

Universidade de Évora - Escola de Artes

Mestrado em Música

Área de especialização | Interpretação

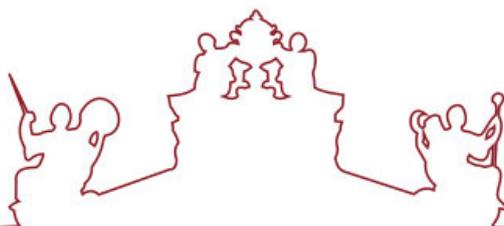
Trabalho de Projeto

Experimental creative practice at the piano: a case study

Mariana da Silva Miguel

Orientador(es) | Ana Telles

Évora 2021



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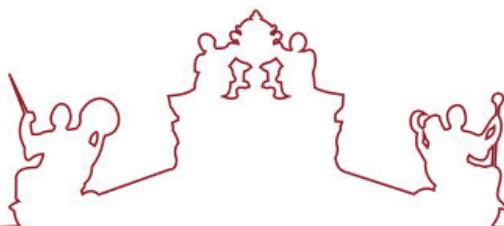
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O trabalho de projeto foi objeto de apreciação e discussão pública pelo seguinte júri nomeado pelo Diretor da Escola de Artes:

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Title

Experimental creative practice at the piano: a case study

Abstract

This document focuses on the development of an artistic practice-based research project focused on active experimentation and the development of creativity at the piano. The experimentation process relies on the exploration of extended and prepared piano techniques, which are described throughout the text, as well as on the use of electronics. The creative process involves the composition of a musical piece (*Become One*) inspired mainly by *Music for 18 Musicians*, by Steve Reich, its structure, instrumentation and compositional processes. The purpose of this project is to reflect on the work of authors such as Dewey (1934), Shockley (2018), Vaes (2009) and Mayas (2019), and relate it to the documentation of these processes, hence fostering future creative and experimental practices in other performers.

Keywords

Sound exploration; extended techniques; experimental music; prepared piano; creativity

Título

Prática criativa experimental ao piano: um estudo de caso

Resumo

O presente documento foca-se no desenvolvimento de um projecto de investigação artística baseado na experimentação e no desenvolvimento da criatividade ao piano. O processo de experimentação está centrado na exploração de técnicas expandidas e de piano preparado, descritas ao longo do texto, assim como na utilização de electrónica. O processo criativo envolve a composição de uma obra musical (*Become One*), inspirada maioritariamente em *Música para 18 Músicos* de Steve Reich, a sua estrutura, instrumentação e processos de composição. O propósito deste projecto centra-se na reflexão do trabalho de autores como Dewey (1934), Shockley (2018), Vaes (2019) e Mayas (2019), relacionando-a com a documentação dos processos criativo e de experimentação, promovendo a replicação de práticas idênticas por parte de outros instrumentistas.

Palavras-chave

Exploração sonora; técnicas estendidas; música experimental; piano preparado; criatividade

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Introduction

This dissertation documents the process of experimentation and creation of a musical work (*Become One*) based on the characteristics of the minimalistic piece *Music for 18 Musicians*, by Steve Reich, and their adaptation to inside piano and prepared piano techniques. The resulting artwork will be presented in a recital at the occasion of the presentation of this dissertation. I will play one of the parts live, while using previously recorded tapes corresponding to the other parts. The piece is written in a way that allows for the interpretation of one or more parts live, depending on the number of musicians available. This dissertation documents the solo version, played at the recital, whose the scores of which (Live piano part and full score) are available in the Appendices. Other options, such as an ensemble version, are considered in section 4.2.3.

The creation of a piece for this project corresponds to an artistic practice-based research, while reflecting and relating to the piano legacy from other composers, interpreters, and innovators in the area. Supported by the writings of Mayas (2019), Shockley (2018) and Vaes (2009), among others, I set out to compose a piece that proves and showcases the constellation of possibilities and timbral richness of the piano, when used in a non-conventional way. The prepared piano is viewed, in this case, as a starting point for the composition of a minimalistic piece.

Dewey (1934), among others, defends a view of art as experience, emphasizing the importance of a conscious and continuous approach to life and the arts in a wholesome way. Thus, active exploration and interaction with the instrument are fundamental in the communication of a meaningful artistic experience. Creativity, in this case, allows for a symbiotic and permeable relationship between performer and composer (being the same person), creating a feedback loop between what's experimented at the piano - in terms of preparations and sounds, and what's written and established at the desk.

The purpose of this project is to contribute to both the scientific agenda of the contemporary piano techniques and to inspire others (particularly performers) to experiment and create, specifically within the framework of the piano, expanding its possibilities, repertoire, and traditional use.

Stemming from my own artistic path and acquired experience, I propose to explore unconventional piano performance techniques (including extended techniques and prepared piano, the integration of electronics and visual aspects such as video projection) and incorporate them into the main product of this project – the created piece *Become One* – while describing the creative processes involved. There will be a correspondence of timbres between the instrumentation of *Music for 18 Musicians* and piano-based timbres in *Become One*, and a consideration on interactive and communicative aspects of the performance and outside the performance.

The dissertation follows a traditional academic structure (including an introduction and conclusion), starting with a contextualization around the research question and its theme – the prepared piano through the lens of artistic practice-based research (Section 1 –

Framework). This section being particularly relevant, given the importance of my path as an artist (which led me to this research), I have decided to detach it from the Introduction. The State of the Art features the second main section and is divided into two core categories: the first one concerning creative practices and the other regarding the piano, its history and practice. The Toolbox section relates to the project in a practical way, since it describes key concepts, materials and resources used both in the performance and creation of the artwork. The piece *Become One* is thoroughly examined in section 4 (Repertoire), through the creative, formal and performer perspectives. All figures were designed and written by me for the purpose of this document, unless specified otherwise. An effort has been made in the usage of the gender-inclusive singular *they* pronoun, as referred by LaScotte (2016) and Stormbom (2019).

1. Framework

1.1 Personal musical path and relevant experiences

Although my artistic education was relatively conservative, having studied in a conservatoire and applied for a bachelor's degree in Music (Piano), my academic path provided a fair share of meaningful experiences that help trace influences and interests in the creative experiences I am keen to partake. The first relevant mention is my “second home”, Escola de Artes da Bairrada, which opened in Troviscal, Oliveira do Bairro, in 2003, providing access to public specialized artistic education to the local population. I participated in the school's educative project first steps, along with circa 30 students, and I continue to relate to the school through artistic and pedagogic contributions and initiatives. From the start, the percussion class had a great impact in the school's ecosystem – their teacher created a percussion ensemble where inventiveness and inspiration were essential. This group, CRASSH¹, would later turn into a professional ensemble with specific characteristics which will be discussed further on.

Having developed a passion for the marimba at a very early stage, I enrolled in percussion classes in 2010, also at the conservatoire, as a second instrument. At the same time, I was encouraged by my peers to join a local philharmonic wind band with the intent of participating in their Asian tour (Hong Kong, Macau and Chiayi City for the WASBE convention) in 2011². The band conductor André Granjo became, then, responsible for introducing me to contemporary works for wind band, including works with electronics³ and Henry Cowell's *Little Concerto*, which I had the pleasure to play in 2015.

At the end of my high school path, I had collected some prizes in local photography contests and started collaborating with CRASSH as a photographer, later joining the group as a musician. As already mentioned, CRASSH is nowadays a professional percussion group based on the idea of creative percussion – creating sounds with mostly anything, with a strong visual impact and an educative and social component. CRASSH integrates the WeTumTum association, and develops subprojects CRASSH Stage, Street, Babies, Workshops and “Playing with...”. As part of our workshops and community offer, musicians were encouraged to attend Casa da Música's Educational Service Training Course for Music Performers, which prepares artists and educators to lead and facilitate music making in group contexts⁴. I enrolled in its 10th edition, and it was yet another relevant influence. It required and trained musicians to be ready to perform and work in a broader range of situations than usual, such as real-time composition and arrangement of music, and playing/leading communities which include non-professional musicians.

In 2012 I enrolled in the bachelor's degree in Music (Piano) at Universidade de Évora (UÉ), starting my academic studies with Professor Ana Telles. The syllabus included a piece of contemporary music to be played each semester, starting on the 2nd, and direct contact with the composer (if possible) was encouraged. During my bachelor's degree, I transferred

¹ See <http://www.crassh.pt> for further reference.

² Further reference available at <https://wasbe.org/2011-wasbe-conference>.

³ Some examples include Steven Bryant's *Ecstatic Waters* and Mason Bates' *Mothership*.

⁴ <https://www.casadamusica.com/pt/servico-educativo/formacao/2019-2020/xv-curso-de-formacao-de-animadores-musicais/>, accessed on 12th April 2020.

temporarily to Universidade de Aveiro (UA), where I would, in 2015, meet Paulo Maria Rodrigues, through the course “Projectos Multidisciplinares”⁵. In addition to being a teacher at UA, Paulo is also the composer in residence of Companhia de Música Teatral⁶ (CMT), and the creator of CMT projects in which I would later collaborate with, such as *Pianoscópio*, *Gamelão de Porcelana e Cristal*, *Murmúrios das Árvores*⁷, among others. CMT’s practice is based on three axes: artistic creation, investigation of human communication and development of tools that promote human development (Rodrigues et al., 2020). Back at Universidade de Évora, I graduated and enrolled in the master’s degree in performance (piano). The connection between artistic practices and related research at CMT, together with my academic path at UÉ, have allowed me to begin my scientific contribution in the academic context. I have presented work, led workshops and participated in conferences, thus exposing me to pioneering investigation at the piano (such as “Hands On Piano”⁸ and “III Encontro Internacional de Piano Contemporâneo”⁹).

1.1.1. *Pianoscópio*

Pianoscópio is a laboratorial project created in 2012 by *Companhia de Música Teatral* (CMT), which encompasses a visual and interactive installation, a performance model and a workshop model. At CMT, artistic projects are organized in so-called “artistic-educative constellations” (Rodrigues et al., 2020). These constellations group different aspects and formats of a particular aesthetic, theme or methodology: shows/performances, workshops, training, conferences, editions (CDs, books, documentaries) and installations (Miguel et al., in press). *Pianoscópio* is featured in the “*Anatomia do Piano*” (AdP)¹⁰ constellation (Figure 1).



Figure 1. Visual representation of the AdP constellation. Design by Mafalda Maia. Taken with permission from *Guia do Universo-CMT*.

Anatomia do Piano is a show aiming at the deconstruction of “the instrument that may be considered the most influential in the history of Western music”¹¹. After the creative process and the show’s premiere, it was obvious that the possibilities could be expanded into different kinds of works where audience interaction could have an even bigger role. Old pianos were donated and Universidade de Aveiro provided a space where they could be transformed; the

⁵ Multidisciplinary projects. See <https://www.ua.pt/deca/uc/2790>

⁶ <http://www.musicateatral.com>

⁷ *Pianoscope*, *Porcelain and Crystal Gamelan*, and *Murmurs from the Trees*, respectively.

⁸ <http://artisticresearch.web.ua.pt/handsonresearch/index.php/about/hands-on-specific-instrumental-areas/hands-on-piano/>

⁹ Organized in 2018 at Universidade de Évora.

¹⁰ *Piano Anatomy*.

¹¹ <http://www.musicateatral.com/anatomiadopiano/en> accessed in March 2020.

Pianoscópio developed from then on. The installation was born, tested and then transported and premiered at CCB's Big Bang Festival¹² in 2013.

Pianoscópio aims to contribute to the construction of an innovative vision of music by creating opportunities for discovery and expression, and also to challenge some conventions about music by “transforming the piano into a collective instrument, a sound exhibit/sculpture capable of producing sounds of a myriad of colours, a space to be inhabited by people and produce sound as a result of their combined interaction” (Rodrigues & Rodrigues, n.d.).

It was devised considering a wide range of possible experiences:

- a) an interactive exhibit that could be visited and explored freely,
- b) a series of resources and ideas that would support a workshop based on exploring the different sound elements as well as on the construction of musical pieces that would combine a predefined basis with elements of improvisation,
- c) a resource that would allow medium or long term creative projects with a focus on music but allowing to explore other artistic languages and areas of knowledge, as well as the development of social skills such as communication and cooperation (Rodrigues et al., 2019, p. 155).

Whereas generally piano components are supposed to be mechanically precise but completely silent, in the Pianoscópio each one of them (keys, hammers or soundboard) became an instrument/object on its own, whose sounds are valid and can be enhanced electronically through piezo microphones and contact transducers (speakers). The soundboards are prepared in the same way we would find a prepared piano, but there's a possibility to add other materials or stands, such as *chuveadores*¹³, woodpeckers' rows and/or visualizers (tablets that can show oscilloscopes and other related materials).



Figure 2. Aspects of Pianoscópio at the BIG BANG Festival, CCB, Lisbon. Pictures given by Companhia de Música Teatral.

¹² BIG BANG Festival is an arts festival dedicated to young audiences, supported by the Creative Programme of the EU and co-produced by Zonzo company and different European Art Centers. In Portugal, this happens through a partnership between Zonzo and Centro Cultural de Belém (CCB).

¹³ “rainmakers”.

Although these objects can work without amplification, “Pianoscópio was designed with the purpose of amplifying all the sounds produced by them, as well as taking advantage of their resonant properties to diffuse sound” (Rodrigues et al., 2019). Adding this possibility was important both for musical aesthetic reasons and because of its deep implications on how sounds can be perceived in creative and/or learning contexts.

The electronics comprise of a circuit of transparent hoses with audio cables, which visually creates an idea of a complex network (see fig. 3). All instruments have microphones, and the soundboards have, in addition, contact speakers that are connected to a computer via an Audio interface, which routes the audio signals, processing and effects by using a dedicated MaxMSP patch¹⁴. Additionally, a microphone is used to amplify voices, narrators and small choirs. The audio is then sent to the contact transducers that use the resonant properties of the soundboard to diffuse the sound into the space.

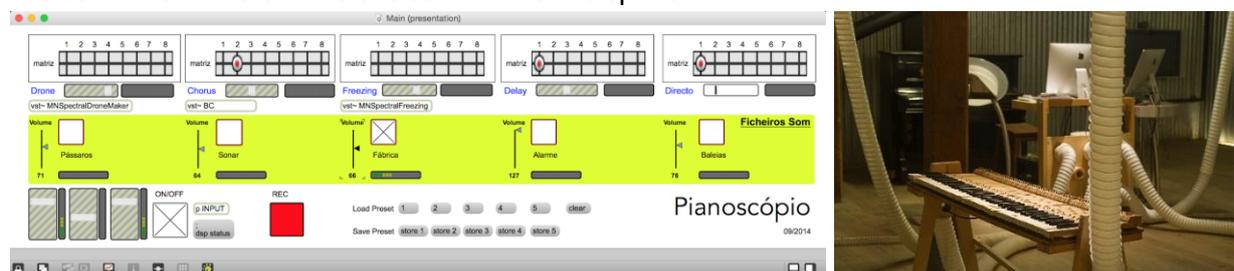


Figure 3. Aspects of Pianoscópio at Fábrica da Ciência Viva, Aveiro. Graphic User Interface (GUI) (left) and a view of the installation space (right). Images given by Companhia de Música Teatral.

The establishment of a connection between acoustic and electronic sounds, the emanation of the amplified sounds (including voices and pre-recorded sounds) from the installation elements and the possibility of processing these sounds, were strong features of the installation. The strings of the piano soundboards vibrate sympathetically, providing a rich solution that allowed the creation of a true sound spatialization effect. It was also a “poetic statement about the piano as a soundscapes resonator” (Rodrigues et al., 2019, p. 158) and about “the nature of music and our communication” (Rodrigues et al., 2019, p. 158) as human beings. The “theatrical atmosphere” created with previously recorded sounds was also important in establishing a mysterious atmosphere of “breathing machinery”, as if the installation was “alive” and waiting to be “awakened” (Rodrigues et al., 2019, p. 158).

Pianoscópio is thus a sort of living machine/laboratory where one can interact with the insides of a piano and listen to its feedback, experiment and communicate artistically.

1.1.2 Sonatas and Interludes for prepared piano, John Cage

In 2019, as part of my 2nd semester piano class, I proposed to incorporate John Cage’s Sonatas and Interludes for prepared piano in the syllabus as a class project, using one of the two grand pianos available on our classroom and exam room. This gave me some experience in preparing the piano in a consistent way – not just by individual experimentation but by actually searching for the composer’s specifications and intents. In addition, other students were given the chance to play and study repertoire for prepared piano which, to the vast majority, was a first experience in that domain. Students chose which pieces to play, aided by

¹⁴ See Rodrigues et al. (2019).

their teacher, and got to work. The preparation took two days, comparing measures between the score indications and the piano used – a Steinway concert grand piano.

To facilitate practice, the room was booked exclusively for the piano class for the semester, and I gave the other students tools and information on how to purchase and set up Big Fish Audio’s John Cage Prepared Piano sample library¹⁵ through a PC, using a USB or USB-Midi cable and their electronic pianos at home (Figure 4).

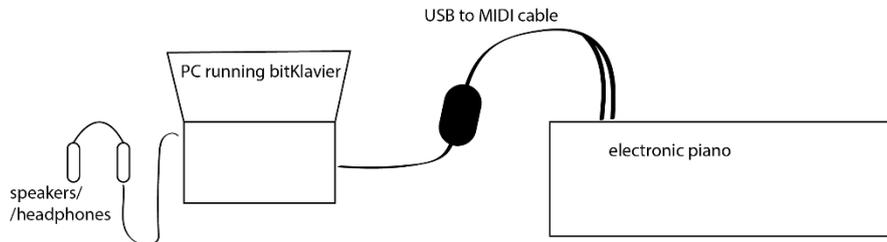


Figure 4. Diagram of the setup required to practice John Cage’s Sonatas and Interludes for prepared piano, using a computer to hear the prepared piano. Created by the author.

Because of its connection to the prepared piano, and since it is an open-source software, I used the digital musical instrument bitKlavier¹⁶ to manage the sample library, although other resources, such as digital audio workstations (DAWs) like Ableton or Logic, can be used instead. bitKlavier is a “prepared digital piano” (Trueman et al., n.d.), allowing sounds to be changed and manipulated with simple visual programming tools. This was demonstrated in a meeting with the piano students, introducing them to the software and encouraging further exploration.

1.1.3 Prepared Piano Repertoire for Four Hands via Chamber Music course

In the second semester of the chamber music course (from the master’s program), I collaborated with Tiago Quintas, a student from the piano class who is also a composer, in the creation and performance of repertoire for prepared piano. We created two unrelated pieces, each exploring different techniques: *Mapa* (written by me) and *Fábrica* (Tiago’s composition)¹⁷.

Mapa is a piece for prepared piano and electronics (two players). It is divided into five movements, each with a different technique. The piece was inspired by my travels from my hometown to the university (Aveiro – Évora), with a recurring stop in Lisboa. The seminal idea of a journey is present in the content and organization of each movement and also the “proximity” to the piano (the last movement *Chegada* is the only one played on the keyboard). The movements are as follows:

- 1) Ondas – played with an Ocean Drum, whose sound is captured by a microphone and “translated” into music via a MaxMSP patch created by Tiago. The sounds produced by the patch are amplified using contact transducers placed in the piano soundboard, which create sympathetic vibrations in the

¹⁵ See <https://www.bigfishaudio.com/John-Cage-Prepared-Piano>, accessed on 29th November 2020.

¹⁶ <https://bitklavier.com>, accessed on 29th November 2020

¹⁷ Translated as Map and Factory, respectively.

strings. This movement is played with no direct contact with the piano, although it is based on its resonance.

- 2) Ponte – the two players use violin bows to produce sound with bells placed on the piano soundboard. These sounds are gradually replaced with string plucking.
- 3) Viagem – a recording of a traditional folk song from Alentejo is sounded through the contact transducers, while the two players accompany it, bowing strings on the piano with nylon and arpeggiating the strings in a harp-like manner¹⁸
- 4) Gamelão – the two players sound the bells with mallets, performing indeterminate and determinate polyrhythms, which evoke Alentejo's soundscapes and their characteristic *chocalhos*¹⁹
- 5) Chegada – the audience is invited to participate, by activating two music boxes which manipulate the two players, respectively. A set of predefined notes and rhythm is played freely for as long as their assigned music box mechanism is moving. Playing speed must correspond to the winding mechanism's speed.

Fábrica is a piece for two pianists and prepared piano, featuring six movements using the same preparations, (explained in the music score) and some theatrical requests. The narrative follows the idea of the piano as a machine which is started, repaired and manipulated by the two players. The movements can be described as follows:

- 1) Ligar (Prepare to Start) – replicates the “engine start” using bowed notes, mallets hitting the clothespins' preparations, and passages played conventionally on the keyboard
- 2) Dar corda (wind up, as in a clock) – ostinato-like passage, also played on the keyboard
- 3) Pôr a trabalhar 1 (Start) – similar to movement 2
- 4) Reparar (Repair) – theatrical directions which include pianist 1 moving to the underside of the piano, like a mechanic, and repairing the “machine”. Pianist 2 plays the music score, mimicking a music box, interspersed by the actions of pianist 1
- 5) Pôr a trabalhar 2 (Start) – similar to movements 2 and 3
- 6) Desligar (Turn off) – the preparations are removed gradually, while sounding the notes from bottom to top

The preparations for this piece include chopsticks, nylon strings and modified clothespins of various sizes, such as those discussed in Section 3.3. The score is fairly traditional, featuring

¹⁸ This technique was popularized by Henry Cowell, with the piece *Aeolian Harp*, where the pianist silently presses the designated chords with one hand and strums the strings with the other. Crumb refers to this technique as the “aeolian harp effect”, followed by many composers (Shockley, 2018).

¹⁹ In some regions of Portugal, such as Alentejo, farm animals wear handmade bells/rattles (“chocalhos”) around their necks, which help their owners locate them. These bells were a sign of wealth and power to the farmers, in the 19th and 20th centuries, but, according to Torres & Oliveira (2018) today their use is decaying, other than for musical or ornamental purposes. In 2015, the “chocalhos de Alcáçovas” were distinguished by UNESCO as “Intangible heritage of Humanity”, and listed as “Intangible cultural heritage in urgent need of safeguarding” (“Award,” 2015)

bow marks for the use of nylon strings, crossed noteheads to symbolise mallet use, and theatrical directions (for instance, in the 4th movement: “check machine parameters, sliding fingers rapidly through the sticks”) (Quintas, 2019).

1.2 Scope and Research Questions

Following the experiences described in the previous chapter, I was highly interested in placing the piano at the centre of an interactive artistic research project, conducted in collaboration with peers (both artists and composers) and the audience, and bringing together different art forms. Due to financial, time and logistics constraints, this collaboration materialized in a composition which I developed alongside my own experimentation at the piano. In the future, I hope this work will serve as a basis for experimentation with other artists, students, and public in general (see 1.3 and 1.5).

Having decided on the creation of a minimalistic piece that could explore the realm of the prepared piano through its correspondence with other western musical instruments, the following research questions were set:

1. How can the piano represent, and to what extent, instruments present in the *Music for 18 Musicians*, by Steve Reich?
2. How can similar timbres be achieved, by preparing the piano and using extended techniques?

From the above questions, specific questions can be raised:

- i. What materials can be used to mimic another instrument’s timbre? Are they related to the original instrument’s materials?
- ii. How can one musician perform such a piece, when it requires different techniques being applied simultaneously?
- iii. How can experimentation and creation help to explore the full potential of the piano?
- iv. Can minimalistic music help bridge the gap between classically trained pianists and the prepared piano, and help develop a more holistic approach to music performance?

1.2.1 Aims and Approaches

Resulting from the questions proposed, I aim to:

1. explore different types of pianistic performance, such as extended techniques, prepared piano, the use of electronics and/or non-conventional sound resources, and the integration of extramusical components such as video projection, movement and narration (to name a few)
2. establish connections between resulting sounds from the piano soundscape and other instruments (namely, considering the piece *Music for 18 Musicians*, as a source of inspiration)
3. focus on the promotion and description of the interactive and communicative aspects that points 1 and 2 can bring to the performance, as well as the use of extra-concert activities such as lectures, seminars and workshops

4. premiere a work written by myself, specifically composed for this purpose, considering and integrating aspects found in the first point, while simultaneously describing the processes related to their composition, explorations and interpretation.

To achieve these, I propose to:

- i. Research possible piano timbres, using creative experimentation and both extended and prepared piano techniques
- ii. Draft an organization of the different produced timbres into various “sub-instruments” within the piano frame, matching them with conventional western musical instruments used in Steve Reich’s *Music for 18 Musicians*
- iii. Produce a work exploring extended and prepared piano techniques in a minimalistic style
- iv. Disseminate the work and provide opportunities for a deep exploration of the piano by other artists, educators, students

1.3 Outcomes

The outcomes of this investigation can be sorted into two categories: direct and indirect.

Direct outcomes include:

- i. the musical composition;
- ii. the recital (which will be video recorded); and (iii) the thesis.

Indirect outcomes include:

- i. the edition of the score;
- ii. a CD recording;
- iii. the online publication of performance videos and/or educative videos where preparations are explained;
- iv. dynamization of workshops and other artistic and educative activities where people can be engaged in the creative process, either to perform the finished piece or to create and to experiment with it.

2. State of the Art

This section is divided into two sub-sections, which accommodate the main aspects that characterize this project. First, the project is based upon a creative experiment which relates artistic research with an active exploration of the object of study (the piano). Secondly, the object of study is traced to its history and practices, which inspire the manipulation and exploration of the instrument that occurs within the project.

2.1 Performance, Creativity and a Hands-on Approach

This dissertation is based upon the view of the artist as an experimenter, proposing questions that might stimulate creativity and creation, in an open environment. By being immersed in the creation of the aesthetic experience of the performance – in this case, exploring and selecting the prepared piano sounds, and composing the piece – I argue that a new relationship with the instrument can be nurtured, allowing for a deeper sense of communication, both in the context of performance (with others and the audience) and generally as a human being.

This stems from the idea that the artist onstage ought to use their full capacities to communicate, using theatre, movement, and expression to fully convey the meaning and embodiment of the performance to the audience. Or rather, that an artist – be it a professional pianist or a circus performer – should, rather than remove themselves from the performance, make sure that their presence and all their actions concern their performance. In short, that they should be, to the best of their abilities, in tune with the performance, mentally, emotionally, and physically.

Moreover, by using creation as part of the experience, one connects the performance to its place and time in existence. While it might be replicated, the preparation for it – specifically concerning the preparation of the instrument -, will certainly be different, which will create a different performance. I argue that a piece with a defined macro-structure, and an open micro-structure, allows for the necessary adaptation to a different environment – whether it concerns different participants, different instruments, or simply an introspectively different artist.

These ideas have been in development along with my own artistic progress, in which the work of John Dewey in *Art as Experience* (1934) has created some resonance. In its first chapters, the relationship between a living creature, its environment and its qualities, is described from the perspective of its interaction with life. This interaction causes changes in the equilibrium between the live being and its environment, and thus allows the existence of aesthetic experience (Leddy, 2020). Dewey argues that to think and reflect on the philosophy of the Arts, one should start by restoring “continuity between the refined and intensified forms of experience that are works of art and the everyday events, doings, and sufferings that are universally recognized to constitute experience” (Dewey, 1934, p. 2).

Although aesthetic qualities are present in everyday life, to Dewey, it is Man’s consciousness and perception that allow him to experience and create aesthetically and artistically. Quoting Leddy (2020), “Dewey holds that man takes the unity of sense and impulse of animal life and

infuses it with conscious meaning through communication”. Another important aspect of his view consists in the distinction between the kind of experience that happens inevitably through our interactions in life and having a meaningful experience – one that is wholly experienced and fulfilling.

Dewey (1934) defends that aesthetic experience shapes the art object. As much as an observer or listener goes through the experience of an art form, the artist himself, while doing or making it, is embedding its product with his own whole experience. This process is necessary to a meaningful artistic product, in a unified and complete way.

Accordingly, in this thesis I intend to document past experiences which help me to narrate the outcome piece, and bring sense to it, in a theoretical approach. Simultaneously, I accept that this view is not necessary to experience the music produced, but it might serve its purpose as an educational tool for further investigations and replications.

This reflection and philosophical engagement relates to the purpose of musicians/performers as active artistic-researchers, framed as “performers working in the context of Western art music who are working within a creative and research-based mode of performance” by Paulo de Assis (2018, p. 45). His work *Logic of Experimentation: Rethinking Music Performance through Artistic Research* (De Assis, 2018) resonates with the project presented in this dissertation, through his proposed methodology of artistic research, which facilitates an “unifying approach to performance and composition” and grasps “the potential of performance and composition to operate as knowledge-producing activities” (2018, p. 111), and the requisite of experimentation in performance: “Beyond interpretation, performance is the place to embrace experimentation, to establish, on the basis of productive contradictions, the possibility of free, creative action for music performers.” (De Assis, 2018, p. 198)

Drawing on the importance of experience, Pauline Oliveros’ *Deep Listening* (2005) provides us with exercises and a basis for tuning the body to its environment and to listen, which is particularly helpful to the exploration of the inside piano, as well as a good practice for any performer. Likewise, Murray Schafer’s Creative Music Education “teaching style”, described by Rutherford (2014, p. 16) is ever more relevant to the development of sound-attuned people and, especially, artists. This is further explained in Schafer’s *The thinking Ear* (1986), a collection of booklets previously published separately, which include his reflections and exercises from his experience as a music teacher. In his writings, Schafer focuses on his view as a composer (Schafer, 1993), and his reflections on experiences within the music classroom. Despite this, he makes no connection to music performers and how they might be influenced by this education/experience. Both Schafer and Paynter share the idea that listening and creative experiment should be nurtured as “the first step [to] the understanding of the medium and its potential” (Paynter & Aston, 1973, p. 7)²⁰. In their view, it is essential to provide for an environment where creativity and experiments are at the centre of the educative process.

²⁰ See also (Rutherford, 2014)

These ideas are present in Boucher and Moisey (2019), which base their research's theoretical framework in Kolb's Experiential Learning Theory (2015). This theory, which relates Dewey's "philosophical pragmatism" to the works of scholars such as Lewin and Piaget (Kolb et al., 2001), is structured around six propositions, found in Boucher and Moisey (2019), from which two are particularly relevant here: "Learning is a holistic process of adaptation to the world" and "of creating knowledge" (Boucher & Moisey, 2019, p. 2114).

Thus, learning by doing or having a hands-on approach might help us, as performers, better know our instrument and our music, and, as artists and people, better connect with our environment and better communicate aesthetic experiences.

2.2 The piano, its uses and craftspeople

From the creation of the first iterations of the pianoforte by Bartolomeo Cristofori, in 1700, the instrument has suffered adaptations and experimentations over time. This technological development (namely the rise of the piano industry and its manufacturing transformations) is further described and analysed in Good (2002). The piano's register expansion (and subsequent size expansion), as well as the adoption of hand-stops, knee levers and pedals providing different timbres and additional control over the produced sound, prove its versatility as an instrument. However, manufacture and demand might have influenced the rate of invention and adoption in favour of conservatism (Good, 2002). An example of this was the reluctance of certain makers in adopting an iron frame (Good, 2002).

The demand for the piano as a household instrument was such that the development of square pianos and vertical pianos further separated them from the "concert grand" (which was first specified as grand for being large), due to the challenge of producing instruments capable of considerable volume of sound, dynamic range, and a responsive action at a reasonable price range (Good, 2002). This ended up creating a gap between the experience a student or player will have at home when practicing in an upright piano and when performing in a concert grand instrument, which proves particularly important when performing pieces that include preparations or playing inside the piano.

Likewise, if the standard piano repertoire panorama relies on certain general characteristics of the instrument, it is difficult to implement or successfully add improvements to the already existent piano market. This has been the problem both with bold designs and features such as the "pedal piano"²¹ (which has an additional pedalboard, much like an organ) and with smaller but useful improvements such as marking overtones and dampers to assist inside-piano playing (from makers Sauter and Steingraeber & Söhne) (Shockley, 2018).

2.2.1 Brief notes on the physicality of piano performance

Literature available regarding the piano and musical contexts in the 18th and 19th century, as well as methods and publications advising proper technique and exercises for aspiring

²¹ This has been recently revived by the Pinchi Pedalboard System (Shockley, 2018) and pianist Roberto Prosseda (*ROBERTO PROSSEDA - Progetti*, n.d.).

pianists, is plentiful, ranging from Loesser (1990), Rowland (1998) and Isacoff (2011) to Ortmann (1929), Sándor (1981), Neuhaus (1993) and Fink (1992), among others.

Since the use of extended techniques implies a heightened relevance to pianists' playing positions, this section is mainly focused on research regarding body movement and its expression.

In Rink's *Musical Performance* (2002), Jane Davidson addresses body communication in performance and social aspects of movement. By quoting studies such as Davidson and Dawson (1995), Davidson argues that movement should not be restricted, since it has been shown to enhance audiences' perception of musical works (in Western art music). Specifically, she mentions pianists' circular motion in the upper body and arms gestures. This, I suggest, might be heightened by handling the piano's soundboard while adopting a standing position – as a percussionist or a woodworker might do. On the other hand, if the audience is unable to see the hands of the performer and its actions inside the piano, their movements might lose their meaning. A standing position, in my opinion, can thus be both positive or negative, and shouldn't prevent the pianist from exploring other positions which might permit fuller (and visually more perceptible) body movements/motions.

Anthony Gritten and Elaine King (Gritten & King, 2006, 2011) incorporate Davidson's research in their publications on the application of movement and gesture in music: specifically in the chapter on the importance and influence of breathing in piano performance of their 2006 publication(2006), and more generally throughout their 2011 publication.

With the popularisation of the piano and its expanding presence in different contexts, such as social events and media, there was a diversification of the instrument's performative characteristics. Some examples include the use of the piano for silent movies accompaniment, for instance, or its incorporation in movies for comical effect, and its appropriation in jazz and popular music (Parakilas, 2002). Parakilas (2002) relates these settings with the corresponding expectations regarding the pianists' movements and expressions: "But in the twentieth century, classical pianists, along with mock-classy pianists like Liberace, needed to shun aggressiveness in order to distinguish themselves from rockers like Lewis, just as Lewis needed to pounce on the piano to prove that he was a real rocker, even if he did play the piano" (Parakilas, 2002, p. 291).

Likewise, when attending a show by Victor Borge²² or the duo Igudesman & Joo²³, there's a different degree of physicality associated with the performance – comical gags include movements associated with a classical piano performance (such as placing the sheet music on the stand, or adjusting the piano bench) but go beyond that scope (including dramatic exaggeration of movements, intentional mistakes or dancing)²⁴.

These examples pose a few questions: How does a piano performance have a positive impact on the audience? To what extent are extramusical activities necessary or beneficial to the enjoyment of performance? And how do they change in different contexts? The use of extended techniques and inside-piano playing adds a new dimension to the physicality of the instrument, which should be accounted for. Both Hudicek (2002) and Mayas (2019) refer this,

²² See <https://www.victorborge.org>, accessed on 29th November 2020.

²³ See <https://igudesmanandjoo.com>, accessed on 29th November 2020.

²⁴ Numerous excerpts on the performers' acts are available on streaming platforms such as Youtube.

as well as the importance of preparing and studying movements that facilitate optimal sound production, and comply with the aesthetics of performance.

This view does not correspond to a linear function where the amount of movement or physicality employed in a performance directly correlates to a better performance, but rather as a means to highlight the importance of considering the performers' physical presence as one of the axes of expression in performance, to be holistically in tune with its aesthetics.

In conclusion, although the piano has increasingly been included in a variety of contexts, investigation on modern piano performative practices, namely the use of body movement (with and without the use of unconventional techniques), could be expanded. In my opinion, this expansion might help bridge the gap between the knowledge and refinement of conventional techniques and their practice, and unconventional techniques.

2.2.2 The piano and the Art World

The piano became an icon of western music (Ziegler et al., 2013). Throughout the 19th century, it became increasingly common in all sorts of institutions – businesses, schools, churches and healthcare institutions (such as nursing homes and asylums) (Parakilas, 2002). In fact, it became common to find a grand piano in concert halls and theatres, as well as upright pianos in households, which had a correspondence with a certain social status.

In the last few decades, despite its stabilization as an instrument, the piano has been subject to new experimentation and emerging art forms, occupying a new space in art-galleries and public spaces. That happens in the case of movements focused on the breaking of stereotypes and the exploration of innovative art forms, such as the Fluxus movement²⁵, where artists such as George Maciunas, John Cage, Nam June Paik, among others, developed performances “to disrupt the expected conventions of musical and theatrical performance and spectatorship” (MoMA | *The Collection | Fluxus*, 2015). Some examples include Nam June Paik's *Piano Piece* (1993)²⁶ (*Piano Piece | Albright-Knox*, n.d.) and Philip Corner's *Piano Activities* (Philip Corner, 2010). Although other composers like Charles Ives, Henry Cowell and George Crumb have also contributed to innovative piano music and practice, it was perhaps John Cage who brought it into the scope of contemporary art forms such as sound art, performance art and video art, due to his influence and association with Fluxus artists (Nicholls, 2002).

Other examples of the use of pianos for artistic purposes include audiovisual installation *Piano Migration* by Kathy Hinde, art installations by Joseph Beuys (*Infiltration for piano*), Ken Unsworth (*Rapture, A ringing glass, ...*), Chiharu Shiota (*In Silence*), Rebecca Horn's *Sculpture Concert for Anarchy*, and kinetic sculptures by Trimpin (*Red Hot*), Robert Gligorov (*Dollar note*) and Stephen Cornford (*Extended Piano*). As a contribution to the accessibility of music, Luke Jerram's worldwide installation *Play it, I'm yours*, which places “street pianos” in public spaces (*Play Me, I'm Yours | Street Pianos*, n.d.) is also relevant, having since been replicated in unrelated events.

²⁵ For more information and resources on this movement, see <https://monoskop.org/Fluxus> .

²⁶ A preview of this is available at <https://www.youtube.com/watch?v=opug8uW21eU> .

Although the presence of the piano in modern and contemporary art forms is unmistakable, reference to it in musical literature is hard to find. For instance, the Cambridge Companion to the Piano (Rowland, 1998) features only one section on the prepared piano, referring to John Cage and ending with a quote concerning the damaging of the instrument. An exception to this phenomenon is Parakilas (2002), who goes beyond the usual scope of piano history to trace its usage in such contexts as popular music, jazz, and Hollywood. A hypothesis for this is the fact that, in the contexts described above, the piano becomes the art object, rather than an instrument to perform music or create art. Despite this, a vast understanding of the uses of the piano within the various arts might prove inspirational.

2.2.3 On the prepared piano

Richard Bunker's *The Well-Prepared Piano* (1973)²⁷ was the first publication concerned with educating pianists for the instrument's preparation. It is a practical guide, featuring diagrams and figures that illustrate his suggestions as to how and what to put inside the piano. Bunker was an acknowledged pianist and composer, who worked closely with John Cage, performing his prepared piano pieces (Bunker, 1973)²⁸. Some academic works following Bunker's include a focus on George Crumb (Chun, 1983; Matthews, 1981), the glissando (Lin, 1997), and an overview of techniques extended techniques, including the prepared piano (Harrel, 1977; Hudicek, 2002) (Vaes, 2009).

Hudicek (2002) reviews Bunker's publications, as well as David Burge's *Twentieth Century Piano Music* (also out of print), Gardner Read's *Contemporary Instrumental Techniques*, and a film by Adam Eder called *Non-traditional Piano Use* (which is only available upon personal request). An important progress concerning previous publications is that Hudicek includes techniques on labelling the piano and refers to the practice of unconventional techniques in such a detailed manner as conventional piano practice, in order to produce the intended effects.

Dianova's *John Cage's Prepared Piano* (2008) focuses on the works of John Cage; through a description and illustration of materials, she details the common challenges and misconceptions of preparing a piano.

The year 2009 was of relevance concerning publications on extended piano techniques, with the publication of Proulx's thesis *A Pedagogical Guide to Extended Piano Techniques* (2009) and Vaes' *Extended Piano Techniques: In Theory, History and Performance Practice* (2009). Proulx's publication is a useful guide to pianists and teachers alike, mainly focusing on the application of his own exercises which facilitate practice of extended piano techniques. It features a complete range of exercises, which might be selected depending on the repertoire one intends to study or perform, or used as a whole, in the case of professional musicians interested in specializing in extended techniques.

Luk Vaes's thesis (2009) focuses not only on 20th century music but also earlier experimentation and techniques, namely the glissando, cluster and extensions, in an

²⁷ This publication is currently out of print but can still be found in some libraries across the world.

²⁸ An interesting interview is available on The Internet Archive, with Bunker playing Cage, Cowell, Budd and Paull live in the studio. See https://archive.org/details/AM_1973_05_17 (visited on the 20th October 2020).

comprehensive document. This book is extensive, and it might be difficult to handle by pianists and other performers. However, it is an important asset to the piano history and literature.

From this point of view, Shockley's *The contemporary piano* (2018) bridges the gap between musicological rigour and a composer and/or interpreter's perspective, offering a practical guide encompassing all the major developments and publications concerning the piano, which might be helpful for contemporary pianists and composers. Shockley occasionally features his own examples – both of music composed by himself and from composers whose work he has played. While contemporary piano techniques are vast, certain examples on preparations or effects which to me seem essential, specifically string preparations, such as tape and bamboo chopsticks, escape the scope of this book. Nevertheless, the preparation categorization, description and techniques, as well as the acknowledgment of new piano models or inventions (such as the pedalboard mentioned in Section 2.2), make this book an essential source to this dissertation and any pianist in the making.

In Portugal, the panorama of prepared and extended piano includes some academic works, such as Ribeiro (2016) and Fernandes (2015), and inclusion in projects such as FCT-funded project Xperimus – a project based on experimentation in music in Portuguese culture (*Xperimus | Home*, n.d.).

One of the most recent contemporary piano publications, by the composer-performer-improviser Magda Mayas, *Orchestrating Timbre* (2019) provides the necessary inspiration to my personal and holistic experience of exploring the possibilities of the instrument. The book describes her personal inquiry on timbre and analysis of past experiences and performances. Publications on prepared piano synthesis, notation, acoustics and physical models, which are outside the scope of this research but relevant to further inquiries, include works by Ducceschi and Bilbao (2019)²⁹, Berdahl et al. (2005) and Longari (2002).

²⁹ The authors provide a website with some examples as a complement to the paper, which might be of interest: <http://mdphys.org/preparedpiano.html>, accessed on 26th November 2020.

3. The toolbox

In order to follow the creative process and be able to recreate this experiment, one needs a basic understanding of the concepts explored and the materials used.

3.1 Concepts

This section focuses on the definition of concepts used in this document, in an attempt to prepare the reader for the repertoire analysis and process description.

Extended Techniques

Extended techniques are generally understood as unconventional, or “improper” (Vaes, 2009), techniques applied to a performer’s instrument during the performance. These can include the manipulation of the instrument in an unexpected way (for instance, pressing the strings of a piano note to sound its harmonics), the use of other materials to change a conventionally produced sound (for instance, using pieces of paper or ping-pong balls on wind instruments’ bells, and other techniques. Vaes (2009) points to the lack of a precise definition for the terms “extended piano” and “extended techniques”, although they’re widely referenced.

Prepared piano

The prepared piano is a term coined by John Cage for his piece *Bacchanale* (1940), written as an accompaniment to Syvilla Fort’s dance recital (Hinson & Roberts, 2014) at the Repertory Playhouse in Seattle (Nicholls, 2002). Cage prepared the piano with nuts and bolts to make it resemble a percussion ensemble, since he only had an upright piano available to work with³⁰. He later wrote more pieces for prepared piano, such as the *Sonatas and Interludes* (mentioned in Section 1.1.2) and the *Concerto for Prepared Piano and Chamber Orchestra*. The prepared piano consists in the modification of the instrument, before the performance, by inserting materials that can change the expected sounds in a controlled environment. Usually, composers include preparation notes to aid the pianist find the right materials and place them precisely in the piano, although calculations have to be made in order to produce similar sounds in different pianos. The prepared piano distinguishes itself from the “inside piano” by the conventional playing on the keyboard, whereas “inside piano” refers to playing other parts of the piano (namely the soundboard and strings).

Preparations include (but are not limited to) household objects such as nuts, bolts, pencils, rubber, magnets, marbles, etc.

Pulse/Pulsing

As a musical term, pulse (or “beat”) refers to regular recurrent articulations throughout music. A sense of pulse occurs in listeners as a response to the “rhythmic organization of the musical surface” and is an essential condition for musical metre. Although pulses need not necessarily be present in music, they generally are, and fall within a certain temporal range, relative to the average heartbeat rate of a resting adult³¹. (London, 2001)

³⁰ This anecdote is described by himself in the foreword to Richard Bunker’s *The Well Prepared Piano* (1973).

³¹ See also *Tactus* and *Rhythm* entries in the Grove Music Online encyclopedia.

The term is used by Steve Reich to define a steady repetition of a note, or a “repeated [pattern of] eighth-notes on the same pitch or pitches” (Mellits, 2009, p. 12)³². Mellits, in his analysis of *Music for 18 Musicians* (Mellits, 2009), divides pulses into two categories: background and foreground pulses; the former corresponds to the section’s chord repeated by the pianos and mallets, whereas the latter refers to the pulses created by “breaths” in the remaining instruments.

Orchestration

The Grove Music Online defines Instrumentation and Orchestration as “the art of combining the sounds of a complex of instruments (an orchestra or other ensemble) to form a satisfactory blend and balance.” (Kreitner et al., 2001) “Orchestration” and “to orchestrate” also refer to idiomatic writing and rearranging a work originally written for a solo instrument or a small ensemble, respectively (Kreitner et al., 2001).

Mayas (2019) refers to the broad meaning of the word “orchestrate” and relates it to her description of timbre, suggesting that it “entails arranging, composing, and carefully and attentively re-organizing the active agents in a performance situation: material, space and body” (Mayas, 2019, p. 29).

In the context of this dissertation, the orchestration process precedes the performance almost completely, giving emphasis to the creation part of the process: to prepare and multiply sounds from a single piano in order to make an “orchestra” out of it.

Timbre

Timbre can be defined as the characteristic colour or sound of a particular instrument or voice (Grout et al., 2014). Helmholtz (1885) holds the acoustical definition of the timbre or “musical quality” as depending on the relative intensity (presence, strength and later including relative location within the frequency continuum) of partial tones – the acoustic spectrum (Wedin & Goude, 1972). Additionally, Sethares’ book on Tuning, Timbre, Spectrum and Scale (2005) might provide some help in understanding the theme. Sethares refers timbre as a “multidimensional attribute of sound” (Sethares, 2005, pp. 29, 30).

Mayas (2019) addresses the difficulty in the definition of the term and its attempts by quoting Helmholtz (1885), Schaeffer (1966) and Murail (2005), among others, and introduces an “extended understanding of timbre” (2019, p. 21) which incorporates its subjective characteristics. Although there is research available on timbre in the fields of psychoacoustics, music psychology and computer music, there isn’t yet a quantified measurement of timbre (Mayas, 2019), which Mayas attributes to the “fact that timbre is a perceptual phenomenon that circumscribes sound as a whole and is defined through its temporal and transitory attributes” (2019, p. 58).

³² See also (Reich & Hillier, 2004) and (MacNeil, 2008).

3.2 The piano

Two pianos were used to create the final product for the recital – the piano played at Universidade de Évora and a Yamaha C5 for the preparations, experimentations and recordings.

Since all the preparations were based on the piano available (C5), there was no need for adaptation of previously tested techniques: all sounds were created by experimentation with this particular piano.

The Yamaha C5 features 3 iron braces (between strings A#2/B2, D5/D#5 and G6/G#6, and an additional diagonal connection between the first and the frame), single wound strings (between A0-F#1), double wound strings (unisons) (G1-A#2) and triple steel strings (unisons) (B2-C8). Strings obscured by overstringing are B2 to C3, and there are no dampers from F#6 upwards³³. These characteristics were personally measured and follow the template of other models' descriptions in Shockley's *The Contemporary Piano* (2018), Appendix C.

3.3 Materials

The materials used were chosen largely due to past experiences, mainly from Pianoscópio, and because they were easy items to find or buy.

3.3.1 Modified clothespins

These wood clothespins come in various sizes and are usually found in craft or utility stores. The metal spring is removed (and can be used as a rattle), while the wooden parts are turned outwards and tied with elastic bands (Figure 5). The elastic bands' size should be proportionate to the whole, to provide a strong force without too much material around the structure.



Figure 5. Clothespins arranged by size (from left to right: mini, small, medium, regular A, regular B and large). Picture taken by the author.

For the purpose of the piece, I used clothespins of different sizes, and named them accordingly: mini, small, medium, regular and large. It should be noted that within the crafts'

³³ Pitches are notated in accordance with the American Scientific Pitch Notation (Hamm & Hughes, n.d.).

clothespins, there are distinctions in terms of size (mini, small and medium) and placement of elastic bands (Figure 6).

According to Quintas' practical experimentation upon the '*Fábrica*' composition, both large and normal clothespins produce a muted sound, which is richer when the objects are positioned in the nodes related to the strings' partials. Two tones are produced, one lower than the note pitch and one higher, which can vary between a major 3rd and a minor 2nd, and a minor 6th and an indefinite interval, respectively (moving away from the middle point of the string).

Smaller clothespins produce a more resonant sound, which resembles mallet instruments, throughout the whole length of the string. The same intervals can be obtained, but the closer the clothespins are to the agraffes, the closer their sound will be to the original pitch.

Further investigation is needed to detail these characteristics and test them on a varied range of pianos.

These materials are generally referred by Shockley (2018) and Bunger (1973), though the latter focuses on the use of only a half of the pin.

3.3.2 Fishing line and nylon strings' bows

These are among the most widely used and discussed preparations, considering non-aggressive materials. The use of bows mimicking string instruments' sounds was developed by Curtis-Smith, which led Stephen Scott to the foundation of the Bowed Piano Ensemble (Shockley, 2018).

To create a bow, several nylon filaments (available at utility stores) should be tied together on each end, with approximately one meter in length (figure 6). When used for bowing steel strings, the filament diameter is irrelevant, but thicker filaments should be used in copper strings to prevent damage. Although Curtis-Smith recommends a specific brand of rosin (Shockley, 2018), ordinary violin/cello rosin will work well.



Figure 6. Aspects of nylon bow placement and usage. Pictures taken by the author.

To facilitate bowing, wooden beads can be placed on one end and glued to the filaments' knot. This will also make it easier when identifying different notes. When placing the bow between the strings, making a loop on the end which goes under the strings will make it easier to catch (figure 6). One should be careful not to bow too close to adjacent strings, or, when

possible (especially in the middle/high register), place the nylon filaments between the first and third unison strings. Another option, if the adjacent strings aren't used elsewhere, is to mute them with felt or adhesives (See 3.3.6).

3.3.3 Chopsticks and skewers

Bamboo/wood chopsticks and skewers can be used as a preparation material, placing them between the strings and pressing the corresponding keys, or as an extended technique, in which fingers sliding alongside the bamboo prompt it to resonate (figure 7). Both techniques were used, though prepared separately.



Figure 7. Examples of bamboo chopsticks as piano preparations. Pictures taken by the author.

I generally tend to prefer bamboo chopsticks to skewers because their slight increase in thickness helps them stabilize between the strings. An exception to this is the higher register, where strings are under a greater degree of tension, and a thinner material is useful not to damage the strings and/or tuning.

3.3.4 Bolts, Bakelite, Coins and Magnets

The only metallic materials used were bolts, coins and magnets, due to the need for different timbres, that would be more resonant. For this, I decided to use bolts of 6mm of diameter and pennies (figure 8).



Figure 8. Examples of materials presented: a bolt with Bakelite attached (left), a penny (centre) and magnets (right). Pictures taken by the author.

The bolts were positioned vertically, with the bottom up, with Bakelite handles attached. Despite the increase in weight, this did not change their sound and allowed them to be played both through the keyboard action and directly, with mallets. Bolts without Bakelite were positioned normally, to allow the insertion of magnets on top, when needed.

The magnets used were cylindrical and 5 to 7 mm wide (figure 8, right); when attached to the coins or bolts, they decrease the frequency of the sounding pitches.

3.3.5 Bushings

Plastic screw bushings (the ones used to wall-mount screws) are also a great material to produce rich and resonant sounds, with the advantage of flexibility (thus not creating too much tension on the strings). These are the standard size (figure 9) and can be found in hardware stores.



Figure 9. Example of placement of plastic screw bushings on the strings. Picture taken by the author.

3.3.6 Adhesive pads/poster putty (Patafix)

Richard Bunker advises pianists to mute unprepared notes (if not meant to be played) with felt or poster putty, which can act as a mute but also provides a sound similar to the xylophone (with a fast decay). An example of this is shown on figure 10.



Figure 10. Poster putty (or Patafix) muting the strings. Picture taken by the author.

3.3.7 Vinyl rubber

These pieces of rubber were originally bought for a dance studio floor and repurposed as piano preparations (figure 11). They were also used for the preparation of the John Cage's *Sonatas and Interludes*. They provide a sound which is similar to the poster putty – muted, but with the option of easily sliding the rubbers through the strings, which may resound other partials.



Figure 11. Example of vinyl rubber used as a piano preparation. Picture taken by the author.

3.3.8 Mallets

Preparations such as the bolts with Bakelite, bushings, bamboos and clothespins can be played directly on the preparation, as well as through conventional key pressing. Soft mallets can be made from repurposed piano hammers and medium mallets with cork stoppers.

Unprepared strings can also be played in this manner, although accuracy may require some training.

3.3.9 Others

As a muting device, a tuning block made of rubber was used between the strings, pressing against the soundboard (figure 12). Also, for the same purpose, a small piece of fabric was freely resting on the soundboard, touching the metal preparations lightly, and therefore muting their lowest sound.

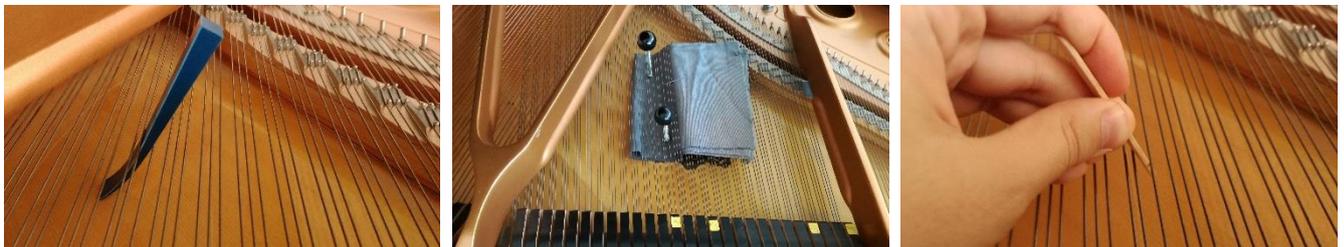


Figure 12. Aspects of miscellaneous preparations/mutes and the use of a popsicle stick as a wedge to insert/remove preparations (on the right). Pictures taken by the author.

A popsicle stick (unused) was repurposed as a wedge to insert and remove preparations without damaging the strings (figure 12). Bunger (1973) suggests a screwdriver for the same purpose, although I argue that a softer material might prevent damage or dents to the strings.

3.4 Software and Recording Gear

For the purpose of recording the different parts, I used a Zoom H2n recorder connected to my laptop, which was running Ableton Live 10 (Suite) and the ASIO driver.

3.4.1 Software

Ableton Live is a software designed for live performances, generally of electronic music and/or video. It features several software instruments, plugins and effects, and is compatible with most MIDI and audio interfaces. Ableton stands out from the regular Digital Audio

Workstations (DAW) by its vertical layout/interface, designated for loop creation and manipulation (Figure 13), and its MaxMSP integration (Max4Live).

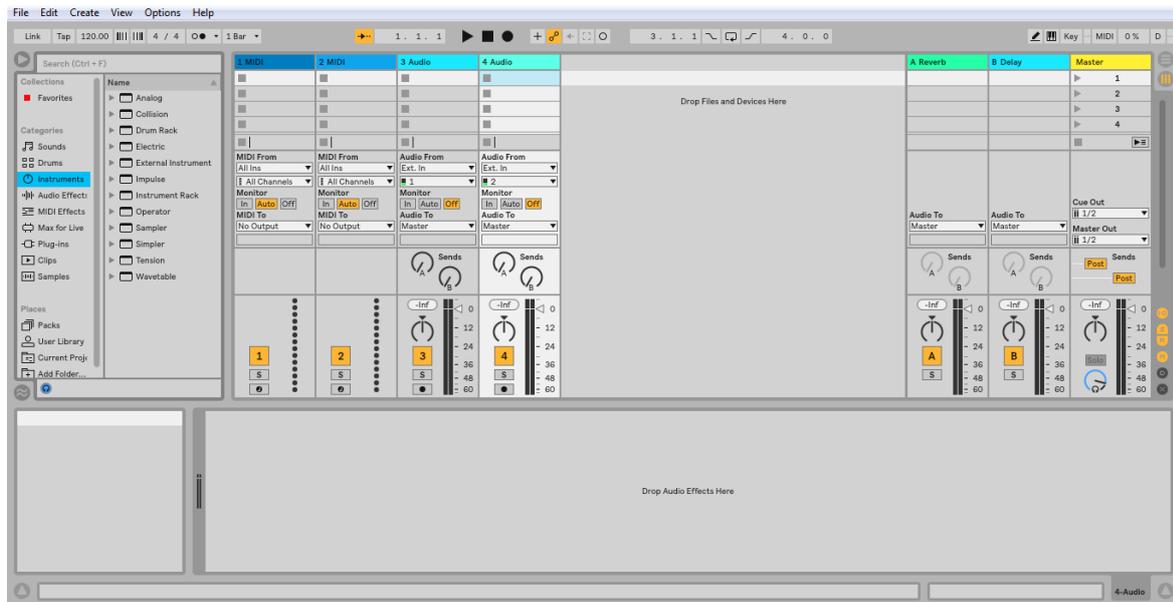


Figure 13. GUI at the startup of Ableton Live 10 (Session View). Screenshot taken by the author.

On the left-hand side, the selection menu is displayed, where instruments, plugins, etc. may be chosen and dragged to their place.

On the centre, each MIDI or audio track is assigned a colour (in this case, shades of blue).

The cells on each column/track are clip slots, where recorded loops or samples are stored.

On the top, one sees the general controls for the performance such as tempo, play/record; on the bottom, specific controls for each selected clip/instrument/effect are to be found.

On the right-hand side, the effects (A and B) and the Master track (pale yellow) are visible, each number corresponding to a Scene (horizontal row).

In order to record and playback the sounds on Ableton, an audio driver must be chosen through the Audio Preferences menu. For this purpose, I chose the MME/DirectX Window's native driver, although the ASIO driver is also recommended.

3.4.2 Recording setup

Although the recordings could have been made independently, using only the recorder, and later added to the Live project, I chose to record directly onto the tracks on Live. For this purpose, the Zoom recorder is connected to the laptop via a USB cable and used as an audio interface (in this case, a microphone) (Figure 14).

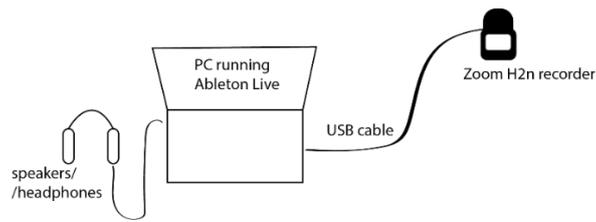


Figure 14. Diagram of the recording setup. Created by the author.

In Ableton Live’s audio preferences, the “Zoom Recording Mixer” was chosen as the Audio Input Device.

3.5 Performance gear and setup

The performance setup includes a laptop or computer running the Ableton Live software and Live Set, connected to a midi foot controller which allows the pianist to decide in real-time when to change sections (within the designated limits for each section), and to an amplifier that outputs the computer sound to two contact speakers (or transducers), attached to the piano’s soundboard.

The piano may also be prepared in accordance with its sound possibilities and the piece’s requirements.

The laptop will be connected to all the other hardware, providing a click track and monitoring through the headphones, the output sound through the amplifier and contact speakers, and facilitating control of the Live project through the midi controller (Figure 15).

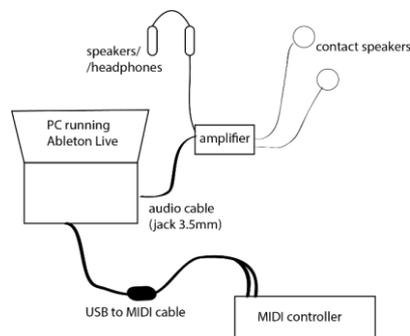


Figure 15. Diagram of the performance gear setup. Created by the author.

The midi controller helps the pianist choose the duration of each pattern and scene by allowing them to “conduct” the piece and give digital cues to the recorded instruments.

The use of contact speakers/transducers is recommended since their placement in the piano’s soundboard causes the natural resonance of the sounds produced. These can be replaced by regular speakers if needed.

If for some reason this setup is not feasible, some other options can be considered:

- i. having another musician control the software directly through the laptop while the pianist plays the live part,
- ii. exporting the Live project as an audio file and play it (which implies having no control over changes, repetitions, volumes and effects).

4. Repertoire – *Become One*

4.1. Overview of the creative process

The idea for this project came from a desire to create a framework for experimentation inside the piano and was highly influenced by my informal studies of Composition and Analysis. I had been studying both Parisian isorhythmic motets and works by Perotin, which led me to Steve Reich, who claims to have been influenced by the latter's music (Reich & Hillier, 2004). While listening to *Music for 18 Musicians*, I became attracted to the idea of a piece where, due to note and ostinato repetitions, timbral changes lead the music forward. I decided to create a piece where the orchestration would be led by experimentation with the piano, by:

1. transforming the piano into several instruments
2. corresponding sounds from *Music for 18 Musicians* to researched sounds within the piano
3. using similar musical processes from *Music for 18 Musicians* onto an independent artwork

The actual process of finding sounds within the piano and composing the piece started by gathering a set of materials thought to prepare the piano and experimenting freely with them. At first, I wanted to follow a predefined harmonic structure, but I was challenged by the fact that some combinations of sounds wouldn't be possible or wouldn't produce the desired chords. I decided to start from a blank page and compose something out of the piano I was working with, incorporating its characteristics and taking advantage of them.

One of the difficulties of playing prepared piano music is the fact that a pianist will always find a different piano at each concert venue, and consequently must acknowledge changes in the preparation to accommodate that. If they fail to do this, the piece will probably not sound as the composer intended. Hudicek (2002) warns against this, as well as Bunger (1973), advising a familiarisation with the instrument, its repertoire, and, most importantly, a finely tuned ear and demand for the search of the proper sounds to be used.

After a satisfactory exploration of the sounds available, I set out to create a piece where I could develop the idea of constant change. In order to achieve this, I used the following processes, based on Reich's *Music for 18 Musicians*³⁴:

- i. Overlap of patterns with different durations;
- ii. Development of a pattern through the addition or subtraction of notes and beat/rest substitution;
- iii. Augmentation of a pattern duration, shifting synchronization between elements/patterns;
- iv. Manipulation of previously presented material (in the piece) to create new patterns, following the principle of isorhythmic motets;
- v. Pulses of different duration, creating an offset and the idea of "breath" duration.

³⁴ See Reich & Hillier (2004), MacNeil (2008) and Mellits (2009). This is further explained in the next sections (4.1.1 and 4.1.2).

The creation of the tenor part in isorhythmic motets of the 13th and 14th centuries, which I had been studying through Burkhart (1994) prior to the development of this project, was made by subjecting a series of pitches (*color*), usually taken from a plainchant, to a “constantly reiterated rhythmic pattern” (*talea*) (Burkhart, 1994, p. 6). The repetition of the melodic pattern (*color*) against the rhythmic pattern (*talea*) creates a larger pattern or phrase that can then be repeated (Burkhart, 1994).

The use of repeating notes or chords in *pulses* is one of the main characteristics borrowed from *Music for 18 Musicians* and follows the ideas of gradual appearance/disappearance (“breaths”) and constant repetitions.

These processes are used in my own composition and further explained in Section 4.3.3, with practical examples.

I was also interested in exploring gradual changes of timbre through the overlap of different sound layers. This idea was also present while writing *Mapa’s* movement *Ondas* (see Section 1.1.3), where, through a microphone and MaxMSP patch, the “waves” produced by the ocean drum would trigger pre-defined piano notes randomly, much like washing them ashore. The same idea was developed here with a difference: gradually, the imitation with different timbres took place, and sounds were slowly transforming into new sounds, in an organic process.

Thus, the piece *Become One* embodies both isorhythmic motets’ processes and minimalistic principles of repetition and gradual changes, specifically Steve Reich’s pulses and the musical processes techniques described above, in a narrative focused on the piano becoming a wider range of instruments which simultaneously become (one) the piano. On a different level, the main performer, through this process of experimentation, creation, and interpretation also “becomes one” (figuratively) with the piano, by further understanding of its sound production mechanisms.

4.1.1 Starting point – *Music for 18 Musicians*, and Divergence point – new creation

As mentioned above, Reich’s *Music for 18 Musicians* was the main propeller for this experiment, although the focus was on the creation of new material based on experimentation. For this reason, the creation of the piece is based on the following characteristics of Reich’s piece: pulses, instrumentation, structure and musical processes.

The first connection between the two pieces is the unconventional method of composition: Reich worked on his piece directly with the musicians, rehearsing, composing and changing parts along the process (Mellits, 2009). The process in *Become One* was similar, although not in communication with other people but with software – the piece was rehearsed, composed and changed along the process of experimentation.

In Reich’s *Music for 18 Musicians*, the harmonies are supported by pulsing notes, which can be played by all instruments or just some, depending on the presence of melodic patterns.

The structure and musical processes in my own work used are the same, but not limited to the imitation of Reich’s piece: the macro-structure is similar, as well as the average duration of sections and flexibility in repetitions, while the structure of each section is completely

independent. The musical processes adopted, consisting in borrowing and transforming patterns from section to section or instrument to instrument, as well as substitution of beats for rests (and vice-versa) (Reich, 1976), are used freely according to the piece's particular narrative.

The departure from Reich's composition starts at the treatment of harmonic material: whereas Reich limits harmonic movement "within the key signature of three sharps at all times" (Reich, 1976), I decided to adopt harmonic progression based on changes between (harmonically) distant chords³⁵ with common notes, inspired by Mário Laginha (see Section 4.2.2). Melodic treatment is based on the same musical processes, although using independent pattern creation and manipulation.

4.1.2 Analysis of *Music for 18 Musicians*, according to Mellits (2009)

In 2009, for his doctoral thesis, Marc Mellits created the first full score for *Music for 18 Musicians*, as well as a modular score and parts, which have since been published by Boosey & Hawkes. His work was crucial for the performance of the piece worldwide and for this project, in the understanding of the piece.

Music for 18 Musicians was written by Steve Reich between 1974 and 1976 in collaboration with the musicians of Reich's ensemble (Reich & Hillier, 2004). Its main compositional techniques, according to Mellits (2009, pp. 8–15), are:

1. "harmonic sketch and fulfilment"
2. "rhythmic construction" or "build up"
3. Augmentation and diminution
4. canon
5. "resulting patterns"
6. pulses
7. inversion

The first technique describes the presentation of the chords and the harmonic progression that make up the whole piece, in the first section. "Rhythmic construction" refers to the substitution of rests for beats, gradually showing the full pattern. The third and fourth techniques are traditional compositional techniques, while "resulting patterns" refers to bringing out melodic notes onto a new pattern, as a product of "canonic correlation" (Mellits, 2009, p. 12). Pulses have already been described in Section 3.1; inversion, in the context of Mellits' thesis, refers to the process of rearrangement of notes of a chord or interval, switching notes' positions and/or octaves³⁶, particularly the "root" note.

In addition, sections are organized in one of two forms (arch or linear) and are delimited by "an enter and exit" (Mellits, 2009, p. 19). These opening/closing parts present the material used in each section, cued by the vibraphone. In addition to "section cues", the vibraphone also has the function "change cues" – for changes occurring within a section (Mellits, 2009, p. 19). Arch forms correspond to ABCBA (for example), while linear forms correspond to ABCD.

³⁵ In this case, distance relates to the difference in number of alterations (sharps/flats).

³⁶ "By simply taking the bottom or top note of a two-note chord and placing it an octave higher or lower in the following chord plus maintaining the other note, Reich creates inversion." (Mellits, 2009, p.15).

Mellits analyses these sections and relates them to the techniques used, which are combined in various ways across the piece. Additionally, he exposes the connection between the techniques of rhythmic construction and augmentation and the arch and linear forms, respectively, while exposing the overall symmetry displayed in the piece³⁷. This symmetry is centred around section V, which acts as a midpoint and the culmination point of the work (Mellits, 2009)³⁸.

To conclude, in *Music for 18 Musicians*, Reich's use and combination of the above-mentioned techniques and processes contributes to the audiences' understanding and listening of the music as it unfolds. Mellits claims that the work "represents a return of music to the people (...) [at] a time when Western art music seemed splintered into styles foreign and difficult to comprehend" (2009, p. 108). This, I hope, can be transposed to this project by the provocation and inspiration intended to create, bridging the gap between performers, their instruments and creative practices.

4.2 On creating recordings for the performance

Recording samples of each prepared piano note and setting them up on Ableton Live is part of the creative process (as mentioned above), by allowing the artist to experiment with different settings and clusters that wouldn't be possible at the piano without the help of more musicians.

With the help of a MIDI controller, previewing the piece's output becomes very intuitive.

Ableton Live's Session view (mentioned in Section 3.4.1) enables the performer to make decisions and compose in real-time, either when rehearsing/writing the piece, or when playing live. If the decisions are made before-hand, the performer can record the preferred structure and parameters into Live's Arrangement view, and either play it from there, or export it as an audio file. This exported audio file can be used as plan B if the electronics fail, for some reason, while it would be recommended to use Live if possible, to guarantee a balanced sound between different samples, tracks and preparations, on one hand, and the live parts, on the other hand.

4.2.1 Method

Each sampled note was inserted into a Drum Rack³⁹ instrument in Ableton Live. Using a drum rack is a simple way of assigning a sample to a specific note (to be played with a mouse, keyboard or MIDI controller). Other ways within the Ableton software include the Sampler instrument, or grouping several audio tracks containing each sample, and MIDI mapping⁴⁰ them to a controller.

³⁷ See pages 97 to 108 of Mellits' dissertation (2009), and particularly, example 12.10 on page 107.

³⁸ This is also the case in *Become One*.

³⁹ For more information on Racks, please refer to the Live Manual:

<https://www.ableton.com/en/manual/instrument-drum-and-effect-racks/>

⁴⁰ For more information on MIDI mapping, please refer to this page: <https://help.ableton.com/hc/en-us/articles/360000038859-Making-custom-MIDI-Mappings>

Two separate instruments/drum racks were used: Bamboos and Prepared Piano. In addition, one track plays the LP part and three grouped tracks are assigned for the strings, voices and mallets, respectively. Figure 16 shows this in Session View.

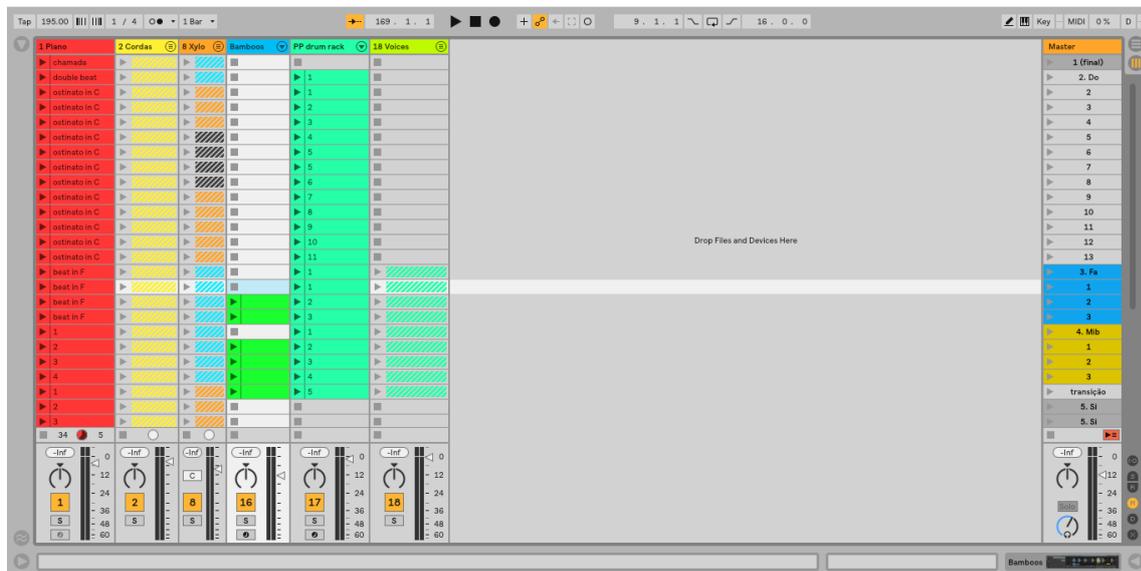


Figure 16. Session view with instruments (Piano or Live Piano Part in red), grouped tracks (Strings [Cordas] in yellow, Mallets [Xylo] in orange and Voices in green), and drum racks (Bamboos in blue and Prepared Piano [PP drum rack] in turquoise).

These instruments were saved in a Live Set for further reference and experimentation. For the purpose of the composition, some notes (namely the Strings and Mallets) were then extracted from the originally created drum racks (by dragging them to a new MIDI track), to allow for parameter automation (namely the clip volume, creating fade in/out effects) and independent control.

Thus, the result was a set of instruments where each group corresponds to a type of sound, and within each group, each track corresponds to one note/preparation, preserving their order (from left to right, bottom to top).

4.2.2 Performance issues

Issues can arise from the performance of a piece with such complex requirements. These can be divided into technological, instrumental and practical issues.

Technological problems can include the failure of software or hardware involved in the reproduction of the piece. In order to prevent that, or at least enhance problem solving strategies, it is advised to ask for the help of a fellow colleague who understands the concept of the piece and the software involved and who can be present at the time of performance, to help change settings and/or materials.

Since the Ableton Live trial can be installed on any computer (that meets system requirements), it is advised to have a spare laptop or computer running the program and the same project. If this is not possible, an exported audio file should be played instead, as long as the performer is familiar with their own choices regarding repetitions in that version.

Instrumental issues can occur if the piano with which the performer should play doesn't meet the requirements for the piece. This can easily be fixed if the pianist is prepared to play other parts of the piece, accommodating the unpredictability of available instruments.

Practical issues might involve lack of familiarisation with the techniques required or with the piece. One should note that, in order to play with the electronics, one should be acquainted with the use of a click track through in-ear earphones, for synchronisation purposes". In addition, the performer may choose to record and play spoken cues which will only be heard through the earphones.

4.2.3 Playing with other musicians or software?

The performance of the piece as it is written (to be published) would require two pianos – preferably three to account for the fast repetition of notes played simultaneously with keys and mallets (on the preparations). Nevertheless, since the purpose was to create something specific to the pianos and circumstances available, changes could (and should) be made in order to replicate the piece in different settings.

Similarly to *Music for 18 Musicians* (particularly its modular score), the number of repetitions of each pattern is optional and should, preferably, be previously agreed between participants in a rehearsal context.

The number of players can range from a minimum of 14 (4 "string" players, 2 keyboard players, 2 bamboo players, 3 "mallet" players and 3 singers), facilitating the distribution of parts and players around each piano. To perform with an ensemble, and considering the sound produced by different preparations against an unprepared piano, I would recommend using amplification for the prepared piano.

4.3 Parameters of the piece *Become One*

This section takes into account the characteristics and musical processes used in the piece's creation and relates its material to *Music for 18 Musicians* whenever there was a clear relationship between the two. Starting by relating the materials used (presented in section 3.3) with the sounds produced, a correspondence is made between these and the instruments (from *Music for 18 Musicians*) that inspired their research. The piano preparations used and their resulting sound pitches are presented, as well as the characteristics of the piano performed live, introducing the description of the compositional process. Lastly, some considerations are made on the challenges this artwork/project may pose.

4.3.1 Timbrical relationships and correspondences

Become One follows the principle of *Music for 18 Musicians*, in which Reich groups instruments based on their function throughout the piece: pianos and mallet instruments create a "regular rhythmic pulse (...) that continues throughout the piece" (Reich, 1976, p. 3) and the voices, wind and string instruments follow the "rhythm of the human breath" (Reich, 1976, p. 3). Accordingly, in *Become One*, the prepared piano keeps a regular pulse throughout, complemented by the live piano, which takes the function of cueing new sections (as does the vibraphone in Reich's piece). The strings (fishing line) are the equivalent to the strings of

Music for 18 Musicians. However, they have more relevance here, since the bamboos (which correspond to the clarinets) and the voices are fewer in number.

The prepared piano materials correspond to the majority of the instruments in *Music for 18 Musicians*. The characteristics of the sounds produced can be analysed in table 1.

Material	Technique(s)	Corresponding original instrument	Sound description	Pitch change	Interval	Decay	Repetitive playing resistance
fishing line bows	bow the strings by sliding the fishing line	string instruments (violin, viola, cello)	Sustained note similar to string instruments	none (possibility of sounding partials)	-	slow	high
clothespins	keyboard + inside piano with mallets	wood mallet instruments – marimbas and xylophones	medium resonant sound	higher/ lower than original pitch	dependent on position and size	medium to fast	medium to high
bolts+ Bakelite, coins and magnets	keyboard + mallets playing	metal mallet instruments (vibraphone) and bells/gamelan	highly resonant sound	higher/ lower than original pitch	dependent on position and weight	medium	high
vinyl rubber	keyboard	xylophones	muted sound	lower	major 2 nd lower + partials	fast	high
poster putty	keyboard	xylophones	slightly muted sound	none	-	fast	high
chopsticks	keyboard	xylophones	slightly muted sound	lower	dependent on position and tension applied to the strings	fast	medium

Table 1. Correspondence between materials used in the piece *Become One*, their characteristics, and their counterpart in *Music for 18 Musicians*. Created by the author.

Additionally, the extended technique of bamboo sliding (mentioned in Section 3.3.3) corresponds to the clarinets section of *Music for 18 Musicians*, while the vocal part (3 singing voices) corresponds to the same part in Reich's piece.

4.3.2 Piano preparations

While the sound exploration and preparation were unrestricted, according to the materials and the piano I had available, the systematization of the preparations was an important step in organizing the material for the piece. Thus, after having chosen the sounds and preparations, I recorded them separately into audio samples and wrote down the measurements, materials and corresponding sounds. I used two pages with the image of a keyboard at the centre (figures 18 and 19), matching each key to its preparation and sounding pitches. In this way, I was able to prepare the piano as many times as needed and could easily match notes to their sounding pitches (which in most cases do not correspond to the original).

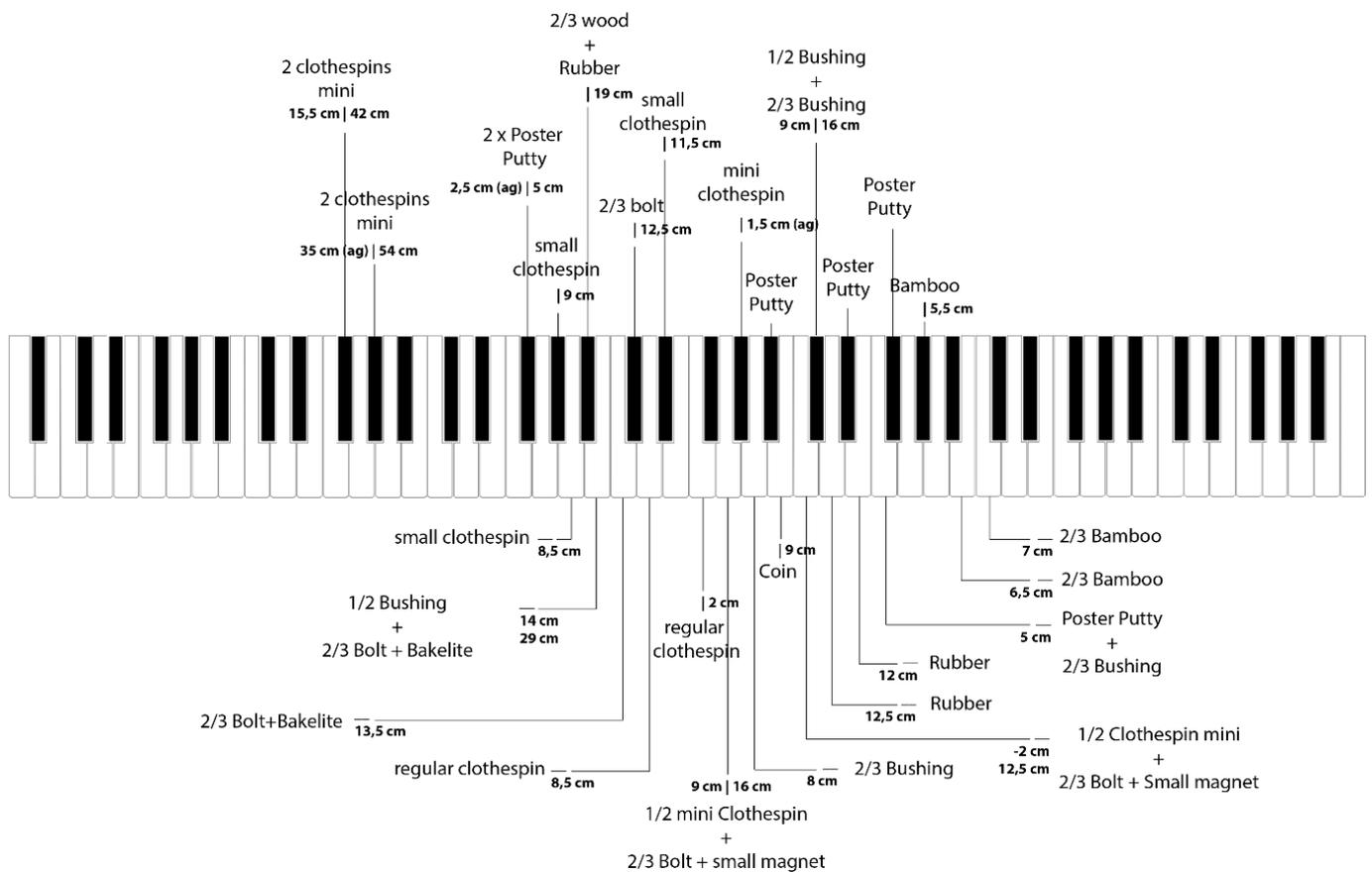


Figure 17. Note preparations, materials and measurements. Negative numbers refer to measurements from the furthest agraffe, (ag) refers to measurements from the nearest agraffe, and all other measurements are from the dampers onwards. Created by the author.

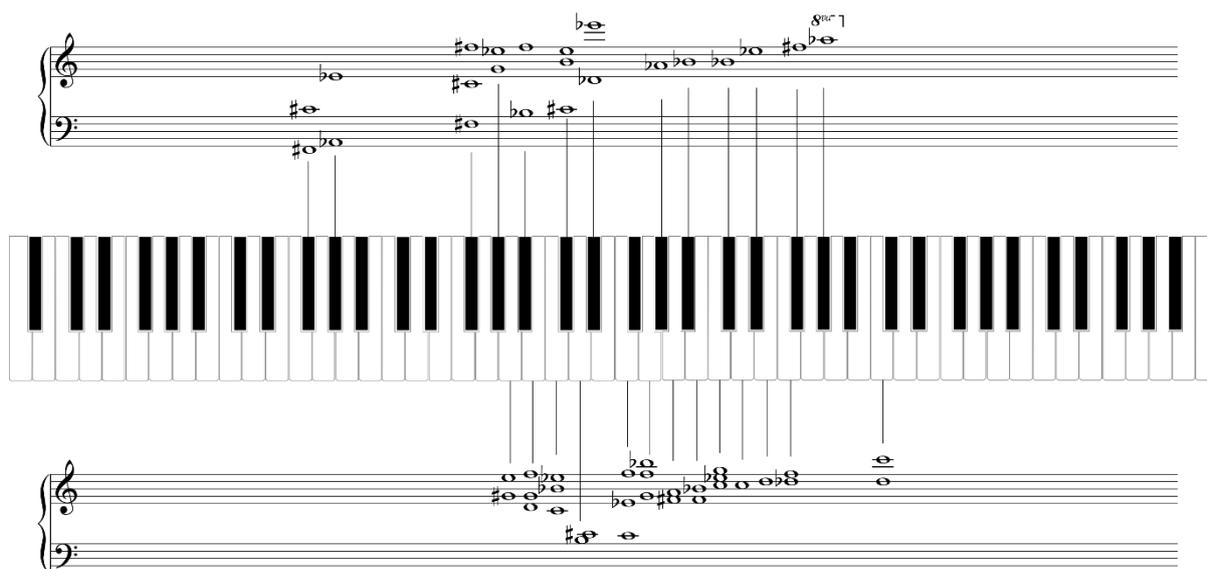


Figure 18. Sounding pitches for the prepared notes. Created by the author.

To establish the pitches used, each note was compared against unprepared piano notes until the resulting pitches were matched with their notes. In addition, the samples recorded were checked with a spectral pitch display tool available in the audio editing software Adobe Audition.

Although these charts were useful, Figure 26 could be enhanced by applying methods of categorization of relative volume for each sounding pitch (for example, with colour matching), since for the same note, some pitches are more resonant than others (considering their preparations).

4.3.3.1 Live piano

Depending on the authorization to prepare the live piano, some (or all) of the preparations shown above can be replicated, thus permitting the pianist to play the prepared piano part.

If this is not possible, or if the pianist decides otherwise, they can still play the piece and choose from the unprepared piano parts or the least invasive extended techniques.

In the recital, I will be presenting a version which incorporates as many different techniques as possible, in a narrative manner which fits the idea of the piece: the pianist starts by playing on the keyboard, an extremity of the piano, and moves inside the instrument – a metaphor for growing familiarity with and understanding its instrument.

The presented version corresponds to the one described in Section 4.2.2 as the “live piano part”.

4.3.3 Compositional process

The piece follows the same macro structure as the *Music for 18 Musicians*: 11 sections of circa 5 minutes each.

The first section works as a harmonic overview of the piece, with fast transitions between chords, supported by the pulses of each instrument.

From there onward, the piano (played live) leads the piece by anticipating patterns, dynamic bursts, and changes. In an ensemble setting, this would create visual and sound cues for the other musicians, similarly to Reich's conception (Reich, 1976). In a solo setting, the live piano part follows a specific structure in which each section features a different technique, moving from the keys to the inside of the piano, and the pianist chooses and triggers the next changes. This was inspired by the idea of immersion with the instrument (hence the title). Alternatively, if certain preparations or techniques are unavailable to the pianist, they can choose to play other parts in each section.

Section I

This introductory section cycles through the whole harmonic progression of the piece, in a way comparable to what happens in *Music for 18 Musicians*, that is, throughout the progression featuring the 10 chords that correspond to each of the next sections (Figure 20). While the chords are different for both pieces, the process is the same.

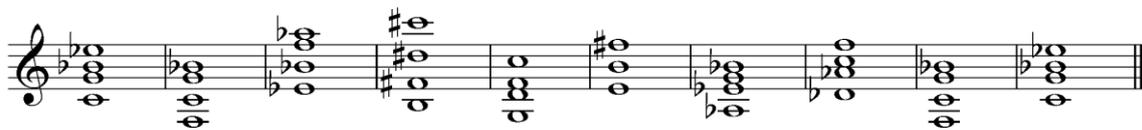


Figure 19. Reduced progression from the chords used in *Become One*. Base note refers to tonal/modal centre, higher notes to relevant extensions. The progression is as follows: C minor, F, Eb Major, B Major, G, E (minor and Major), Ab Major, Db Major, F, C minor.

The piece starts with the repetition of the middle C, which gradually increases in speed until it reaches the designated tempo (195 bpm). This beginning, as well as the progression, were broadly inspired by Mário Laginha's composition *A menina e o Piano* (Laginha, 2003), and its idea of progress and transitions between common notes. This particular inspiration materialized in the development of a harmonic progression around C⁴¹, similar to Laginha's piece, and the introduction in *accelerando*. In the specific case of *Become One*, the overall idea for the piece was one of internal change through common aspects/points – much like a kaleidoscope produces different images with the same objects, or something that grows into something else of the same nature. That is why, instead of a perfect symmetry, there is a return to the beginning⁴² through a different path, even though several relationships between chords are present.

⁴¹ This progression happens in an arch-like manner, from C to E (midpoint) and back to C.

⁴² Further described in the last section, specifically concerning timbre changes.

Section II – C minor

This section reaches the first chord (C minor), and is characterized by the presence of two ostinatos which develop in opposite directions, regarding the number of notes: the Prepared Piano ostinato in a build-up, and the Live Piano in a decreasing manner (Figure 20). When the Live Piano part only has one note left, Section 3 begins.

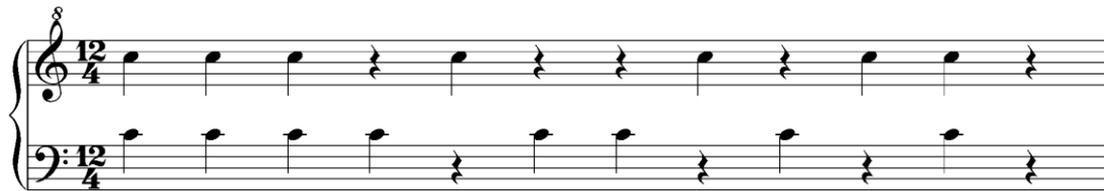


Figure 20. Live piano complete ostinato.

Section III – F

The chord for this section is based on the modal centre F dorian/mixolydian. Since there aren't any 3rds (A's), which would differentiate between the two options, no definite mode is specified.

In this section, the voices enter, using a transformation of the live piano ostinato pattern. The bamboos emerge from the voices section, creating a timbral shift which works as a transition to the next section.

The prepared piano follows the same process as before, now deconstructing the pattern created previously, by beats/rests substitution. The live piano maintains a pulse using the section's base chord (similarly to the piano function in *Music for 18 Musicians*).

The pattern for the voices was created by taking the right-hand pattern from the live piano part and converting each note to a dotted minim and each pause to a minim pause⁴³, which results in the transformation of the initial 12 beats phrase into a 31 beats phrase (Figure 21).

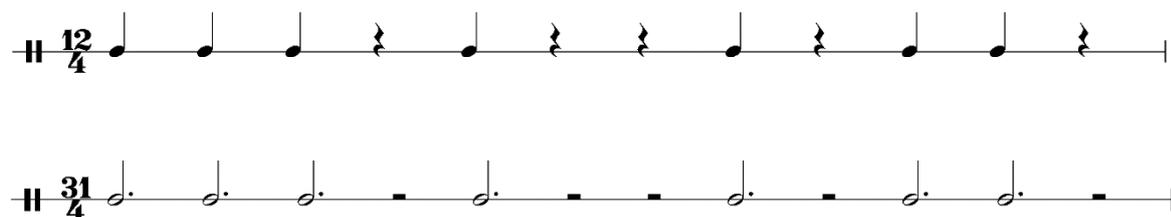


Figure 21. Correspondence between the initial right-hand pattern (first) and the resulting 'talea' (last).

This process of borrowing and transforming is the same as described in section 4.1, inspired by the Tenor part in thirteenth century motets. In this case, the *color* would only be two notes long, and the *talea* would correspond to the 31 beats rhythmic phrase (Figure 22). Since the

⁴³ To do this, I went through an intermediary step by using binary code – a note translates as a 1, a rest as a 0. The resulting pattern (111010010110) was then converted backwards using a different "key" – 1 equals a dotted minim, 0 equals a minim rest. This isn't a necessary step in achieving this kind of transformation but simply an option and, in my case, a personal choice.

color is two notes long and there is an odd number of notes within the *talea*, two repetitions of the *talea* would be necessary to complete the cycle. I have chosen to repeat the first half until the beginning of the transition. This idea is further developed in sections VIII and X.

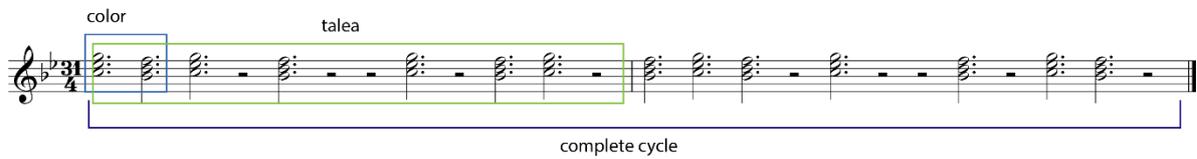


Figure 22. Correspondence between the choir section pattern and its elements.

The bamboos repeat this phrase, starting 4 to 12 bars after, while the vocal part begins a *diminuendo al niente*, which lasts from 6 to 18 repetitions (while also featuring a *diminuendo* within the repeated pattern). As a result of the overlap of both *diminuendo* techniques, the ending of the vocal part’s pattern will disappear first, while the beginning of the pattern will be heard for a longer period. As soon as the vocal parts stop, the pianist gives the cue to the next section.

Section IV – Eb Major

This section is characterised by the presence of one pattern happening simultaneously in different ways and different instruments. The “master” pattern is in the live piano part, shown in Figures 23 and 24, below. In this section, the right-hand pattern is repeated throughout, while the left-hand pattern is developed.



Figure 23. Right-hand pattern of Live Piano part.



Figure 24. Left-hand patterns of Live Piano part.

The prepared piano part was based on the right-hand pattern but developed differently (Figure 25). Throughout the section, it unfolds by subtraction of notes until only the pivot note (Eb) is left (transition to next section).



Figure 25. Prepared piano pattern 1 (notes correspond to playing notes, not sounding pitches).

The bamboos double the left-hand patterns 1 and 2, highlighting the transition.

Section V – B Major

This section marks the beginning of ‘open’ parts: bars where the number of repetitions is predetermined, but notes are only suggested and their use and assigned rhythm is chosen by the players (in the case of the ensemble version) or the performer (in the solo version). This can be agreed in rehearsal, or improvised at the performance, as long as there is coherence between same instrument players.

The bamboos have, thus, open parts for this section, which can be amplified by the voices when played in the ensemble version. In the software version, the voices imitate the strings and the pianist plays the bamboo part, if possible.

The pattern of the live piano is based on the right-hand pattern of the last section, a semitone higher, with a different development for both hands. In the transition, the right-hand is presented, and at the beginning of the section, the left-hand starts doubling the right-hand (first at the octave and then at the 11th). The pattern then suffers changes in duration, removing the eight and sixth beats, in that order (Figure 26).



Figure 26. Development of the pattern of the Live Piano part in Section V.

The prepared piano follows the same bar structure, developing the pattern presented in the previous section.

This pattern will be further developed in Section VII, in the vocal part.

Section VI – G Major

In this section, the higher strings assume a new relevance, in dialog with the live piano part, which keeps the last presented right-hand pattern (last bar from Figure 27), transposed to G Major. The left hand will freely mute the piano strings which correspond to the pattern’s notes, sounding their harmonics, and thus prompting the strings’ players to play. If no notes are muted, the strings will await a cue from the left-hand. When playing in a solo setting with the software, the pianist may choose either to program the software to play via the MIDI controller (triggering the strings notes) or to predetermine the muted sounds and the strings pattern.

This dialog then spreads to the vocal part, which mimics the strings’ attacks and notes until the next piano cue, which consists in the left hand returning to the keyboard and duplicating the right-hand pattern. This cue will “call” the vocal part to start playing the right-hand

pattern by an additive process of repetition similar to Reich's piece: at first only one note of the pattern is played, in a determined number of repetitions, then another one is added and repeated, until all notes are played. At the same time, the strings return to their base pattern of pulsed notes, preparing the harmonic transition.

When the vocal part reaches the full pattern as seen in the last bar for the right-hand in figure 26, the next section begins.

Section VII – E minor/Major

This section is subdivided into two parts: E minor and E Major, which have a relative duration decided by the performer, by giving the cue to the next part. The first part is inspired by the pattern from *Piano Phase*, by Steve Reich, specifically in what concerns the alternation between left and right hand, with each hand playing a group of notes of different number, in a constant pulse (Figure 27). Simultaneously, the voices repeat the substitution process of their pattern in reverse – now increasing the number of rests until the two first notes are left.



Figure 27. Rhythmic pattern of *Piano Phase*.

In the E minor section, the live piano part features a series of rhythm ostinatos to be manipulated and played by the performer, who improvises the notes with which to play and chooses the number of repetitions before each change.

The other instruments gradually reduce their presence, by decreasing their volume and number of notes (in the case of the strings) and increasing time between interventions (in the case of the prepared piano, mallets, bamboos and voices), preparing the setting for the E Major part.

Contrarily to the other sections in this piece and in Reich's *Music for 18 Musicians*, in this section the cue for the next part is a moment of silence - 8 beats of rests, played by the live piano part. This marks the beginning of the second half of the piece, where certain symmetries and similarities between the two halves become apparent.

In the E Major section, the live piano part comprises of a solo improvisation, while the other instruments' parts complete an accompaniment pattern. The strings act as a drone, where the lowest pitch E is repeated throughout, and higher pitches alternate slowly.

This section transitions into the next one when the performer begins preparing the piano with their left hand, while maintaining an *ostinato* (chosen/improvised by the performer) with the right hand in the high register. The preparations used must be in accordance with the permissions given to the pianist, and, to decrease risk of damage to the piano, clothespins, bamboos, poster putty and/or magnets are recommended.

Section VIII – Ab Major

Since the live piano part now includes prepared notes in its patterns, the prepared piano part resumes the pulsing notes that make up the basic rhythm of the piece. Similarly, the pattern that first originated in the vocal part (Figure 22), now appears in the two higher strings.

The live piano part's pattern repetitions replace regular notes with prepared notes (similarly to Reich's *rhythmic construction* technique). When all the notes are prepared, the next section begins, with the performer playing the materials directly inside the piano.

Section IX – Db Major

The live piano part mimics the pattern created in Section IV in the prepared piano part (Figure 25), in the same process of substitution of beats for rests until only the F notes are left, cueing the next section. The prepared piano and mallet parts feature the pattern of the left-hand in Section IV, augmented in different pitches and beat subdivisions.

Section X – F

This section works symmetrically to section II, where the live piano part consisted of a pulsed chord. However, in this section, the performer has the opportunity to play inside the piano (if possible), instead of the pulse presented in section II, which can be heard through the playback. In this section, the performer is requested to bow the strings in a pulse-like manner, doubling one of the string players.

The bamboo part and the vocal part exchange roles – the vocal part now emerges from the bamboos, and the pattern shifts – now in deconstruction. The prepared piano features the same ostinato in retrograde.

Section XI – C

This section repeats the harmonic progression of the whole piece, in pulses, without the unprepared piano – the performer now plays one of the bass notes along with the string players, having arrived at the inside of the piano.

The ending happens by a process of reduction of notes and instruments played, with the performer playing the bass C in a *diminuendo al niente* and a suspension on the reverberation of the piano created by the contact speakers.

4.3.4 Challenges for the player/pianist/creator

The creation of this piece using a minimalistic style in the search and exploration of “inside piano” and prepared piano sounds has given rise to a number of challenges and questions to the performer.

As a creator, if planning to recreate this experience given the methods described, one should be acquainted with the use of technology in the making and performing of music – specifically audio interfaces and the use of Ableton Live.

As a performer, if playing with software, and similarly to other repertoire with electronics, the performer must be capable of playing with a “click track”, in order to maintain synchronization between the live performed parts and the recorded playback. When playing minimalistic music, additional concentration is also required to play repetitive patterns for

long periods of time. Additionally, the performer must be willing to use and learn new techniques to play and prepare the piano and develop their musical ear in order to match the desired sound quality to both conventional and unconventional piano sounds. These issues have also been referred to by Hudicek (2002), Bungler (1973) and Shockley (2018), with recommendations on listening and being exposed to prepared piano music.

Conclusion

The project undertaken for this thesis culminates in the performance of the created piece *Become One*. This piece features elements of unconventional piano techniques in a search for an expansion of pianistic timbres, related to the original instrumentation of *Music for 18 Musicians*. The experimentation and exploration at the piano, which led to the choice of materials and preparations (Sections 3.3 and 4.3.2), was successful in establishing a correspondence between the two pieces' instrumentation, and a rudimentary categorization of the featured sounds according to similar timbres (table 1). Nevertheless, as Mayas (2019) describes in her thesis, an extended understanding of timbre includes its subjectivity and the impact that memory and body perception have in it, therefore, these findings and descriptions are highly personal. While this could be a handicap, it also proves the pertinence of nurturing experimental and creative processes in students and musicians, thus contributing to the expansion of knowledge concerning experimental piano performative practices.

The dissemination of this work and subsequent feedback from peers will be crucial in determining the extent to which it might favourably interest and facilitate others' communication and interaction with the piano. Specifically, if Minimalism might help the introduction of classically trained pianists to extended and prepared piano techniques (in particular) and to the use of creativity (in general). In my case, this was facilitated by previous experiences and a profound interest in exposure to inventive situations – quoting Segni Mossi's pitch for their lockdown-proof online course: “make yourself uncomfortable” (Lumare & Lobefaro, n.d.).

The association between the piano-produced sounds and conventional western musical elements has been made, in reference to personal timbral experiences. Acoustic and physical measurements might help further detail and investigate the similarities proposed by this association, even though its purpose lies on provoking further sound experiments rather than on a theoretical approach. Additionally, there was not enough information to infer a relationship between the materials used and the instruments they evoked. This could be coincidental, considering that the instruments used in *Music for 18 Musicians* exhibit notorious differences in what sound production is concerned (wind, percussion, strings, keyboards and voices sound production is categorically different).

Become One successfully explores different extended and prepared piano techniques. Moreover, it instigates creative problem solving through the organization and development of a performance incorporating those techniques. This can negatively impact an approach by pianists unfamiliar with the same techniques. A solution would be to develop a set of smaller compositions based on *Become One*, each focusing on specific techniques, thus helping performers to get acquainted with the different resources employed and slowly expand and improve their capabilities without the risk of overwhelm. Additionally, more than aiming at the piece's replication, other possibilities that promote performers' creativity, such as the creation of open works with a set of instructions to create or compose in real-time, should be considered.

The use of electronics is yet another aspect in which this project may influence the extension of capabilities by the composer/performer. On one hand, it allows them to better piece together their composition and overlap different techniques and sounds in a soloist setting. On the other hand, it adds an increased risk to the performance, imposing on the performer another layer of information that they must control while playing. The adaptation of the piece to different numbers of players, as well as the ensemble version, can provide different musical experiences to the performers involved, especially in terms of interaction between musicians versus digital interfaces. Nevertheless, the possibility of adapting the piece to a single performer and a “player piano” (for instance, Disklavier) is interesting, considering further exploration of the piano’s sound production and material.

The research undertaken limits the correspondence of timbres between piano and conventional western instruments to the specific context of music with pulses, since the techniques used for a specific sound are limited. Consider, for example, the bamboos, in which it’s impossible to play two different notes with a legato articulation. Further investigation in detailing preparations and techniques, as well as experimentation with different piano models could improve this work and its dissemination as a composition to be played and transformed. Moreover, the publication of a conventional written score (as opposed to the Ableton Live project script) and interaction with peers would facilitate the assessment of interest in this project and its characteristics.

In conclusion, the process of experimentation and creation was a key factor in my own individual exploration of a broader perception of the piano’s full potential. In a model such as the one I suggest, where the pianist is both the performer and the composer, I argue that they become more capable of adapting to the circumstances, and more in tune with their own perspective of how the music should sound – rather than trying to investigate what the composer might have wanted. While this process was specific to the development of the piece *Become One*, it can be translated onto other experiments in order to expand the piano performance panorama and influence new music production.

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Appendix A: *Become One* – Full Score

Become One (B1)

Intro
Senza misura, accel. al ♩=195

Piano Mallets (2 players)

Piano

Prepared Piano

Piano Bamboos (2 players)

Voice 1

Voice 2

Voice 3

Intro
Senza misura, accel. al ♩=195

Piano High Strings

Piano Middle Strings I

Piano Middle Strings II

Piano Bass Strings

Sost. Ped. (w/ right foot) al I

2

I

$\text{♩} = 195$

Mallets *mf*

Pno. *cresc. al mf* *mf*

P. Pno. *mf* *sim.*

Bamboos (P. Pno.) *mf* *sim.*

(P. Pno.) *mf* *sim.*

Voice 1 (P. Pno.) *mf* *sim.* To Voice

I

$\text{♩} = 195$

Pno. Strings *mp* *mf* *sim.* *sim.*

* crescendo/diminuendo ad lib. through repeats, with non-measured rests in-between, (different notes in the same chord can have different dynamic lengths)

12 3

Mallets

Pno.

P. Pno.

Bamboos

Voice 1

4

II

Mallets

Pno.

P. Pno.

Pno. Strings



Mallets

Pno.

P. Pno.

Bamboo I

Pno. Strings

sync entrance with P. Pno.

5

27

Mallets

Pno.

P. Pno.

Bamboo I

Pno. Strings

29

Mallets

Pno.

P. Pno.

Bamboo I

Pno. Strings

6

31

Mallets

Pno.

P. Pno.

Bamboo I

Pno. Strings

33b

Mallets

Pno.

P. Pno.

Bamboo I

Pno. Strings

7 **III**

34

Mallets

Pno.

P. Pno.

Voices 1, 2, 3

Pno. Strings

play any notes repeatedly (in 8th notes) after 6-12 bar repetitions, choose another configuration and repeat

play one note repeatedly (in 8th notes) after 16 bar repetitions, restart (using either the same note or another) and repeat

36 b

Mallets

Pno.

P. Pno.

Bamboos

Voices 1, 2, 3

Pno. Strings

sync entrance with Voices

(non dim.)

* *dim. al niente* - - - - -

* decrescendo within the bar, and diminuendo al niente through repeats

8 **IV**

40

Mallets

Pno.

P. Pno.

Bamboos

Pno. Strings

repetitions only

sync with Piano l.h.

play one note repeatedly (in 8th notes) after 16 bar repetitions, restart (using either the same note or another) and repeat

43

Mallets

Pno.

P. Pno.

Pno. Strings

V

45

Mallets

Pno.

P. Pno.

Bamboos

Pno. Strings

improvise freely with the notes provided and possible harmonics

play one note repeatedly (in 8th notes) after 16 bar repetitions, restart (using either the same note or another) and repeat

48

Mallets

Pno.

P. Pno.

Bamboos

Pno. Strings

sync with Piano

VI

53

Mallets

Pno.

P. Pno.

Voice 1

Voice 2

Voice 3

Pno. Strings

* (+ - +)

8^{va} 8^{va}

play only after cue from Piano High Strings

play only after cue from Piano Middle Strings I

play only after cue from Piano Middle Strings II

play only after cue from Piano

play only after cue from Piano

play only after cue from Piano

54

Mallets

Pno.

P. Pno.

Voices (unison)

Pno. Strings

* mute (with l.h.) one or more strings corresponding to the notes played by the r.h.
after X repetitions, add or change the number of muted strings with a visible cue to the Piano Strings players

58

Mallets

Pno.

P. Pno.

Voices (unison)

Pno. Strings

VII

62

Mallets

Pno.

P. Pno.

Voices (unison)

Pno. Strings

* choose a group of notes for each hand and create an ostinato to be repeated ad lib.

* other combinations (such as 4 notes for one hand and 3 to the other, for example) can be introduced; pitches not specific to octave

66

Mallets

Pno.

P. Pno.

Voices (unison)

Pno. Strings

VII b

68

Mallets

Pno.

P. Pno.

Bamboos

Pno. Strings

sync with Piano entrance

improvise repetitive patterns within E Major

play one ostinato with the r.h. and position l.h. to start preparing the piano

VIII

71

Mallets

Pno.

P. Pno. (reduction)

Pno. Strings

play one ostinato with the r.h. and prepare the corresponding notes on the piano with l.h.; cue the prepared piano players when half the notes are prepared, and when all notes are prepared

each player chooses two notes to repeat with a crescendo and decrescendo, as in Section II; with each cue from the piano, choose a different set of notes

=

71b

Mallets

Pno.

P. Pno.

Pno. Strings

IX

75

Mallets

Pno.

P. Pno.

Pno. Strings

play directly on materials placed on the corresponding strings (with mallets)

78

Mallets

Pno.

P. Pno.

Pno. Strings

15

X

80

Mallets

Pno.

P. Pno.

Bamboos

Pno. Strings

bow the strings corresponding to one of the notes, similarly to the piano string players

(non dim.)

83

Mallets

Pno.

P. Pno.

Bamboos

Voices 1, 2, 3

Pno. Strings

To Prepared Piano

To Prepared Piano

sync with Bamboos

* *dim. al niente* - - - - -

* decrescendo within the bar, and diminuendo al niente through repeats

XI

85

Mallets

Pno.

P. Pno.

Bamboos

Voice 1

Pno. Strings

bow the note's strings, freely,
similarly to the piano strings players

sim.

sim.

100

Mallets

Pno.

P. Pno.

Bamboos

Pno. Strings

* , ad lib through repeats, with non-measured rests in-between,
different notes in the same chord can have different dynamic lengths

Mallets

Pno.

P. Pno.

Bamboos

Voices

Pno. Strings

dim. al niente - - - -

Appendix B: *Become One* – Live Piano Score

B1 - Live Piano

Intro

Mariana Miguel

I

Senza misura, accel. al $\text{♩} = 195$

$\text{♩} = 195$

1 2 3 4 5 6 7 8

42-50x 12-20x 28-36x 28-36x 56-72x 42-50x 42-50x

p *cresc. al mf* *mf*

Sost. Ped. (w/ right foot) al I Ped. al II

9 10 11 12 13 14 15 16 17 18 19 20 21 22

42-50x 42-50x

II

23 24 25

6-8x 6-8x 6-8x

p

26 27 28

6-8x 6-8x 6-8x

43 **43** 8-12x **44** 8-24x

repetitions only

V
45 **45** 20-24x **46** 24-28x **47** 28-32x

VI
48 **48** 32-44x **52** 12-32x **53** 84-120x **54** 84-92x

* (+ + +)

* mute (with l.h.) one or more strings corresponding to the notes played by the r.h. after 20 to 24 repetitions, add or change the number of muted strings with a visible cue to the Piano Strings players

VII ca. 5' **VII b** **69** ca. 5' **70**

improvise repetitive patterns within E Major play one ostinato with the r.h. and position l.h. to start preparing the piano

* choose a group of notes for each hand and create an ostinato to be repeated ad lib.

4 **VIII** **IX**

71 75

play one ostinato with the r.h. and prepare the corresponding notes on the piano with l.h.;
cue the prepared piano players when half the notes are prepared, and when all notes are prepared

play directly on materials placed on the corresponding strings (with mallets)

76

79b **X** **XI**

80

bow the strings corresponding to one of the notes,
similarly to the piano string players

(cresc. and dim. through repeats, with breathing rests)

bow the note's strings, freely,
similarly to the piano strings players

94

dim. al niente - - - -