a sound pattern, quality, and identity. However, sounds within an environment are not always

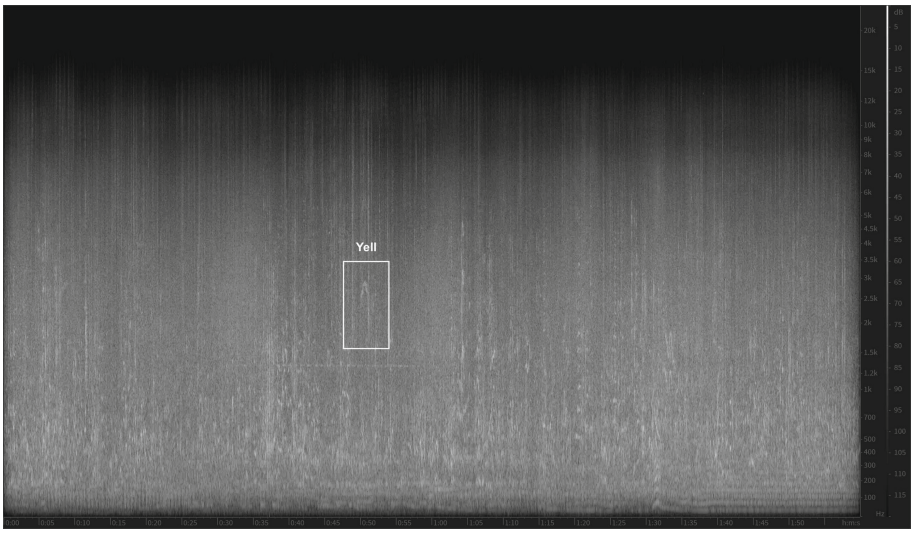

Fig. 2. Spectrogram of 2021-01-02-Place Jaques Cartier-Montreal Lockdown-Part 3.

perceived individually; Gaver also proposes "everyday listening," sounds that create a momentary experience within the environment. Both musical and everyday listening encompasses the sound source, but the interpretive framework determines what sounds can offer the listener. A sound can be an action or an event, depending on the positioning of the listener. One can consider either the sound–motion object, which would identify the features and movement of a particular sound or a sound event, which collects experienced sounds to interpret the environment and allows for reactive decision-making.

3.2 Mental Presence

To embrace a holistic approach with both sound–motion objects and everyday listening to phenomena, Wittmann (2011) proposes the concept of mental presence, a moment of unified experiences of self and presence. Combining spatial-temporal features can encapsulate sound-motion objects within experienced moments beyond the 3-s limit, allowing for a better understanding of sound sequences and their context. Mental presence, while perceptual, aids in the sonic recall by listening to all sonic moments instead of short sonic fragments, where there may be a reduced capability to accurately depict all sonic information. Setti et al. (2022) studied spatial memory and discovered that people could identify the source of an unknown sound within three and a half seconds; however, this was with separate sound playback rather than sequential. Kaplan and Iacoboni (2007) discuss how, in the environment, multimodal representations are better perceived by action sounds than non-active ones. Therefore, to understand sonic changes in an environment and the connection between the perceiver and the lived world, sound in the natural world needs to be understood as a continuous perceptual link to the changing environment.

Soundscape listening can provide a framework for the perceptual interpretation of the self in the present through mental presence and consideration of the sonic characteristics of sound–motion objects. Lähdeoja (2018) reexamines the original ideas surrounding Schaeffer's sound object by introducing contextualisation of sounds to their environment, thereby expanding the concept of gestures and movement. Permitting multiple perceptual understandings that are transferable and applicable to diverse creative forms of soundscape compositions or others.

Truax (2001; 2022) introduces and develops the idea of analytical listening, which involves technological capabilities of re-examining collected sounds for contextual knowledge-making through repeated listening experiences. Regarding the Covid-19 soundscapes, these soundscape recordings and compositions enable a repeatable re-experience and re-examination of the perceived sonic environment over time, which can be compared to sound–motion objects and the expansion of considering mental presence for further analysis.

Godøy (2019) describes how we consider sound production and perception by instrument or body motion for music and sound design. Those same principles apply to listening in on the sonic environment, forming relationships between the features and the perception of heard sounds in a place. Jenison (1997) explains that on an ecological level, we consider physical acoustic properties such as.

- sound intensity: sonic energy with various lengths of decay
- interaural-time-delay: sound heard between the left and right ear
- Doppler effects: sound moving through mediums

All of these inform about audio signals in a space and place. The audio signal provides position, direction, and movement. In contrast, we perceive sound characteristics as salient features to distinguish between a place and space.

We can engage in alternative levels of comprehension regarding the meaning of those listened sounds concerning a place and space by listening to audio signals and forming perceptions of those sounds and events. As listeners, Feld (1996, p. 97) explains that sound can be used as a tool for understanding sonic experiences, coined as an acoustemological framework. Acoustic ecology acknowledges the relationship of the sonic environment to the listener, what sounds mean, and informs us of a place (Devers 2019; Westerkamp 2002; Traux 2001; Schafer 1966). Creating a possibility for knowledge-making through sonic experiences embraces our awareness of sonic presence. During a period known as mental presence, when sensory-motor perception, cognition, and emotion mix to produce a phenomenal experience, a person notices themselves and their surroundings (Wittmann 2011). It extends to being present within the environment and listening to sound to build relationships within a place by attaching meaning to sounds from our perspective.

4 Analysing the *Sounding Covid-19* Soundscapes

Regarding sounds during the pandemic, we need to consider the sonic markers of urban spaces. Sonic markers, or soundmarks, are culturally significant sounds that identify a place and space (Birdsall and Drozdzewski 2018). While a sonic marker agrees with

Godøy's sound–motion object in terms of features, each individual sound marks a particular place yet is not always in line with the context of the space. Interwoven sounds provide aural information to the listener, understanding their position in the place or space and rendering a perceptual understanding of the sonic environment. According to Cuadrado et al. (2020), for listeners to have a complete experience, they need both sound sources and sound events to create meaning, interpretation, and emotional responses. We would define sound sources as the sound–motion objects and the sound events relating to mental presence. Emotional responses to sounds play a crucial role in individuals' considering sounds pleasant or unpleasant, significant or insignificant, which then promotes the sonic identity of a space, either by the individual or community (Liu and Kang 2016; Jeon et al. 2013; Yang and Kang 2013; Cain et al. 2013). Each listener will have an individualised experience, rendering multiple varied perceptions of sonic importance or relevancy from a place, meaning that sound markers can change from person to person and across time.

Hall et al. (2013) examined that the interaction between the individual experience and subjectivity in a physical and a socio-cultural setting is equally significant as the auditory signal. This is not to say that the physical property of sounds in a place should be disregarded, but instead that it is essential to understand that once the listener attaches meanings to sounds, hierarchy, attention, and recall, they create a sonic impression of a place and space. Sound markers are critical to the phonic identity of a place, incorporating the sounds in the environment, associating with the individual or community, and branding the various types of activities that occur from their sources (Rehan 2016). Only listening to sound–motion objects makes a minimal connection to the context of sound events in the place. However, the distinctive characteristics of produced sounds allow one to review the contextualisation and association of that sound with a place.

For instance, certain acoustic characteristics of Belfast's urban spaces were captured on field recordings during lockdown periods. For example, the Albert Memorial Clock is an iconic slanted clock tower structure located within the city that serves as a physical connection between entering and exiting the city. However, its distinctive bell chimes that acoustically complement the landscape are what give it its sonic identity, and these chimes are what make it easily recognisable (Fig. 3).

The clock's chimes are distinguishable based on their acoustic characteristics and the physical materials used in their construction, with each strike travelling horizontally and vertically through space and time. One chime lasts approximately 2.7–2.9 s, making it an acceptable indicator of Godøy's sound–motion object. Nevertheless, if we consider the pattern that develops over time and the accumulation of fifteen-second-long chimes that represent the hours of the day we enter a state of mental presence that enables us to recognise a sound and be aware of our immediate surroundings. This enlarges the specificities of a place by indicating a particular moment only by listening to an extension of the sound–motion objects that are sequentially attached to provide a context.

By analysing the clock's chimes and identifying the specific source of the sound, we can locate them at landmarks in the physical environment. Based on our analysis of the recording's traffic flow, seagull activity, and human-generated sounds, we can accurately determine the level of human activity at the location and time. For instance, Traffic Flow

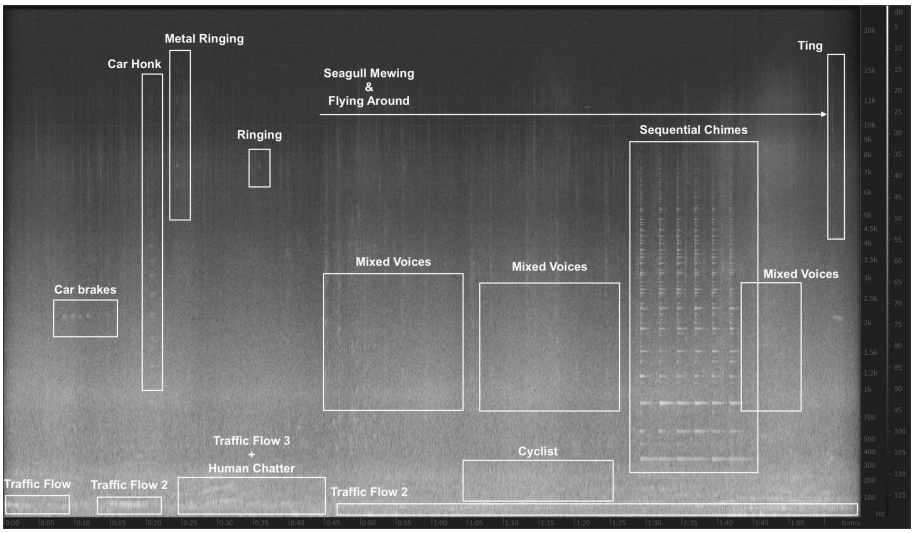

Fig. 3. Spectrogram of 2020–07-04-Albert Memorial Clock-Exit Strategies 2020 - summed channels.

2 lasted 6 s, seagulls for 1 m 12 s, and mixed voices were audible for 20 s. These findings suggest the presence of a group of people and a possible relaxation of restrictions.

With the addition of context information, like metadata descriptions, we can look at how all the sounds in a specific soundscape composition relate to each other and come up with more ways to explain how the sounds interact, form relationships, and consider the state of events related to urban space in the city with either previous experience or collected data. This enables a mode of understanding that these sounds are influenced by an event, such as Covid-19, which has resulted in a decrease in human-generated sounds during lockdowns, including fewer sounds from social spaces, pubs, commutes, vehicles, and other human activities. Due to government regulations, these "regular" urban sounds were absent, which created the impression that the area had been abandoned or isolated. When the restrictions were lifted, the spaces began to flourish with the preconceived sonic properties of these urban spaces. This phenomenon was caused by long periods of lockdown, which encouraged people to reunite, and the architecture of these urban places as platforms for various auditory interactions between humans, urban sounds, and nature sounds.

A second example is the Botanic Gardens, which host a variety of human, natural, and urban sounds but, during the first lockdown, seemed less affected by changes. However, listening solely to each of the sound–motion objects individually, such as a bird call, a spoken voice, a distant or passing vehicle, or a cyclist, would make it difficult to understand the location recording and the context. However, by enlarging the focus with mental presence to combine the mixture of those aforementioned sound-motion objects, it can be perceived that it is in more natural environment settings as there are fewer sounds generated by what ISO (2017) would define as facility activity. Without context, this may be deemed any other park or nature recording and any part of the year. Yet,

the metadata provides an additional layer to attach the recordings to specific periods or events, framing the recording to consider that once we recognise certain sound-motion objects, it enlarges our framework for understanding with mental presence. We can consider how sounds fit the context of the place and space, informing us about possible relationships affected or generated by events such as Covid-19.

We design each public urban space for a purpose and function, constantly inviting different interaction sets and sonic relationships from city planners, building architecture and designs, artistic practises, and daily life (Belgiojoso 2014). However, if we only consider sound as a sound–motion object, we may overlook the connections to and from a specific sound, its relationship to the spaces it inhabits, and the listener's perceptual experience.

The state of lockdowns removed humans from inner city life and allowed them to reconnect with the natural world, even while living in a city. Regarding sound–motion objects, it would be difficult to distinguish the Botanic Gardens (an urban city park) from other urban city parks during lockdowns. If we increase our capacity for perceptual awareness by listening for extended durations, we may be able to determine where we are in a given environment. We can distinguish between a city park and a forest based on various urban ambiences and/or sounds, birds, human sounds, and human activity. It is possible that a single sound can aid in the detection of auditory features, but when we listen for longer periods, we gain the ability to differentiate between different environments and identify spaces based on their collective sonic makers.

> Some of the socially important values that are ascribed to soundscapes include creating a sense of place, providing cultural and historical heritage values, interacting with landscape perceptions, and connecting humans to the nature. (Jia et al. 2020)

Reflecting on individual sound markers, the question becomes, what happens when we listen to multiple sounds over time, and how do we derive meaning from those accumulated sounds? Regarding soundscapes and mental presence, we enlarge the listening experience to connect with the surrounding sonic environment as a perceiver and creator of sounds within that space. Sounds produce an ambience or a reflection of space, with various impressions of sounds associated with the pandemic lockdowns. When multiple sounds are active within a period, such as masking, the ability to differentiate each sound becomes muddled unless the context of multiple sounds is considered an event. The sound marker functions as a representative sonic anchor for a particular location and connects the soundscape to the landscape. This is also useful for creating a basis for comparison when repeating listening practises and soundscape recordings. Developing a pattern that requires measurement points, including date, time, recording position, and location. The *Sounding Covid-19 Repository* strictly adhered to the government's guidelines throughout the pandemic. All recordings were limited to a maximum of five minutes and taken at consistent locations and times, with only slight variations due to weather. Moreover, the recordings repeat on the same days each year, except during Lockdown 2, when they focus on the weekly comparisons. This comprehensive two-year study offered a detailed analysis of the impact of pandemic restrictions on urban soundscapes.

Sound's meaning is inextricably linked to the environment in which it is produced, heard, and understood. Our environment influences many of the concepts we use to comprehend the world, and our upbringing unconsciously shapes how we hear. As a result, our understanding of sound is considerably more complex than most individuals think about. Sound is a resource and instrument for constructing the relationship between the listener and their present environment. It is the combination of experiencing the present moment through auditory senses, which bases itself on the situationality of sound.

5 Understanding the *Sounding Covid-19 Repository*

Embracing both sound–motion objects and mental presence, we can listen to recorded sounds to develop an internal visualisation of a recorded place and space by considering spatial and temporal specific sound behaviours in a process Godøy discusses as "sonic images" (2010). A recorded or composed soundscape has the ability to preserve sonic information, allowing individuals to listen to or examine sonic events to imagine the acoustic environment, and therefore has the potential to contribute towards knowledge-making. As previously discussed, a sound–motion object is a short durational perceptual understanding of a sound's features, with the concept of mental presence to extend the time and consider the present awareness of the listener with sound. However, moving from a sound–motion object to a sonic image perspective, we designate a specific time-frame to retain the typology and morphology of a sound object, enabling the visualisation of a sound object's shape, qualities, and movement (Godøy 2019). These essential characteristics enable the imagination of sounds without the need to be present when they occur. Like a soundscape, recorded and listened-to sounds have multiple contexts, such as mobile device listening, designed soundwalk experiences (apps), online via soundmaps or audio players, and other creative playback methods.

The purpose of the soundscape is to generate an auditory understanding of a time and place, which is just as important as visual information for landscape conservation (Brown 2010). Possibilities exist to audibly visualise sounds, ambience, and sonic events from a particular period and expand sensorial knowledge-building and the period's sounds. We create an internal visualisation of sounds, highlighted by sonic markers and other sonic features, from a location to imagine the ambience of a place to be listened to later. According to Kang (2014: 96), the perception of a soundscape is the result of a deliberate design procedure. A sonic imprint develops, which may change over time based on the environmental and urban relationships cultivated or constructed during the urban space's development. Similar to how visual methods such as photography or painting can provide visual information and settings, preserving the soundscape through various recording techniques allows us to return to a sonic environment and place ourselves within it.

Soundscape recordings preserve information such as cultural events, socioeconomic shifts, defining meaning-making moments, and time-stamping a particular occurrence (Dumyahn and Pijanowski 2011). The soundscape recording is a collective representation of dynamic relationships, incorporating our past, learned, and current experiences to render perceptions of the space we occupy. We tend to assume there is a problem in the urban space of a city if there is a lack or absence of human sounds in the urban

space because the urban space is designed to reflect these sounds (Ouzounian 2017). This perspective during the Covid-19 lockdown/exit strategies allows people to understand how societal changes affect sound environments and how sound can represent the effects of the pandemic on daily life. These effects can be shown through government, economy, health and well-being, and culture changes, such as business closures, the lack of street performers or musicians, rush hour traffic, and social interaction in different urban settings.

The sound identifies our own knowledge and life experiences from a phenomenological standpoint. Therefore, listening becomes an active moment with urban space and listening to the soundscape while understanding the more significant social impacts intertwined or absent in that space. The lockdown soundscape composition repository contains a two-year timeline of varying sonic environments influenced by government restrictions. It is not necessary for listeners to be present to experience these effects. However, by reviewing the audio material, they can form a sonic image based on the auditory characteristics of city life changes during and after lockdowns. The perceptual experience of isolation and abandonment occurred during lockdowns due to a lack of human movement, voice, and otherly generated human sounds. At the same time, an increase in wildlife was predominant in the foreground of the urban space, despite the presence of motorised vehicles in the distance. In particular, Commercial Court is in the Cathedral Quarter, known for its art and nightlife and an important part of Belfast's identity as a city. It is a specially designed area that would have had a greater amount of human-produced sounds, such as human voice and movement, had there been no lockdown at the time of the recording. Unfortunately, the lockdown rules prohibited certain outdoor activities, preventing businesses from opening and people from occupying designed urban spaces like this, creating an unusual historical period. By comparing the same recording location of Commercial Court in Lockdown 1 and Lifted Restrictions, we can compare the sound-motion objects with the use of mental presence to get an idea of how the area changed between these two times when different outside policies affected it.

Table 1 summarises the recognised individual sound–motion objects heard in the soundscape compositions during a period of mental presence and may help to place a comparative visualisation of the periods through sonic images.

Table 1. Comparison of Commercial Court in Lockdown 1 and Lifted Restrictions. Please refer to the project web page access the compositions or on Zenodo.

2020-03-27-Lockdown 1	2022-03-27-Lifted Restrictions
Seagull's Mewing + Movement	Human chatter
Distant Motorised Transport	Background Music
Electromechanical	Motorised Transport
	Electromechanical

As mentioned earlier, one's perception of a soundscape depends on their surrounding environment and experiences. The first recordings of the lockdown were carried out on March 27, 2020, in Belfast. During the first week of the lockdown, the soundscape was erratic and disorienting, and this was especially noticeable when recordings were carried out on Friday evenings. This is a vastly different recording and imaging of the space compared to Sunday morning, when the area would be much quieter sonically. This area was alive with pedestrians, musicians, shoppers, nightlife, modes of transportation, and other urban or natural sounds before the advent of Covid. *Lifted Restrictions* recordings were taken two years later, on March 27, 2022. Both soundscapes depict how wildlife was or was not present in the areas, indicating a sense of isolation. Within *Lockdown 1 of Commercial Court*, the absence of human-produced sounds was quickly filled by the movement and calling of various birds. A dominant factor that stands out from the local sounds can be an indication of changes taking place.This also provides another sensory experience of isolation, in that there are no human voice sounds near one of the more popular streets in the city centre. The birds' flocking and calling circled overhead, exacerbating the sense of isolation within this space. The only human sounds produced were self-made from recording this moment. Which differs when listening to the *Lifted Restrictions of the Commercial Court*. When lockdowns and restrictions were lifted, people returned to these urban areas, and human interaction sounds once again dominated the listening experience. As a result of the otherly sonic interactions of human sounds, wildlife becomes suppressed and almost nonexistent in this specific urban area. Furthermore, self-isolation is still relevant on a personal level. Human isolation is disrupted as there are forms of gathering and sounds of togetherness from the chatter, laughter, footsteps, and other relatable human sounds in this space once again.

Similarly, upon returning to Montreal, Canada, after months of isolation in Belfast, the research was expanded to specific sites to self-observe and self-reflect on the changes imposed by those local governments. During the Christmas holiday season, the Old Port district of Montreal usually hosts a variety of outdoor celebrations, cultural events, and entertainment shows or performances. Contrasting to the Belfast recording period and conditions, wildlife aids in indicating degrees of isolation, whereas this is not a similar point for Montreal, especially when much wildlife migrates or hibernates during these colder winter periods. However, recordings and compositions from this trip depict a mixture of isolated or less active sonic conditions and varying social encounters mostly indicated by human-generated sounds. People in Montreal attempted to embrace the cultural significance of winter celebrations by continuing to walk through snowy paths after the rule prohibiting them from entering other people's homes was changed just before Christmas and New Year's Eve.

Only in public urban spaces could such celebrations be shared with others. In the *Place Jaques-Cartier-Montréa*l soundscape composition, we can hear forms of speech, individuals purchasing and eating Tire d'érable (maple taffy) from outdoor kiosks—a local culturally traditional dessert—and others continuing to walk through cold conditions around the port area, with some utilising an outdoor light installation in a park square. The yell at 49 s, lasting 1.9 s, was previously mentioned as a sound–motion object in this piece. Still, if we consider mental presence and processing as sonic images

to the listening experience, we can start to connect this particular yell with play and expressions of content.

The soundscape composition reflects Covid-19-modified cultural identity and interactions experienced in such urban spaces. By recording and forming these soundscape compositions, there is a process of self-connection to the areas, with another appreciation of the immediate moment. While there is an inability to possibly see everything, listening to the recorded and composed soundscapes allows us to visualise this beyond the single experience. For example, returning to the yell found in the piece, on its own, minimises any form of understanding of the context of the sonic activities present and recording conditions. Having soundscape compositions that encompass a longer durational experience of sounds defined under mental presence parameters, we can formulate the connections beyond the durational limits of sound–motion objects, even considering how the interplay of sounds affects the self of repeated listening experiences. This interacts with Covid-19's real and repeated experiences, ultimately attempting to re-adapt from previous interactions with the space while adhering to current government and health policies. Specifically, at this moment, the 2-m distance had to be continuously reminded of while recording: "Do not be so close to anyone." Having these invisible rules dictate movement in such complex areas allowed for variable sets of sonic interactions, whether formed by one's own bubble or multiple bubbles occupying a space. This mindset must be considered: there are constant considerations not only on how to experience but also on what is brought into or affected by visible or invisible factors.

However, there were significant individual differences based on prior exposure to these urban spaces and the Covid-19 effect during a culturally significant time of the year. The concept of the sonic imprint that will be experienced is generated by the sounds that are heard and specifically listened to, giving rise to a sense of memory as well as a response to a particular location. Extreme changes from the preventative measures taken for Covid-19 radically altered both the past and the present's sonic memories and experiences.

These experiences reinforced that sonic moments can be irretrievably lost and inspired me to record numerous instances that can provide auditory information for others to imagine, experience, and revisit in the future. From an archival standpoint, collecting, gathering, and including sonic information (recordings or other audio material) is a progressive step toward including all ranges to create a broader sense of history (Swain 2003). We can imagine a sound's features, characteristics, location, and relationships. However, this is only true if we experience the sound at the source or via recordings.

Schafer (1977) stated that earwitness reports from persons who were present and who testify or can testify as to what they heard are the only way we may learn about historical soundscapes. Not to imply that every moment should be captured, but historically, sound has not been preserved to the same extent as visual information (photographs, paintings, and text). Smith (2007) explains that visual information alone is insufficient to comprehend complete historical experiences and that various other senses must be preserved. Moreover, a sound's sensory production (replicability) and sensory consumption (contextual relationship) are distinct types of historical review. Sensory consumption focuses on understanding what a sound or sonic event signifies over time,

considering sociocultural life and excluding our contemporary ideals or perceptions if we are attempting to place ourselves in the past. We can use soundscapes as a resource and instrument to expand the potential for making historical connections, recalling moments, and imagining spaces.

6 Reflections

This chapter considers how the transformational periods of the Covid-19 pandemic lockdowns might be better understood by listening to and analysing field recordings and soundscape compositions made during these times. By comparing audio recordings made at different points in time through varying lockdown restrictions, we can begin to sonically depict the dynamic shifts in urban spaces caused by lockdowns. This sonic comparison reveals changes in environmental sound markers, acoustics, and social sounds.

The analysis attempts to combine concepts of the sonic image, sound–motion objects, and mental presence to consider the context of environmental sounds and their relationship to the listener. In addition to visualising sounds for historical learning with sonic images and sensory consumption, it is essential to consider the contextualisation of sonic events from a period.

Each city's climate, pedestrian and transportation accessibility, social interaction, and designed spaces are unique. During pandemic lockdowns, the ability to listen to the present sonic environment and identify the changes in social life is possible through considering sound–motion objects and heightening our experience through methods of mental presence. Capturing audio in these urban locations marks a specific period in modern times, and creating a range of lockdown soundscape compositions enables the act of each person to process the sonic information for sonic image association, a way of imagining these changing periods.

Another way to enhance the visualisation of sonic events would be through soundmaps and soundwalking apps to create experiential learning. The Sounding Covid-19 soundscape compositions are featured across various platforms, such as Uno Noll's Radio Aporee (2021), Josh Kopeček's Echoes Soundwalking App (2020), Pete Stollery's COVID–19 Soundmap (2020), Stuart Fowke's Cities and Memories (2020), and others. This variety allows users/listeners to place themselves within the material's listened/recorded/composed experience, either on-site or online. Combining Godøy's concept of sonic images and these experiential tools can explore Smith's sensory consumption. Creating a sense of presence, visualisation, and a new response to the present-day environment (more pronounced if on-site) can be a way of experiencing points in time with an immersed sense of presence in the space and place where the sounds were recorded.

In future sonic preservation work, there may be potential in capturing, documenting, archiving, and analysing sound in varying spatial audio formats, e.g., ambisonic and binaural recordings. Ambisonic recordings depict a 360-degree perspective of the sonic environment and may contribute to developing a stronger sense of presence and contextual meaning-making. Applying similar strategies from the SSID protocol can enable a larger dataset, incorporating audio, video, and survey responses to formulate

an extensive comprehension of soundscape investigations (Mitchell et al. 2020). Such a study can contribute to a deeper understanding of the sonic relationships that stereo recordings are limited to capturing or representing.

The *Sounding Covid-19 Repository* serves as a reflective archive, enabling future investigation of soundscapes shaped by the pandemic. As an aural time capsule, the soundscapes preserve a temporal evolution through pandemic lockdowns and exit strategies. Analysis and reflection upon the archive serve to reconnect the listener with these shifting soundscapes and interrogate the broader socio-cultural transformations that shaped them.

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