

‘The Mind is not Limited by the Skin’: The Expert Piano Technician’s Experience of Working on Pianos of Professional Concert Performers

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Abstract This study explores the experience of concert piano technicians who work on pianos played by the top tier of concert pianists in the world. They identify as craftspeople with a strong sense of vocation, who are autonomous, skilled, yet connected. They consider their pianos to be alive, with their own personalities and agency, needing to be tamed, loved, and negotiated with. The connection between their human fingers and the body of the piano is experienced as one of sensation and vibration rather than conscious thought, leading to ‘flow’. Findings are contextualized through qualitative psychology, Actor Network, and Material Engagement Theory.

Introducing Piano Technicians and the Rationale for this Study

Many classical music concert-goers will have subliminally noticed a piano technician in shadowy attendant role, testing, adjusting, and manipulating the strings, keys, and pedals of a magnificent piano in a world-class concert hall before the auditorium fills. If all goes well, their job is done by the time the lights go down and the famous pianist steps onto the stage, and so the technician slips away into the night.

This study shines a light on the experience of those technicians, as they tend the concert grand pianos played by pianists who perform in international concert venues. Technicians can be asked to travel in support of an artist’s concert schedule, spending hours in empty halls with an impeccable instrument, working under pressure to find the exact voicing and tuning to suit the acoustic as well as the touch and preferences of the pianist they have followed. When not on the road, technicians will spend many days alone with precision tools in the privacy of their workshops, renovating, refining, and maintaining the myriad different parts of the piano, a complex mechanical structure. (This process is illustrated in [Figures 1–6](#).)

Technicians are vital to effective piano performance but, as the acoustic piano is replaced by the electric keyboard in domestic settings,¹ opportunities for formal training

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I am grateful to friends and colleagues who have commented on this study in various forms and encouraged me to consider publication, as well as to my anonymous readers.

¹ Bob Popyk, ‘Where is the Piano Business Heading?’, *Music Trades*, 164.10 (2016), p. 60.

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as well as for gaining the many hours of practical experience necessary to develop the complex set of technical skills required for this role have diminished. Historically, a technician's training started in the workshop of a major piano manufacturer or, in the twentieth century, at a specialist furniture-making course.² Working under the supervision of a more experienced practitioner in a master-apprentice relationship over the course of around ten years, the most determined and talented technicians, such as those interviewed for this study, gradually develop the skills required to support major concert artists.³ Piano tuning, voicing (the manipulation of parts of the piano to modify the quality of sound), and restoration work (rebuilding and repairing the body of the piano) are largely done with hand-held specialist tools,⁴ so the technician needs a high level of dexterity as well as patience, since much of the work is repetitive. Tuning also requires a sophisticated understanding of acoustics and aural sensitivity due to the twin demands of equal temperament and the acoustic of the music room or concert hall.⁵

The experiential analysis offered here uses a technique akin to ethnographic interviewing that originates in the social sciences, called interpretative phenomenological analysis (IPA), and contextualizes its findings by reference to psychological theory. This approach demonstrates the potential for psychology and in particular IPA to yield new insights into apparently commonplace musicological territories. The analysis concludes with a discussion of how a technician's experience, as examined through the lens of psychology, can be further interrogated by invoking various interdisciplinary approaches to materiality and mediation, a significant and ever-growing area of importance to musicology.⁶ Accordingly, the title for this essay refers not to George Benjamin's haunting and brutal opera *Written on Skin* (2012) but to something altogether more tender and introspective — the interconnection of exquisite instrument and human intelligence, where skin is not inscribed, but rather dissolves through close attention.

What is explored here is an aspect of the world of pianos which has hitherto been largely hidden from view. While pianists and pianos have of course been the source of popular and academic scrutiny from autobiographical, biographical, historical, sociological, educational and many other perspectives (I mention some in the course of this

² Pianoforte Tuners' Association, 'How Do I Become a Piano Tuner?', n.d. <<https://pianotuner.org.uk/how-do-i-become-a-piano-tuner/>> [accessed 2 July 2023].

³ Jasper Rees, 'Get me Gerhartz', *The Guardian*, 23 February 2009, <<https://www.theguardian.com/music/2009/feb/23/ulrich-gerhartz-piano-tuning-brendel>> [accessed 2 July 2023].

⁴ H. J. Fletcher & Newmann Ltd Piano Parts Catalogue, n.d. <<https://www.fletcher-newman.co.uk>> [accessed 2 July 2023]. Edwin M. Good, *Giraffes, Black Dragons, and Other Pianos*, 2nd ed. (Stanford University Press, 2001). James Barron, *Piano the Making of a Steinway Concert Grand* (Times Books, 2006). David Levitan, *The Craft of Piano Tuning* (The Soundboard Press, 2011). Arthur A. Reblitz, *Piano Servicing, Tuning, and Rebuilding: A Guide for the Professional, Student, and Hobbyist*, 3rd ed. (Rowman & Littlefield, 2019). *Note by Note: The Making of a Steinway L1037*, dir. by Ben Niles (Plow Productions, 2007).

⁵ Thomas D. Rossing and Neville H. Fletcher, *Principles of Vibration and Sound* (Springer, 2012). Nicolas Giordano, *Physics of the Piano* (Oxford University Press, 2016).

⁶ Georgina Born and Andrew Barry, 'Music, Mediation Theories and Actor-Network Theory', *Contemporary Music Review*, 37.5–6 (2018), pp. 443–87.

article), there are few accounts that enter into the world of the piano technician, the film *Pianomania* and books *The Piano Shop on the Left Bank* and *Love is Blind* being some interesting exceptions.⁷ I wanted to understand the experience of technicians before — perhaps — it becomes too late to do so. My motivation was my lifelong fascination with pianos and the people who fashion them, as well as a later-in-life interest in how psychology can enrich musicological understanding.

Outside the field of music, there have been many studies of skilled performers, such as surgeons,⁸ or world-class sports people,⁹ and of the relationship of coach/mentor to a protégé.¹⁰ There is also a large technical literature on optimizing the performance of complex instruments, whether scientific,¹¹ artistic,¹² or sporting.¹³ Increasingly there is interest in the interaction between person and instrument through robotics or AI.¹⁴ The following account differs from these, however, revealing an intimately complex *triangulation* between highly-skilled piano technician, performer, and elite instrument; as such, it invites exploration of similar human/non-human relationships in any context where the stakes are high, whether concert hall, court room, velodrome, or operating theatre.

Method and Study Design

The origins and application of IPA

IPA was first developed in health sciences towards the end of the twentieth century and is still widely used in and other health- and welfare-related contexts. Its origins are in the thinking of Husserl and other phenomenologists and its purpose is to gain a

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- ⁷ *Pianomania*, dir. and prod. by Lillan Franck and Robert Cibis (WILDArtFILM, 2009); Thaddeus Carhart, *The Piano Shop on the Left Bank: Discovering a Forgotten Passion in a Paris Atelier* (Vintage, 2001); William Boyd, *Love is Blind* (Penguin Books, 2018).
- ⁸ Haroon Sabir Kahn, Rehan Ahmed Kahn, and Joharia Azhar, 'Personal Qualities of Brilliant Surgeons: A Myth or Reality', *Pakistan Armed Forces Medical Journal*, 68.5 (2018), pp.1126–32.
- ⁹ Nayara Malheiros Caruzzo and others, 'Leadership, Mental Toughness, and Attachment Relationship in the World Beach Volleyball Context', *Sustainability*, 13.19 (2021), 10748 doi:10.3390/su131910748.
- ¹⁰ Cristina López De Subijana and others, 'How Coach Leadership Is Related to the Coach-Athlete Relationship in Elite Sport', *International Journal of Sports Science & Coaching*, 16.6 (2021), pp. 1239–46, doi:10.1177/17479541211021523.
- ¹¹ Spoorthi Sudhakar Shetty and others, 'Impact of Optimizing and Creating Dedicated Breast Surgical Instrument Trays Using LEAN Methodology', *IJQHC Communications*, 1.1 (2021), lyab018 doi:10.1093/ijcoms/lyab018.
- ¹² Antreas Kantaros and Olaf Diegel, '3D Printing Technology in Musical Instrument Research: Reviewing the Potential', *Rapid Prototyping Journal*, 24.9 (2018), pp. 1511–23, doi:10.1108/RPJ-05-2017-0095.
- ¹³ Benjamin Stone and others, 'Elite Handcycling: A Qualitative Analysis of Recumbent Handbike Configuration for Optimal Sports Performance', *Ergonomics* 62.3 (2018), pp. 449–58, doi:10.1080/00140139.2018.1531149.
- ¹⁴ Tetsuyou Watanabe, Kensuke Harada, and Mitsunori Tada, *Human Inspired Dexterity in Robotic Manipulation* (Elsevier Science & Technology, 2018). Zainab Hussain, 'Adopting New Technology is Crucial to Surgeons' Training', *British Medical Journal*, 378 (2022), doi:10.1136/bmj.o1989.



Figures 1–6. Some stages of a piano renovation carried out by one of the technicians interviewed for this study (permissions copyright holder, one of the anonymized interviewees).



Figures 1–6. (Continued)



Figures 1–6. (Continued)



Figures 1–6. (Continued)

detailed and rich description of the experience of people in quality-of-life changing situations such as becoming a mother or living with cancer.¹⁵ IPA has more recently been applied to arts-based practice, including music. For instance, IPA has been used to better understand the different demands made on conservatoire and professional jazz and classical performers,¹⁶ explore the significance of music for older amateur keyboard players,¹⁷ and investigate the experience of music therapists when improvising in a clinical setting.¹⁸ In these and other music-related IPA studies identified, a primary motivation is to understand factors contributing to the well-being of the participant-musician or another group of people with whom the participant-musician was working. In the current study, there was no specific assumption about what might come out of the data, other than that the technician will inevitably be concerned with piano, performer, and place, hence the research question for this study was ‘What is the experience of the highly skilled concert piano technician when working on a piano to be played by a professional concert performer?’

The characteristics of Interpretative Phenomenological Analysis

IPA is a qualitative research method. Ontologically, qualitative research considers that reality is subjective, and experiences can only be understood within their social contexts.¹⁹ Epistemologically, qualitative research proposes that knowledge is co-constructed by the researcher and participant.²⁰ A qualitative, rather than quantitative design was therefore considered appropriate for this study which focusses (as is typical of qualitative work)²¹ on the individual, subjective experience of participants.

IPA has the following four characteristics. It is idiographic in that it seeks to understand the experience of a few fairly similar lives. IPA does not start by testing a

¹⁵ Jonathan A. Smith, ‘Identity Development during the Transition to Motherhood: An Interpretative Phenomenological Analysis’, *Journal of Reproductive and Infant Psychology*, 17.3 (1999), pp. 281–99, doi:10.1080/02646839908404595. Grant J. McGeechan, Kerry E. McPherson and Karen Roberts, ‘An Interpretative Phenomenological Analysis of the Experience of Living with Colorectal Cancer as a Chronic Illness’, *Journal of Clinical Nursing*, 27.15–16 (2018), pp. 3148–56, doi:10.1111/jocn.14509.

¹⁶ Melissa C. Dobson, ‘Performing Your Self? Autonomy and Self-expression in the Work of Jazz Musicians and Classical String Players’, *Music Performance Research*, 3.1 (2010), pp. 42–60.

¹⁷ Angela Taylor, ‘Using Interpretative Phenomenological Analysis in a Mixed Methods Research Design to Explore Music in the Lives of Mature Age Amateur Keyboard Players’, *Music Education Research*, 17.4 (2015), pp. 237–52, doi:10.1080/14613808.2014.906397.

¹⁸ Tríona McCaffrey, ‘Music Therapists’ Experience of Self in Clinical Improvisation in Music Therapy: A Phenomenological Investigation’, *The Arts in Psychotherapy*, 40.3 (2013), pp. 306–11, doi:10.1016/j.aip.2013.05.018.

¹⁹ Danica G. Hays and Anneliese Singh, *Qualitative Inquiry in Clinical and Educational Settings* (Guildford Press, 2012).

²⁰ Renée Spencer, Julia M. Pryce and Jill Walsh, ‘Philosophical Approaches to Qualitative Research’, in *The Oxford Handbook of Qualitative Research*, ed. by Patricia Levy (Oxford University Press, 2020), pp. 113–42.

²¹ Norman K. Denzin and Yvonna S. Lincoln, ‘Introduction: The Discipline and Practice of Qualitative Research’, in *The SAGE Handbook of Qualitative Research*, 5th ed., ed. by Norman K. Denzin and Yvonna S. Lincoln (SAGE, 2018), pp. 29–71.

hypothesis, any more than most critical musicological or indeed ethnographic writing does; instead — and this is a key aspect of IPA — it works inductively, from the bottom up, investigating the data with an open mind to see what themes emerge. It is phenomenological, in that it seeks to uncover the lived experience of something of major significance to participants. Crucially, it engages in what is referred to as a “double hermeneutic”, acknowledging that the researcher can only access the participant's experience through their own subjective interpretative frame. Researchers are thus encouraged to be reflexive in their approach. This aspect of IPA was appropriate for the current study given I was close to the subject investigated. I know the world of performers and technicians well having witnessed their activities over many decades on the concert platform, in workshops and piano showrooms, and as they tune and maintain quality pianos in domestic settings.²²

Process

There are many ways of approaching IPA²³ but the version used in this study largely follows Denis Howitt's, as represented in Figure 7.²⁴ The process begins with ‘data collection’, as shown in the left-hand column. Having formulated a research question (as referred to above), the researcher creates a sampling plan (in this case, that four people would be interviewed for the study). In the current study, the data was generated from a semi-structured interview schedule, so that all participants were asked similar questions. Extracts from that schedule are set out in Table 1. As is usual with IPA, the questions are ‘open’, to avoid leading the participant. The interviews are recorded and then transcribed (yielding around 36,000 words in the present study). The method of transcription depends on the researcher's preoccupation. It may sometimes, as for example when working with trauma victims, be appropriate to transcribe every nuance, including stutters and pauses. In contrast, the transcripts in this study are ‘denaturalised’ in order to remove ‘noise’ and thus ease comprehension.²⁵

The second stage of the process is ‘data analysis’, as shown in the right-hand column of Figure 7. The researcher first works carefully through with one interview transcription (or ‘case’), making detailed notes on it which may lead to identification of initial ‘themes’ and connections between them. This stage is followed by the creation of a systematic table of themes for that initial case. The researcher then repeats the same process with the other transcriptions and, only as a last stage, synthesises the results into a ‘Master Table’ of themes, thus exemplifying the inductive approach referred to

²² For some standard texts on IPA supplementing this description see, for instance, Igor J. Pietkiewicz and Jonathan A. Smith, ‘A Practical Guide to Using Interpretative Phenomenological Analysis in Qualitative Research Psychology’, *Psychological Journal*, 20.1 (2014), pp. 7–14, doi:10.14691/CPPJ.20.1.7; Jonathan A., Smith, Michael Howard Larkin, and Paul Flowers, *Interpretative Phenomenological Analysis: Theory, Method and Research*. 2nd ed. (SAGE, 2022).

²³ As described in the various guides to IPA previously referred to in this article.

²⁴ Dennis Howitt, *Introduction to Qualitative Methods in Psychology*, 4th ed. (Pearson, 2019), p. 316.

²⁵ The terminology used in this sentence is from Gail Jefferson, ‘Glossary of Transcript Symbols with an Introduction’, in *Conversation Analysis: Studies from the First Generation*, ed. by Gene H. Lerner (John Benjamins, 2004), pp. 13–31.

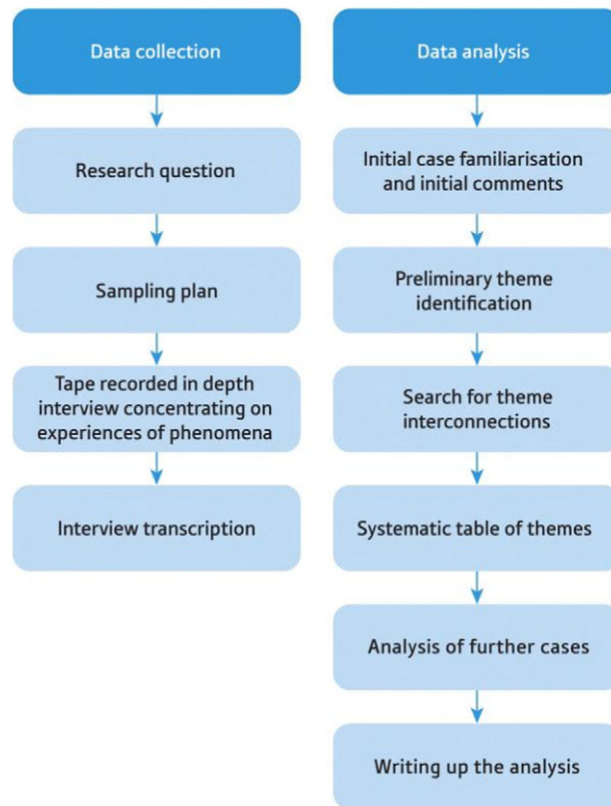


Figure 7. IPA procedure (extract from Howitt, 2019, p. 316).

TABLE 1
EXAMPLES OF SEMI-STRUCTURED INTERVIEW QUESTIONS

Please think back to a time you were preparing a piano in an international concert hall for a specific performer. Could you describe how you felt when you were first asked to take on the engagement?

Having prepared the piano, did you listen to the performance and, if so, how did you engage with it?

Please think of a particular piano which you regularly tune. How do you feel emotionally about this instrument? [*probes*] Is it an object of indifference, love, something to be tamed and negotiated with?

What does your role mean to you?

earlier. The Master Table for this study is set out at Figure 8. In some healthcare settings, a group of researchers will independently analyse the same data before creating a Master Table so as to counter individual bias. Traditionally, IPA was done manually, with marginal annotations on transcripts, file cards, shuffled yellow stickits, and so on, but most researchers will now use a software package such as NVivo thus facilitating a more efficient and refined process of thematizing the data.²⁶

²⁶ 'NVivo – Lumivero', n.d. <<https://lumivero.com/products/nvivo/>> [accessed 25 June 2024].

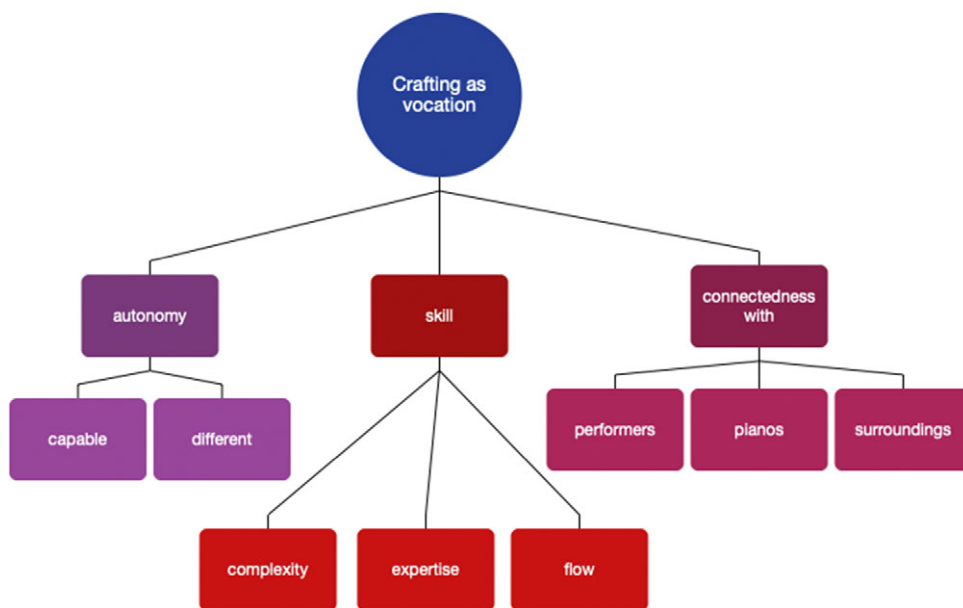


Figure 8. Master table of themes.

TABLE 2
CHARACTERISTICS OF PARTICIPANTS

Pseudonym	Date and length of interview (all May 2020)	Approximate age	Employment status	Relationship to researcher
Kershaw	4 May 2020; 60 minutes	50–60	Employed (conservatoire)	Current technician
William	7 May 2020; 130 minutes	55–65	Self-employed	Past technician (until 1990s)
Alex	14 May 2020; 55 minutes	50–60	Employed	None
Tony	29 May 2020; 60 minutes	50–60	Employed (piano house)	None

Table 2 shows the characteristics of the four participants in this study who were, as is typical for an IPA, a limited and relatively homogeneous sample. Since the present study aimed to understand the experience of highly trained piano technicians, these were inevitably people who had many years of experience of their jobs, hence they are all aged between fifty and sixty. Because there are only between twenty and thirty technicians in the world working at the highest levels (these figures were confirmed during the interview process), no attempt was made to choose technicians at random; instead, they were selected by ‘snowball sampling’, that is by seeking recommendations from the technicians already known to the author.

Ethics

Because this study involved interviews of living individuals, was subject to university ethics approval.²⁷ Accordingly, the transcripts were anonymised, removing details of places, performers, specific concert hall locations, and so on. The following account includes extracts from the transcripts removed from their larger context and does not make complete transcripts available as supporting data. This is normal practice in IPA and in the present case it avoids deductive disclosure because people familiar with this highly specialised field may recognize unique characteristics of interviewees. Prior to being interviewed, each participant gave consent to their data being collected for research and subsequent publication, and each reviewed and approved the final form of their transcript.

Findings: The Experience of Crafting

Although an IPA researcher tries to keep an open mind regarding the themes that will be revealed by the process of analysis, it is inevitable that they will have some prior expectations. My assumption prior to starting this research was that the relationship of the technicians to the performers they worked with would be at the centre of their experience, but this was not what emerged from the inductive process just described. The answer to my research question ‘What is the experience of the highly skilled concert piano technician when working on a piano to be played by a professional concert performer?’ was that technicians considered ‘crafting as a vocation’ to be the guiding principle of their working lives. This is shown at the top level of the Master Table, in [Figure 8](#). As subordinate layers of the Master Table indicate, this overarching theme consists of three elements: ‘autonomy’, containing subcomponent themes of being ‘capable’ but ‘different’; ‘skill’ containing subcomponent themes of ‘complexity’, ‘expertise’ and ‘flow’; and ‘connectedness’ with ‘performers’, ‘pianos’, and ‘surroundings’.

Though the Master Table is necessarily an abstraction, the richness of the technician’s experience is illustrated in the following sections of this study, where each theme is represented by quotations from the transcripts, giving — as IPA would characterize it — direct access to the ‘lived experience’ of participants. These quotations are not isolated examples: they exemplify significant trends in the data analysed. To add further texture and depth, the themes are contextualized by reference to existing psychological concepts. Given that IPA starts with no pre-conceptions, the contextualization is done during and after the analysis, rather than as part of an initial literature review. Italics included in the quotations are to emphasize a point made in the analysis, not a participant’s tone of voice. The following commentary follows the presentation of the Master Table, proceeding from the topmost theme downwards through its components and sub-components (and reversing the process of analysis described earlier).

²⁷ Ethical approval for publication of the data in this study was given by Birmingham City University.

Crafting as vocation: 'It had to be done; it had to be done right [...] It means something which I can't quite describe'

Crafting has been defined as 'skilled making' by means of 'refined gestures informed by hand and mind [...] sustained through supplemental material-based practice'.²⁸ Technicians speak of using their hands, ears, and eyes to shape the materials of the piano so as to craft the exact sound required by each performer. Each technician considered themselves to be a craftsman, and rejected other designations. As if to underline their central preoccupation, they chose without prompting to be interviewed (remotely, via Microsoft Teams because the interviews took place during the 2020 Covid-19 lockdown), sitting alone in their workshops, with their tools and the inside parts of pianos at various stages of deconstruction or reconstruction behind them. Occasionally a participant would turn to touch, strike, or stroke a piano body part to support a point made.

Crafting is experienced by the technicians as a 'vocation' or 'calling' rather than a job.²⁹ Richard Sennett, for instance, writing about crafting, notes the original connotations of vocation as involving dedicated spiritual practice, aligning this with the slow, purposeful development of expertise in craft, involving habit and discipline, as a 'sustaining narrative'.³⁰ Kershaw's comments that: 'A calling is a good expression, but without the religious aspect. I love building pianos. *I've got to the stage now when I know what the limitations are in an instant.* So, I know what to do if it doesn't work and how to make it sound better, how to make it feel better.' There is a progression in this sentence from Kershaw's own direct experience to making 'it' (the piano, sound itself, his reflexive response—or all three?) 'feel' better through the application of skill.

Occupational psychologists Dobrow and Tosti-Kharas refer to a calling as a 'consuming, meaningful, passion'.³¹ Time and again the words of the technicians reflect this. 'Tony' visualizes his passion dynamically: 'you have to *throw your personality* into the job and with that you make yourself very vulnerable, because if you want to please somebody and they don't care you can be hurt.' Technicians are compelled, sometimes in ways they cannot fully articulate, to do what is necessary to get the right result:

So, last year I spent the whole night on a piano. I wasn't satisfied with a piano, but an artist is coming in, *so it had to be done, it had to be right.* If she wasn't happy, I wouldn't be happy. I did nineteen hours non-stop, no break, no food, no nothing, just carried on. [...] it was ridiculous. I feel quite ill after doing some of these things, but that goes out the window because it has to be right so there is a meaningfulness [sic] in there [...] It means

²⁸ Katherine Townsend, Rhian Solomon, and Amanda Briggs-Goode, *Introduction, in Crafting Anatomies: Archives, Dialogues, Fabrications* ed. by Katherine Townsend, Rhian Solomon and Amanda Briggs-Goode (Bloomsbury Visual Arts, 2020), pp. 1–26 (p. 2).

²⁹ The terms are used interchangeably in the literature; see Bryan B. Dik and Ryan D. Duffy, 'Calling and Vocation at Work', *The Counselling Psychologist*, 37.3 (2009), pp. 424–50, doi:10.1177/0011000008316430.

³⁰ Richard Sennett, *The Craftsman* (Yale University Press, 2008), p. 263

³¹ Shoshana R. Dobrow and Jennifer Tosti-Kharas, 'Calling: The Development of a Scale Measure', *Personnel Psychology*, 64.1 (2011), pp. 1001–49 (p. 1003), doi:10.1111/j.1744-6570.2011.01234.x.

something *which I can't quite describe*. People say, 'What the hell do you do that for? You don't get paid for it', and I go 'I couldn't not do it — I had to do it.' (William)

William celebrates his compulsive pursuit of meaning. He is both inside and yet a dispassionate observer of a process, beyond words, rationality, and conscious control.

Under the over-arching theme of 'crafting as vocation' participants invoked three different aspects of their role: 'autonomy', 'skill', and 'connectedness', discussed next.

Autonomy: 'In concert work there is no hiding'

Dimitri Leontiev proposed personal autonomy as the goal of positive personality development.³² Autonomy, in his analysis, is something a person needs to cultivate incessantly; it involves becoming resourceful and independent. For participants in this study, their experience of being autonomous was positive in that they felt capable, but their independence could make them feel different, which had both positive and negative aspects.

Capability comes from years of experience, as explained by Kershaw: 'It took me a long time to understand some of the aspects of piano work. And *having been through that I can almost see it from the other side*. I can see the craftsmanship. You know, in the area I work in there are probably twenty to thirty different skills. A lot of people out there just have the one, for instance tuning.' His long training is transformative, even alchemic: having been through it he sees crafting in a new light. Technicians also need resourcefulness, self-confidence, and independence. Alex comments on the 'pressure' felt because in '*concert work there is no hiding*. You are really exposed. Anything which goes wrong is immediately obvious to everyone'. Technicians might, for instance, be called upon to solve urgent issues, such as adjusting a pedal that starts squeaking in concert or being required at short notice to retune a piano to a non-standard concert pitch for an historically informed performance.

Technicians are resilient when unexpected, time-critical issues occur, but also by spending long hours alone in the concert hall preparing a piano for performance and in their own workshops. These solitary hours require resourcefulness but can lead to technicians feeling different from other people. Alex says: 'I don't know whether working alone *makes us a bit strange*' and notes that 'there is no sense of community'. William echoes this: 'It [the technicians' profession] is still very solitary; most of my colleagues who I get a chance to meet, I meet only occasionally.' Sometimes, this solitariness goes further to 'a bit of rivalry between certain technicians' (Kershaw) or to feeling technicians are 'the *weirdest group of people*' (William).

At the most extreme, the skills of a technician are akin to conjuring, '*almost like a dark art*. I mean, there's this kind of joke in the trade that no one ever talks to another technician about voicing a piano because they each have their own way of doing it' (Kershaw). William relates a meeting when he was younger with a technician with

³² Dimitry Leontiev, 'Positive Personality Development: Approaching Personal Autonomy', in *A Life Worth Living: Contributions to Positive Psychology*, ed. by Mihaly Csikszentmihalyi and Isabella Selega Csikszentmihalyi (Oxford University Press, 2006), pp.99–122.

legendary voicing skills: 'He taught me this technique. "This is a secret technique," he said, "there are only two or three people who know this, and we don't pass this on, but *if you hadn't been able to hear what I have just done* [to the piano], I wouldn't be showing you how to do it now.'" Here an initiate passes on closely guarded secrets to another member of his magic circle.

Skill: 'building sound' and 'finding the magic'

The second main component of 'crafting as vocation' is 'skill', in the sense of having 'high competence' and 'high-order motor ability' (*Oxford English Dictionary*). For technicians, skill involves managing 'complexity', having 'expertise', and experiencing 'flow'. Tony's experience of complexity is kaleidoscopic:

People have absolutely no concept of what the technical work entails. It's highly mechanical but it's also a real craft that involves timber and materials — sensitivity towards materials — and then the whole musicality plus, you know, too, if you think you have a construction holding twenty tonnes of tension, it's amazing, it is almost like an engine that allows the pianist access to the sound kit of the piano.

Kershaw explains the accrual of experience more viscerally, in physical, almost architectural terms: '*You build sound*. You have to know what you're aiming for. You don't just go in blind and see what happens. You build it up. And it is a slow process. You build up tone.' Here we might refer to the [images](#) of a piano renovation shown earlier, where an injured, stained body of an instrument is shaped, coaxed, shaved, re-ebonized and finally transformed into a gleaming acoustic reincarnation of its younger self.

A crucial aspect of the technician's role, requiring significant expertise and referenced in the process of rebuilding described above, is piano restoration, involving arduous, lonely, lovingly detailed labour. Kershaw refers to 'repeating the same thing eighty-eight times' (i.e. the number of hammers and keys on a concert grand piano) as a way of building up dexterity and skill. Alex says that 'meticulous attention to detail is where my best work comes out really'. Tony goes further, linking the mechanical to tactile and aural: 'You've got eighty-eight hammers, eighty-eight keys and the *piano technician with their fingers and ears and through the medium of hammers on the strings*, has to create an orchestra with dynamic ranges in all the different sections and which is well balanced overall.' Here, the human-mechanical boundary is dissolved, through the medium (a term both scientific and magical) of hammers on strings.

It is through devoting close attention to a piano's needs that the technician progresses from the acquisition of skill to experiencing 'flow'.³³ Flow is associated with high level, skilled, motor repetition, such as is demanded by the soothing, repetitive adjustment of a precise number of hammers and keys. Flow is a subjective state characterised by total absorption in a task which the individual finds intrinsically rewarding, a merging of

³³ Jeanne Namamura and Mihaly Csikszentmihalyi, 'The Concept of Flow', in *Handbook of Positive Psychology*, ed. by C. R. Snyder and Shane Lopez (Oxford University Press, 2005), pp. 89–105.

awareness and action, and loss of self-awareness and sense of time.³⁴ An individual experiences flow when they have sufficient skill to manage the task they are doing; the task has a clear and proximate goal; and the individual gets immediate, unambiguous feedback.³⁵

Participants reported the ingredients of flow present as they worked:

I know when I'm tuning, I get such a feel for the piano. *I feel the piano responding to how I'm working with it* and think, 'These pins are clicking beautifully into tune, this is a lovely solid piano' and I walk away thinking 'that piano is going to stay in tune for a long time'. I'm confident *the piano has worked with me*. When I'm tuning, I get such a feel for the piano. *I feel the piano responding to how I'm working with it*. I'm confident *the piano has worked with me*. (Kershaw)

You just go by gut instinct ... of ... of the ... [sigh] ... *the part of you* which knows what to do that you can't explain, it just does it, you just go onto *autopilot and just do it*, the moment you start thinking about it, like in music, if you're thinking about it, it is over, and if you're not thinking about it, well it is scary. Some people don't want to do it (they say, 'if I do that, I might be in trouble'), but you have to go there because *that is where the magic is*, that is where you have to go, it is allowing that to happen ... but it is dangerous! (William)

We witness here an interactive process between the technician and the instrument, such that the person and the inanimate object seem mutually co-opted into a customary, yet entrancingly mystical endeavour.

These accounts of different aspects of skill reveal the technician's experience of immersion and absorption, of doing something highly demanding and yet intimate, so that the conscious brain can disengage, allowing fingers, ears, and body to take over. The technicians focus intently on the steady, satisfying 'clicks' of the pins, as each string locks onto the correct frequency in itself and in relation to one another, and the detail of every part of the piano is perfectly aligned. Once prepared, the instrument is literally *their* harmony.

Connectedness with performers, pianos, and surroundings

Participants are deeply connected with the three main facets of their working life: performers, pianos, and surroundings. Connection with performers can last a lifetime. Kershaw says that some clients 'won't have anyone else working *for* them' but him, and Tony has the 'same relationship with [name of pianist] as I did twenty-five years ago; she *relies on me* in just the same way'. He says, 'There are the great names, [names of performers] who say that *unless I'm with them they will not play*, so I'm there.' This close and sustained relationship with the performer is deeply rewarding and validates the technician. Tony remembers: '[Name of performer] who, although being such a huge

³⁴ Dwight C.K. Tse, Jeanne Nakamura, and Mihaly Csikszentmihalyi, 'Beyond Challenge-seeking and Skill-building: Toward the Lifespan Developmental Perspective on Flow Theory', *The Journal of Positive Psychology*, 15.2 (2020), pp. 171–82, doi:10.1080/17439760.2019.1579362.

³⁵ Namamura and Csikszentmihalyi, 'The Concept of Flow', p. 90.

intellect of a person, wanted the company of his piano technician, *somebody who became his Piano Angel as he calls them*. Somebody who is there to help him to make the piano good so that he can perform, well it's hugely important, hugely important.'

The connectedness between technician and pianist is thus one of mutual trust and regard. William characterizes this symbiotic relationship by explaining how a particular performer wanted to get a specific sound 'in my head', through reminding him how he had played a passage in a previous concert. Here, then, the boundary between the mind of performer and technician is permeable. William, through recollection, prepares a different piano in a different concert hall so it 'translates into his [the performer's] characteristic sound'. William describes even greater intimacy when he says, 'If I could have played the piano really well, I probably wouldn't be doing this, I'd be playing it. But I couldn't make music my profession. I think like a musician, so I understand how musicians work, [...] but I don't have the ability to do it. *So, they are my hands*. They do what I would have wanted to do.' William originally wanted to be a virtuoso performer but felt he was not good enough. Through his own devotion and skill to his craft and his intimate relationships with great pianists, however, he performs through the agency of the performer's hands.

A second kind of connectedness is equally powerful for the technicians: connectedness with their pianos. They feel that each piano is alive and has its own unique personality that develops across the arc of its life:

The [top quality concert pianos] start off on the concert circuit. I think as much as anything it is about power. Cutting to the back of a huge concert hall. A youngster can do that — they are brash and bold and have no fear, and they can reach to the back you know — but gradually they get more mature and a bit more laid back perhaps, and they are better in a smaller venue. They are still fabulous pianos, absolutely fabulous pianos, but they just don't want to be bothered with having to reach the back of an enormous auditorium anymore. (Alex)

Tony, too, speaks fondly of finding a good home for his mature, well-maintained older pianos, in music clubs, or smaller but discerning venues, once they are past their fiery, youthful years.

The piano as living creature is acknowledged in William's description of his secret voicing technique bringing the piano 'alive. It is literally alive.' Tony, too, tells of how a great piano technician gives the piano 'character, personality, and almost a stage presence that can go on stage with the performer'. Sometimes pianos technicians are protective towards a piano that would be too 'refined' (Kershaw) for a certain player; at other times they need 'wrestling with' (Alex). Kershaw's favourite conservatoire piano was originally 'like a wild beast which needed taming'. Pianos are not only animate, however: they are seen as family members. Alex admits '[pianos] are almost like children. You nurture them and you want them to show their best when they are performed on. [...] It is almost a personal relationship.' Alex's tenderness is reflected in Tony's description of having 'a huge family of pianos scattered around the world that are almost an extension of the pianos that sit around me here [in my showroom], and I know them all intimately'.

Pianos beguile technicians. Kershaw describes his favourite piano as ‘the most beautiful thing in the world’ and the ‘detail of the beams [underneath the piano] you never see’; Alex says, they ‘are beautiful [...] everything about the piano is done to that level of detail, with that kind of attention. It is beauty.’ The deepest level of intimacy with the instrument is, however, through touch. The touch of a finger on a piano key is, after all, where performer and technician literally connect with the piano and each other. Alex says, ‘It is the feel under the fingers. If there is something wrong, you feel it instantly.’ Tony says, ‘my fingers can feel the dynamics in every single note’ and explains his ‘relationship to the piano as a combination of fingers and ears and sensations: you feel it’. The technician interacts with the piano directly through sensation unmediated by conscious thought. They cannot *say* how they know what they know. Similarly, William feels (see earlier) his obsessive drive to perfect a piano involves ‘something he can’t quite describe’, as if feeling the piano controls him.

Regarding the third form of connectedness, connectedness with surroundings, all technicians have a strong sense of place. William and Tony have worked on pianos in the same major concert halls for years, and Alex and Kershaw work for leading conservatoires overseeing performances by talented student and professional players, alongside their independent assignments. Alex says she gets an ‘enormous kick out of sitting in the audience looking round at the people enjoying what’s happening and thinking, “that is partly down to me, even though it is a small part”.’ William underlines his perception of being part of a larger whole, referring to teamwork on the day of the concert: ‘It is frightening what those guys [the performers] have to do. [...] And they expect nothing less than that of the team, the *being part of the team*, the people on the day, making sure all is right, because *we know what they are trying to do*.’

Tony is inspired by another kind of teamwork — the relationships within his large organization. He refers to himself as ‘Mr Motivator’, creating a team where everyone has a part, and he maintains mutually supportive relationships with other parts of the piano empire he works for, referring to himself as the ‘cushion between corporate [name of piano makers] and the artisans [who make the pianos in the factory] and the artists [the performers]’. He loves being ‘globally involved with pianos that come out of the place where I trained’.

The more metaphysical aspect of connectedness to surroundings relates to the experience of ‘flow’ referred to above but seems to go beyond it to the point when everything merges. William refers to ‘a physical aspect when you feel totally in tune with the piano because *you have to be at one with it*’. Kershaw’s description is similar, but he fuses the performer’s experience of the piano with his own by an ambiguous use of ‘you’ in the first sentence: ‘I think the interesting thing with musicians is that *you become so intensely involved* with the instrument you’re playing it is almost as if *you* become part of it. I know when I’m tuning, I get such a feel for the piano.’ Tony also refers to the pianist merging with the piano, interpreting that as part of a whole infrastructure (of which he is an intrinsic part) working together: ‘you have to get *the whole combination right*: the right piano, properly prepared, on the stage. The pianist can then *become one with* the piano and just enjoy the sensation of making music, and

that is just fantastic.' William goes further, describing something approaching the metaphysical:

I'm just part of mechanics which allows for everything to happen. From the point of view that artist, you could almost say it is like a composer is actually sitting there. Where does the idea the composer had in their head — and one hundred years later someone is playing that piece of music — where did it start and stop? Because the point is that it all happens in the now anyway and it is timeless, it is timeless. And I think that is the essential ingredient of everything I've ever done, when it has been at that level, it has been the fact that I don't know how I did that at the end of the day because *I didn't do it ... I wasn't there.*

William's experience is consonant with that of other participants, even if they speak in more restrained tones. At its best, a concert is not about any individual person or component. Instead, composer, beautiful concert grand piano meticulously prepared by a technician at the top of their game, 'superhuman' (William) pianist, superb concert hall, and fearsomely challenging repertoire are all experienced collectively by everyone there in that place, together in that same moment, outside time. Perhaps implicitly technicians draw upon a Romantic aesthetic of music, with its notions of exalted imagination, that was crucially facilitated by technological advances,³⁶ including to the construction of the arch-Romantic instrument of the time, the concert grand piano.

In developmental psychology, following foundational work of John Bowlby³⁷ on attachment, a large literature has developed on the importance of place attachment in both secular and sacred contexts.³⁸ Victor Counted and Fraser Watts explore from the psychological perspective the religious place as a space where a 'process of communication' occurs between it and the individual.³⁹ In this space, the individual experiences the place as an ensemble of physical elements, as being associated with certain activities, and as having wider societal significance. The combination of these elements creates in the individual a sense of coherence, group identity and transcendence. Classical concert performance is itself ritualistic. Conventions regarding clapping, provision of programmes, and performance dress are still largely governed by nineteenth-century performance practice.⁴⁰ Technicians experience these venues not just as places in which a piano is technically prepared and then played, but in addition as akin to secular cathedrals, touching the sublime.

³⁶ John Tresch, 'Music and Technology', in *The Cambridge Companion to Music and Technology*, ed. by Benedict Taylor (Cambridge University Press, 2021), pp. 110–26.

³⁷ John Bowlby, *Childcare and the Growth of Love* (Penguin Books, 1953).

³⁸ Shampa Mazumdar and Sanjoy Mazumdar, 'Religion and Place Attachment: A Study of Sacred Places', *Journal of Environmental Psychology*, 24.3 (2004), pp. 385–97, doi:10.1016/j.jenvp.2004.08.005.

³⁹ Victor Counted and Fraser Watts, 'A Space of Transition and Transaction: A Rejoinder to Selected Commentaries on Place Spirituality', *Archive for the Psychology of Religion*, 41.1 (2019), pp. 42–52, (p. 50), doi:10.1177/0084672419832673.

⁴⁰ Claire D. Nicholls, Clare Hall, and Rachel Forgasz, 'Charting the Past to Understand the Cultural Inheritance of Concert Hall Listening and Audience Development Practices', *Paedagogica Historica*, 54.4 (2018), pp. 502–16.

Reflections on the Three Components of ‘Crafting as Vocation’

Autonomy, skill, and connectedness, as the components of ‘crafting as vocation’, have been reviewed in individual detail in the preceding account, but I return now to consider their relatedness. Due to the deductive process followed by IPA, it was evident only after the analysis of data was complete that these three components map onto the three psychological needs of autonomy, competence, and connection identified by Self-Determination Theory (SDT) as the necessary conditions for an individual to be motivated to grow and become self-determined in many different contexts. SDT, pioneered by psychologists Edward Deci and Richard Ryan from the 1970s to the present,⁴¹ has had a major influence on the study of motivation in human behaviour in psychology, and been widely tested across work, family, educational, and social contexts.⁴² It has largely discredited prior twentieth-century behaviourist understanding of motivation,⁴³ most known to musicians through the work of Leonard Meyer.⁴⁴

My findings show that all of the technicians had a high degree of independence in performing their role. They felt not just competent but highly valued for their great skill. Despite their autonomy they experienced a sense of relatedness and connectedness to pianos, people, and their environments. This sense of relatedness as well as the validation they received from the performers drove them to develop further expertise, as when sharing secrets of their ‘dark art’. SDT proposes that people who experience autonomy, competence, and connectedness in their work domains, as the technicians do, will feel happy and fulfilled in their work. As a consequence, such people are intrinsically motivated to make pro-social, beneficent acts, generating a virtuous circle of continuing well-being.⁴⁵ William’s account of tuning all night to prepare a piano to the highest standard whilst knowing that the performer might not ever find out he had done so exemplifies intrinsic motivation leading him to make a pro-social act. All technicians are, after many years, still passionate about their work, feeling a valued part of something greater than themselves and always wanting to learn more.

Considering the Larger Perspective

The Findings show how each participant has undertaken a challenging journey towards working at the peak of their profession. This involved a long and demanding training, and accrual of the technical and interpersonal skills needed to manage difficult

⁴¹ Richard M. Ryan and Edward L. Deci, *Self-Determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness* (The Guilford Press, 2017).

⁴² Marylene Gagne, *The Oxford Handbook of Work Engagement, Motivation, and Self-Determination Theory* (Oxford University Press, 2014).

⁴³ B. F. Skinner, *Science and Human Behavior* (Free Press, 1965).

⁴⁴ For example, Leonard B. Meyer, *Emotion and Meaning in Music* (University of Chicago Press, 1956); *Explaining Music: Essays and Explorations* (University of California Press, 1973).

⁴⁵ Frank Martela and Richard Ryan, ‘The Benefits of Benevolence: Basic Psychological Needs, Beneficence, and the Enhancement of Well-Being’, *Journal of Personality*, 84.6 (2016), pp. 750–64, doi:10.1111/jopy.12215; Frank Martela and Tapani J.J. Riekkii, ‘Autonomy, Competence, Relatedness, and Beneficence: A Multicultural Comparison of the Four Pathways to Meaningful Work’, *Frontiers in Psychology*, 9 (2018), 1157, doi:10.3389/fpsyg.2018.01157.

performance situations and indeed performers. They tell a story of passion for being part of an extraordinary aesthetic experience and of a love for the beautiful instruments they touch, transform, and are in turn transformed by. Crucial to their sense of identity is that they are crafts people, giving them a strong sense of vocation. Stepping back from these intense accounts of individual lives which have been shown enmeshed, as all lives are, in a variety of psychological constructs, the concluding sections of this essay briefly consider some of its wider implications for the discipline of musicology.

The analysis presented here offers insight into the interior world of technicians, where pianos, people and places loom large and other aspects of their lives are, at least in the conversations which formed the basis of this research, left largely obscured. Technicians are, of course, actors within complex systems comprising mechanical technology (pianos and their places of production), concert artists (with their own commercial representatives and private practise studios), and concert venues (engaging sound and lighting technicians, front of house management and many other individuals). Accordingly, Actor Network Theory (ANT), which notoriously proposes that non-humans have agency and are capable of taking part in actor networks that are continuously performed,⁴⁶ and that has been drawn into musicological discourse by writers such as Eliot Bates and Benjamin Piekut,⁴⁷ could contribute another perspective on this study, particularly given the striking language used by the technicians to attribute agency to pianos. Such a study would, however, be a very different kind of endeavour from the current one, as is suggested by Georgina Born and Andrew Barry's reflections on recent theories of musical mediation including ANT. They note ANT's traditionally 'flat ontology', where non-humans and humans are considered to exist symmetrically within underlying structures, and pointedly observe that ANT can be 'so blinded by the presence of observable objects and materials in any musical assemblage that the analyst's sensibility is used up in recounting what is manifestly there'.⁴⁸ In contrast, the core purpose of IPA is to interrogate the significance of observable objects *in the experience* of the participants. Through close attention to the detailed language used by the technicians, it is possible to sense not only how they experience the most significant manifest objects in their lives but additionally how they experience the otherwise intangible connections *between* them.

If crafting as vocation is the warp of the fabric of this study, then connectedness is the weft, identified within each subcomponent of the top-level theme. It is worth, therefore, considering the nature of that connectedness from various perspectives more or less familiar to musicology. One might, following Csikszentmihalyi's foundational 1981 article, characterize the relationality of technicians to their pianos as transactional

⁴⁶ Bruno Latour, 'On Technical Mediation', *Common Knowledge*, 3.2 (1994), pp. 29–64; Bruno Latour. *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford University Press, 2007).

⁴⁷ Eliot Bates, 'The Social Life of Musical Instruments', *Ethnomusicology*, 56.3 (2012), pp. 363–95, doi:10.5406/ethnomusicology.56.3.0363; Benjamin Piekut, 'Actor-Networks in Music History: Clarifications and Critiques', *Twentieth-Century Music*, 11.2 (2014), pp. 191–215, doi:10.1017/S147857221400005X.

⁴⁸ Born and Barry, 'Music, Mediation Theories', p. 446.

and symbolic, since technicians speak of pianos being alive, having their own personalities and agency, and needing to be tamed, loved, and negotiated with. In other words, an object (in this case a piano) takes on meaning through what it signifies and thus communicates to an individual in what is experienced as a reciprocal exchange where the object has its own agency.⁴⁹ In crafts literature, this same agenda has more recently been reframed as a debate regarding the interaction of body with materials. For example, Frayling conceives contemporary crafting as a place where body, technology and material converge,⁵⁰ and Katherine Townsend, Rhian Solomon, and Amanda Briggs-Goode propose a transdisciplinary exploration of crafting, centred on the human body.⁵¹ These views of crafting therefore nuance the more familiar definition set out earlier in this essay, that emphasizes polarity and relationality rather than interconnectedness.

The dynamic relationship — and connectedness — between the body and its surroundings, has become a central preoccupation across many disciplines today. Elizabeth Le Guin was an early exponent in musicology, writing of her experience of inhabiting the body and sensibility of Boccherini through the medium of her cello.⁵² More recently, Youn Kim and Sander Gilman argue that '[musical] instruments extend somatic boundaries' and are 'in fact, incorporated into their [the musicians'] brain maps after years of practice'.⁵³ Their proposition is supported by neurological studies that compare brain structures of professional, amateur, and non-musicians to show the structural adaptations of the brain due to long-term motor and auditory training.⁵⁴ The current study is another example of connectedness between sound, feel, body and instrument as experienced by Technicians who spend many hours of their working life touching and responding to the sounds of pianos, 'repeating the same thing eighty-eight times' (Tony).

Materiality and body studies sit within the broader concerns of multidisciplinary-based Material Engagement Theory (MET) proposed by Lambros Malafouris.⁵⁵ MET identifies a plasticity between mind, body, and object, a view of cognition of evident relevance to the performing arts though originating in the field of cognitive archaeology. As Malafouris puts it, drawing on a long line of philosophical enquiry including

⁴⁹ Mihaly Csikszentmihalyi and Eugene Halton, *The Meaning of Things: Domestic Symbols and the Self* (Cambridge: University Press, 1981).

⁵⁰ Christopher Frayling, *On Craftsmanship: Towards a New Bauhaus* (Oberon Books, 2012).

⁵¹ Townsend, Solomon and Briggs-Goode, *Crafting Anatomies*.

⁵² Elizabeth Le Guin, *Boccherini's Body* (University of California Press, 2005).

⁵³ Youn Kim and Sander L. Gilman, 'Contextualizing Music and the Body: An Introduction', in *The Oxford Handbook of Music and the Body*, ed. by Youn Kim and Sander L. Gilman (Oxford University Press, 2018), p. 9 doi:[10.1093/oxfordhb/9780190636234.013.26](https://doi.org/10.1093/oxfordhb/9780190636234.013.26).

⁵⁴ Christian Gaser and Gottfried Schlaug, 'Brain Structures Differ between Musicians and Non-Musicians', *Journal of Neuroscience*, 23.27 (2003), pp. 9240–45, doi:[10.1523/JNEUROSCI.23-27-09240.2003](https://doi.org/10.1523/JNEUROSCI.23-27-09240.2003); F.T. Van Vugt and others, 'The Impact of Early Musical Training on Striatal Functional Connectivity', *NeuroImage* a, 238 (2021), 118251, doi:[10.1016/j.neuroimage.2021.118251](https://doi.org/10.1016/j.neuroimage.2021.118251); Oana G. Rus-Oswald and others, 'Musicianship-Related Structural and Functional Cortical Features Are Preserved in Elderly Musicians', *Frontiers in Aging Neuroscience*, 14 (2022), 807971, doi:[10.3389/fnagi.2022.807971](https://doi.org/10.3389/fnagi.2022.807971).

⁵⁵ Lambros Malafouris, *How Things Shape the Mind* (MIT Press, 2013).

Merleau-Ponty's phenomenology,⁵⁶ 'the mind is not limited by the skin'.⁵⁷ Malafouris proposes a permeable connection between creator (performer) and thing, whether prehistoric tool, musical instrument, or technical device. An emblematic example of permeability, theorized by Malafouris's collaborator, clinical psychologist-turned-potter Paul March, is the relationship between the potter and the clay. The relationship is one of intermediation rather than the potter feeling they manipulate the clay. 'Sculptural forms', Martin says, 'seem to arise directly from the interaction between my body (eyes, arms and hands) and the clay. It feels like the clay and I create something together.'⁵⁸ Technicians describe a similarly porous, plastic relationship with the piano, facilitated by the connection between their fingers and the body of the piano being perceived as one of sensation and vibration rather than conscious thought. As two of many examples of plasticity in the current study, Kershaw visualizes his hands building sound, and William, through his technical expertise, becomes the hands of the performer. Their experience is of crossing perceptual boundaries from the physical and aural to the visual and spatial with body, piano key, hammers, or remembered sound as medium. Their minds flow into the body of the piano, as the pianos seem to lure them towards ever greater feats of imagination.

Conclusion

This study examines the relationship between two highly skilled people, technicians and pianists, with different, but complementary skills working towards a common goal, mediated by a non-human (the piano) that is perceived to have its own agency and is a much-loved thing. Offered largely from the perspective of psychology, but with a nod to interdisciplinary practices engaged by musicologists, the findings invite exploration of similar conjunctions across many other kinds of music production whether live, streamed, synthesized, or produced by AI.

The material uncovered here has also shown the potential for concepts and qualitative analytical approaches derived from the social sciences to enrich humanities research. Interviewing techniques are used in ethnomusicology, of course, but the systematic aspect of IPA, that tries to collect and process data collected as neutrally as possible (whilst recognising absolute neutrality is impossible), has the potential to make what is thought familiar appear newly strange. Pianos are one of the most apparently over-observed objects of musical colonial culture and yet this study offers new insight into how they are regarded by a previously largely overlooked class of people, the highly skilled technicians who care so faithfully for these magnificent exemplars of a different age.

⁵⁶ Maurice Merleau-Ponty, *The Visible and the Invisible*, trans. by Alphonso Lingis, ed. by Claude Lefort (Northwestern University Press, 1968).

⁵⁷ Lambros Malafouris, 'Thinking as "Thinging": Psychology with Things', *Current Directions in Psychological Science: Journal of the American Psychological Society*, 29.1 (2020), pp. 3–8, (p. 4), doi:10.1177/0963721419873349.

⁵⁸ Paul Louis March, 'Playing with Clay and the Uncertainty of Agency: A Material Engagement Theory Perspective', *Phenomenology and the Cognitive Sciences*, 18 (2019), pp. 133–51 (p. 134), doi:10.1007/s11097-017-9552-9.