Investigating Professional Classical Guitarists' Performance-Related Musculoskeletal Disorders: Exploring Lived Experience & Evaluating a New Guitar Support

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Abstract

Specialist musical training frequently does not prepare guitarists for the high physical demands of professional careers, leaving them at higher risk of developing playing-related musculoskeletal disorders (PRMDs). Among professional musicians, injuries remain 'hidden' as musicians are reluctant to discuss them for fear it would jeopardise their career. The over-arching aim of this thesis is to gain further insight into professional classical guitarists' lived experiences of PRMDs, an area of research that is currently under-explored. Quantitative studies carried out in Australia, Great Britain, Europe, and the United States show the prevalence of overuse injuries among classical orchestral musicians. However, far fewer studies focus on classical guitarists, and extant research literature contains inconsistencies in epidemiology, definition, and assessment of injury type, location, severity, and duration, that hamper understanding. Given the guitar's popularity there has been surprisingly little work carried out to understand and mitigate PRMDs among this population, and the experiences of musicians themselves (a valuable source of potential insight) remain under-researched. This thesis offers a critical examination of the societal and physiological risk factors that contribute to PRMDs and the ways they are currently addressed by music education, together with an empirical study of the lived experiences of overuse injuries among professional classical guitarists. To highlight professional performing guitarists' perspectives on PRMDs, semi-structured interviews were carried out with eight participants and the resulting data subjected to Interpretative Phenomenological Analysis (IPA). A second empirical enquiry centred on ways to reduce and/or prevent overuse injuries via the introduction of a bespoke intervention; an innovative guitar support, functioning as an integrative 'prosthesis', rather than external attachment. The lived experience of its use was examined through accounts of guitarists who tested it for two weeks. Data generated by the first study was split into two data subsets: musicians' focal hand dystonia (mFHD), and posture-related pain. Findings from this first study confirm that there is a culture of silence amongst professional classical musicians living with injuries, which

hinders the dissemination of helpful information. It also shows that this is commonly accompanied by a distrust of medical professionals. A musician's identity is strongly intertwined with their instrument, so being unable to play is psychologically devastating. Musicians do not appear to learn what the body needs for healthy and optimal function until they are injured, but crucially, both psychophysical and psychosocial factors can contribute to the development of mFHD. This neurological impairment of mFHD can terminate a career by robbing the musician of control of a finger or whole hand. Onset patterns, symptoms, and treatment needs of mFHD vary. Regarding the second data subset, although the role of posture in low back pain is controversial, this thesis shows that 'improved' posture can drastically reduce back pain in classical guitarists. Findings from the second study indicate that guitarists are open to trying different guitar supports that do not require changes to the guitar itself, with limited data supporting the idea mentioned above - that 'improved' posture can reduce back pain. In conclusion, this thesis informs and enhances theoretical understanding of some of the risk factors for developing PRMDs by drawing on sports rehabilitation literature and health research, alongside phenomenological insight into guitarists' first-hand experience of over-use injuries. These insights could be used to inform the design of music performance education curricula that focus on the health and longevity of not just classical guitarists, but musicians in general.

Table Of Contents

List of tables

List of figures

Declaration:

I declare that this thesis has been composed by myself and that the work has not been submitted for any other degree or professional qualification. I confirm that the work submitted is my own, except where work which has formed part of jointly authored publications or published works has been included.

Thesis Guide

This PhD provides an interdisciplinary synthesis, combining insights from psychology, sports rehabilitation, anatomy, and ergonomics with interpretative phenomenological analysis of semi-structured interviews. This thesis is divided into five chapters. Three empirical chapters form a practical core (chapters 2, 3, and 4), which is framed by the broader theoretical discussion of chapters 1 and 5.

Chapter 1 draws on existing literature to demonstrate the high level of injury prevalence among elite and professional musicians, and to illustrate the common injury types. This is followed by an overview of methodological issues in musicians' performance-related musculoskeletal disorder (PRMD) research, including a review of the literature surrounding musicians' task-specific focal hand dystonia (mFHD). The critique indicates the need for an investigation of what it is like to experience an injury as an elite classical musician – the lived experience of such injuries. It suggests that exploration of the musicians' understanding of interaction between self, situation and environment with relation to 'real-world' naturalistic contexts yields richer empirical data concerning the phenomenology of chronic injury than studies which are solely laboratory- or questionnaire-based. The chapter concludes by introducing the research focus and research questions of the thesis.

Chapters 2 and 3 cover the first empirical study, exploring the lived experience of professional classical guitarists with PRMDs. Chapter 2 discusses mFHD, while chapter 3 examines posture-related pain. Both employ interpretative phenomenological analysis (IPA) of semi-structured interview data concerning experiential phenomena retrospectively recalled by participants (four in each chapter), with relation to both relatively recent and distant past experiences, to identify and discuss main

phenomenological themes.

Chapter 4 is informed by the findings of chapters 2 and 3, and comprises the second empirical study: a pilot project intervention that gives initial insight into the lived experiences of professional guitarists testing a prototype guitar support. This support was designed to address a number of issues highlighted by chapters 2 and 3. The trial used a pre-post study design with mainly open-ended questions. Finally, a retrospective data analysis was carried out on responses to public videos stemming from this thesis.

Chapter 5 synthesises the themes from all chapters and addresses the research questions set out in chapter 1. It begins by revisiting the research questions from the end of chapter 1, before discussing other important points raised by this investigation that were not directly related to those questions. The chapter ends with observations concerning the limitations of the current study, together with suggestions for future directions.

Glossaries 1, 2 and 3 contain abbreviations, initials, and terms used throughout this work.

Chapter 1: Overview of Musicians' Performance-Related Musculoskeletal Injuries

1.1 Introduction

The phenomenon of performance-related injuries amongst elite musicians is widespread, under-reported and poorly understood. In the case of the classical guitar, the tension between the traditions of the instrument and the needs of individual players contributes to the development and maintenance of performance-related musculoskeletal disorders (PRMDs), as will be shown in chapter 3. The over-arching aim of this thesis is to explore professional classical guitarists' lived experience of PRMDs. A subsidiary aim is to better understand the aetiology of classical guitarists' PRMDs in the hopes that better understanding may facilitate prevention by informing the development of music performance curricula. Thus far, numerous physiological causes for PRMDs have been identified, but there is less research on the impact of psychosocial factors on musicians' health. Therefore, this thesis begins with a critical examination of existing PRMD literature that summarises what is known, to demonstrate how severe and widespread the issue is, while also highlighting certain gaps in our understanding relating to classical guitarists' injuries. This is followed by a two-stage empirical inquiry: the first stage centres on a qualitative investigation of the lived experience of musicians' performance-related problems, inclusive of but not solely relating to pain conditions; the second stage broadens the inquiry by exploring the experiences of guitarists testing an innovative guitar support that attaches semi-permanently to the guitar. This is the first study to evaluate musicians' experiences of using a guitar support device that includes participant guidance on posture in order to achieve an optimum posture whilst playing classical guitar. Additionally, a retrospective data analysis was carried out on responses to public videos stemming from this thesis. To situate these empirical inquiries within a broader frame of reference, this chapter begins with a review of literature pertaining to performer's health, covering injury prevalence in classical musicians in general and

how it compares to prevalence among guitarists. I also cover common injury types and guitarists' injury sites. This literature overview and critique of key themes provides the platform for the introduction of the research questions which structure this study.

1.2 Research on musicians' health: a review

Practitioners and researchers in the field of performers' health face various fundamental challenges, such as clearly defining 'health' (Clift and Hancox 2001: 249). According to the World Health Organization (WHO), health is defined 'as a complete state of physical, mental, and social well-being, not just the absence of disease' (World Health Organisation 2023a). It can be argued that being healthy is more than just the absence of unpleasant symptoms; there are other factors to consider, such as 'fitness, personal well-being (mental, emotional, social and spiritual), sense of purpose, empowerment and quality of life' (Clift and Hancox 2001: 249). Perhaps this is where 'health' starts to overlap with 'quality of life' and the difference between merely 'being alive' and 'living life' exists. This highlights the interconnectedness of physiological, psychological and social factors in developing a healthy life, and contributes to understanding the impact that injury can have on musicians [1].

There are various models attempting to explain and understand the causes of illness and how people respond to the threat of illness, presented here in simplified form. A definition used by scholars to distinguish between disease and illness as follows:

> Disease is defined as an objective biological event involving the disruption of specific body structures or organ systems caused by either anatomical, pathological, or physiological changes. In contrast, illness refers to a subjective experience or self-attribution that a disease is present. Thus, illness refers to how a sick person and members of his or her family live with, and respond to, symptoms of disability.
>
> (Gatchel *et al.* 2007: 582)

[1] See 2.3.2.ii GETs: Professional identity and 2.4.2 Identity.

As such, 'illness' relates to a wider state of wellbeing rather than a specific biological event. It may therefore often be overlooked in professional musicians' lives, since it can be a highly stressful occupation [2]. From the Renaissance it was believed that the body and mind function as separate systems, and that the root of all disease and illness could be found in one of those systems. The 1970s brought the recognition that illness could have roots in biological, psychological, and societal factors. Thus, the Biopsychosocial model (BPS) was developed to understand causes of illness (Gatchel *et al.* 2007: 582).

Two key models that deal with people's response to the threat of disease or illness are the Health Belief model (HBM) and the Stages of Change model (SoC). The HBM 'was developed in the 1950s by psychologists … and has become one of the most widely recognized conceptual frameworks of health behavior [*sic.*]' (Green *et al.* 2020: 1). It posits that individuals 'conduct an internal assessment of the net benefits of changing their behavior [*sic.*], and decide whether or not to act' (Green *et al.* 2020: 1). It identifies four stages of assessment: perceived susceptibility to a particular health problem; perceived seriousness of the condition; belief in effectiveness of the new behaviour; perceived barriers to taking action (Green *et al.* 2020: 1). The process of making changes is addressed in the SoC, which was introduced in 1982 for smoking cessation (Green *et al.* 2020: 2). It identifies the following stages: precontemplation (has not considered quitting); contemplation (recognises the need to quit); preparation (is thinking about quitting); action (has stopped smoking for less than six months); maintenance (has not smoked for 6 months or more; relapse (Green *et al.* 2020: 2). More recently, the concept of self-efficacy (the perceived ability to take a recommended action) was incorporated into the SoC model (Green *et al.* 2020: 1). The SoC can be adapted to suit any behaviour that needs to be changed to aid recovery from a condition, for example, a musician's practice habits that cause injury and reinjury. These three models (BPS, HBM, SoC) will here be used as a framework to better understand musicians and the processes of injury and recovery.

Many injuries experienced by musicians are well-studied (albeit sometimes poorly understood) in other professions - from athletes to truck drivers to office workers. These last two categories are most similar to classical guitarists, the majority of whom sit to play. Back pain amongst sedentary workers is

[2] See 2.3.4.i GETs: Over-working.

commonplace, affecting psychophysiological functioning, and has been reported for centuries. In 1713 Ramazzini described various problems, including back pain, for those whose job involved prolonged standing or sitting (cited in Franco 2001: 1380). In the 1980s it was reported that nearly half of the industrialised world had a back complaint (Mandal 1981: 19). More recently, the prevalence of low back pain is being reported amongst sedentary office workers at a rate of at least 33% (Janwantanakul *et al.* 2008: 436; Omokhodion and Sanya 2003: 287) with some surpassing 60% (Harcombe *et al.* 2009: 437; Spyropoulos *et al*. 2007: 651). Reports from other seated occupations include truckers at 17.6% (Guo *et al.* 1999: 1030) and dentists between 36.3% and 60.1% reporting back pain (Hayes *et al*. 2009: 159). The seated athletic pursuits that are comparable to musicians are kayaking and white-water rafting, in which the legs are relatively static while the arms are actively engaged. Here, 20.8% of kayaking guides have reported 'back pain lasting longer than 1 week' (Jackson and Verscheure 2006: 162). The causative relationship between sitting behaviour and back pain remains controversial and is both supported and challenged by evidence in the literature (Bontrup *et al.* 2019: 1). Despite this, a key contributing factor seems to be prolonged static positions [3].

Another condition that affects people across diverse occupations are overuse injuries. Even though the dangers of repetitive hand movements in clerks were reported as long ago as 1713 (Ramazzini in Franco 2001: 1380), there was a rapid increase in cases near the end of the 20th century. They were labelled 'repetition strain injuries' and were initially reported to affect typists in Australia (Hopkins 1990: 365). This was treated with much scepticism and labelled 'kangaroo paw' (Hopkins 1990: 365), but by the mid 1990s newspapers around the world were running stories about the epidemic of repetitive strain injuries (RSI) (MacEachen 2005: 490) and 'RSI became a household expression' (Hopkins 1990: 365). Its exponential increase is believed to have coincided with the introduction of new word-processing equipment and the increased work pressures that accompanied this change, while its decline was brought about by workplace strategies designed to prevent the occurrence of RSI (Hopkins 1990: 366). Andersen *et al.*'s study of 5,658 computer workers reports prevalence rates of possible carpal tunnel syndrome (CTS) cases

[3] See 4.2 Investigating posture & pain.

at up to 4.8% (Andersen *et al.* 2003: 2966). Lassen *et al*.'s study (2004: 526) of 6,943 office workers found pain problems between the elbow and hand to be at almost 1%. Common office-worker conditions such as carpal tunnel syndrome are also experienced by musicians [4], yet it is only the former who received prioritised solutions (e.g. the redesigned mouse). Despite Ramazzini's documentation of musicians' injuries in 1713 (in Franco 2001: 1380), the field of performing arts medicine did not officially start until 1983, 270 years later (Manchester 2012: 55; National Library of Medicine, n.d.).

The intersectionality of activities of daily living (ADL) and being a musician must also be considered: if the serious hobbyist or aspiring professional sustains a PRMD, it might prevent them from carrying out their day job since activities such as carrying boxes, opening doors, and typing all become awkward with back or wrist pain. For the full-time professional musician[5], it could be catastrophic since they are not eligible for benefits in some countries such as Canada (Guptill 2010: 273; Zaza 1998: 1020), and musicians' injuries can last years (Dhrithi *et al.* 2013: 2; Zaza 1998: 1020). Many suffer 'for a large part of their careers' (Roset-Llobet 2000: 173) with symptoms ranging from temporary discomfort which resolves spontaneously with minimal treatment, to pain that prevents musicians from using that body part for any activity (Lockwood 1989: 221). Participants in this thesis reported that their condition affected their ability to perform daily tasks such as writing [6], or getting out of bed [7].

1.2.1 Injury prevalence in the general musician population

Although this thesis centres on the lived experience of classical guitarists with PRMDs, certain statistics shall be discussed to show the prevalence of the PRMD phenomenon. It is also beneficial to consider prevalence statistics of players of instruments other than guitar for comparison. Overuse injuries are common among elite [8] musicians and can happen at any stage of someone's music career, although a survey of high-level musicians carried out in 1985 found that the onset of serious musculoskeletal problems

[4] See 1.2.2 Injury types among musicians.
[5] For the purposes of this thesis 'professional musician' is defined as someone who earns money from playing. Since this is about classical musicians, an elite level of playing is also assumed.
[6] See 2.3.1.i GETs: Onset.
[7] See 3.3.1.iv GETs: Symptoms
[8] For the purposes of this thesis 'elite musician' is defined as someone of a very high technical level but not necessarily earning money from performing. 'Professional musician' is defined as someone who earns money from performing, therefore, since this is about classical musicians, an elite level of playing is also assumed.

typically occurred after about 12 years of playing (Caldron *et al*. in Berg 2008: 8). Pascarelli asserts that 'many prominent careers are prematurely terminated by injuries that could be prevented with proper exercise and instruction on anatomical correct technique' (in Quarrier, 1993: 93), while Upjohn, writing about her experiences as a physiotherapist at a school for musically gifted children, reports that the 'severity of the injuries seen at the school ranged from inconvenient to career ending' (2013: 33), suggesting that health and longevity information should be better implemented at the earliest stages of training.

Statistical evidence shows high prevalence rates of injury in the orchestral population. Quantitative studies covering a total of 2,900 orchestral musicians across Europe and Britain (table 1) found that 30% of children under the age of 17 reported a PRMD, while in conservatoires it ranged from 48% to 79.7%. In professional orchestras prevalence figures range from 40% to 86.4% (Cruder *et al.* 2018: 53-55; Gasenzer *et al*. 2017: 6; Sousa *et al.* 2016: 8; Berque *et al.* 2016: 78; Steinmetz *et al*. 2015: 965; Ackermann *et al.* 2014: 7; Ranelli *et al*. 2011: 28; Kreutz *et al.* 2008: 3). This data suggests that injuries become more prevalent with time. Only three surveys reported numbers on the quantity of injury sites per musician. They all report more than one complaint in over 40% of participants (Berque *et al.* 2016: 82; Steinmetz *et al*.

Authors	Year	Sample Size	Professional Level	Location	Age Range
Gasenzer *et al.*	2017	740	Professional orchestral	Germany	46.4 years SD = 9.5
Ranelli *et al.*	2011	731	Government schools	Australia	7-17 years
Steinmetz *et al.*	2015	408	Professional orchestral	Germany	undisclosed
Ackermann *et al.*	2014	377	Professional orchestral	Australia	42 years (SD = 10.2)
Kreutz *et al.*	2008	273	Conservatoire	England	undisclosed
Cruder *et al.*	2018	158	Conservatoire	Switzerland England Scotland Wales	Mean: 22.4 Range: 17-41
Sousa *et al.*	2016	112	Professional orchestras	Portugal	undisclosed
Berque *et al.*	2016	101	Professional orchestral	Scotland	47.7 SD = 10.4

Table 1: Demographic information about orchestral injury studies

2015: 965; Kreutz *et al*. 2008: 7). This shows that pain commonly affects multiple body parts of individual musicians. Even so, data on how many musicians have terminated their career due to injury is extremely sparse, and is an area that needs further investigation.

Even the most conservative figures from these studies should be enough to cause concern, but why there is such variation is not clear. Some possible explanations are: quantifying pain is a complex task; it can be difficult to distinguish between the discomfort associated with endurance training adaptations and chronic, recurring, or intermittent pain; musicians do not want to talk about their injuries, even anonymously; some articles do not make a clear distinction between point prevalence and lifetime prevalence. These issues will be discussed below [9].

1.2.2 Injury types among musicians

The injuries experienced by musicians are neither new, nor unique to those populations, being comparable to work-related disorders in other sectors (Berque *et al.* 2016: 78; Ranelli *et al*. 2011: 30; Zaza *et al*. 1998: 2013; Lambert 1992: 265). Thus far, seven categories of PRMDs have been identified:

1. **Overuse injuries to muscles, tendons and/or ligaments** (Valenzuela-Gómez *et al.* 2020: 892; Marić *et al.* 2019: 1118; Bosi 2018b: 2; Gembris *et al.* 2018: 5; Topoğlu *et al*. 2018: 118; Poore 1887: 442), which are the most usual (Silva *et al.* 2015: 8; Lee *et al*. 2012: 85). Common locations for these pain complaints would be the fingers, wrists, elbows (e.g. tennis elbow [10] or golfer's elbow [11]), or postural muscles of the shoulders, neck and back;
2. **Overuse injuries to joints**. Osteoarthritis is the most common bone-related condition found in the literature on musicians. However, most quantitative studies do not include specific information about types of such injuries (Bosi 2018b: 3; Gembris *et al.* 2018: 5; Ranelli *et al*. 2011: 28; Storm 2006: 894);
3. **Nerve entrapments**, which can cause a spectrum of symptoms such as pain, paraesthesia [12], weakness, or numbness (Valenzuela-Gómez *et al.* 2020: 892; Marić *et al.* 2019: 1118; Gembris *et al.*

[9] See
[10] AKA lateral epicondylitis.
[11] AKA medial epicondylitis.
[12] Tingling.

2018: 5; Ioannou and Altenmuller 2015: 135). Carpal tunnel syndrome (CTS) is most commonly caused by local nerve impingement at the wrist (Bosi 2018b: 2; Lambert 1992: 267), however, the same symptoms can be caused by entrapment of nerves at the elbow or shoulder (Myers 2009: 149; Lambert 1992: 266);

4. **Hearing loss or tinnitus** (Gembris *et al.* 2018: 5), which is not a common risk factor for classical guitarists since sound levels tend to be comparatively low;
5. **Compartment syndromes**, which are thought to be caused by tight fascia (the connective tissue surrounding muscles) not being able to stretch or expand during intense repetitive activity that increases blood volume in the muscles. Over time, increases in muscle bulk may add further pressure to the fascia causing pain by increasing pressure on nerves and blood vessels (Winkes *et al.* 2016: 1; Storm 2006: 894; Lambert 1992: 267);
6. **Central nervous system (CNS) fatigue**. Over-working can result in an overload of the CNS, eventually leading to fatigue, which is defined as a perception of increasing effort needed to sustain a submaximal task (Tornero-Aguilera *et aI*. 2022: 3909). This could be felt as local muscle weakness or generalised fatigue and/or tiredness and could persist even during periods of rest (Knicker *et al.* 2011: 313). Symptoms differ depending on the activity, individual, and environment (Knicker *et al.* 2011: 322) but could include declining speed and diminished accuracy of technique (Knicker *et al.* 2011: 315-16). This is not discussed in musical performance research, partly because it is such a new field, but also because measuring CNS fatigue poses many challenges and is not clearly defined (Knicker *et al.* 2011: 322; Davis and Bailey 1997: 8);
7. **Dystonia**, a condition causing muscle spasms or unwanted tension, producing undesirable movements or positions (Hallett 2011: 1; Standaert 2011: 148; Quartarone 2011: 166). Although it is thought to be one of the rarest PRMDs, estimated to affect 1% of professional musicians, it can be career-ending (Altenmüller and Jabusch 2010: 31; Münte *et al.* 2002: 476). Further information on this condition can be found in 1.2.5 Musician's focal hand dystonia.

1.2.3 Injury prevalence among guitarists

Although this thesis uses qualitative methodologies to focus on the lived experience of professional

classical guitarists with PRMDs, it is necessary to summarise the literature on guitarists' injury prevalence to understand the extent of the situation, and therefore, how important this topic is. Unfortunately, the question of how widespread this problem is among classical guitarists remains unanswered for two reasons: Firstly, there are only a few quantitative studies covering plucked strings, with classical guitar as a subset and few details provided; Secondly, existing studies use different methodologies and do not provide comparable data, as shall be discussed below. Although the data on PRMDs among classical guitarists is sparse and often lacking detail, the overall data indicates high levels of prevalence of such injuries.

Only two of these studies focus on classical guitarists, and the numbers they provide are very different. It is noteworthy that the study focusing on entrants in an international competition about the preceding five years reports much lower figures than the one with broader inclusion that covers a shorter period. Why this is so is unclear. Zuhdi *et al*.'s 2017 study used 190 classical guitarists with an average playing time of 20 years. They were contacted through the National Association of Schools of Music (NASM) and other public organisations including magazines in the United States (Zuhdi *et al*. 2017). The overall prevalence of PRMDs within the preceding year was 88.9% (Zuhdi *et al.* 2020: 167). Sánchez-Padilla *et al.* (2013) took data from 40 participants in an international guitar competition in Barcelona [13] and found that 67.5% had PRMDs within the preceding five years (Sánchez-Padilla *et al.* 2013: 243, translation: Bonner). These two studies give very different numbers, but still provide an estimate regarding prevalence rates of injuries among classical guitarists.

Another study included classical guitarists as a subset of musicians playing plucked strings. Fjellman-Wiklund and Chesky's survey of 520 pluckers contained only 6% classical guitarists (Fjellman-Wiklund and Chesky 2006: 171), which could be anything from 29 to 33 players. This study analysed data taken from the University of North Texas Musician Health Survey and included acoustic, electric and bass guitars as well as banjo (Fjellman-Wiklund and Chesky 2006: 169). They found 81% of the whole group reported PRMDs in at least one body part (Fjellman-Wiklund and Chesky 2006: 171). Although quantities were not provided, they reported that classical guitarists had 'significantly more musculoskeletal problems' than the

[13] Certamen Internacional de Guitarra de Barcelona.

non-classical guitarists (Fjellman-Wiklund and Chesky 2006: 171).

Surveys of non-classical guitarists report similar figures regarding injury prevalence. Rigg *et al.*'s survey of 261 professional, amateur and student guitarists across the United States and Canada covered rock, blues, jazz, and folk (2003: 150). They found that 61.3% experienced a PRMD within the previous year (Rigg *et al.* 2003: 150). Scully surveyed 244 students from the University of Limerick, Ireland, revealing a PRMD prevalence of 46% (Scully 2011: 13), although playing style was not mentioned. 92% of these injuries started more than a year before, 64% of them started earlier (Scully 2011: 14), showing that PRMDs can last a long time when not treated properly. Portnoy *et al*.'s 2022 study was not a quantitative study of prevalence and used different methods of assessment, comparing kinematics when playing seated or standing [14]. Nevertheless, their cross-sectional sample of 25 young adult guitarists in Tel-Aviv, Israel, playing non-classical styles (Portnoy *et al*. 2022: 7) report that all participants had joint pain within the previous year (Portnoy *et al*. 2022: 5). Inclusion criteria were being aged 18–35 and playing for at least five years for at least 20 hours a week (Portnoy *et al*. 2022: 3). They did not state if the recruitment process mentioned PRMDs, making this high incidence unexpected.

Musicians reporting multiple injury locations is mentioned by only two of these six studies. 60% of the injured participants in Scully's survey reported one injury site, 6% had two, 9% had three, 4% had four symptoms, and 1% had more than four (Scully 2011: 18). The high prevalence rates are noteworthy given that over 80% of participants reported practising less than eight hours per week (Scully 2011: 14). Due to Portnoy *et al.*'s study not being statistical, specifics regarding injury locations were not provided, but pain was reported in up to 18 sites per individual (Portnoy *et al*. 2022: 5).

1.2.4 Injury locations among guitarists

Considering the popularity of the guitar, there are surprisingly few studies investigating injury locations among guitarists, and fewer still for classical guitarists. They provide quite different results, but this is only partly explained by the use of different anatomical classifications (e.g. one study separating the hand, wrist, and forearm, while another study groups it all together as 'the arm'). Other reasons are not

[14] See 4.2 Investigating posture & pain.

clear, so more studies are needed to understand this to inform the development of guitar education curricula.

Of the three studies on classical guitarists' and flamenco guitarists' injury locations, findings are rather different. Analysis and explanation are hindered by the incompleteness of the data they provide about participants. Zuhdi *et al*. (2020, table 2) show most complaints are related to the hand, with postural problems far behind, while Marques *et al.* (2003, see table 3) found much higher incidence of pain in the forearm, with postural pain only slightly behind. Sánchez-Padilla *et al.* (2013, table 4) found neck pain to be most common, with back pain significantly less

Injury Location	Prevalence
Left thumb (base)	25.3%
Right upper back	15.3%
Left thumb (back)	14.7%
Left thumb median nerve	13.2%
Right shoulder	11.6%
Left upper back	11.6%
Left 4th finger	8.4%

Table 2: Zuhdi *et al*. 2020

Injury Location	Classical	Flamenco
Pain in the forearm	56.3%	65.6%
Tension in the upper extremities	56.3%	81.3%
Dorsal and cervical pain	53.1%	53.1%
Motor dis-coordination	18.8%	25.0%
Paraesthesia in the fingers	6.3%	6.3%

Table 3: Marques *et al.* 2003

Injury Location	Previous 1 year	Previous 5 years
Neck pain	27.5%	47.5%
Continuous elbow pain	22.5%	No info
Continuous arm & wrist pain	20%	40%
Continuous back & lumbar pain	12.5%	22.5%
Hip pain	No info	17.5%
Knee pain	No info	7.5%

Table 4: Sánchez-Padilla *et al.* 2013

Researcher	Year	Sample Size	Percentage Male/female	Average Age	Average years playing
Zuhdi *et al.*	2017	190	84 / 14	45	over 20
Marques *et al.*	2003	64	75 / 25	32	undisclosed
Sánchez-Padilla *et al.*	2013	40	77 / 25	undisclosed	Over 20

Table 5: Demographic information of guitarists' injury studies participants

common than arm pain. PRMDs affect a wide range of body areas, some are instrument specific and others do not appear to be. An example of this, is that the flamenco guitarists in Marques *et al.*'s study show higher incidence of forearm pain than classical guitarists, which could be explained by the former's use of the distinctive strumming technique called *rasgueado.* Further research into prevalence, predisposing factors, and recovery times are required. Table 5 summarises the available demographic information of the participants in these three studies, where it can be seen that making comparisons is hindered by incomplete data about factors such as average age, playing duration, career stage, posture, practice habits, etc.

The non-classical guitar surveys show similar disagreement in the locations and types of complaint, but again, they vary in the information provided, such as what playing styles were included. Fjellman-Wiklund and Chesky's survey of plucked strings comprised 6% classical guitarists; Rigg *et al*.'s study contained only those playing popular styles; the other four surveys (Scully, Dawson, Roset-Llobet, and Dhrithi) did not disclose styles, making comparisons even harder. Fjellman-Wiklund and Chesky, Rigg *et al*., Scully, Shahanawaz *et al*. and Dawson all show the majority of non-classical guitarists' injuries occurring near the hand, while Roset-Llobet and Dhrithi show postural pain to be more frequent. Nerve entrapments are only reported in two studies (Scully 2011, and Dawson 2013) indicating that they may not be as common as other conditions. Fjellman-Wiklund and Chesky (2006: 173) note that there was a distinct trend for left-sided problems for guitarists, although their reported data shows this is only true from the elbows to the fingers (*ibid.*: 171). It is likely that this is because the left hand, usually the player's non-dominant hand, does most of the work holding notes with more independence of the fingers. This is especially true when a plectrum (also known as a 'pick') is used and right-hand finger dexterity is replaced with wrist motions. With postural muscles the problems were equal or more common on the right (*ibid.* 171). This issue could be attributed to the tendency for guitarists to lean to the left, increasing the strain on postural muscles of the right side. In-depth comparison of data from these studies is hindered by the lack of information such as what types of plucked strings were included, and what styles were played (e.g. fingerstyle or with a plectrum).

Comparing studies on guitarists with other seated, sedentary occupations reveals that the prevalence

of injuries is similar, or higher, among guitarists. These studies report back pain prevalence rates amongst guitarists in the range of 11.6% to 53.1%, which is comparable to that reported for office workers and dentists, which ranges from 33% to 60% [15] (Hayes *et al*. 2009: 159; Janwantanakul *et al.* 2008: 436; Omokhodion and Sanya 2003: 287). The lived experience of back pain is explored in chapter 3. The prevalence of pain problems in the forearm and hand region in office workers is reportedly <1% (Lassen *et al*. 2004: 526). While I have combined the computer-user injuries into the forearm/hand as a whole, no studies on guitarists provided figures on such a large anatomical area: they were all broken down into areas such as 'elbow', 'fingers', or even 'back of thumb'. Even so, the numbers for these smaller areas range from 8.4% to 65.6% in guitarists (see tables 2-4), which is far in excess of the figures provided for the combined forearm and hand region in office workers. Despite the much higher prevalence rates of back and hand pain in guitarists than office workers, it is the latter who have received more attention in the form of studies and interventions.

1.2.5 Musician's focal hand dystonia

1.2.5.1 Background

Musician's Focal Hand Dystonia (mFHD) is a multifactorial and poorly understood condition. Medical literature and case studies provide differing perspectives on causes, treatment, and recovery. There is no gold standard treatment and the condition often remains unresolved, resulting in the termination or drastic change of careers (Lockwood 1989: 221). There are over 60,000 professional musicians in native English-speaking countries [16]. It is estimated that 1% of professional musicians are affected (Altenmüller and Jabusch 2010: 31; Münte *et al.* 2002: 476), with about 30% of mFHD cases resulting in prematurely terminated careers (Ackermann and Altenmüller 2021: 310). The statistics on amateurs are unknown, thus, actual figures may be considerably higher.

Dystonia is a condition where muscles spasm or tense at unwanted times causing unwanted movements or positions (Hallett 2011: 1; Standaert 2011: 148; Quartarone 2011: 166). Symptoms are

[15] See 1.2 Musicians' health research: a review.

[16] Professional musicians by country: 1,560 independent Americans (Statista 2020); 17,451 Australians (Australian Government 2007); 52,000 British: (Statista 2019); 35,000 Canadians (Canada Council 2019); 1,000 New Zealanders (Figure 2018).

classed as primary or secondary. The latter is when the dystonia is caused by another disease such as Parkinson's, but this article discusses the former, with contractions as the only symptom. Primary dystonia can be general, affecting several body parts, but the commonest form of primary dystonia is referred to as focal, wherein only a single body part (such as a hand or finger) is affected (Standaert 2011: 149). There are various ways mFHD can manifest: fingers may move involuntarily; attempting to move one finger will cause others to move in a process called overflow (Hallett 2011: 2); or the movements will be stiff and awkward due to 'simultaneous contractions of agonist and antagonist muscles' (Quartarone 2011: 166). Usually the problem is limited to one hand and only affects the specialist activity, but sometimes the problem spreads to other tasks (Hallett 2011: 2).

The term 'dystonia' was first used in 1911 (Stahl and Frucht 2017: 1536), but cases of mFHD were described much earlier. In Poore's 1887 article he describes 'a tendency, during the exercise of runs and scales, for all the fingers of the left hand to 'run together' ' (Poore 1887: 442), or, in another case: 'the left forefinger would not keep off the keys' (Poore 1887: 442). Bianchi (1876) reported treating a flautist who had 'a kind of torpor in the left arm, accompanied with pervading numbness' and later an 'irresistible hiccough that lasted day and night'. These symptoms were relieved with the application of electrical current, but the inability to control the left ring finger did not respond to this treatment. Injections of strychnine were administered to the forearm every other day for 20 days and the symptoms were permanently cured (Bianchi 1878: 88). Despite the reported success, this treatment does not seem to appear in contemporary literature. It is often said that the pianist Schumann permanently injured his hand in the early 1830s with a device intended to strengthen his fingers, but it is now known that he had mFHD and the device was intended to remedy the problem (Altenmüller and Jabusch 2010: 34; Altenmüler 2005: 179). Around this time, it was noted that clerks in the British Civil Service were experiencing difficulty writing (Stahl and Frucht 2017: 1536). These studies demonstrate that focal dystonia is not new and affects a diverse population.

1.2.5.2 Physiology & aetiology of focal dystonia

With dystonia there are demonstrable changes within the brain, yet it is unknown what the root cause is (Hallett 2011: 1; Quartarone 2011: 167; Bara-Jimenez *et al.* 1998: 830). Since the brain can constantly

adapt, it is theorised that faulty movement patterns change the cortical layout. If, however, the brain map changed and instigated the dystonic motions, that does not explain what caused that rearrangement. It is currently considered multifactorial (Altenmüller and Jabusch 2010: 31).

Around 30 dystonia genes have been identified but, just like with high blood pressure, some people carry these genes asymptomatically (Edwards 2016: 6:30). Certain physiological changes have also been identified in the brain, such as reduced sensory perception (Altenmüller and Jabusch 2010: 32; Bara-Jimenez *et al.* 1998: 830) and distorted sensory feedback. These changes confound accurate movements (Edwards 2016, 22: 15; Rosenkranz *et al.* 2009: 14635). Loss of inhibition in antagonistic muscles (Hallett 2011: 5; Beck *et al.* 2009: 1513) makes joints stiff and immobile (Bara-Jimenez *et al.* 1998: 830). Musicians have greater neuroplasticity than non-musicians in the form of enlarged cortical representations of fingers, increased synaptic quantity and effectiveness, and more grey matter (Rosenkranz *et al.* 2007: 5200), as well as new growth of dendrites and neurons (Münte *et al.* 2002: 476). However, dystonics have extreme levels of neuroplasticity (Edwards 2016, 16:55; Quartarone 2011: 163). A study by Byl *et al.* (1997) gave a repetitive hand task to primates to perform until they developed dystonia. The brain sectors responsible for moving each finger should be 'sharply segregated', but scans of these primates' brains revealed that they had become blurred with dystonia (Byl *et al.* 1997: 269). Scans of eight dystonic human brains revealed that these zones were closer for affected hands (fig. 1, Meunier *et al.* 2001: 523; Bara-Jimenez *et al.* 1998: 830; Elbert *et al.* 1998: 3573) while a different trial including six human patients found the zones to be inverted (fig. 1) in half the cases (Bara-Jimenez *et al.* 1998: 830). Whether dystonic tension patterns alter cortical layouts or vice versa is not understood (Hallett 2011: 1; Quartarone 2011: 167; Rosenkranz *et al.* 2007: 5205; Bara-Jimenez *et al.* 1998: 830). These findings are contested by a more recent study comparing the layouts of nine dystonic

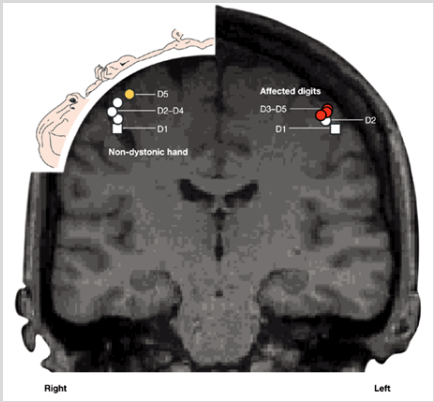

Fig. 1
Brain scans.

Image used with kind permission from: Münte et al. (2002), Nature Reviews Neuroscience

musicians' brains with nine healthy musicians' brains, in which no differences were found (Sadnicka *et al.* 2023: 1511). The reasons for this difference in results remains unclear, since different scanning resolutions does not explain zones being found to be inverted in some brains. Bara-Jimenez *et al.*'s 1998 study only found this inversion in three of the six participants, so it is possible that a sufficient quantity of scans would show the phenomena to be quite rare.

It has been argued that players requiring the highest levels of fine-motor skills are more at risk (Altenmüller and Jabusch 2010: 31) and may have been exacerbated by certain notable events. The first was the emergence of masters like Paganini and Liszt, who pushed technical demands to new limits (Altenmüller and Jabusch 2010: 34). Works by such composers that were first deemed unplayable are now standard repertoire. The second event is more prevalent and is therefore potentially more impactful: digital recording technology (Provost 2019, 8:05; Altenmüller and Jabusch 2010: 35), discussed further in 2.3.4.i and 2.4.4. Both of these societal pressures potentially exacerbate the trend of injuries through increased playing time, repetition, and stress, because people also expect to hear flawless live performances (Provost 2019, 2:57). The over-trained primates in Byl *et al*.'s 1997 study supports the notion that repeated movements contribute to mFHD (Hallett 2011: 2; Quartarone 2011: 166; Altenmüller and Jabusch 2010: 34). This puts classical musicians at risk since they train to recreate musical passages exactly the same, time after time.

Anxiety and mFHD may share a pathophysiological cause. Stress can alter technique at any time (Paraskevas [17]), and those with a tendency toward anxiety and extreme perfectionism may subconsciously latch onto new, wrong, movements (Détári *et al.* 2022: 10). One proposition is that, since music is the only activity where precise timing and co-ordination are combined with intense emotions (Altenmüller and Jabusch 2010: 34), this 'may facilitate the establishment of dystonic movement patterns in patients with perfectionism and anxiety' (Altenmüller and Jabusch 2010: 34). A psychological study of 44 professional musicians with mFHD, 45 healthy musicians, and 44 healthy non-musicians using the State-Trait Anxiety Inventory (STAI) and NEO Five-Factor Inventory (NEO-FFI) found that musicians with mFHD have

[17] See 2.3.4.iv GETs: Psychology.

elevated levels of anxiety and neuroticism (Enders *et al*. 2011: 539). Since they found no correlation between anxiety and mFHD duration, the authors suggest that anxiety and mFHD share a pathophysiological cause rather than anxiety being caused by mFHD (Enders *et al*. 2011: 539). There is also support for the hypothesis that psychological trauma from childhood (such as neglect or abuse) may play a role (Alpheis *et al*. 2023: 23; Détári 2023: 2; Scheider *et al*. 2021: 1).

1.2.5.3 Focal dystonia treatments

If an individual were recently diagnosed with mFHD they might turn to readily accessible medical sources but receive a gloomy prognosis: **'**It's usually a lifelong condition. It may get worse for a few years but then remain steady. Occasionally, it can improve over time' (National Health Service 2018). However, there are several treatments that show promise, some of which are publicly available. A summary is given below, so that they may be compared to the accounts of recovered and recovering dystonics in chapter 2, particularly when those accounts discuss entrusting care to medical professionals.

Some treatments are complex or require varying amounts of specialised equipment. The most invasive treatment is the thalamotomy: burning a lesion in the thalamus [18]. Some patients have returned to professional playing after surgery, showing no relapse years later (Horisawa *et al*. 2013: 650). This option carries considerable risks as a mistake can result in paralysis (Horisawa *et al*. 2013: 653), which would be worse than dystonia since parts of the hand may be rendered unusable for ADL. Thalamotomies can also be performed with a gamma knife, a form of targeted radiation therapy, which carries far lower risks (Horisawa *et al*. 2017: 89; Stahl and Frucht 2017: 1539). Injections of botulinum toxin [19] into the affected muscles is not a cure, merely a temporary way of 'switching off' dysfunctional muscles, but it works for less than 69% of patients (Horisawa *et al*. 2013: 652). Long-term usage is only effective for 36% (Horisawa *et al*. 2013: 652). Side effects such as weakness are possible (Horisawa *et al*. 2013: 652) and injections need to be repeated every three months but developing tolerance is possible. According to a study of 12 dystonic musicians compared to 12 healthy ones in which forearm muscles in the affected arm were

[18] An area near the centre of the brain.
[19] AKA botox.

measured with ultrasonography and compared to the unaffected arms, muscle belly thickness and power output were decreased by 10.6% (± 5.3%) and 12.5% (± 6.4%) respectively by treatment with botox. The amount of atrophy was proportional to the amount of botox received, but even 3.5 years after the last injection, atrophy was not fully reversed (Ioannou *et al.* 2023: 296). This potential long-term reduction of function may not be considered acceptable by some musicians. There are drugs affecting neurotransmitters, which increases the inhibition of opposing muscles (Hallett 2011: 9). Unfortunately, medication cannot help everyone and side effects differ between patients (Edwards 2016, 13: 49). Repetitive transcranial magnetic stimulation (rTMS) has been used to manipulate electrical signals in the brain to increase inhibition (Hallett 2011: 9) with varying degrees of success (Kimberley *et al.* 2015: 9; Borich *et al.* 2009: 55). Transcranial direct current stimulation (tDCS) has been paired with simple bimanual mirrored motions performed as evenly as possible on the piano (Furuya *et al*. 2014: 701). While some participants retained improvements after 4 days (Furuya *et al*. 2014: 705), it is unclear how effective this method is in the long term due to lack of follow-up (Furuya *et al*. 2014: 707). Using vibrations as part of a proprioceptive training programme (Hallett 2011: 10; Rosenkranz *et al.* 2009: 14627) yielded improvements in dystonic pianists, but it is not clear how long these effects last. There is also proprioceptive deep tendon reflex (P-DTR), which claims to reset neuromuscular dysfunction through stimulating paired receptors (Palomar 2014: 9-10), but information on this method is beyond sparse and not peer reviewed. These treatments show varying amounts of efficacy, as well as having a wide range of risks from muscle atrophy to paralysis.

Retraining is a promising mFHD treatment and is non-invasive, but there is not yet enough research to standardise treatment methods (Ackermann and Altenmüller 2021: 310). One such method involves splinting the hand to allow the player to use only certain dystonic fingers, which usually allows the affected finger(s) to move more independently (Berque *et al*. 2010: 153), although this did not work for Schumann (Altenmüller 2005: 179). Speed is increased fractionally only when passages can be played with full control (Berque *et al*. 2010: 153). Later, a second strategy can be added: pieces of music that normally trigger abnormal movements are slowed down to the point where they can be played with control. Speed is increased by 1 or 2 metronome increments each week if the musician is still in control (Berque *et al*. 2010: 153-154). Another trial used this second method only (Sakai 2006: 25), and both methods brought

promising results. Whereas the treatments mentioned previously can be categorised as medical interventions, these two methods trialled by Berque *et al.* and Sakai are forms of musical retraining. The participants in chapter 3 used musical retraining successfully, although their methods had different focuses to the abovementioned strategy of playing very slowly.

Medical literature and case studies provide differing perspectives on aetiology, treatment, and recovery. However, they do not tap the phenomenology (subjective experience) of mFHD. This empirical study aims to explore the lived experience of professional classical guitarists with mFHD through interpretative phenomenological analysis in chapter 2. This yields insights into other treatment methods that, to the best of my knowledge, are not mentioned in the literature.

1.2.6 Musicians' injury risk factors

PRMDs have a complex and multifactorial aetiology, with factors that may interweave and contribute to each other. Although it is beyond the scope of this thesis to discuss all the risk factors that have been identified in PRMD literature in depth, a brief discussion will be useful to further situate this project in the wider field, although this list may not be fully comprehensive. The risk factors can be grouped into three categories: non-modifiable intrinsic factors; modifiable intrinsic factors; extrinsic factors.

Non-modifiable intrinsic factors include: Genetics (Edwards 2016: 6:30), possibly including factors such as abnormal brain plasticity – see 1.2.5.ii Physiology & aetiology of focal dystonia; Anatomical morphology, or the proportions of an individual's bodyparts (Abreu-Ramos and Micheo 2007: 97; Bruser 1999: 73) - including factors such as playing an instrument that is too large for the individual; Growth spurts during adolescence (Upjohn 2013: 36; Bruser 1999: 73), which change the mechanics of playing due to changing limb proportions.

Modifiable intrinsic factors include: Poor posture, see 3.3.1.iii GETs: Posture, and 3.4.1 Embodiment; Static positions, see 3.1 Introduction, and 3.4.1 Embodiment; Excess effort (Ackermann 2004: 669-670; Culf 1998: 20-23), which includes tension, see 2.3.1.ii GETs: Awareness; Poor interoception, the awareness of the sensations and movements of one's own body (Price and Hooven 2018), see 2.3.1.ii GETs: Awareness, and 2.4.1 Embodiment; Poor phsyical condition (Ioannou *et al.* 2018: 27; Blanco-Piñeiro et al 2017: 1; Abreu-Ramos and Micheo 2007: 97-98), see 3.4.1 Embodiment; Stress, see 2.3.4.iv GETs:

Psychology; Delayed treatment (Zięba *et al.* 2019: 118; Zięba *et al.* 2019: 116**;** Gasenzer *et al.* 2017: 7; Lee *et al*. 2012: 85; Culf 1998: 20-23) - there are several reasons a musician may delay seeking treatment, see 5.1.3 Societal & physiological risk factors for PRMDs.

Extrinsic factors include: Pressure, which could come directly from teachers (Guptill 2010: 276), or from other implicit societal sources such as digital recordings - see 2.3.4.i GETs: Over-working, and 2.4.4 Attribution; Poor practice habits, which includes not taking sufficient breaks (Marić *et al.* 2019: 1118; Chan *et al.* 2014: 181; Culf 1998: 20-23), or ignoring pain (Leisner 2018: 5; Ioannou and Altenmuller 2015: 140); Daily practice volume - durations of up to ten hours per day have been reported (Portnoy *et al*. 2022: 5; Gasenzer *et al.* 2017: 7; Savino *et al*. 2013: 859; Quarrier 2011: 329); New repertoire (Rietveld 2013: 431; Abreu-Ramos and Micheo 2007: 97), due to the additional practice time it may incite; Too much repetition (Marić *et al.* 2019: 1118; Zięba *et al.* 2019: 116; Overton *et al.* 2018: 32; Gasenzer *et al.* 2017: 7; Chan *et al.* 2014: 181; Dhrithi *et al*. 2013); Increased playing time (Quarrier 2011: 32; Abreu-Ramos and Micheo 2007: 102); A new teacher (Rietveld 2013: 431), due to the additional practice time they may incite, or changes to technique; Teaching style - instrument teaching traditionally follows the 'master and apprentice model', which has been criticised - see 3.3.2.i GETs: Education & Learning; A new instrument (Rietveld 2013: 431; Abreu-Ramos and Micheo 2007: 97; Ackermann 2004: 669-670), due to the additional practice time it may incite, or because the proportions and/or dimensions are slightly different to the previous instrument.

In line with the Biopsychosocial model of health and illness (BPS, Wade and Halligan 2017) [20], risk factors identified so far include physical, psychological and societal. This thesis addresses some of these physical risk factors, such as poor interoception, and posture. Despite being mentioned more than a decade ago by Guptill (2011: 84), to the best of my knowledge there is currently more research on the physical risk factors, their aetiologies and treatments, and less on psychosocial elements. Therefore, this thesis also addresses some of the psychological and societal factors, such as stress and pressure.

[20] See 4.2 Investigating posture & pain, and 5.1.2 Framing lived experience: how existing health & illness models fit musicians with PRMDs.

1.3 Methodological issues in PRMD research

A key difficulty in assessing the extent of injury prevalence is that research studies use different methodologies and definitions. To address this issue, in 1998 Zaza *et al.* recruited a panel of English-speaking Canadian high-level classical musicians to develop and refine a definition of performance-related musculoskeletal disorders (Zaza *et al*. 1998: 2013). They settled on 'pain, weakness, lack of control, numbness, tingling, or other symptoms that interfere with the ability to play at the accustomed level' (Zaza *et al*. 1998: 2016). Not all recent studies state the use of this definition, so might unknowingly inflate figures by including transient problems that go away without treatment, or pain that does not affect playing level. However, a meta-analysis found that including all pain levels only increased the prevalence rates from between 25.8% and 84.4% to 29% and 90% (Silva *et al.* 2015: 8), which may not be very significant. Since small pains can develop into injuries, including them would be useful for a better understanding of how PRMDs develop, but the distinction should be made for clarity. Among the studies of classical musicians, Marques *et al.* (2003) and Sánchez-Padilla *et al.* (2013) adhere to Zaza *et al*.'s PRMD definition, while Zuhdi *et al*. (2017) give no clear definition of pain. In the non-classical surveys, Scully (2011), Shahanawaz *et al.* (2020), Dhrithi *et al.* (2013) and Roset-Llobet (2000) use Zaza *et al.*'s definition, while Dawson (2002) does not define injuries but took statistics from an injury clinic and may, as such, be assumed to adhere. Studies by Fjellman-Wiklund and Chesky (2006) and Rigg *et al.* (2003) refer to musculoskeletal pain/problems, and therefore do not adhere. Many studies, including all those used here, use pre-existing validated and standardised tests such as the Nordic Musculoskeletal Questionnaire (NMQ), which was developed as a standardised questionnaire that would allow for comparison of pain complaints in the back, neck, shoulders and upper extremities (Crawford 2007: 300). Unfortunately, not all PRMD studies used the same questionnaire, and may not state explicitly that they follow Zaza *et al.*'s definition of injury.

1.3.1 Lifetime prevalence or point prevalence

Something that could greatly affect results in injury prevalence reporting is sometimes omitted from papers: the distinction between point prevalence (PP) and lifetime prevalence (LP). Questionnaires asking if someone has ever been injured (LP) would provide higher figures than one asking if they are currently injured (PP) if complaints have not become permanent. Lifetime prevalence has been reported in a range

of 77% - 84% (Berque *et al.* 2016: 80; Ackermann *et al*. 2014: 7). Point prevalence has been reported in a range of 30% - 50% (Berque *et al.* 2016: 80; Ackermann *et al*. 2014: 7; Ranelli *et al*. 2011: 32). The difference between lifetime and point prevalence is in important distinction as it can be an indication of how long conditions have lasted. Indeed, it has been reported that injuries tend to last years and even worsen with time (Wahlström Edling and Fjellman-Wiklund 2009: 113). Three authors report the duration of pain, but not clearly. One study found 66% of musicians reported current or recurring pain, with 63.5% suffering continuous pain for more than three months (Gasenzer *et al*. 2017: 3) and over 50% stating it was permanent (Gasenzer *et al*. 2017: 6). Steinmetz *et al*. (2015: 965) and Ackermann *et al*. (2014: 7) report frequent, permanent, or constant pain at 40% and 24% respectively. In all 3 articles it is unclear if words like 'permanent' refer to exceeding a minimum period of months during which playing is painful, or if they experienced pain even when not playing but over an unspecified period. Although these surveys give us some insight into the prevalence and duration of PRMDs, this is clouded by undefined terms, and no indication of whether figures refer to point prevalence of lifetime prevalence.

1.3.2 Measuring pain

Quantifying pain is a challenge because it is a subjective and multifactorial experience (de Freitas and Silva 2019; Younger *et al.* 2009: 39) that could be described with diverse words such as sharp or dull, aching or shooting (Nall 2021). There are many instruments available to measure pain levels from the simplest unidimensional visual analogue scale (VAS) to more complex surveys exploring multiple dimensions of the experience (Kumar and Tripath 2014: 62; Younger *et al.* 2009: 44). All of these are subjective, relying on the opinion of the patient, and as yet there are no validated, objective measurement methods (Younger *et al.* 2009: 39). Certain factors complicate estimating pain levels. The coping mechanisms the patient may develop can reduce the extent that pain impacts quality of life (Younger *et al.* 2009: 43), and alter the rating they give, perhaps affecting the treatment prescribed. Pain perception is also affected by mood and personality type (Loggia *et al*. 2008: 784; Ramírez-Maestre *et al*. 2004: 147). Thus, there are many confounding factors in quantifying pain.

1.3.3 A culture of silence

Studies on musicians' injury prevalence often have very low response rates, possibly due to a culture

of silence that surrounds musicians' injuries (Guptill 2011: 91), and there are several reasons for this. Some musicians are concerned that they might be 'blacklisted' as potentially unreliable should word of their injury get out (Gasenzer *et al.* 2017: 6; Guptill 2011: 91; Medoff 1999: 210; Newmark and Lederman 1987: 142; Caldron *et al.*1986: 135). One musician gave this analogy: 'I mean you're not gonna tell the coach you're hurting or he's not gonna put me in' (Guptill 2011: 91). Psychosocial pressure in the classical music industry is extremely high (Ioannou and Altenmuller 2015: 140). Orchestral positions are highly prized so it is understandable that few are willing to discuss their health (Gasenzer *et al.* 2017: 6). Freelance musicians in particular are concerned about discretion (Newmark and Lederman 1987: 142), because peripatetic orchestral players are in a more precarious position since they are not able to prove themselves as regularly, unlike permanent members who are in daily rehearsals and performances. There is no reason to think the situation is better for soloists since concert bookings are also highly competitive. As internationally renowned pianist Gary Graffman wrote: 'Nobody wants a wounded pianist. There is an oversupply of healthy ones. Admitting difficulties is like jumping, bleeding, into piranha-filled waters' (Mencimer 2003). The individual's state of mind, and perception of injuries and their cause is also a factor. One study found that musicians 'thought that even thinking about injuries was negative in itself, which might make them more vulnerable to disorders' (Fjellman-Wiklund *et al*. 2004: 365), while elsewhere an attitude of 'ignore it and it will go away' (Park *et al*. 2007: 93) is reported. There seems to be a taboo among musicians about asking for help as if injuries might be interpreted as 'a sign of deficient technique' (Paraskevas 2018, 4:45; Ioannou and Altenmuller 2015: 140) or that they are not up to the task mentally or physically (Rickert *et al*. 2013b: 96). There is also the possibility that some musicians are simply too busy to fill in a questionnaire with no perceived direct benefit. All of these factors contribute to a culture of silence, meaning that injuries may be underreported.

Thanks to musicians like Graffman, and the work of groups such as the British Association for Performing Arts Medicine (BAPAM), awareness of injury prevalence and its causes and treatments is increasing, leading to the gradual decrease in prejudice against the injured (Bruser 1999: 24-25). However, there is still reticence to discussing these issues, and the ensuing low response rates to prevalence studies leaves a grey area of potentially unreported injures: it is likely that the number of reported injuries is much

lower than the actual number.

1.4 Phenomenology of musicians' injuries

With poorly understood conditions, patients can have numerous confusing and frustrating consultations because therapists are not trained in that specific area (Sturge-Jacobs 2002: 27), or believe such diseases are psychosomatic (Mencimer 2003; Sturge-Jacobs 2002: 27). Such dismissal can have a stigmatising effect (Pascarelli and Hsu 2001: 15; Joachim and Acorn 2003: 604) and this issue is reported for other poorly understood conditions such as scleroderma (Joachim and Acorn 2003: 604), fibromyalgia (Sturge-Jacobs 2002: 27), and myalgic encephalomyelitis (Hammond 2010: 256). Practitioners are often unaware of the challenges that patients face (Mohammed *et al.* 2016: 2), and in recent years the importance of patient-reported experience is increasingly recognised as essential for improving healthcare and patient outcomes (Mohammed *et al.* 2016: 1).

Phenomenological studies, such as those by Zaza *et al*. (1998) and Guptill (2010), use qualitive data gathering methods to focus on the individual's unique experiences within their world (Neubauer *et al.* 2019: 90). Open-ended questions in semi-structured interviews 'allow … participants to describe their [complex] lived experiences' freely as well as allowing the interviewer flexibility when statements inspire additional questions, thus potentially allowing deeper insights (McCready and Reid 2007: 141; Clandinin and Huber 2002: 163). Interviews may be in small focus groups or even one-to-one, with each interview easily exceeding one hour. Data may then be analysed multiple times (see 2.2.2 Material for more details). Due to this time-intensive nature, sample sizes are usually small, but the information yielded can be very in-depth.

Of the phenomenological studies reviewed here, there is variety of geographic location and genre. De Kock (*et al*. 2023: 1) interviewed five professional South African violinists, while Guptil (2011), McCready and Reid (2007), Rickert *et al*. (2013a) and Zaza *et al*. (1998) interviewed orchestral string, woodwind, brass and percussion musicians in Australia and Canada. Apart from the student musicians in McCready and Reid's study (2007) they were all professional orchestral players. Wilson *et al*. (2014) interviewed Irish traditional musicians of any instrument.

The themes highlighted by these key studies are also evident in the interviews carried out for this thesis and shall be discussed in depth later. Healthcare support has been deemed unsatisfactory by musicians. They may already feel inferior as a result of their injury (De Kock *et al*. 2023: 10), so when medical professionals show a lack of respect and a lack of understanding by suggesting they 'just stop playing' and 'get a real job' (Zaza *et al*. 1998: 2019) it is not productive. Other musicians report that therapists are ignorant of the injuries experienced by musicians and therefore cannot help (De Kock *et al*. 2023: 9). Understandably, this leads to musicians distrusting medical professionals (Wilson *et al*. 2014: 683). Another factor that therapists reportedly are unaware of is that musicians will not stop playing when injured and will usually play through pain (De Kock *et al*. 2023: 10; Wilson *et al*. 2014: 682; McCready and Reid 2007: 144; Zaza *et al*. 1998: 2019). Indeed, in some circles there is a belief that PRMDs are integral to being a musician, and therefore that injuries are not taken seriously (Wilson *et al*. 2014: 682). Despite reports that 'horror stories' (Zaza *et al*. 1998: 2019) of bad experiences with therapists can spread, there is a culture of silence surrounding PRMDs (Guptill 2011: 91). This obviously contributes to the lack of awareness of the possibility of injury mentioned above, but also contributes to feelings of isolation if musicians believe they are experiencing something unusual.

The most prevalent theme is surely that a musician's identity and feelings of self-worth are strongly tied to their playing (Rickert *et al*. 2013c: 126; Zaza *et al*. 1998: 2013), with the instrument being described as an extension of their body (Guptill 2011: 88). There are downsides to this even before injury occurs: some have reported an inability to fully engage in non-musical activities (McCready and Reid 2007: 144). The injured musician may feel they are in an abusive relationship with their instrument, or describe it as like a drug addiction, because they cannot stop playing despite pain (Guptill 2011: 88). A lack of awareness of various factors is reported, such as reduced interoception (self-awareness) when playing (Guptill 2011: 90). This increases the likelihood of exacerbating injuries because in the early stages when pain levels are low, they are easily ignored or missed. Some musicians were totally unaware that their profession could cause injuries before they sustained an injury themselves (De Kock *et al*. 2023: 10), but when forced to deal with their own PRMDs they developed more awareness of what their body requires for healthy function (McCready and Reid 2007: 145). Also mentioned is the belief that there are gaps in education systems,

because of the reliance on copying the teacher, with no established consensus on the 'correct' way to play (Wilson *et al*. 2014: 685). To the best of my knowledge, this is the first study to investigate these topics for classical guitarists with mFHD.

1.5 Conclusions

A review of the interdisciplinary literature in the field demonstrates that the phenomenon of performance-related injuries amongst elite musicians is widespread, under-reported and poorly understood. From the previous overview of literature, the following points emerge:

- There are five types of injury common to guitarists, and they are not unique to the population;
- Pain conditions such as back pain and carpal tunnel syndrome are common in computer workers and musicians, but the latter do not receive the same level of help despite higher prevalence rates;
- Although methodologies of guitarists' injuries studies differ, rates of PRMDs seem to be similar to those of orchestral instruments;
- Guitarists' injuries studies give markedly different statistics about injury sites, highlighting how poorly understood guitarists' injuries are, and perhaps reflecting differences in methodologies and questionnaire phrasing. There is a need for more detail about information such as playing style and posture, which these reports all lack;
- There are statistical articles and surveys, but very few qualitative or phenomenological interviews with musicians, and seemingly none including classical guitarists;
- There are methodological difficulties in measuring pain;
- There is a culture of silence surrounding PRMDs, making estimating prevalence difficult;
- A body of work around the prevention and management of injuries exists but is not widely disseminated amongst musicians, who may not even be aware that injuries are likely. There is little information about the body that is presented for musicians, thereby necessitating an interdisciplinary approach for this thesis.

1.6 Research questions

Understanding that injury may have biological, psychological, and societal factors as outlined in the

Biopsychosocial model is vital for understanding the mechanisms of developing PRMDs. This would have the potential to inform the creation of injury prevention guidelines to be included in music curricula. Therefore, in response to these gaps in the literature, this thesis uses phenomenological interviews with performing guitarists with a professional career starting as early as the 1960s to explore their experiences with PRMDs and recollections of their time in education.

In response to the conclusion that posture plays a role in developing PRMDs (see 3.4 Discussion), and that tension is an issue (see 2.3.1.ii GETs: Awareness) that is often related to posture (see 2.4.4 Attribution), an intervention project was conducted, which will be discussed in chapter 4. The thesis, informed by the assessment of existing guitar supports (see appendix 2), explains the design process (see appendix 3) that led to pilot-testing a prototype guitar support that aims to eliminate the drawbacks of existing models while providing all of the benefits of existing ergonomic supports.

After reviewing the literature and exposing the gaps therein, the following questions arise:

1) What is the lived experience of overuse injuries among professional classical guitarists?
2) What are the societal and physiological risk factors for PRMDs?
3) Are existing health and illness models a good fit for musicians with disorders?
4) What are the implications of the findings stemming from questions one, two, and three for prevention & management of PRMDs for classical guitarists?

As this project is qualitative, and its nature exploratory, semi-structured interviews appear to be the most suitable methodology. Chapter 2 will explore the empirical data, examining key phenomenological themes that emerge from interviews with professional classical guitarists.

Chapter 2: Musicians' Lived Experiences of Focal Hand Dystonia

2.1 Introduction

Musician's focal hand dystonia (mFHD) is a complex and poorly understood condition, causing muscle spasms or tension at unwanted times (Hallett 2011: 1; Standaert 2011: 148; Quartarone 2011: 166). It can manifest in various ways: fingers may move involuntarily in spasm (Quartarone 2011: 167); attempting to move one finger will cause others to move in a process called overflow (Hallett 2011: 2); movements may be stiff and awkward due to 'simultaneous contractions of agonist and antagonist muscles' (Quartarone 2011: 166); a muscle group (e.g. finger flexors) may remain tense, holding fingers in an unwanted position. This last phenomenon is seemingly not mentioned in the literature, but is evident in the interviews with classical guitarists that form the focus of this chapter.

The aetiology of mFHD is currently considered as multifactorial (Altenmüller and Jabusch 2010: 31) and it is unknown whether changes to the brain's cortical layout cause faulty movement patterns or vice versa. Risk factors include: playing an instrument requiring the highest levels of fine-motor skills (Altenmüller and Jabusch 2010: 31); extreme perfectionism and/or anxiety (Enders *et al*. 2011: 539; Altenmüller and Jabusch 2010: 34); and high workload (Ackermann and Altenmüller 2021: 311; Tubiana 2003: 166). Various treatments have been tested, including: thalamotomy; botox injections; drugs affecting neurotransmitters; repetitive transcranial magnetic stimulation (rTMS); transcranial direct current stimulation (tDCS); retraining, sometimes including finger splinting. Each has varying degrees of success, but these differ from the methods used by the participants in this chapter.

Medical literature and case studies provide differing perspectives on aetiology, treatment, and recovery. However, they do not tap the phenomenology (subjective experience) of mFHD. This empirical

study aims to explore the lived experience of professional classical guitarists with mFHD through interpretative phenomenological analysis (IPA) to address research question 1. IPA is an inductive approach with a constructivist epistemological stance that emphasises the individual's active construction of ideas of reality (Shannon-Baker 2023: 702) focusing on their own descriptions, and narrations of their lived experiences (Shannon-Baker 2023: 702). It is a qualitative approach that explores what experiences are like, and how people make sense of them (Smith *et al*., 2022: 3; Smith *et al.* 2009: 1; Guptill 2011: 84) using participants' own vocabulary rather than predefined categories (Smith *et al.* 2009: 32). Rather than taking participants' statements as completely factually accurate, IPA attempts to make sense of how participants make sense of their experiences through their own interpretation of events as they recall them (Smith and Osborn 2015, p.41; Pietkiewicz & Smith 2012, p.362). Interpretation of the data is intended to be thorough and credible, but it is also recognised that there may be alternative interpretations (Oakland *et al.* 2014: 44). This methodology is particularly apt since 'the importance of patient-reported experience is increasingly recognised as essential for improving healthcare and patient outcomes' in recent years (Mohammed *et al.* 2016: 1), and may therefore inform future studies and treatments.

2.2 Method

2.2.1 Participants

Eight participants were interviewed using the same semi-structured interview schedule [21]. Each interview began with broad 'warm up' questions (e.g. 'how common do you think performance-related musculoskeletal disorders (PRMDs) are?') before moving on to questions about their personal experiences with PRMDs. The questions used were informed by the reading of academic articles from a variety of disciplines, including: posture; IPA and phenomenological papers; and Berque *et al.*'s (2014b: 14) validated Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians (MPIIQM). Since this study is about lived experience, questions were open-ended with the aim of stimulating nuanced discussion rather than receiving simple or numerical responses. Questions such as 'What do you think contributed to this injury?' were intended to bring forth their own opinions as teachers and performers rather than medical

[21] See Appendix 1: Semi-structured interview schedule.

Deleted: Medical literature and case studies provide differing perspectives on aetiology, treatment, and recovery. However, they do not tap the phenomenology (subjective experience) of mFHD. This empirical study aims to explore the lived experience of professional classical guitarists with mFHD through interpretative phenomenological analysis (IPA) to address research question 1. IPA is a qualitative approach that explores what experiences are like, and how people make sense of them (Smith *et al*., 2022: 3; Smith *et al.* 2009: 1; Guptill 2011: 84) using participants' own vocabulary rather than predefined categories (Smith *et al.* 2009: 32). Interpretation of the data is intended to be thorough and credible, but it is also recognised that there may be alternative interpretations (Oakland *et al.* 2014: 44). This methodology is particularly apt since 'the importance of patient-reported experience is increasingly recognised as essential for improving healthcare and patient outcomes' in recent years (Mohammed *et al.* 2016: 1), and may therefore inform future studies and treatments. ¶

'facts', although sometimes both were offered. The interview schedule was intended to generate data for the first two research questions (What is the lived experience of overuse injuries among professional classical guitarists? What are the societal and physiological risk factors for PRMDs?) with questions 3 and 4 (Are existing health and illness models a good fit for musicians with disorders? What are the implications of the findings stemming from questions one, two, and three for prevention & management of PRMDs for classical guitarists?) being explored as part of the analysis of said data.

The results fell into two distinct subsets: four participants had experienced the painless condition mFHD, the other four had experienced posture-related pain. The data from these subsets is therefore analysed in a separate chapter. This chapter examines the data from the four guitarists with mFHD. The number of participants interviewed accords with Smith *et al.*'s recommended sample size of no more than six (Smith et al., 2022: 46; Smith *et al.* 2009: 106), which allows in-depth analysis of emergent themes as well as details such as the language used. A brief biography of each is included here to demonstrate their high levels of accomplishment at the point when their musician's focal hand dystonia manifested:

1) David Leisner began playing guitar in the 1960s at the age of ten and had a very promising start to his career when he came joint second in a 1975 international guitar competition. Nine years later, dystonia stopped him from playing. He has since released nine CDs (AllMusic.com 2022) and is a prolific composer;
2) Richard Provost began as a jazz guitarist but switched to classical guitar. He founded the guitar department at the University of Hartford, Connecticut. He performed in the last of Segovia's masterclasses, released one solo CD (Discogs n.d.) and five with his duet partner (Goldspiel n.d.), and published three books on guitar technique;
3) Gerald Garcia has an Oxford University chemistry degree but became a professional classical guitarist instead, releasing eleven CDs (GeraldGarcia.com 2020) but is perhaps best known for his compositions;
4) Grammy nominated classical guitarist and composer Apostolos Paraskevas has released 16 CDs (ApostolosParaskevas.com n.d.) and teaches at Berklee College of Music.

All participants gave written informed consent for their information to be used without

Deleted: Eight participants were interviewed using the same semi-structured interview schedule [22]. Each interview began with broad 'warm up' questions (e.g. 'how common do you think performance-related musculoskeletal disorders (PRMDs) are?') before moving on to questions about their personal experiences with PRMDs. The results fell into two distinct subsets: four participants had experienced the painless condition mFHD, the other four had experienced posture-related pain. The data from these subsets is therefore analysed in a separate chapter. This chapter examines the data from the four guitarists with mFHD. The number of participants interviewed accords with Smith *et al.*'s recommended sample size of no more than six (Smith et al., 2022: 46; Smith *et al.* 2009: 106), which allows in-depth analysis of emergent themes as well as details such as the language used. A brief biography of each is included here to demonstrate their high levels of accomplishment at the point when their musician's focal hand dystonia manifested: ¶

anonymisation. Each participant was given a verbal description of the project before taking part and advised that they could withdraw at any time or refuse to answer any question. Permission to video record interviews was granted, so that excerpts could be disseminated online for the benefit of the public. Participation was voluntary. Participants were recruited through opportunistic sampling, with the prime inclusion criterion being that they were currently (or had been) elite, professional performing classical guitarists. Table 6 provides participant details, including their individual histories of mFHD. Ethical clearance was granted by the Central Research Ethics Committee (CREAG) of the University of Kent.

Name	Born	Onset Age	Onset Duration	Degree of Affect	Recovery Status
Leisner, David	1953	31 (1984)	Months	3 of 5 digits unusable	Recovered
Provost, Richard	1938	~60 (~1997)	Years	Occasional disruption of a finger	Almost recovered
Garcia, Gerald	1949	~51 (~2000)	Days	Whole hand disruption	Ongoing
Paraskevas, Apostolos	1964	45 (2009)	Days	Whole hand locked	Recovered

Table 6: Participant Information for chapter 2

2.2.2 Material

One interview (Garcia) was carried out in person in the participant's home. Two (Paraskevas, Provost) were carried out online from their homes since they live in the United States. One was carried out in a hotel bar while the participant (Leisner, also from the United States) was on tour. Being in the participant's own home was preferred, to encourage a more relaxed, informal atmosphere. Each interview was one-to-one, taking one to two hours in one sitting (with breaks taken if required) using pre-prepared open questions in semi-structured interviews [23]. The flexible format of the semi-structured interview allows for other areas of interest to be explored as they arise. Some follow-up questions were sent via email where necessary.

The videoed interviews were listened to several times, then transcribed verbatim by the investigator. In accordance with IPA procedure, transcripts were read multiple times and analysed sentence-by-sentence

[23] See Appendix 1: Semi-structured interview schedule.

(Smith *et al.* 2022: 78-9). No specific software was used for this process. Themes were noted as they were found, rather than specific themes being sought. This was done by making notes of phrases or words that seemed interesting or important in a column to the left of the transcript. These emergent themes were categorised as personal experiential statements (PETs). These notes were later given short, broad, descriptive labels in a column to the right. For example, sentences with words such as 'noticed' or 'thinking' might be given the label 'awareness' for later consideration. Keywords were sometimes given multiple labels could therefore be analysed under more than one theme. One example is the statement 'In the very beginning I had a lessening of speed' which was labelled 'onset slow' as well as 'aware of decline'. After repeating these steps multiple times for all interviews PETs were grouped by the given labels to begin forming group experiential statements (GETs). Statements grouped together in this way were then compared to spot patterns of convergence or divergence both within the same interview as well as across multiple interviews. These GETs were then grouped into superordinate themes, for example: 'workarounds' and 'retraining' became subthemes of 'strategies' (see 2.3 Results). GETs were then analysed and interpreted to make statements about the lived experience of mFHD using patients' own words to put the individual's voices at the forefront in a way that has not been done before within mFHD research on classical guitarists. It is 'organized around themes which emerged from the transcripts, rather than constructs predicted in advance' (Osborn and Smith 1998: 68).

It is important to explain my positionality as the researcher to demonstrate the reliability of the findings: as a classical guitarist myself I understand the complexities of playing, such as the difficulties of finding a good and reliable posture. Being knowledgeable on that subject as well as having a background of anatomical knowledge allowed more pertinent questions to be asked as the need arose and participants could use jargon freely, knowing that I would understand. With any form of interpretivist analysis there is always danger of results being 'coloured' by the 'lens' the researcher is viewing through and it must be recognised that the researcher is not separate from the research process, although this is seen as a positive influence when additional questions can be asked to clarify or obtain more insight (Shannon-Baker 2023: 702). Since I have never experienced the playing-related disorders discussed here, biases may be small. Punctuation and italics have been used as an attempt to convey their rhythm of speech, including emphasis

and moments of hesitation. No attempt has been made to correct grammatical errors, which are most evident in Paraskevas' speech since he is not a native English speaker. In Leisner's case, there are times when text from his book illustrates a point better than a quote from the interview.

2.3 Results

As stated earlier, this chapter explores one data subset (focusing on the lived experiences of mFHD) from the larger study. The data gathered from these accounts yields insights into:

- The lack of interoception (the ability to sense intrinsic physiological processes, including muscle tension) many high-level musicians have;
- The musicians' ability to develop interoception as part of their recovery, and hopefully avoid recurrence;
- The various onset patterns they experienced;
- Perceived aetiology of mFHD;
- How musicians make sense of this confusing injury that has no obvious physical cause, unlike many acute and chronic pain injuries;
- Professional identities;
- Patients' attitudes towards therapists;
- The retraining processes they used;
- How the experience has affected them.

The above topics have been grouped into subthemes within the overarching group experiential themes (GETs), which are listed below:

Embodiment

- Onset
- Awareness
- Language related to the body
  - Experiencing vs. Observing
  - Three perceived entities in one body

Deleted: The videoed interviews were listened to several times, then transcribed verbatim by the investigator. Punctuation and italics have been used as an attempt to convey their rhythm of speech, including emphasis and moments of hesitation. No attempt has been made to correct grammatical errors, which are most evident in Paraskevas' speech since he is not a native English speaker. In Leisner's case, there are times when text from his book illustrates a point better than a quote from the interview. In accordance with IPA procedure, transcripts were read multiple times and exploratory notes were made on each interview, highlighting key words and phrases (Smith *et al.* 2022: 78-9). Themes were noted as they were found, rather than specific themes being sought. Emergent themes were categorised as personal experiential statements (PETs). These PETs were then compared for connections and grouped to form group experiential statements (GETs). GETs were then analysed and interpreted to make statements about the lived experience of mFHD using patients' own words to put the individual's voices at the forefront in a way that has not been done before within mFHD research on classical guitarists. The resulting analysis is 'organized around themes which emerged from the transcripts, rather than constructs predicted in advance' (Osborn and Smith 1998: 68).¶

Identity

- Culture of silence
- Professional identity

Strategies

- Giving up
- Workarounds
- Retraining
- Networking
- Distrust of doctors
- Treatment
- Prognosis

Attribution

- Over-working
- Habit
- Aetiology
- Psychology

2.3.1 Embodiment

A guitarist's musical sense of self includes awareness of finger movements and other bodily sensations, and is therefore embodied (MacDonald and Saarikallio 2020: 731). Musicians spend decades developing high levels of fine motor control, so it is unsurprising that participants expressed frustration at its loss. This section explores how these musicians tried to make sense of the experience of losing control of their fingers. As well as comparing onset patterns, it examines the language they used to describe what happened, which is revealing in terms of the subjective experience and the perceived relationship between body and mind, including 'ownership' or control of the body.

2.3.1.i GETs: Onset

Garcia, Leisner, Provost, and Paraskevas contracted dystonia in their right (dominant) hand, which

they use for plucking. Among these four participants we can see four different onset patterns. These were events that confused them, and they struggled to explain it:

> It was just an inability to move the way I used to.
>
> (Garcia)

> [the fingers] don't respond in the way that, that they normally do.
>
> (Provost)

> Just feel that you are actually trying to move your fingers and they are not doing what you're supposed to do.
>
> (Paraskevas)

> … they just weren't responding right and I didn't, I had no idea what was going on.
>
> (Leisner)

Although they all seemed to experience a disconnection between their brain and their fingers, each participant showed different onset patterns, ranging from an occasional problem to the whole hand becoming unusable overnight. For Leisner, the onset came in Spring and was subtle at first:

> In the very beginning I had a lessening of speed. I was playing Villa-Lobos 12 Etudes and I noticed that I was playing a little slower and then it seemed to get a little [more] slower and there was some hampering in the in the movement of the fingers.

This puzzled him, but he was unaware how to address it and the problem progressed slowly. The realisation that it was a serious problem emerged the following Autumn:

> I had a concert in Portland, Oregon, in which I played the 12 études [24] on the second half, first half

[24] By Heitor Villa-Lobos.

> went, okay, not bad. But when I got to the études, my hand fell apart and I could not control the finger at all.

Taken together with the subtle reduction of speed, this event made the symptoms much clearer:

> But it was very clear that that it was the ring finger [that] was the affected finger and it was curling into my palm and I could pull it out and it would be kind of slow and then I'd play again and it would pull in again, and it just got worse and worse.

This gradual worsening of symptoms has been observed in others. Provost, from his discussions with other dystonics, observed that 'most of the time [dystonia] occurs as gradual, you can't release the fingers and the more they want to curl, the less control you have over the index and middle finger'. This is similar to Leisner's onset in that the ring finger was causing loss of control of the other fingers in the form of slowing them down. Although Provost stated that this was the most common presentation of dystonia, it is not what he, Garcia, or Paraskevas experienced.

Unlike the others, Provost did not experience a debilitating onset of mFHD. He was working as normal under his self-imposed huge workload [25]:

> So suddenly I find my index finger's flying out uncontrollably in certain passages, well okay, so if those passages became a problem then I might switch and I might say "Okay I'm gonna do instead of *i* [index] and *m* [middle] I'm gonna do *i* and *a* [annular, or right-hand ring finger]." That would solve that problem … That would get me through, and then maybe a year later something else would come up and I'd say "Oh, okay, I can re-finger this, I can do *p* [pulgar, or right-hand thumb] and *i* or some other combination." And so I did this for 20 years during the duo [laughs].

Rather than the steady decline experienced by Leisner, this was a malfunction in certain phrases that could be remedied by using a different fingering. Curiously, he mentioned replacing *i* & *m* with *i* & *a,* or *i* & *p,*

[25] See 2.3.4.i GETs: Over-working.

even though it was the *i* finger that was malfunctioning. It seems he was able to stop *i* flying out if he changed which finger he used it in combination with. This workaround [26] was so effective that he was able to continue this process each time it recurred until he retired from performing due to arthritis some 20 years later (Provost).

For two participants the onset was rapid and catastrophic:

> Basically, I woke up one morning and I found that my hand couldn't work the way it usually worked, so I felt that my hand was jamming up … I couldn't reach notes.
>
> (Garcia).

> When I tried to play the guitar a few days later, I wasn't there [27].
>
> (Paraskevas)

Although these two participants experienced an almost overnight loss of control, it was worse for Paraskevas, who was suddenly unable to even play open strings. Whereas Garcia lost control of the movements of his fingers, Paraskevas' whole hand locked into a claw when near the guitar:

> I realised that my fingers, they were not following what I was supposed to do. I was trying to engage uh, that specific finger and that finger was not following, was very hard to move it. My *a* finger was going inwards, my index finger was going outwards. So, and immediately then I realised, you know, there is there is a problem.

Symptoms escalated among three participants. For many musicians, the natural response when playing does not go well is to practice more [28], which is how Garcia responded to his onset. Unfortunately, this approach backfired for him, probably in part because the stress caused by the onset made him more

[26] This labelled as a workaround rather than a strategy because he was skirting the issue. This is discussed in 2.3.3.ii GETs: Workarounds.
[27] This turn of phrase 'I wasn't there' is discussed in 2.3.1.iii.a Experiencing vs. observing.
[28] See 2.4.2 Identity.

tense: ‘I practised more and my playing got worse [laughs]. And that was very dispiriting’. Although Provost’s problem was mostly the occasionally flying index, he too experienced an escalation: ‘as I started to address the issue with the finger flying out, suddenly the ring finger and the pinky finger, which were never a problem, started curling in. So why is this curling in when this is getting better?’ It is unknown what other factors were in play at this time, making further analysis problematic [29]. Leisner described his escalation as follows:

> You know, over this time, my condition, which began with fingers curling into the palm as I played, very quickly deteriorated into fingers curling into the palm when I even began to approach the strings, just almost thinking about approaching the string, [the] finger would curl into the palm. I didn't even have to play. When I was done with the Hoshino therapist, I would hold out my hand for change in the store and would flick the change out of my hand. It was just horrendous, just unbelievable.

His steady decline of hand control culminated in his fingers spasming into his palm during other activities of daily living (ADL), even for simple tasks like accepting coins. Paraskevas’s dystonia also affected his ADL by altering his ability to hold a pen. Although he has long since cured his mFHD, there are still times when his writing is affected. Garcia stated that his abilities to write and play piano were not affected. Each participant described a unique onset process in terms of speed, which fingers were affected, how they were affected, and the degree of disability caused. This shows how varied the symptoms of dystonia can be.

2.3.1.ii GETs: Awareness

Achieving full musical potential requires a sustained awareness, not just of the sounds being created but also of how the body is being used. This awareness of the sensations and movements of one’s own body is known as interoception (Price and Hooven 2018). These participants had not developed, or were not using, their interoception, and they all needed to improve this area in order to recover from dystonia. Other areas of awareness are also discussed here, including: some showed an awareness of onset indicators as it occurred, others retrospectively; an awareness of muscular tension; the recognition of their own lack of

[29] Further clarification with Provost was not possible as he passed away in 2022.

awareness at, and before, the onset period.

Participants showed different levels of awareness of their onset indicators, from saying there were none to being fully aware. Leisner was fully aware of his onset indicators, noticing a decline in his abilities:

> In the very beginning I had a lessening of speed. I was playing Villa Lobos 12 Etudes and I noticed that I was playing a little slower and then it seemed to get a little slower and there was some hampering in the movement of the fingers, they just weren't responding right,

He noticed his fingers were progressively losing speed, which may have been due to a gradually increasing inability to relax; in essence, he was fighting his own tension. Since he had a performance schedule to maintain he did not have the opportunity to tackle it for some months. When the time came, he took the only approach he could think of:

> Let's see, that was in the Spring … then in the summertime when I had little or no concerts I started to investigate it, [laughs and adds air quotes] 'investigate' it by hanging my head down and watching every little movement that my finger would make and that process made the thing much, much worse so it deteriorated into what I later found out was focal dystonia.

His use of air quotes for 'investigate' suggests he thought that his attempt at diagnosing the problem was not very scientific or thorough. The validity of this heuristic approach will be explored in the discussion section of this chapter. At this time, he was under no pressure from concerts yet his condition worsened significantly during this period, so he believes his self-analysis exacerbated symptoms. Soon his fingers were very difficult to control:

> The [ring finger] was curling into my palm and I could pull it out and it would be kind of slow and then I'd play again and it would pull in again, and it just got worse and worse.

First, he became aware that his speed was declining gradually, then, when he had time to focus on the

problem, he noticed his decline accelerate until he had to concentrate on pulling the affected finger away from the strings in order to reuse it. This indicates that the finger flexors were not relaxing after each pluck.

A slow but steady decline in one's playing may be quite easy to observe, but for participants who did not experienced this, onset indicators were harder to notice. Nevertheless, Provost was certain of his indicator, albeit retrospectively:

> Even when I was playing jazz guitar I always played with a certain amount of tension in my right shoulder that I just assumed was a natural aspect of playing the guitar. I didn't know any better … [It] should've been the warning sign for me: *look, deal with this*.

He was a jazz guitarist before he changed to classical guitar in his late teens (Provost), so this shoulder tension was with him for a long time. He believes this to be the indicator because dealing with his shoulder tension has played a large part in his recovery:

> So now … since I've retired from performing two years ago, I've been really focusing on getting rid of all of these issues and finding out that the issues had very little to do with my fingers but had to do with all the tension I was storing in my shoulders and neck.

Although Provost also mentions using splints to isolate finger movements, he still believed his ever-present shoulder tension was the root, and that alleviating the tension has brought the most improvement. This indicates that he was partially aware of the cause of his dystonia many years before onset. Another participant had retrospective awareness of a possible onset indicator:

> I did notice, when I used to play a lot, that I would have a pain in my shoulder here [indicates upper right trapezius], perhaps I should have taken more note of that … It was definitely tension … and [dystonia] may have had to do with that or it may actually had to do with something in the finger movement and that might well have been an indicator to me that something was not right.
>
> (Garcia)

These two participants were aware of tension in the right shoulder; the same side as the dystonic hand, years before onset. However, Garcia is not certain that this is the cause and he did not mention that working on his shoulder tension was part of his recovery.

Two of the participants only realised the extent of their excess tension well after their onset: 'I realise I cannot go to the string, relaxed. The moment I was going to the string, I was tense, was tense here, was tense here [indicates hand and forearm]' (Paraskevas). He discovered that the act of approaching the string triggered the tension. Leisner also said this was almost the case for him at one time: 'just almost thinking about approaching the string, [the] finger would curl into the palm'. Leisner admitted that he was better at fixing tension in his students than in himself:

> Tension in the little finger … is a problem that must not be ignored, as that tension will only increase and spread over time. This was a problem that I observed and fixed only in the hands of my students, never in my own hand, until the dreaded focal dystonia appeared, causing an extreme amount of tension in my little finger.
>
> (Leisner 2018: 75)

In the above excerpt from his book, Leisner seemed to hint that releasing his own hand tension may have allowed him to avoid dystonia. For another participant, this retrospective awareness brings the realisation that knowing the cause earlier could have saved him a lot of time and effort during his rehabilitation:

> If I had recognised early on that the flying out was more than just the tension not releasing properly in the index finger, but that there was something in the shoulder causing it, then I could have fixed it that much sooner.
>
> (Provost)

Surprisingly, Provost did not say that if he had recognised the tension issue even earlier, he could have prevented mFHD. He was admitting that he needed a clear signal of something actually failing to make him

take action. Garcia took pre-emptive classes that focused on relaxation before his onset:

> I did do Alexander [Technique] lessons, but you know, it was at a point when I didn't need them, actually - I didn't think anyway. I felt, you know, well, everything is working normally, but I was probably wrong!

It seems that anything he learned during those lessons either did not get implemented into his playing or was later forgotten. His retrospective awareness made him think that, although he believed he did not really need Alexander Technique (AT) lessons at that time he may have been mistaken and simply lacked the awareness to realise his mistake.

Although Paraskevas did not say it affected his playing before his sudden onset, he too felt something happening in his hand, which he rationalised away at the time and ignored:

> I did see some kind of weakness on my hand, but nothing that I have not experienced before. "Oh, I am kind of weak because I'm practising a lot" … at that time I was playing again at the Carnegie Hall and I was playing that night two guitar concertos plus solo, plus chamber, huge programme. Nothing that I haven't done anything before, but as you getting older you, you know, I pushed myself, "Okay, I can do that."

He rationalised away the symptom because he had experienced it before [30]. This is logical, although weakness during a period of intense work has been reported elsewhere with dystonia [31]. He mentions and reiterates that he played a good concert: '[I] played the whole night, no problem … I played, I pushed myself, there was no problem during the performance'. However, afterwards he felt drained:

> Emotionally, though, I did *not* feel well … after this I got tired in terms of "I don't want to play the guitar for a few days. I wanna take a break." When I tried to play the guitar a few days later I wasn't

[30] This is discussed further in 2.3.4.i GETs: Over-working.
[31] See Discussion.

there [32] … There was no warning.

Of the four participants, this constituted the fastest and most severe onset with Paraskevas's hand locking up into an immobile claw when next he tried to play. Although it may be true that his weakness was unrelated to mFHD its relevance cannot be ruled out. The only conclusion to be drawn from this is that this participant was not aware of any onset warning.

Among some of the participants, awareness of their recovery progress was evident from their accounts. Of the two still in recovery, only one quantified his progress: 'I must be about 70, 80 percent' (Garcia). Provost did not attempt to measure his progress, but stated: 'I've been working on that now for, for four years. And it's finally, I'm getting close to being able to return to a normal movement of hands', which suggests being closer than 80%. What he regards as 'normal' seems strange considering he had dystonia for twenty years and the movements of a well-trained musician's hand are far beyond 'normal'. Leisner also took around four years, but he was able to explain yearly milestones:

> It took me about a year for the middle finger to stop pulling in, that was the least affected, and then another year for the pinkie to stop pulling in and er the ring finger was pulling in less after another year, and I was completely cured after one more year. So after four years of this work in 1996, I was a hundred percent cured.

Although Garcia, Leisner, and Paraskevas all suffered from debilitating dystonia of multiple fingers, only Leisner mentioned each finger recovering successively.

Participants discussed lack of interoception. Garcia described feeling pain only at the end of practice:

> I did notice when I used to play a lot that I would have a pain in my shoulder here [indicates upper right trapezius], and perhaps I should have taken more note of that … It was it was definitely tension … It was something that, when I finished playing, I just noticed.

[32] This turn of phrase 'I wasn't there' is discussed in 2.3.1.iii.a Experiencing vs. observing.

> Interviewer: Is that because you were so focused on the playing that you were blocking out the pain?
>
> Garcia: I would say so.

This unawareness of tension was also mentioned by Leisner in his book:

> Tension in the little finger is one of the most common and most debilitating problems I have observed in the right hand of guitarists … It is a problem that must not be ignored, as that tension will only increase and spread over time. This was a problem that I observed and fixed only in the hands of my students, never in my own hand, until the dreaded focal dystonia appeared, causing an extreme amount of tension.
>
> (Leisner 2018: 75)

Although he helped others through this problem, he was unable to observe it in himself. As Garcia noted, 'it's easier to tell people what to do than to do it yourself'. When Paraskevas had a wrist injury, he found he could avoid the pain by adopting a slightly different hand posture:

> I remember I had an injury on my wrist. And I had it for like three months and that injury made to me to create tension on my right hand, because when I was having my hand in this certain way, I was feeling the pain, so I moved my hand to play in a different way. The moment I play, I had to move in a different way that caused tension. And the moment I did this [demonstrates hand position] it helped me to play till I … thought that that's my normal position, but I was doing it in an unconscious way. Because I had the pain I changed my technique, but I did not pay attention. And that found me in a place where I had to practise a lot and rehearse a lot, and suddenly the alignment of my fingers, they went off.

Because of his lack of interoception he did not notice that this slight change of position increased hand tension, causing his fingers to make compensatory movements to avoid getting in the way of other fingers. When his wrist injury had healed, this new posture had become habitual without him noticing the change.

This dampened self-awareness has been noted in the literature [33], and seems to be a common phenomenon. Given the complexity of classical guitar, this is not surprising, yet many musicians may even be avoiding opportunities to improve embodied self-awareness:

> Among us, or among professional musicians, it's almost like an embarrassment to ask a colleague "What do you think about this? What do you think about my hand? What do you think about this technique?" And, of course we don't talk to the other person as well because, you know, no one gives the green light to say "Oh by the way, do you notice you're doing this?"
>
> (Paraskevas)

By not seeking help, such musicians are potentially missing opportunities for learning and developing. Fingering changes could make a passage easier, or allow a slightly different timbre. They may have different suggestions for stylistic or expressive interpretation. Even more importantly, a problematic movement pattern might be pointed out: 'it could take only one sentence to alleviate decades of suffering' (Paraskevas). 'For a recovering dystonic, I mean, I think it's really important to be completely aware of everything that you're feeling, that's going on' (Garcia), yet methods of improving interoception are avoided. Garcia believes that 'injury happens … because you're not aware of what you're doing or what your body's saying … you're … doing something … other than what you think you're doing' so there is a real need to develop awareness to catch problems early. He spoke of Body Mapping, a branch of AT:

> And we're also talking about where you think your arm begins, for instance … A lot of people think it starts here [indicates insertion of deltoid], but actually when you when you move your arms, this is the joint where they move from [indicates glenohumeral joint]. Right? So being aware of that for instance.

Body Mapping was developed by the AT teacher Barbara Conable specifically for musicians (Association

[33] See 2.4.1 Embodiment.

for Body Mapping Education 2019a). The ‘body map’ is a person’s representation of their body in their own brain. Teachers of Body Mapping assert that the less accurate this map is, the more inefficient movements will be, and this can lead to injury through excess tension (Association for Body Mapping Education 2019b). This could happen when, using Garcia’s example, a person believes their shoulder joint to be several inches below the actual location. This leads to them ‘trying to do things which [the limbs] just won't do’ (Garcia) such as attempting movement from somewhere along the length of their humerus while locking the shoulder joint in place with tension.

Provost noted that, in his experience of teaching tertiary level students, most of them do not come in with a developed body awareness, and they do not think of playing the guitar as ‘you're training the muscles to respond in a specific fashion’. Thus, they are not aware that if they are always playing with tension, they may one day be unable to play without it. In their desperation to achieve a high level as fast as possible students may push themselves excessively, ‘But if you're forcing your fingers to do something because you, you yourself don't understand what the finger needs to do, now you're creating the possibility for an injury’ (Provost). Garcia recalled:

> David Leisner … realised that the kind of people who'd got [mFHD] are very ambitious people who want to actually get get on with their playing to improve their playing and often push themselves beyond what their muscles are capable of doing. So it's actually a question of self-knowledge partly, and knowing your limits.

This is something Garcia only realised about himself in retrospect: ‘Unfortunately, I wasn't actually doing it quite the right way and not being completely aware of what I was doing’. Provost noted that some students ‘have fingers that do what is needed quite quickly’, whereas others need to study the movements and work more methodically. He explained that this ability to learn so thoughtlessly can cause problems:

> The students who seem to be able to fly through [education] without any major injuries are often, oftentimes are incredibly gifted people, and they have a really highly developed natural sense of coordination. And when they do get an injury, they're at a loss of what to do with it because they don't

> really understand how they've even trained their hands to do what they do at the current level.

Because they have attained a high standard so easily, highly able students have not had the chance to develop the interoception necessary for players with less natural coordination. Paraskevas' observations indicated that he was likely to be an example of the former, since he explained that recovering from dystonia improved his teaching. Before dystonia he would demonstrate how things were done because he could not explain:

> A student will ask me "How do I play this?" … and most of us sometimes do it: "Let me show you." Because your hand is doing it. "Let me show you." "Oh, okay." But you cannot tell. You have to take the instrument and see how you're doing it. [Dystonia] made me a better teacher. Yeah, because now I don't need to just show them - I know exactly what I'm doing.

Since dystonia forced him to re-evaluate every aspect of right-hand technique, he gained sufficient awareness of his own body to be able to explain things to students, instead of merely showing them and expecting them to work it out from his demonstration.

Recovering from dystonia required an increase in interoception for these participants. As this thesis shows, musicians focus on creating music: the right notes, rhythms, and timbres. The body is given little attention until an injury occurs. As Paraskevas notes: 'we learn an instrument mostly as kids by instinct'. This implies that he learned to play with no thought about the mechanics of playing, just the intent to create certain sounds. His process of recovery involved studying the hand and how it works, which has given him new insight: 'Now I know *exactly* what my fingers are doing. Before I didn't know'. He did not just say that he knows what the fingers are doing; twice he said 'I know exactly'. He credits this for his improved playing: 'I just released my, new CD. I play more effortlessly than I played before, because I … learned the guitar as a guitarist now'. The phrase 'as a guitarist' is used to capture the embodied sense of knowing the guitar, an intimate and detailed physical interaction with the instrument itself, marked by an increase in interoceptive awareness. For Garcia, this process of studying the hand included 'making sure I can

understand what it means to relax a finger, which is not pushing it back into position … but relaxing - switching off the muscle so it relaxes again'. Like Paraskevas, he also studied how the hand works in order to recover, and learned to 'start distinguishing individual muscles and fingers again' by 'looking into deeply my own playing' (Garcia). Using words such as 'looking deeply' and 'understanding' suggest he is now putting a great deal of thought into the movements rather than solely focusing on the music created.

During recovery, Leisner's awareness was shifted away from music and even away from the hands and into the muscles around the shoulder. To begin with, he knew he had begun to engage different muscles in his playing: 'but I didn't know where they were, and it took me actually a couple of years before I figured out that they were involved in the armpit'. It therefore took him considerable time to develop his awareness to the point where he could locate the muscles, but he persevered: 'the more I intuited about it, the more I understood and the more success that I had'.

Two of the musicians spoke about their dystonia with the benefit of hindsight. Paraskevas believed he played better as a result of his experience, as his account (an amplification of his previous comment) illustrates:

> I just released my, my new CD. I play more effortless than I played before, because I … I learned the guitar as a guitarist now, which is like, you know, because we learned the guitar, we learn an instrument mostly as kids - by instinct … When you have an injury like this, it's a blessing in disguise, which, you know many people they will laugh about this and say, "Yeah, bullshit!" but no, actually it is because if you recover *out* of this, you are relearning with the knowledge you have as a musician and body awareness and everything, and of course, asking for help for people about techniques, so you are learning the guitar as a musician, you are not learning the guitar as an amateur. And *that* is, that's an amazing thing. The moment you relearn the instrument, then there is no way that you can be injured again.

Here he lists several benefits provided by his recovery from dystonia. When learning as a child, he did not put much thought into playing – he allowed his body to do what comes naturally, which, unfortunately, included tension because the focus was on the sounds rather than efficiency. His recovery method focused

on relaxation while playing, allowing him to use less tension than before. This allows the music to flow more easily. With decades of musical experience behind him, he was able to ask more informed questions when seeking advice from others, potentially allowing him to discover things he missed as a child. After learning so much about how his hands work, he now believes that he knows enough to avoid serious injuries in the future. This is vital information, and he acknowledges that he has had a valuable opportunity:

> I don't want to sound, you know, er, [a] megalomaniac in this, but very few have this opportunity to relearn their instrument *again* as professional musicians. That's, that's the, I don't want to say the beauty of it, because it *is* a devastating thing when is happening, but when you come out the other side of the tunnel, it's like, "Wow, look at this, I relearned the instrument the way I was supposed to learn it."
>
> (Paraskevas)

Not only did he recognise that this constituted a great opportunity for relearning that he believed few people experienced, but he admitted that he learned incorrectly the first time. The value of his experience extended beyond himself to aiding other people: 'it happened for a reason. And, that reason also brought us today here, so we can have this conversation'.

Sometimes musicians only become aware of how much of their life is devoted to their career [34] when they are injured. When asked if he would erase dystonia from his life given the chance, Paraskevas was unable to answer definitively:

> You have to put so many other parameters there, then you say, "Okay, you made the mov-, you made some movies, okay, you relearn the instrument, but you went through hell for four years in that corner, playing open strings."

Although his recovery period was a horrendous trial, it did allow him to explore and fully engage in other

[34] See also 2.3.2.ii GETs: Professional identity, and 2.4.2 Identity.

passions, including movie-making: something he had ‘always wanted to do’. If dystonia had not stopped him performing, he would never have had time to do these other things:

> I will never have done this if I was still the guitarist I used to be because I will never conceive “Let me go and do movies now.” So, so, during my recovery years, I found so many other interesting things I wanted to do all my life.

He was aware that his temporary disability gave him the time to try activities that would have gone unexplored had he never developed mFHD. Garcia also became aware, through dystonia, that music was very time consuming for him: ‘I realise now that when I could really play, I was actually spending an awful lot of time playing the guitar. The phrase ‘awful lot’ is a powerful one, suggestive of little time being left available for other ventures. The topic of musicians not being able to fully engage in non-musical activities is revisited in 2.4.2 Identity.

Provost was aware of the paradox that he was both glad his dystonia was not worse while also wishing it *had* been worse. At one time he expressed gratitude that his mFHD was mild enough that he could work around it [35]:

> I was very fortunate that it didn't shut me down, as it did with some of my colleagues. I was able to play through it, but as a consequence, now that I'm retired and I'm no longer performing and I'm really trying to get rid of all of the vestiges of that, I'm finding out how much damage I did to myself by finding alternatives to get through this.

He considered himself lucky that mFHD did not really affect his career, yet at the same time he discovered how much worse he made things by working around the problem instead of addressing the root:

> I've had to brace fingers, use braces to stop fingers, isolate finger movement to get back the

[35] See 2.3.3.ii GETs: Workarounds.

> independence that I had naturally with all of the other fingers. So that's what I mean by that is it created, I think, more problems than I would have experienced, uh, if I had dealt with initially.

Spending twenty years focusing on individual workarounds for symptoms as they appeared may have ingrained the problem further, necessitating him to use methods he might not have needed if he had dealt with it at the start. Although he said he was lucky that his onset did not 'shut him down', part of him wished it had been more severe so that he did not need to spend his retirement years eliminating it:

> Apostolos, you know his, he woke up one morning and he just couldn't play [snaps his fingers to emphasise the rapidity]. And you know, and, and in retrospect, I wish that had happened to me! [laughs]. You know? Because then I would have been forced to say, "Let's deal with this thing."
>
> (Provost)

He seemed to have been laughing at the ridiculousness of wishing his disability had been worse, but also aware that it would have enabled him to tackle the issue and even continue his career without dystonia.

These participants discussed many facets of awareness, including their own lack of interoception, the development of interoception as part of their recovery, the awareness (or lack) of onset indicators, and how much of their life was dedicated to the guitar before injury.

2.3.1.iii GETs: Language related to the body

The language used by participants gives us insight into how they conceptualised their experiences and understood embodiment, with some correlation between the language used and the participant's recovery status. At times the use of language indicated a certain detachment between the participants and their fingers, suggesting how much control they felt they had over the onset and recovery processes. At other times they used simile and metaphor to liken the player to machinery. The relationship between the player's intentions and their fingers was sometimes referred to in a way resembling the notion of teamwork, and at others in a way resembling the idea of sending orders, speaking of the brain, the self, and the fingers as three different entities.

2.3.1.iii.a Experiencing vs. observing

Sometimes dissociative language was used, as if to put distance between the individual and the situation. When speaking of his sudden onset that occurred after a few days off, Paraskevas said ‘when I tried to play the guitar a few days later, I wasn't there.’ It is as if the dissociation from the discovery that his hand had locked up was so strong that he placed himself in a different location to the instrument. This could be similar to the colloquialism of ‘being in a good place’, whereby the metaphorical ‘good place’ is a situation, period of time, or even a state of mind rather than a physical location. In this case Paraskevas could not access the guitar because his hand, locked with tension, was a physical barrier. There were other times when dissociative language was seemingly used for separation from a malfunctioning body part, thereby taking the position of a detached observer (henceforth referred to as observational language). At other times, they used possessive language, as if claiming or accepting ownership or responsibility, expressing (perhaps unintentionally) a more involved and embodied experience (henceforth referred to as experiential language).

At times, participants suggested a disconnection from their fingers by not using possessive language, saying ‘the fingers’ rather than ‘my fingers’, as in the following:

> suddenly the ring finger and the pinky finger … started curling in.
>
> (Provost)

> It took me about a year for the middle finger to stop pulling in, that was the least affected, and then another year for the pinkie to stop pulling in.
>
> (Leisner)

Leisner’s use of the personal pronoun in the phrase ‘it took *me*’ suggests he was actively engaged in the recovery process. This was supported by contextual information supplied during the interview that indicated he was retraining rather than passively taking pills or having surgery. Furthermore, he was designing his own retraining strategy because he knew of nobody else with his condition. He then used a definite article to distance himself from the body parts he was treating: he said ‘the’ finger rather than ‘my’ finger. Personal pronouns may be seen to imply active involvement or agency, whereas using 'the' suggests

a separation between the self and the body, with the body and mind operating independently. This is also apparent in Provost's description of his symptoms: 'In my case, it involves the … flying out of the index finger'. Although he has situated himself in the event ('in my case') he took a detached observer stance ('the fingers'), thereby distancing himself from the symptoms. At another point 'it' is used to indicate a finger: 'I could pull it out and it would be kind of slow and then I'd play again and it would pull in again' (Leisner). This is clear observational language since 'it' is often used for inanimate objects. Leisner even goes as far as saying 'I noticed that I was playing a little slower and then it seemed to get a little slower and there was some hampering in the in the movement of the fingers'. The word 'hampering' has connotations of an external force that is slowing his fingers down, reinforcing the idea that he wanted to separate himself emotionally from the faulty fingers. It is as if, after spending so much time training fine motor control, these musicians do not want to believe that parts of their body could malfunction so powerfully, therefore they used language that separated themselves from 'the fingers'.

At times there was not such a clear delineation between the use of experiential and observational language when referring to body parts, yet these occasions may still provide insights into moments of dissociation. Language was more frequently mixed, making interpretation hard. For example:

> I realised that my fingers, they were not following what I was supposed to do. I was trying to engage uh, that specific finger and that finger was not following [36], was very hard to move it.
>
> (Paraskevas)

Although he used 'my' at the start, Paraskevas's language becomes observational, since 'it' is often used for inanimate objects. This mixture could be because English is not his native language, or because the frustration at lack of control only comes through when it is mentioned specifically ('not following'). Alternatively, the realisation that his fingers 'were not following' caused him to dissociate because he felt he had lost the connection to his fingers. The same explanation is not applicable to Leisner when he mixed

[36] The implication that his fingers disobeyed orders is discussed elsewhere.

his language when describing a disastrous recital: ‘my hand fell apart and I could not control the fingers at all’. Here, he has referred to the hand and fingers differently, which suggests a divide between his conception of ‘his’ hand and ‘the’ fingers, as if he owns the hand but the fingers are working independently. It is possible that, since the fingers tend to move more than the hand during play, he felt the fault lay with the fingers exclusively. Another example of this mixture is seen in this excerpt, which begins as experiential:

> I've been really focussing on getting rid of all of these, these issues and finding out that the issues had very little to do with my fingers, but had to do with all the tension I was storing in my shoulders and neck because I was willing myself to play these passages at a level that I felt I needed to play at to present my musical ideas.
>
> (Provost)

Yet at another point, although talking about the same body parts, he used observational language:

> if I had recognised early on that the flying out was more than just the tension not releasing properly in the index finger, but that there was something in the shoulder causing it, then I could have fixed it that much sooner.
>
> (Provost)

In the first passage he used experiential language because he accepts the blame for his condition [37], whereas in the second he has used observational language to distance himself (perhaps subconsciously) because he is talking about not recognising the cause. In saying ‘if I had recognised … I could have fixed it’ he is reinforcing his blame acceptance [38] by using first person. Similarly, there was a point when Paraskevas’ language also changed, but this time from one sentence to the next:

[37] This is discussed further in 2.3.4 Attribution.
[38] This is discussed further in 2.3.4 Attribution.

> The first year it was experimentation including– I didn't know what to do, I mean, asking people, trying to do this, trying to play my old way. Then the second year, it was something, you know, changing techniques and all this stuff, at the end of the second year I start focussing in this kind of retraining. So, if I knew the things I know now, I will say could have taking me half of the time.

To begin with, in the part of his narrative involving experimenting with every method and finding no success, he notes 'it was experimentation', as if he was distancing himself from the years of failed efforts. At the point when he realised what he needed to do ('I start focussing'), he appears to connect himself with the more informed approach that led to his recovery. A clearer example is found in Leisner's description of his recovery period: 'the ring finger was pulling in less after another year, and I was completely cured after one more year'. His language began as observational when describing the fading of his symptoms, but when he reaches the point of full recovery his language abruptly changed to experiential: 'I was … cured'.

Experiential language was also used by one individual when talking about the new knowledge that came from curing his dystonia: 'Now I know exactly what my fingers are doing. Before I didn't know (Paraskevas). He considered his new-found knowledge vital in the process of helping other dystonics and keeping himself injury free in the future, calling his experience 'a blessing in disguise'. This disguise was very effective, since he also described the experience as 'four years of hell' and he did not discover the 'blessings' until after his recovery [39]. He may have used experiential language ('Now I know exactly what my fingers are doing') because did not wish to distance himself from the experience as it gave him new insight and improved his teaching. Garcia, who was still suffering dystonia, used experiential language exclusively: 'It was just, erm, an inability to move, the way I used to' and: 'Basically, I woke up one morning and I found that my hand couldn't work the way it usually worked, so I felt that my hand was jamming up [40]'. Garcia did not speak about his own experience as much as the others did, focusing more on other peoples' research [41]. Although he was not avoiding the topic, it is likely he did not wish to dwell on his own bad experiences because, of the four participants, he was the least recovered even though he

[39] Another 'blessing' is mentioned in 2.3.1.ii GETs: Awareness.
[40] The imagery of 'jamming up' is discussed further later.
[41] It should be noted that he was not deliberately avoiding the topic.

had spent the most time on retraining.

2.3.1.iii.b Three perceived entities in one body

The participants' way of understanding embodiment is revealed through the language used in their explanations. The brain, the fingers, and the self were often spoken of as three independent entities with their own agency. This was expressed succinctly as 'the brain is not us' (Paraskevas), although what constitutes 'us' was not discussed. The scenario of someone who has played the wrong way for a long time and now wishes to play correctly (i.e. without tension) was described in this way:

> The brain, of course, in the beginning will kick back, will say, "Are you kidding me? For a year and a half, you're telling me to play this way with tension" for instance, "with the wrong motion, with the wrong technique. Now you want me to play in a different way." The brain will want to go back to what it was used to.
>
> (Paraskevas)

There is a clear dualism between the brain - represented as a separate entity with its own voice and volition ('the brain will want to go back to what it is used to') - and the self that gives new instructions ('Now you {the self} want me {the brain} to play in a different way'). This imagery is of a violent struggle ('will kick back') between the brain and the self's intentions.

The idea that the brain is separate to the self was taken further: 'The brain has no idea what is wrong and what is right. Whatever you give to the brain it will do' (Paraskevas). This indicates a sense that good and bad movement patterns are stored without discrimination: 'The brain will have no idea that you doing mistakes. The brain will say 'This is one version of your C major scale; this is a different version of the C major scale. The more mistakes you make, the more versions the brain will have of one single thing' (Paraskevas). Although the brain is depicted as the controller, it is an indiscriminate one that catalogues all information with no assessment: 'If you give to the brain stuff that - that's not good stuff, still, the brain will take it as information' (Paraskevas). He warned that 'If the hand is not working in a conscious approach, the brain will get confused', and this is part of the mechanism for developing dystonia according

to him. In these examples the intimation is that 'the brain' houses habits and basic function, whereas 'the self', the part that is really 'us', is the personality, where the intent to move a certain way originates.

The dualistic relationship between brain and body, with the brain depicted as having its own personality and volition, is vividly captured by one participant's assertion that: 'The brain is like a little puppy … The brain is like, "Okay, I'm here, give me stuff"' (Paraskevas). This image is very telling in its likening of the brain to an undiscerning and innocent creature. The word 'puppy' carrying connotations of a playful and happy pet. Paraskevas took the simile further in saying that dystonics have been 'feeding the brain with the wrong message'. Provost put forward a different analogy – that of a fierce animal: 'You can develop muscle memory that's going to come back and bite you- [he hesitated, unsure how to finish the metaphor] down the road [laughs]'. Here we have two depictions of animals used to conceptualise dystonia that seem very different, yet the 'little puppy' could be 'fed the wrong message' so that it eventually bites.

Within several participant accounts there were suggestions that dystonia causes communication between these entities to break down. Lack of finger control was framed as a split between the mind and body, with dystonia causing a change in the expected command-response process: 'they don't respond in the way that, that they normally do' (Provost); 'the fingers, they just weren't responding right and I didn't, I had no idea what was going on' (Leisner). The word 'respond' in both accounts implies that the fingers have independent volition that ultimately rejected the orders, whereas Paraskevas' language has different connotations: my fingers, they were not following what I was supposed to do. I was trying to engage uh, that specific finger and that finger was not following, was very hard to move it'. 'Following' suggests being led in a thoughtless state, as if obeying orders without question, compared to 'responding' to a suggestion after consideration. It is as if Provost and Leisner considered their fingers to possess independent agency; by contrast Paraskevas' observations do not attribute difficulties to independent agency of the fingers, but to something else (unidentified) that was interrupting the lines of communication. Interestingly, such attribution did not completely accord with their beliefs: in all three cases there is a perceived divide between the self and the body, but Leisner believed the cause of his mFHD was that he was not using the correct muscles, whereas Paraskevas and Provost surmised that it was caused by tension reprogramming the brain

to send the wrong signals [42].

At times dystonia was referred to metaphorically as an object rather than a condition. Garcia referred to it as 'this hole'. When he said 'I should be able to get out of it' he hinted at doubt because he did not say 'I can get out of it'. Since his chances of getting out of the 'hole' were uncertain it suggests he thought of the hole as deep and hard to escape from. At another time dystonia was referred to as a fourth distinct entity: 'We put ourselves in a situation where that injury manifests itself' (Garcia). In saying 'manifests itself' instead of 'manifests' there is a suggestion that he is conceptualising injury as an independent phenomenon with its own agency.

The processes of playing were frequently described utilising mechanistic imagery, with retraining being framed as rewiring the brain (Paraskevas). Provost explained that the accepted explanation for mFHD is 'some kind of short circuiting of the impulses, neurological impulses, from the brain to your fingers so that they don't respond in the way that, that they normally do'. Likening the brain to a computer is not a new idea, and the reference here is, in one sense, very appropriate since they both work with electrical signals. A short circuit is when an unintended connection is made that bypasses certain components, something that is apt in light of the finding that brain sectors responsible for moving each finger become blurred with dystonia (Byl *et al.* 1997: 269). Activating one finger can trigger other fingers due to this overlap. At other times the language evoked mechanical machinery. Garcia said that it feels a bit like 'everything jamming up suddenly', which brings to mind binding gears. Leisner described the process of trying to use his dystonic fingers like this: 'I could pull it out and it would be kind of slow and then I'd play again and it would pull in again'. Here, the sense of detachment from using 'it' is so strong he could just as well be talking about a piston in an engine. These accounts serve to simplify complex living tissues into simpler mechanical and electrical systems in an effort to convey the experience to those who have not lived it. Paraskevas took this simplification a few steps further, likening the creation of new neurones [43] to new roads: 'It's like almost like a new highway that says, "Oh from now on, you will take this highway to

[42] This is discussed in 2.3.4.iii GETs: Aetiology.
[43] The message relays between the brain and body.

wherever you want to go" … And for a year, you take this road, the other neuron, it gets not walked as often anymore'. A disused path can become overgrown and difficult to use, whereas an often-used track gets more deeply entrenched and harder to get away from. This is a gentler way of explaining the difficulty of changing habits [44] than when the brain was said to 'kick back'.

In these accounts we see some correlation between observational and experiential language and the participant's recovery status, with more detached, observational language used more by those who have recovered, and more embodied, experiential language used by those still in recovery.

2.3.2 Identity

A musician's identity is strongly associated with playing their instrument. Identity may be understood as 'the feeling that one is the same person today that one was yesterday or last year (American Psychological Association, 2018). In terms of musicians' identities, Macdonald and Saarikallio (2022) offer a useful theoretical model, distinguishing between ways in which individuals relate to the world via their musical preferences (termed Music In Identities (MII)), and ways individuals actively engage in music as listeners or performers (termed Identities In Music (IIM)) (MacDonald and Saarikallio 2020: 730). MII and IIM may overlap, and, of course, evolve with time, but when something happens that takes away the ability to play, the musician's sense of identity is challenged. These interviews reveal key aspects about a musicians' sense of identity, which is so strongly connected to the instrument (Hargreaves *et al.* 2017: 15; Rickert *et al*. 2013c: 126) that *not* playing is seemingly not an option for them – they will do anything to keep playing. This means that being forced to stop has severe ramifications for their mental wellbeing. As one of the participants in this study put it: 'It's more than [our] livelihood, this is what we *are*, [it] is not what we *do*' (Paraskevas). As a consequence, professional musicians tend to be secretive about injuries in order to protect their reputation. This section explores these themes.

2.3.2.i GETs: Culture of silence

Since a musician's identity is strongly entwined with their playing, an injury is traumatic: 'when [musicians] are injured, they don't think of anything else except their injury. There is nothing else in the

[44] See 2.3.4.ii GETs: Habit.

world' explained Paraskevas. Yet such injuries appear to be commonly concealed from the public. Provost has discussed dystonia with other professionals:

> There are several people within the last couple of years, top level players who developed it, but they were able to really get it under control within six months. And most people will never even know that they had it.

Here, he has stated that other professionals have adopted the strategy of keeping their problem a secret, recovered in secret, and then resumed their career without revealing it to anybody who was not in a position to help them. Provost also explained that in recent times he had heard of fewer cases of mFHD: 'I seem to be hearing less musicians suffering from this now. I don't know if they're keeping it a more guarded secret'. It is possible that people feel more pressure to protect their reputation as a reliable player [45] than previously, so make more effort to maintain secrecy. This concealment was seen as a negative strategy: 'We hide it. We suffer with all of this. This is not helping' (Paraskevas). There is a sense that no musician wants to be the first to admit problems. Subsequently, others do not realise that they are not alone and perhaps do not even know that help is available. Paraskevas insisted that such reticence is another issue that requires addressing: 'this is another injury when you don't want to talk about the problem, you see'. He explained that it is not just injuries that are a taboo subject, but playing technique as well:

> Among us, or among professional musicians, it's almost like an embarrassment to ask a colleague 'what do you think about this? What do you think about my hand? What do you think about this technique?' And, of course we don't talk to the other person as well because, you know, no one gives the green light to say "oh by the way, do you notice you're doing this?"

In saying 'no one gives the green light' he suggests a potentially unconscious assumption that consensual permission is needed for peer support. In some cases, these musicians may fear that if one asks another

[45] See 2.4 Discussion.

about technique, they might learn that they have been doing it incorrectly for years and need to rebuild their technique, something that would require them to put performances on hold for some time. Another possible reason for not seeking advice is that they fear it would undermine their position as an authority or expert.

2.3.2.ii GETs: Professional identity

When a musician is severely injured, they may still feel the need to play, even if it is at a drastically reduced level. After many failed therapies, with his condition worsening so that two of his fingers were uncontrollable even when not playing, Leisner had stopped playing guitar altogether. After some time, however, the need to play became too great: 'Out of frustration, really, just wanting to play, I started just playing with thumb and index fingers'. This suggests that he did not expect this would enable him to play at a high level again, certainly not professionally, with half of his plucking digits out of action. Similarly, Paraskevas did not attempt rehabilitation to continue his performance career: 'I didn't fix [my hand] because I want to make another recording or to play in public. I want[ed] to fix it because I could never conceive myself not playing an instrument'. Paraskevas pursued other activities, including directing films and documentaries, but he could not give up the guitar. There may have been another aspect to his identity that extended beyond merely being a musician, rather he considered himself an indestructible musician:

> I remember two weeks, two weeks before my uh, my Carnegie Hall concert, and [dystonia] after that, I remember bragging to my students: "I never had any health problems in my life." I remember bragging and I remember telling them, "You know, you all come with injuries. I play guitar all my life. Never had any problems." It was so interesting because I said, "You- dammit! You cannot play an open string. And two weeks ago, you were bragging that you never had the hand injury."

He bragged that he had no injuries after decades of playing, although contextual information in the interview tells us that he was not pro-active regarding injury prevention. This suggests that his musician identity included an aspect of invulnerability. This helped to inspire him to recover: after being injury-free for so long he could not accept defeat.

The interviews additionally showed that, given enough time with a disorder, a person's identity may change to incorporate the condition. This became apparent in the interviewees' language: at one point,

Garcia referred to himself as a 'recovering dystonic', suggesting a deeper entrenchment in the condition than 'a person with dystonia'. Paraskevas' language did not convey this same level of entrenchment when he said 'during my focal dystonia years'. Although his language still situated him within dystonia it did not identify him as 'a dystonic'. Both phrases suggest that the condition became a part of their identity (i.e. something that was part of them, rather than an external influence), but more so for Garcia because he was still affected by dystonia at the time of the interview, whereas Paraskevas was affected for a much shorter period and had been fully recovered for some years.

This process of assimilation into identity was also apparent in how participants described the injuries' emotional and psychological effects. According to Paraskevas, passion for music can be all-consuming, therefore 'it *is* a devastating thing to be injured' (Paraskevas), a point also made by Garcia: "People do get depressed who have repetitive strain injury … a lot of people identify themselves with their playing. And then, that's when you start getting a psychological problem". Participants noted that loss of progress or stagnation could be psychologically damaging. During Garcia's twenty-year ongoing recovery process, there were times when progress was slow or non-existent:

> I think one of the worst things about injury is it can actually get you down to the point where you don't really feel that you want to put any more work in because it's not getting you anywhere. And that's a real psychological thing, it's a - it's a real psychological downer.

Later, he also revealed something worse than stagnation that occurred shortly after his onset: 'I practised more and my playing got worse [laughs]. And that was very dispiriting'. Like Leisner, he was unaware that that he had mFHD, and also unaware that playing more would exacerbate the symptoms [46]. Paraskevas described his recovery process in terms that make it clear how hard being injured was, but also how important it was that he regained his playing, saying that he 'went through hell for four years in that corner, playing open strings'. Further demonstrating how all-consuming music can be, he also said:

[46] See 2.4.1. Embodiment.

> Talking about musicians, when they are injured, they don't think of anything else except their injury. There is nothing else in the world. I've seen families being destroyed. Relationships being destroyed, I've seen people going, you know, two different directions, because, you know, usually musicians that they have this kind of injury, they are musicians and they are dedicated to what they do.

The interviews highlighted that severe injury may be so devastating for the musician that it becomes all-consuming because a large part of their identity is taken from them. This can put a huge strain on close relationships (Paraskevas), especially when the relationships are with people who do not fully understand the depth of connection between music and identity. Lost employment can only add more stress to the situation.

This desperation to keep playing meant that the musicians would often go to great lengths to alleviate the condition, such as going on a 'very long quest to find out anything about it' (Garcia). Leisner named seven therapists he consulted but admitted he could not remember them all and even tried playing the guitar the other way around, so that his plucking hand did the fretting. Paraskevas spent two years seeking advice from others and trying every method he could:

> the first year it was experimentation including- I didn't know what to do, I mean, asking people, trying to do this, trying to play my old way … changing techniques and all this stuff. At the end of the second year I start focussing in this kind of retraining.

It was only after two years of failed experiments that he found the method that led to the cure. These long-term "quests" highlight the arduous journeys injured musicians have suffered, and the manifold ways in which these conditions affected their everyday lives.

First-hand accounts of participants' lived experiences of injury revealed that the recovery process is frequently very long, but a key moment that makes someone realise they have finally found the path to recovery has the capacity to stir intense emotions:

> I remember playing the- my, playing my first chord. *Chord*, not piece, which was a C major chord. Playing my first chord. With *no* tension … it was the most beautiful thing I ever heard in my life, and I played 2000 concerts in my life. When I played that first chord, after I felt so relaxed and I cried. I said, 'Wow, I never knew I love the guitar so much!'
>
> (Paraskevas)

After spending three months practising approaching the strings without tension and then six months learning to play open strings without excess tension Paraskevas felt ready to use his fingers together and play a chord. For him, this was the moment he realised recovery was within reach and his emotions overflowed. Furthermore, it was the moment that made him explicitly realise how much he needed to play guitar. Prior to injury, during his preparation for the Carnegie Hall concert, he conceptualised his involvement with the guitar as a job:

> It was my sixth [Carnegie Hall] concert … When I played that night, it was, it was a chore and it was like, 'Oh, another concert … Well I have to practise; I have to do it.' It was like work. As I used to do all these years when finally, I went through this ordeal and I start playing again, I realise how much I missed. I rediscover this love … for the guitar.

Although at the onset of mFHD he could not imagine life without playing it took the possibility of losing that facility and then discovering strategies for recovery to make him realise the importance of playing in his live. Leisner's desire to play was never in doubt but his moment of discovering his cure was no less dramatic. One day he sat in on a colleague's masterclass in which 'he was asking the student to just swing at the string with gross motions' instead of the usual tiny finger movements. This inspired Leisner, who said 'a lightbulb went on in my head'. At the next available opportunity, Leisner tried this idea for himself:

> So, when I went home to New York, right after that, I did this in my practice room and within five minutes of doing this, my ring finger was releasing. And it was an *unbelievable* moment. I mean, my tears were streaming down my face, I couldn't believe it! And I mean, obviously, I wasn't cured on the spot. It, uh, I, I knew that there was a lot of work to be done, but I also knew that this was the

beginning of something.

He realised he had found his answer, and his description of his response was intense: his eyes did not well-up, instead the tears were *streaming*. These accounts of the intensity of their emotions give us insight into just how deeply a musician's identity can be tied to their instrument.

2.3.3 Strategies

These participants used a variety of methods to inform their own recovery strategies, including seeking advice from other musicians. The literature outlines various approaches for recovering from mFHD ranging from playing very slowly with a metronome, to brain surgery [47], however, these participants tried other methods ranging from quick workarounds to enable continued playing with no time off, to a full-scale rebuilding of technique that took years. The perception of one's ability to take action towards a goal is termed self-efficacy within psychological literature (Green *et al.* 2020: 1). Some of the classical guitarist participants in this project demonstrated a high level of self-efficacy by addressing their problems without therapeutic intervention, preferring to seek help from other guitarists.

2.3.3.i GETs: Giving up

Three of the participants experienced crippling dystonia in one hand, but only one of these three gave up looking for a cure, and ceased playing the guitar altogether. After having his hopes 'dashed to the ground' (Leisner) every time a different treatment failed, Leisner spoke to somebody at the National Institute of Health (NIH), who told him mFHD was incurable. Leisner reflected on this by saying 'Well, why am I trying to go to this world if they all think it's incurable?'. Referring to medical help as 'this world' suggests a strong feeling of separation from the help he needed, as if he existed in a place far removed from where he believed his cure could be found. After so many treatments he felt he had run out of options:

> I just stopped dead in my tracks. I did nothing for a while. Just nothing.
>
> Interviewer: Were you still trying to play?
>
> Leisner: Not really at that point. I just didn't know what to do. I was kind of waiting for something to

[47] See 1.2.5.3 Focal dystonia treatments.

> appear, to fall into my lap.

These passages highlight the sense of hopelessness Leisner was experiencing as part of his injury. 'So when it got to that point, I thought, "Well, I'm barking up the wrong alleys here. Nobody can help me, … This is ridiculous. I'm wasting my time." So I stopped'. These experiences stood in conflict with his innate desire to play and continue what he considered a firm part of his identity:

> … and then the next thing I did was I, I, out of frustration, really, just wanting to play, I started just playing with thumb and index fingers and slowly started practising and refingered a lot of things, you know, so in order to do arpeggios, I would do these crazy combinations of fingerings and found that I could play pieces that were quite impressively difficult with the *p-i* combination.

Unable to find a cure, he found a workaround that enabled him to play and he was even able to resume performing with thumb and index while his middle and annular fingers curled into his palm.

Paraskevas was arguably affected more strongly because his whole hand was locked, whereas Leisner always had two useable digits, yet Paraskevas did not stop seeking a cure:

> the first year it was experimentation including- I didn't know what to do, I mean, asking people, trying to do this, trying to play my old way. Then the second year, it was something, you know, changing techniques and all this stuff at the end of the second year I start focussing on this kind of *retraining*.

He spent two years seeking advice from other dystonics, reading about his condition and experimenting before he developed the strategy that led to his full recovery. His use of the word 'experimenting' for the beginning of his process, when combined with his statement that he did not know what to do, suggests he was trying many different ideas, perhaps even on the spur of the moment, with little notion of why, how, or if something might work. At a certain point he realised that he would need to rebuild his technique from

scratch [48], and for this stage of his recovery he used the word 'retraining', suggesting a well-planned approach. This contrasts with his 'experimental' period when he had no plan beyond speaking with 'everyone you may know or you heard [of]' (Paraskevas) [49]. Garcia also did not give up (and is still currently recovering after circa 20 years), although his symptoms were less severe and he was able to make progress once he had identified the problem. This does not mean that Garcia and Paraskevas were more dedicated to the classical guitar than Leisner, rather, there were different psychosocial factors at play. According to Provost, Leisner was one of the earliest professional players to be diagnosed with mFHD and was unable to speak to anybody with experience in either recovering from or treating it. There were many more dystonic musicians in the 21st century for Paraskevas and Garcia to talk to, with the rapid development of the internet facilitating communication with others who had made progress or recovered. This is explored further in 2.3.3.iv GETs: Networking.

2.3.3.ii GETs: Workarounds

These classical guitarists experimented with different methods of working around their dystonia to maintain their accustomed level of play, but these constituted temporary (rather than permanent) strategies. Evidence from this project indicates that musicians will adopt every possible strategy to return to their accustomed level of play as rapidly as possible. Sometimes this means finding quick fixes or workarounds instead of dealing with the root cause. A quick fix means musicians may be able to maintain their accustomed level of play or even continue progressing. Finding a cure that involves retraining would mean taking steps backward or starting from the beginning to eventually reach the same level, something that appears to be very hard for elite musicians to accept.

Garcia stated that 'a lot of people who actually have injuries start fingering things in a different way', which is one of the methods that Leisner tried. At a certain point after he had given up playing, the desire to resume became too strong [50]: "out of frustration, really just wanting to play, I started just playing with thumb and index fingers and slowly started practising and refingered a lot of things". He was so desperate

[48] See 2.3.3.iii GETs: Retraining.
[49] See 2.3.3.iv GETs: Networking.
[50] See 2.3.2.ii GETs: Professional identity.

to play that he decided to ignore the uncontrollable fingers and see what he could accomplish using the only two digits that worked: the thumb and index. Provost used a similar approach to work around his problems, but since his fingers were only dystonic in certain passages, he refingered those parts as needed:

> So suddenly I find my index finger's flying out uncontrollably in certain passages, well okay, so if those passages became a problem then I might switch and I might say "Okay I'm gonna do instead of *i* and *m* I'm gonna do *i* and *a*." That would solve that problem … That would get me through, and then maybe a year later something else would come up and I'd say "Oh, okay, I can re-finger this, I can do *p* and *i* or some other combination."

Even when his index became a problem, he could still use it if he changed which finger it was paired with. He had initially chosen to use index and middle because they facilitated the most speed and fluidity, a common approach among guitarists. The annular is weaker, less mobile and less coordinated, so this workaround involved a combination that is harder to use. His other example of changing index and middle to index and thumb can be a good combination for speed, but it is much harder to obtain a sound that is as full and even. Although these workarounds would 'get him through', he eventually considered it to be patching up a problem instead of addressing the root, but he did not know what was causing the index to fly:

> what happened in my case, because I just kept transferring the problems, I kept doing workarounds … They just contributed to other problems in the shoulders. And if I had recognised early on that the flying out was more than just the tension not releasing properly in the index finger, but that there was something in the shoulder causing it, then I could have fixed it that much sooner.
>
> (Provost)

Provost was able to maintain his performance schedule and keep his dystonia secret because his condition never worsened; rather it occurred in new passages. Whereas Provost had a problem with a finger flying out sometimes, Leisner had three fingers that were uncontrollable with or without a guitar, so he gave up

trying to use his dystonic digits and relied on the remaining two.

Paraskevas' experiments with workarounds were less successful. He explained that this is just what he did for the first year: 'the first year it was experimentation including - I didn't know what to do, I mean, asking people, trying to do this, trying to play my old way'. This is because the old way is the only technique the player knows. This is also what Provost was doing: playing his old way most of the time (because he did not know what else to do) until a passage needed to be refingered. It seems there were times when Paraskevas thought he had found successful workarounds:

> In the beginning … I had no idea in which direction to go, I try this, I changed my hand, I changed this. Everything was working in the beginning, but then tension, the underlying problem always with dystonia is tension.

'Everything was working in the beginning' tells us that some new tweak he thought up would allow his hand to work for a while, until the tension once more became too strong for the hand to move. This suggests that trying an altered technique distracted him from the tension until each new technique started to feel familiar and the tension crept back. It was not until the end of the second year that Paraskevas understood that the problem was not hand position or direction of movement, but that tension was the root. His retelling illustrates his uncertainty as well as his attempts at obscuring it: 'In the beginning, I was trying to play, I was faking it'. Eventually he knew these workarounds were not going to work, but his retelling showed that it took a lot of experimentation to eliminate all possibilities before reaching his final conclusion. Paraskevas is arguably a different case to Provost as his entire hand and forearm tensed up near the guitar, and this might explain why Paraskevas was unable to find workarounds.

Provost discussed another workaround strategy not mentioned by the other participants. He had spoken with many others about their experiences with mFHD, and he explained that the problem often occurs gradually:

> The students, the colleagues that I know suffer from this … most of the time it occurs is a gradual-

> you can't release the fingers and the more they want to curl, the less control you have over the index and middle finger … and in early stages … sometimes you could, you could muscle your way through it, but never more than a couple of months.

The words 'muscle your way through it' suggest a brute force approach to getting the notes out. He notes that this only worked for short periods for those with slow onset. Since 'muscling through' suggests extreme tension, and 'the underlying problem, always with dystonia is tension' (Paraskevas), this approach would worsen the problem. Provost knew, perhaps only retrospectively, that he was using short-term solutions for a long-term problem: 'if you're using that as a temporary solution for the bigger problem, then it's fine because I was on tour and was still actively performing'. As a temporary fix on tour, ad-hoc refingering may be necessary to maintain the performance schedule. The problem for Provost was that he did not implement a long-term solution, but habitually adopted temporary solutions: 'I did this for 20 years! [laughs]'.

Whereas Paraskevas spoke of workarounds only succeeding in the short-term, Provost was able to use workarounds to maintain his career for two decades. Leisner's approach of playing the standard repertoire with only two working fingers may have also been a long-term solution: "in order to do arpeggios, I would do these crazy combinations of fingerings and found that I could play pieces that were quite impressively difficult with the *p-i* combination". When he realised that he could play some impressive pieces, such as Paganini's grand sonata (Leisner), he decided to put his new two-finger technique to the test in front of an audience: "You know, I had sort of worked my way up to it. I played private concerts for the quarter programme and then a half a programme, finally a full programme. And then I went to this major concert in the hall".

> And er, I actually was very successful, it was a concert that had some coverage, was at Jordan Hall in Boston, which is a very fine concert hall. It was covered by a very difficult Boston Globe critic Richard Dyer, who loved it and was very impressed.
>
> And I thought, "Okay, I can do this." So I was playing that way for a while.

After working up from short programmes to full recitals with just thumb and finger he resumed his performance career. Since the index and thumb do not share any of the muscles that the other three fingers share, it is a strategy that perhaps would have been effective long-term. However, it was not much longer until Leisner discovered the method of his 'cure' (detailed in the next section) so his workaround became unnecessary.

Garcia's workaround differed to those discussed so far: 'I'm, trying to find repertoire which is really hard for the left hand and not quite so hard for the right! That's one way round it! [laughs]'. Unlike Provost (and Paraskevas at first), he knew this was just a workaround, but he did not solely rely on this approach since he also engaged in basic training in an ongoing attempt to cure himself [51]. This stop-gap allowed him to maintain his playing because 'you have to feel, I think, if you're studying an instrument, and any endeavour, that you're actually making some kind of progress and, you know, you're encouraged by that' (Garcia). In this case, his progress comes in the form of pieces that challenge him in ways that do not risk adversely affecting his dystonic right hand. His comments indicated that he was not 'muscling through', but trying to play pieces that allowed him to maintain relaxation in his right hand and stay within the limits of its reduced functionality.

After attempting various workarounds to maintain their accustomed level of play, these guitarists concluded that a more significant change was needed.

2.3.3.iii GETs: Retraining

Paraskevas observed that many musicians recovering from an injury 'try to play from where we stop - from the technique we had', but these guitarists learned through trial and error, and failure, that they needed to relearn from the very beginning. They rebuilt their technique from absolute basics, and progressed slowly to avoid tension creeping back in.

Leisner tried the most radical retraining strategy: he flipped the guitar and swapped hands so that his dystonic plucking hand became the fretting hand and vice versa:

[51] See 2.3.3.iii GETs: Retraining.

> Interviewer: Did you consider turning the guitar over and playing that way?
>
> Leisner: At some point, I did. I had heard about the violinist who did that. I don't remember his name. Famous violinist.
>
> Interviewer: Was that to counteract a problem?
>
> Leisner: Focal dystonia. … Yeah, seemed to help him, er … it, it didn't help me.
>
> Interviewer: So your hand still curled up when you tried?
>
> Leisner: Oh, yeah. Yeah.'

He thought a radical change of approach would allow him to use his hand again, although it would be a long process to relearn the intricacies of techniques with the hands in reversed roles. However, his fingers still curled uncontrollably. This contrasts with the account of a pianist recounted by Garcia from his talks with Farías, a doctor who works with dystonia patients (not just musicians) in Spain:

> He had a Japanese pianist who had to give up playing because every time she sat down at the piano, her arms went out like that and she couldn't move. So he discovered, I think by accident, that if you took the piano stool away, put her in a normal chair, she could play.

The change of stimulus with a different seat seems to be key here. While Leisner's guitar turnover was more radical, he did not experience any success with this approach. It is possible that two factors stopped this approach from working, either separately or in combination: Leisner's mFHD had progressed to the point of affecting his ADL; the finger action required for fretting a note and plucking a string are rather similar. Further research is needed to explore such factors.

Garcia explained his approach of relearning how to use each finger separately with more relaxed technique:

> So erm, I've been looking into actually relaxing the fingers again, like a beginner after each stroke, maybe even just using one finger and, just seeing, making sure I can understand what it means to relax a finger … which means not pushing it back into position, but relaxing, switching off the muscle so it

relaxes again.

This suggests his approach is similar to that of Paraskevas sitting 'in that corner, playing open strings' [52] because they both spoke of focusing on relaxing the right-hand fingers while playing very simple patterns, but Paraskevas explained in more detail:

> You have to start from "How I can play one note without being so tense?" In the beginning, you have to approach the instrument with no tension at all … Approach the instrument in a very simple way … we have to engage the string with no tension. You know, we go to the string with tension … So, for instance, I remember for three months … I was going to the string, relaxed. Because I realised I cannot go to the string, relaxed. The moment I was going to the string, I was tense, was tense here, was tense here [indicates areas of forearm]. So lots of my retraining will be how can I approach the instrument? Not rushing it. Even place my right hand on the guitar without tense [*sic*], and I leave my hand on the guitar, and the moment I feel no tense [*sic*], then I will engage the string.

He had spent so much time playing with tension that he lost the ability to relax at the guitar, and it took him three months to learn how to bring his hand to the instrument without it locking up from tension. This was how he began the process of retraining to allow relaxed playing:

> First of all, you have to realise what you do, and you have to retrain the brain. You have to send the right messages from the hand or wherever is the problem with dystonia, back to the brain, and that's how we train the brain the right way or even the wrong way, so we retrain the brain.

Although habitual movements are often referred to as muscle memory, here he has explained that it is the brain that holds the memory, and that the habit process can be trained by carefully giving it the right signals[53] in the form of correct movement patterns: this does not just mean the path a finger takes, but

[52] See 2.3.1.ii GETs: Awareness.

[53] The way language is used to denote the perception of multiple entities involved in the playing and learning process is covered in 2.3.1.iii.b Three perceived entities in one body.

includes how much tension is used.

Leisner's retraining involved learning to use totally different muscles, and he got the idea from sitting in on a colleague's masterclass:

> He was showing a student something that he was just beginning to experiment with, which was using larger muscles, I don't even remember if he described it that way. He may not have, but he was asking the student to just swing at the string with gross motions and that student's playing, it got better, the sound was better, it was a little louder. It was a very interesting idea and a- the light bulb went on in my head. I thought this might have something to do with my focal dystonia. So, when I went home to New York right after that, I did this in my practice room and within five minutes of doing this, my ring finger was releasing … And I mean, obviously, I wasn't cured on the spot. It, uh, I, I knew that there was a lot of work to be done, but I also knew that this was the beginning of something … I took the ball and ran with it. And in my usual intuitive way, developed slowly but surely more and more nuanced and refined understanding of what this meant and how to develop the idea further and what, I knew I was using larger muscles, but I didn't know where they were, and it took me actually a couple of years before I figured out that they were involved in the armpit in a certain spot.

When he shifted his focus from using small movements with hand and forearm muscles to making larger movements with shoulder muscles his hand began relaxing. It took several years of crafting a new way of playing based on this new idea, but more than 20 years later he is still using this approach and using it to help others with their dystonia.

When Provost finally addressed the root of his mFHD after twenty years of working around it, he needed several approaches. Not only was he being treated by a therapist to help him release his decades of shoulder tension, but he recounted that he also needed to use finger braces to restrain healthy fingers to aid his focus on relaxing his dystonic fingers. All four guitarists used workarounds with varying degrees of success before opting for fully rebuilding their technique from scratch.

2.3.3.iv GETs: Networking

Although it has been shown that musicians maintain a culture of silence about their injuries, this data points to a secret network of guitarists with dystonia. In the late 1980s Garcia received a letter from an old

student who had been affected with mFHD and was on ‘a quest to find out anything about it’. At this time Garcia was unaffected and knew nothing about the condition. Around a decade later, when his onset came, he went on his own quest. He did not contact many other musicians ‘because I felt, you know, I got myself into this hole, I should be able to get out of it’, although he did work with Leisner for a while ‘because I read about him having had this horrible sudden affliction’. This is a very different approach to that of Paraskevas: ‘I spoke with *everyone* you may know or you heard [of]’. Whereas Garcia decided to find his own cure without much help from others, Paraskevas decided to seek as much external advice as possible. When Paraskevas said that he contacted ‘*everyone* you may know or you heard [of]’ he implied they were well-known musicians rather than therapists, or at least that musicians featured prominently, since I, the interviewer, am also a classical guitarist. Provost did not mention seeking the help of other musicians for his dystonia, but two decades ago it was an almost unheard-of condition: ‘I was one of the earlier guitar players who developed dystonia. And so the only person that I had a reference to was, was David Leisner’. Although he mentioned knowledge of Leisner, he did not say if he actually worked with him. However, Provost became part of a network of dystonics that have contacted him:

> there are several people within the last couple of years, top level players who developed it, but they were able to really get it under control within six months. And most people will never even know that they had it. Some are very open about this, and others are not so open about it.
>
> (Provost)

Some of those contacting Provost wanted their affliction kept secret, suggestive of a private, protective network within a public culture of silence. Since he did not have the same disastrous sudden onset of Garcia and Paraskevas, Provost did not seek a cure as intensely, being able to work around his problem for many years [54]. When he did decide to eliminate the problem, he did so with the aid of a therapist, but he got the idea from his network:

[54] See 2.3.3.II GETs: Workarounds.

> a colleague of mine … said that their whole issue had to do with their shoulders. And so I immediately started thinking "Shoulders, wow. That must account for why I've always had stiffness in the shoulder," so … I went to this Martin Cherniak who at that time had a musicians' clinic.

His mFHD manifested around the year 2000 and he knew of only one other musician with the condition, but around 20 years later he had a network of dystonic musicians to exchange experiences with. It was through this network that he got the idea of how to cure his fingers, and he immediately went for medical help to correct his long-term shoulder tension while simultaneously working on retraining his fingers. Leisner also sought medical help when he was unable to discover what was going wrong with his hand:

> I started to seek help from various people. First person I went to was a chiropractor, and all these people that I went to there wasn't a single one who helped me … I went to one fellow who dealt with biofeedback, that was interesting but didn't do me any good. I went to a hand specialist who knew the least. Ironic, of course. I went to a myotherapist in Washington. And oh, God, I went to an acupuncturist. I went to a clinical kinesiologist, that was quite esoteric. I don't even remember all of them, the last person I went to was somebody who did what he called Hoshino Therapy, which was an eclectic therapy that involves some Rolfing technique … it's very, very deep tissue massage, but really deep. They go in very deep, very, can be very painful. And some people swear by it. Leon Fleisher sweared [*sic.*] by it.

Since it was the mid 1980s the only other dystonic musician Leisner had heard of was the pianist Fleisher, so medical help was really the only path. When Garcia's onset came circa 2000, there were other options to choose from, and he avoided medical interventions.

There have also been times when medical professionals have sought the help of musicians. Leisner mentioned two people who referred clients to him:

> Nancy Byl … brilliant lady. And she's had some success with people and not with others, and sometimes she'll she'll send me people who she hasn't had success with because she respects what I do. As is true of a medical doctor in in New York who's kind of well-known in the focal dystonia

> world, Steven Frucht.

Leisner mentioned two medical professionals who send musicians to Leisner when they cannot help. Paraskevas also gets referrals, but he has had more diverse requests: ‘I had people, they’re surgeons calling me and asking me’. Unfortunately, Paraskevas felt unable to advise them since the hand movements of guitarists and surgeons are so different.

Two participants mentioned the desire to learn as much as possible about dystonia: ‘Since [recovery] I read more books. I'm interested about the subject, I’m interested about what more we can learn about this’ (Paraskevas). Provost mentioned Leisner’s book Playing With Ease, and explained:

> I've found a solution for my focal dystonia. But I want to see what David's going to do because there may be tips and that can improve my my progress. And more importantly, what I've learned may not work with a student that comes to me with similar problems. So I better have a broader knowledge of that.

Sharing knowledge amongst this network of musicians emerges as vital, especially since not everybody responds to treatments the same way. When well-known performers are open about their dystonia, other dystonics will contact them for help, so the more ideas they have from different sources the more effective their assistance can be.

From these participants we see evidence of secret networks within the culture of silence. Although some musicians are very open about their experience (Leisner and Paraskevas have both published books explaining how they cured themselves), others become a part of this network yet still desire that their problem be kept out of the public domain.

2.3.3.v GETs: Distrust of doctors.

A theme in this data is that of distrusting medical advice and health practitioners. Leisner mentioned being treated by seven different therapists, but also said he could not remember them all. This long list of failed therapies led to his distrust of therapists:

> ‘All of these people that I went to, there wasn’t a single one who helped me. Er, one of them made it worse … and every time I would go to somebody, I would trust them completely and, do everything they said and, and my hopes, ya know, they all said “We can help you” and, I'd be so excited about it and then my hopes were dashed to the ground every time.’

Other musicians had no direct experiences with medical practitioners, choosing to avoid them altogether: ‘I certainly didn't go the medical route’ (Garcia) suggests through the word ‘certainly’ that he was very against the idea. Interview data suggests this was because he had heard about botox injections and invasive brain surgery [55]. He did contact Leisner, and later worked with Dr. Farías (a doctor in Spain who specialises in retraining dystonics) because Farías had had a good deal of success treating dystonia patients without invasive procedures. Paraskevas did not mention working with doctors. When he said ‘I spoke with *everyone* you may know or you heard’, he implied he only spoke to musicians because I as the interviewer and a guitarist may be familiar with musicians. Leisner’s distrust of doctors stems from his direct experiences, not just because of their failure to help him, but also how little they seemed to know about the condition:

> I went to people of eastern medical persuasions to western. I tended to trust the alternative and eastern ones more than the western. The western doctors seemed to know the least … I went to a hand specialist who knew the least. Ironic, of course.

This apparent lack of knowledge among therapists was also the basis for Paraskevas’ distrust, but in his case it did not stem from direct contact: ‘There's a lot of misinformation out there, and especially the misinformation is from the doctors … and the doctors, they don't *really* know what is the focal dystonia for musicians’. Although he did not seek help from therapists, he did a lot of his own research into the condition, and it was this research which formed the basis for this opinion. Garcia and Paraskevas may also have been influenced by Leisner’s story, since it is seemingly well-known among guitarists. Contextual

[55] 1.2.5.3 Focal dystonia treatments.

information from the interviews points to some participants distrusting medical professionals due to research, whereas another participant's distrust stemmed from numerous failed therapies.

2.3.3.vi GETs: Treatment

Although there are mentions of dystonic symptoms and successful treatments dating back to the 19th century (e.g. Bianchi 1878, see 1.2.5.1 Background), such knowledge is still not widespread or standardised, so these participants did their own research and turned to many sources for help with treatment. Provost was one of the earlier guitarists to develop mFHD, saying 'and so the only person that I had a reference to was was David Leisner'. Provost was not aware of treatments when his onset occurred: 'nobody knew anything about the treatment of this and so we were left many times to our own devices'. This partly explains why he used workarounds instead of addressing the root: he had limited options for people to consult.

When Paraskevas spoke to every musician he could that had experience of dystonia he was confronted with extensive and conflicting information:

> Everyone I spoke to, you know, everyone, everyone was following a different, a different approach, and every different approach, it was kind of, it was almost kind of "everything was okay".

Interviews indicated that what participants wanted was a simple solution so that the cure could be seen to be achievable. What Paraskevas encountered was a variety of methods that each needed to be tried: it took him two years to find what would work for him.

His own experience plus what he subsequently learned by helping other dystonics convinced him that retraining needs to be very specific:

> You have to see how you can retrain the specific movements you're trying to reproduce. It's not like a generic thing – "Okay, let me fix my hand to do everything." "What your hand does not do?" "These specific movements." "Why do you need these movements?" "Because it's my profession."
>
> (Paraskevas)

He explained that it is necessary to retrain the hand for the specific faulty movement(s). This partially explains why there are different treatments that work for different people: two guitarists may have very different symptoms, such as Paraskevas' locked hand versus Provost's flying finger; so their rehabilitation needs differ (see 1.2.5.1 Background for a description of different ways in which mFHD symptoms can manifest). Leisner tried Hoshino Therapy, which was successful for another professional: 'Liam Fleischer sweared [*sic*] by it. Actually, he claimed that it cured him. Fleisher was never cured completely, but it did seem to help him. It made me worse'. Leisner mentioned other cases of certain approaches not working for everybody:

> There's a lady in San Francisco who's done a lot of research on the brain issues. Nancy Byl … brilliant lady. And she's had some success with people and not with others, and sometimes she'll send me people who she hasn't had success with because she respects what I do. As is true of a medical doctor in in New York who's kind of well-known in the focal dystonia world, Steven Frucht, um, when the neurological and the brain issues seem to have not proven the pathway, then they send them to me, not knowing exactly why I do what I do works, but knowing that it *does* work for many people.

Byl has published pioneering work in the fields of Body Mapping and focal dystonia, thus, people receiving therapy from her may have high hopes. Leisner has worked with many such people over the decades, but sadly, many of them experience even more disappointment because, although he has helped them all on some level, he has not cured them all [56].

Since guitarists have their own unique treatment needs, the differences for other instrumentalists is marked:

> If I have someone to come to me and say my right hand does not work, as a guitarist I will know exactly what to do with this person. But if someone comes to me and says I am a trombone player and

[56] See 2.3.4.iii GETs: Aetiology.

> I have dystonia, the embouchure dystonia, I will not know how to help except telling the basic principles, but in order to help the person like this, you have to know the technique of what someone needs to do to play this instrument. If a pianist comes to me, it will be, ah, little bit closer, but still is not going to be my specific, my specialisation.
>
> (Paraskevas)

The action of playing a single piano key is similar to that of plucking or fretting a guitar note. As such, Paraskevas felt he could help a pianist to some extent, but not a brass player with embouchure dystonia. As such a public figure, he must have been contacted by people from all around the world, but there were times when he was at a loss to offer much help at all: 'I had … surgeons calling me … I will not know how to help except telling the basic principles' (Paraskevas). He did not go into any details about talking with them, but it is interesting to see that other precise tasks are affected by dystonia.

Musicians tend to be impatient (Garcia), wanting unrealistically fast results. This rushed attitude does not work when recovering from dystonia:

> This is the problem with many of us sometimes trying to recover an injury: we try to play from where we stop - from the technique we have. "Well, I cannot play this anymore." "Okay, you cannot play this right now." So we have to start from basic things, even if we have to play open strings for six months.
>
> (Paraskevas)

Although demoralising, participants noted that it could be necessary to go back to the most basic of movements and work on being able to perform one pluck without excess tension or unwanted movement: 'You have to start from "How I can play one note without being so tense?"' (Paraskevas). Even though Leisner's and Paraskevas' hands were uncontrollably tense when near the guitar they had different approaches to remedying this. Leisner found his fingers started to release after five minutes of 'swing[ing] at the string with gross motions', whereas Paraskevas practiced bringing his hand to the guitar without tension manifesting. They both tried rebuilding their technique from basics, but Paraskevas was still relying

on a traditional technique, whereas Leisner was trying a new method that focused on totally different movement patterns.

These participants turned to various sources for information and treatment and found that treatments that worked for others did not necessarily work for them, meaning that treatments may need to be tailored to the individual.

2.3.3.vii GETs: Prognosis

An individual recently diagnosed with mFHD might receive a gloomy prognosis: **'**It's usually a lifelong condition. It may get worse for a few years but then remain steady. Occasionally, it can improve over time' (National Health Service 2018). When Paraskevas began his retraining, not only did he not know what he needed to do, but he did not know how good his chances of success were: 'In the beginning … I didn't I didn't even know if this is going to work'. Garcia also showed uncertainty as, after circa 18 years, he was only at 'about 70, 80 percent', admitting that 'you may never, ever get back to the original way that you could play'. Leisner has worked with many dystonics over the decades but confessed he has not cured them all:

> I haven't cured everybody by any means and not even close. It's only a small percentage of the people, and I've seen a lot of people come to me from all over the world, and I only a small percentage have really cured, fully cured. But but almost all of them, I have helped in some way.

These accounts demonstrate that there remains a lot of uncertainty around the prognosis of recovery from dystonia because it is not understood well enough and it affects such a small portion of the population, which hinders study. Paraskevas explained that understanding the recovery timeline of other injuries is much simpler:

> If you had the cast around your your hand because you rode the motorcycle, no one will question this. "What happened?" "I broke my damn hand." "Oh, how long it will take?" "It will take a year." "Wow, okay. At least after a year you will play." … But people with, you know, focal dystonia think, "Oh, when am I going to go *out* of this? What's going to happen?"

While healing and expected repair times for fractures and other trauma-related injuries are well established, this is not the case for many overuse and repetitive strain injuries such as tendinopathies, frozen shoulder or non-specific low back pain (Hodges & Tucker, 2011). Even less is understood about conditions such as focal hand dystonia. When Leisner talked to someone at NIH he was given very bad news: 'somebody that I spoke to who worked at the National Institute of Health told me that, in fact, in the performing arts medicine world, focal dystonia is considered incurable'. Leisner's observation relates the 1980s when research on the condition was sparse. Even so, Paraskevas claimed that the situation was not significantly changed when he was affected in 2009: 'there's a lot of misinformation out there, and especially the misinformation is from the doctors'. This could be because the doctors are reliant on the medical literature, which does not contain all the information we have[57].

One area in which mFHD can be seen to be similar to other injuries is that beginning retraining early may allow for a faster cure (Paraskevas, Provost). Leisner believes it begins in the muscles and takes considerable time to become embedded in the neurology:

> I think that focal dystonia begins as a muscular condition, always, and it can deteriorate into a neurological and brain condition, and that's, when it goes to that level, that's when I have less success. When it's reached that level, that's beyond my understanding. But if I catch somebody at the muscular, muscular state stage, that's what I can really help with.

He has found his method more successful when treating people in the earlier stages. Provost's comments accord with this view:

> If you catch it early enough it's reasonably easy to bring it back when I say relatively easy, I don't mean that you just think about it it's gonna be there, but I really should say it's a relatively short recovery period to rehabilitate, I think because you've caught it at its beginning cycle … before you've

[57] See 2.4.3 Strategies.

established a bunch of unwanted neurological impulses for lack of a better word.

He also explained that there have been professionals who have recovered in months, rather than years:

> But now there are … several people within the last couple of years, top level players who developed it, but they were able to really get it under control within six months. And most people will never even know that they had it.

Although medical sources may give a poor prognosis for musicians' dystonia, two of these participants showed that it is possible to fully recover from severe disability. Interview data also suggests that most people can make at least some improvement to maintain a level of play.

2.3.4 Attribution

The participants discussed several factors to which they attributed the development of mFHD. Attribution is a term derived from psychology (Cayirdag 2011: 96) meaning 'the explanations people assign to specific events' (Allen 2012: 1). It is the locus of where someone places credit or blame for lived experience. Most of the attribution was centred on an internal locus, attributing some of the causes to themselves or their own behaviour.

Even though all participants agreed there is lack of education around musicians' health in music curricula, interview data demonstrates that they frequently believed or assumed that they were to blame for their condition and developed attributional explanations, often combining these with neurological and psychophysiological perspectives. For example, Paraskevas attributed difficulties experienced in terms of 'brain messages' that resulted in faulty self-training: 'If you give to the brain stuff that, they're not good stuff, still, the brain will take it as information … when the brain gets the wrong message, we will reproduce the wrong message'. For this reason, he asserted that '*We* are actually doing it. We are making the muscle … do this movement, but we don't realise it'. The phrase '*we* are actually doing it' suggests that he identified himself as part of a collective that had made the same mistake over a long period. This is reinforced by the content of the interview at this point; speaking of his experiences helping other dystonics. Garcia also used language to situate himself within a group when he said 'We put ourselves in a situation where that injury

manifests'. Leisner, when asked what the cause was, simply stated that 'I wasn't using my large muscles correctly, that I wasn't supporting with my large muscles'. Unlike when he was discussing his symptoms[58], he used personal pronouns for both himself and his muscles. The experiential language is strong here, suggesting he accepts all the blame. The same strong acceptance of blame is evident in the language used by others:

> I got myself into this.
>
> I realise now that when I could really play, I was actually spending an awful lot of time playing the guitar … Unfortunately, I wasn't actually doing [it] quite the right way and not being completely aware of what I was doing.
>
> (Garcia)
>
> So now I've been … focussing on getting rid of all of these, these issues and finding out that the issues had very little to do with my fingers, but had to do with all the tension I was storing in my shoulders and neck because I was *willing* myself to play these passages at a level that I felt I needed to play at.
>
> (Provost)

Although he said 'the tension *I* was storing', the strongest evidence of an internal attribution locus was Provost saying 'I have to take the blame for a big portion of it!'. He additionally placed some blame on a hectic touring schedule [59], an example of external attribution.

Although these participants placed some attribution on such things as a busy touring schedule or a gap in education, they all accepted most or all of the blame.

2.3.4.i GETs: Over-working

A theme evident in most of these interviews was that of working extremely hard in the time leading up to onset of dystonia. Three participants explained that they were under a lot of pressure and working

[58] See 2.3.1.iii.a Experiencing vs. observing.
[59] See 2.3.3.ii GETs: Workarounds, and 2.3.4.i GETs: Over-working.

very hard when mFHD manifested. ‘So, I’d just done three CDs with Naxos in one year and I'd just done concerts with a flautist and also some solo ones’ (Garcia). Preparing around three hours of music for recording is no small feat, and maintaining that much music for recording in such a short period is extremely demanding. Since Naxos is a premier publisher of classical music recordings, they would certainly expect a high level of performance. Being prepared for both solo and duet recitals required a lot of private practice as well as duo rehearsal time. Similar to Garcia, Provost was maintaining both solo and duet repertoire alongside preparing future material to be recorded:

> … this duo with with my partner Alan Goldspiel, we were together for 20 years, something like that. We put out, I think, five or six CDs during that period, which meant we're touring with one programme, we're learning another programme that we're getting ready to record. And I was still maintaining at least the solo programme, at least one concerto.

These two musicians were investing a significant amount of overwork to maintain extensive repertoire. Interview data did not suggest that Paraskevas was working on as much music, but he was under different under pressures: ‘At that time I was playing again at the Carnegie Hall and I was playing that night two guitar concertos, plus solo, plus chamber, huge programme … Sold out concert’. He did not mention working on material for other concerts in addition to this, but Carnegie Hall is one of the most prestigious venues for classical music and, therefore, created a high-stress work situation.

These three participants acknowledged that they had imposed a heavy workload on themselves: ‘I did see some kind of weakness on my hand … ‘Oh, I am kind of weak because I’m practising a lot’ (Paraskevas). Another, when a finger malfunctioned and affected his ability to demonstrate to students would tell them:

> Look, you know, for whatever reason, my hand’s acting up and I have to assume I'm really doing more playing than I should be playing, but I really like doing this. So I'm going to find solutions around this thing.
>
> (Provost).

One explained how drained this high workload left him after the concert:

> I pushed myself … Played the whole night, no problem. Emotionally, though, I did not feel well, you know, I, you know, I played, pushed myself. There was no problem during the performance. And then after this I got tired in terms of "I don't want to play the guitar for a few days, I want to take a break."
>
> (Paraskevas)

He did not state that he was working *too* hard, but he did say that he could not bring himself to play in the following days. Feeling emotionally unwell suggests an extreme drain of both energy and his sense of well-being. Garcia did not experience this, but simply noted that 'I realise now that when I could really play, I was actually spending an awful lot of time playing the guitar'. It took losing his abilities and suddenly having a lot more free-time to make him realise how long he spent at the guitar each day, and how hard he was pushing himself.

One factor that may push musicians to achieve more is comparison with other performers, combined with an expectation of a higher performance standard. Provost believed that mFHD is an illness of the modern age:

> It seems to be a 21st century ailment, particularly … for guitarists … you do hear about pianists getting focal dystonia. But again, it's been late 20th century, early 21st century, and I have to say I think it's the performance standards.

In the 19th century and before, comparison with other musicians often required purchasing concert tickets, and people rarely had opportunities to hear virtuosi such as Paganini or Liszt. This rarity gave people a rose-tinted view: 'Segovia was never a note-perfect player. Didn't matter!' (Provost). With vinyl recordings, imperfections and nuances were lost to the technology's inadequacies. With the introduction of the CD, high fidelity recording was taken to a new level and so too were people's expectations due to new editing techniques (Provost; Altenmüller and Jabusch 2010: 35). Splicing in notes can be done with a few clicks

instead of painstaking work with razorblades, as was the case with analogue recordings. Suddenly everybody had to follow suit to stay relevant with 'perfect' recordings, and 100 edits per track became normal (Provost).

Prior to their onsets, three of these participants were under a high workload during a period in which digital recording and editing technology had raised the public's expectation regarding the level of playing in live performances.

2.3.4.ii GETs: Habit

This section concerns how the participants discussed the habit-forming processes involved in learning music, and the difficulties of changing habits after they have been ingrained. When movements are performed often enough, they form engrams. This is a neuropsychological term for 'motor patterns used to perform a movement or skill, that are stored in the motor area of the brain' (Kent 2007). Colloquially, there are known as 'muscle memory' and allow tasks to be performed automatically:

> Through doing the same movement hundreds of thousands of times … you do build up the neural pathway, which I don't really know the mechanism of that, but it obviously has something to do with your brain.
>
> (Garcia)

New neural pathways are created and then reinforced through reiteration (Johnstone 2017; Münte *et al.* 2002: 476). Although referred to as muscle memory, it all takes place in the brain. This process is what allows some people to walk and talk simultaneously, and is also an important part of being a good musician since the player can focus on expression and let muscle memory play the notes.

The ability to store repeated actions as engrams can cause problems when the wrong actions are repeated:

> Most [students] … don't think of playing the guitar as "you're training the muscles to respond in a specific fashion". They think of repetition as you're developing muscle memory. And you are, but you can develop good muscle memory and you can develop muscle memory that's going to come back

> and bite you- [hesitation as he decides how to finish the metaphor] down the road [laughs].
>
> (Provost)

Three participants used slightly different descriptions for the same process occurring in the dystonic brain: 'it seems like it builds up a kind of neural pathway which is wrong' (Garcia) because the habit-forming process has no discernment (Paraskevas). Another interviewee explains: 'it's so simple … when the brain gets the wrong message, we will reproduce the wrong message … you have to teach the brain the right stuff' (Paraskevas). The habit-forming process has no discernment about whether motions are good or bad, efficient or inefficient, so it is up to the player to consciously decide such things:

> The brain has no idea what is wrong and what is right. Whatever you give to the brain it will do. If I want to practise a C major scale and I play the C major scale, and I do a mistake. I played *do re mi*, and when I went to play the F I buzz that F. The brain will classify this as a piece of information. Then you realise you play a mistake. Then you do the scale again from the beginning. You do the scale from … the beginning, then you have another scale that you played *do re mi fa sol* but when you play the *la*, you make a mistake instead of play *la* you play something else. The brain will have no idea that you doing mistakes. The brain will say this is one version of your C major scale, this is a different version of the C major scale. The more mistakes you make, the more versions of the brain will have of one single thing.
>
> (Paraskevas)

Here, 'the brain' refers to the area of the brain responsible for habit-forming, since the 'self', 'brain', and 'fingers' were discussed as if they were three separate entities [60]. Paraskevas explained that every time a passage is played with a slight variation the brain will store that as 'a version' of that passage but will not know which is best; they are just things that occurred. It is up to conscious thought to decide which is the desired version and ensure that version becomes habit. 'So if I play the C major scale exactly as I want it to sound with the right technique, six same times consecutive without a mistake, I'm creating the new

[60] See 2.3.1.iii.b Three perceived entities in one body.

neurone' (Paraskevas). According to him, this new neurone must then be reinforced through repetition, avoiding the strengthening of unwanted neurones.

Deciding what the best motion patterns are, and repeating only those, is what should happen constantly during practice (Paraskevas). This is what Paraskevas calls 'studying' instead of merely 'practicing'. According to these participants, the problem for dystonics is that they have unwittingly created neurones that, although they create exactly the right sounds, caused problems for the fingers later. One participant tried to explain how learning the wrong habit can become a dystonic pattern:

> I think it's got to do with combining movements. For instance, if you're doing tremolo on the guitar, you know, you're actually using *ami*, or *pami* [61]. And it's one movement. If you thought of each one as a separate one, you would never reach that fluency of tremolo … But the thing is something can happen … which means that er, your brain kind of combines or chunks, if you like, a lot of movements together, so you, so you don't think any more of separate movements, it's one movement, which is not necessarily a bad thing, but it can affect the way your hand relaxes. If it does that [demonstrates plucking motion] and you don't relax afterwards, you get stuck in that position, and you sort of tend to lose the fine control over the fingers, which you need to do a really nice tremolo, for instance.
>
> (Garcia)

Two dystonia mechanisms are being described here: overflow; and an inability to relax. Tremolo [62] is a complex technique in which (usually) a bass note is played with the thumb followed by a single melody note played three times by the annular, middle and index fingers. This requires precise control to hit every note evenly in terms of timing, volume, and tone at around ten notes per second. To reach this speed the player cannot be thinking of every note, instead relying on muscle memory to turn each cycle of *pami* fingering into one unit although the four digits are always moving successively, not as one block (Garcia). With dystonia the fingers can lose the ability to move independently and are 'chunked together' (Garca) so that moving one finger causes others to move in a process called overflow (Hallett 2011: 2). This could

[61] *pami* = pulgar (thumb), annular (ring finger), middle, index.
[62] The most famous example of this technique is Tárrega's *Recuerdos de la Alhambra*, as heard here: https: //youtu.be/uIVqnusZbMk

turn four successive yet rapid movements into one uncontrolled motion. Garcia also explains that playing without relaxation at the end of movements can result in the dystonic hand getting stuck at the end position because the hand was not taught to relax. Thus, the fingers lose the ability to relax and remain tucked into the hand, something also experienced by Leisner [63].

Each participant expressed their own way of conceptualising the habit-forming process, using mechanistic and animalistic descriptions as a method to understand an experience that they found confusing. This is related to the next them of aetiology.

2.3.4.iii GETs: Aetiology

All participants believed that body misuse causes cortical changes, although they did not all agree on what constitutes misuse. One participant tentatively believed that the cause was relying on the wrong muscles to play: 'I can only guess that since I cured [myself] this way, that I wasn't using my large muscles correctly, that I wasn't supporting with my large muscles' (Leisner). Shortly after finding his own cure, he discovered that another professional guitarist had come to the same conclusion for somebody else:

> And fascinatingly, right after, about a month or two after I made that discovery, I had breakfast with Pepe Romero [64] in New York. And Pepe, as it turned out, had experience with focal dystonia with his father. His father had focal dystonia, and Pepe helped him cure it. And Pepe, you know, is not a seemingly not an expert on the subject, but he is, like me, he's very intuitive and he had a sense of what to do with his father. And he said, Uh, he said, "I'll show you where the problem was," and he came over to the other side of the table, put his finger in that spot [in the armpit]. I said, "I can't believe you're telling me this because I just discovered this two months ago!" [laughs]. And so we had fun talking about that. But anyway, we had come to the same conclusion from different, different paths.
>
> (Leisner)

As further supporting evidence for his belief, Leisner explained that he has worked with many others suffering hand dystonia, using this same strategy of changing the movement patterns to incorporate more

[63] See 2.3.1.ii GETs: Awareness.
[64] A celebrated classical guitarist.

support from the torso muscles. He explained that his approach has worked on some level for everybody, although he has not cured everybody:

> almost everybody that's come to see me has been helped on some level. I haven't cured everybody by any means and not even close. It's only a small percentage of the people, and I've seen a lot of people come to me from all over the world, and I only a small percentage have really cured, fully cured. But but almost all of them, I have helped in some way.

This belief that dystonia is caused by simply relying predominantly on peripheral muscles is at odds with the beliefs of the other participants.

Provost was convinced that his dystonia was caused by shoulder tension, but did not generalise about this factor's presence in other people: 'the issues had very little to do with my fingers, but had to do with all the tension I was storing in my shoulders and neck'. In contrast, Garcia was fairly convinced that tension was the cause of most problems: 'Now, I believe that the source of most injury has to do with inappropriate tension'. He explains that it is a confusing condition with a very hard to diagnose cause:

> So when you actually get this condition, it feels as if you're doing something wrong in your brain. It *does* feel as if it's your brain that's creating the problem. However, I actually still believe that the problem is created by tension in the muscles, creating this neural pathway so after a while, of course, the two, it's difficult to distinguish which came first, but I think the first thing which comes is an incorrect use of the body.

Another participant was adamant that tension was the root cause of dystonia: 'the underlying problem, always with dystonia is tension' (Paraskevas). He claimed that there is nothing physically wrong with any part of the body: 'there's nothing wrong with the brain, there's nothing wrong with the hand'. These participants believed it to be the fault of the player for misusing the body rather than an innate, possibly genetic, fault that predisposes certain people to this affliction. Paraskevas described that consistently playing with tension trains the brain to keep playing with tension, and Leisner also believed that body

misuse causes the brain changes: ‘the neurological system at some point, it seems to me from what I can tell, becomes involved in in a major way’.

Provost put forward a different theory not based on constant tension or using the wrong muscles:

> If you're trained, as I was to release the finger as the next finger plucks, then that's your point of release. If … if you release it earlier or later, it causes a certain amount of muscular confusion neurologically between the fingers.

Although he attributes his own dystonia to long-term shoulder tension that radiated to his fingers, he suggested that slightly mistimed contractions can cause ‘some kind of short circuiting of the impulses … from the brain to your fingers so that they don't respond in the way that, that they normally do’. These two aetiologies are not mutually exclusive, since shoulder tension could radiate to the fingers so that they do not relax fully or at the right time, triggering this neurological confusion.

Each participant had their own belief regarding the aetiology of their condition. Three believed it was inappropriate tension in the playing muscles, while the fourth believed he was using the wrong muscles. As shall be considered in this chapter’s discussion, these hypotheses differ from that put forth in current literature.

2.3.4.iv GETs: Psychology

The psychology of injury was discussed by some participants. For Leisner, who has worked with many dystonics over the decades, two traits that he associates with mFHD are being especially motivated, and being very detail oriented: ‘Very often, and this is especially true I think of focal dystonia personalities, we tend to be very … driven … and very meticulous about details and stuff like that’. Working with them, he noticed that ‘they'll sort of go to every possible nook and cranny and try to figure out all aspects of it’. This suggests two things about dystonics: that they were displaying obsessive behaviour; that they were missing the big picture due to their minute focus. Another very common characteristic of musicians is the desire to be better instantly: ‘most people who play music are usually impatient’ (Garcia). He included himself in that statement by explaining that recovering from dystonia requires ‘real patient work, which

I'm not necessarily very good at'. He suggested that impatience can lead to dystonia: 'it has to do with impatience, I think, you know, wanting to do something, hearing it in your head, you know, thinking you've got a solution'. The impatience to reach the highest virtuosic level means that musicians will do any amount of practice, focusing purely on the sound. Provost was also guilty of this: 'I was *willing* myself to play these passages at a level that I felt I needed to play at to present my musical ideas'. It could be that he could have achieved the same level with a little more time and patience. Or, since Paraskevas said learning to play with relaxation improved his playing, perhaps Provost could have achieved a higher level with more patience and less tension.

There may be other risk factors beyond personality traits. Paraskevas suggested that psychosocial events can trigger dystonia:

> Everyone I know with injuries that … had focal dystonia, everyone had the perfect technique, but there is a specific time in their lives. This technique is been altered because of different issues, and these different issues can be another injury, can be, you know, psychological issues and you push tension without realising, even with the best technique, and suddenly this is where it turns and it becomes a problem. So it doesn't mean that someone was taught wrong and plays that way for decades and decades. It could happen to any one of us. I mean, that was my at least experience.

Whereas it is possible that someone can develop mFHD through playing badly for many years, Paraskevas observed people developing it after a particular event caused mental stress, increasing the tension in their playing. Garcia also believed that such stresses can lead to injury:

> And I think that's an important aspect of injury as well, that it happens in a circumstance which is brought about either by performing under stressful situations or practising in a in a stressful way. You know, trying, having to get something done in a way which is possibly unrealistic for you at the time.

For him, a stressful situation could include pushing oneself too hard due to impatience with one's perceived playing level.

When it came to recovering from dystonia, Paraskevas mentioned other issues that can impede progress: ‘If you are nervous, you are going to have more tension and you’re going to aggravate the problem’. According to him, someone may be nervous about performing because they are not yet fully recovered, or perhaps they consider themselves cured but still fear a relapse. In these cases, ‘the problem can become psychosomatic. You have the fear for that, you have the fear of tension. So the moment you you start realising: okay, don't add another problem to the already problem’ (Paraskevas). According to him, it is important to keep the mind clear of additional stressors so as not to compound the issue.

Certain personality traits were identified by some participants as contributing to developing injuries, including being detail orientated, or being impatient and pushing themselves excessively. Stressful periods were also highlighted as events that could alter movement patterns and contribute to the development of dystonia. These accounts highlight the complex psychosocial effects of the injury, as well as additional stressors that compound this issue.

2.4 Discussion

This data gives a vantage point on key themes providing information on the lived experiences of classical guitarists with mFHD. Themes included: the musicians’ lack of interoception, which they then developed as part of their treatment; the presence of unique onset patterns for all four participants, although three of them went on to develop very similar aetiology hypotheses; participant development of ‘sense-making’ narratives to understand a confusing injury; the interconnection between professional identity, instrumental facility and health; musicians’ attitudes towards therapists and medical professionals; proactive adoption of, and experimentation with retraining processes. Many, but not all, of the above themes resonate with discussions in sport psychology such as attribution (Rees 2005) and the importance of coping resources and support networks (Johnson 2007), as well as discourse in music medicine such as the culture of silence (Guptill 2011: 91) and insufficient medical support (De Kock *et al*. 2023).

2.4.1 Embodiment

Alongside issues relating to identity, participant reports highlight embodied experience as central to their lived experiences of chronic injury.

Speed of onset is not mentioned in the mFHD literature to the best of my knowledge, but the escalation (sometimes increasing from being task-specific to affecting ADL) is. It can progress to being present even at rest (Torres-Russotto and Perlmutter 2008: 179), although it did not go this far for these participants, two of whom mentioned that attempting to fix the problem with more work resulted in further escalation. This same attitude is expressed elsewhere: Trush, a pianist who contracted mFHD while at a conservatoire, first experienced reduced mobility at the keys. This concluded with difficulties writing, typing, washing hair, and even waving (Trush 2017, 0:20). As was mentioned earlier, the normal response to poor playing is increased practice:

> After attempts on trying to regain the usual feeling by practicing even more for few days, my thumb eventually curled inside my palm with so much tension and from then on, no matter what I did, I could not play through a single measure.
>
> (Trush 2019)

Olson-Moser's (2021) MA dissertation reflects this in four interviews with dystonic professional musicians across a range of instruments. When their technique went awry, they were convinced the answer was yet more practice:

> I knew that I had not practiced enough … so I practiced literally seven hours a day, and it was gone. In two weeks, I couldn't play a note. And … other musicians do the same thing. They think they forgot muscle memory, so they practice more, and they destroy themselves, which is exactly what I did.
>
> (Olson-Moser 2021: 16)

The data suggests that the response of musicians to the onset of dystonia, when they noticed reduced control of their fingers, was to play more. This resulted in exacerbating the condition.

Among the four classical guitarist participants in this project we can see diverse onset patterns, with little to no warning before the fingers began malfunctioning. Hand fatigue and loss of speed could be due to excess tension making movements harder and overworking the muscles. Pianist Trush mentions

weakness as one of her early symptoms before the uncontrollable tension (Trush 2017, 0:20), while Bianchi mentioned treating a musician who experienced 'a kind of torpor in the left arm' (Bianchi 1878: 88). Trush and Bianchi both mentioned numbness, and other sensory observations have been mentioned, such as: increased cold sensitivity (Ackermann and Altenmüller 2021: 311); reduced spatial discrimination or altered kinaesthesia (Hallett 2011: 7). Such sensory changes are rarely mentioned in the dystonia literature. Kinaesthesia or reduced spatial awareness often requires special testing, as symptoms are often mild (Hallett 2011: 7). These mild sensory symptoms were absent from the lived experiences described in this thesis.

In the interviews, self-observation for diagnosis was trivialised, seemingly because it did not involve accurate measurements or any validated data gathering, although self-observation has proven very effective in rehabilitation from neuromuscular conditions such as strokes (Pazzaglia and Galli 2019; Son and Kim 2018) and it was an integral part of recovery for these participants. However, there is no mention in the literature of such treatments for musicians' hands and in Leisner's case this was a diagnostic tool, not an intervention. Accurate measurements would have been beneficial if there was something wrong with how the fingers were moving, but such was not the case. Leisner stated that his condition got worse during this observation phase. Hanging his head to get a better view of his fingers would have increased bodily tension that radiated to his fingers, increasing local tension and contributing to the problem. Mental concentration may also have contributed to the problem. Détári theorises that, since attention to minutiae of movements has been linked with focal dystonia in athletes, such internally focused attention may increase chances of developing dystonia in musicians (Détári *et al.* 2022: 10). Wulf notes that there is evidence suggesting that internal focus hinders performance temporarily, and also detrimentally affects the learning of motor skills (Wulf 2013: 77). This suggests that dystonics being 'very meticulous about details and stuff like that' (Leisner) is not always beneficial.

Since recovering from dystonia is a slow process, Berque *et al*.'s retraining study (2010: 154) allowed participants to increase speed by 1 or 2 metronome increments per week. Using the metronome makes it easy for patients to track their progress over very long periods. Ackermann and Altenmüller's 2021 pilot

study tested a retraining method (MusAARP) and found that patients were aware of a 'gradually returning sense of movement control and awareness of movements' (Ackermann and Altenmüller 2021: 313) over 12 months. The classical guitarist participants in this study discussed their progress over a minimum of one-year periods, with one stating how long each finger took to return to full function using yearly markers.

Lack of self-awareness was discussed, with pain sometimes felt at the end of practice. Although this could be the body's delayed physical response to trauma from hard practice, this may not always be the case. Professional guitarist Richard Durrant [65] also mentioned the way ailments seem to disappear when playing, particularly when performing: 'If you've got any aches and pains, you're feeling under the weather, you're feeling tired, that just goes. And quite possibly that's - that's dangerous'. Guptill's phenomenological study also showed this: 'the experiences of the participants demonstrated that they experience a dampening of their awareness of their bodies when engaged in playing music' (Guptill 2011: 90). A theme in this and the following chapter, as well as other phenomenological studies, is of a lack of awareness prior to injury that was rectified as part of recovery.

One participant mentioned that his playing improved because his recovery method focused on relaxation. This suggests that other treatments may be less beneficial than the retraining described in this chapter. Although methods such as brain surgery have a rapid effect, they allow the musician to continue with the same method of play. Although surgery brings fast relief from dystonia, if they were habitually playing with excess tension, they miss an opportunity to improve their fluidity by not using the retraining methods described by these participants.

A significant number of classical guitarists in this study identified what is, in effect, a theme of dissociation between 'the brain', 'the fingers', and 'self', with all three being treated as separate entities. This alienation from parts of their own body is not mentioned in the wider literature to the best of my knowledge. An explanation for this is that voluntary and involuntary movements are controlled by different parts of the brain. Voluntary movements are initiated in the cortex, while the basal ganglia are 'involved in the enabling of practiced motor acts' (Knierim 2020), and also involved 'in gating the initiation of voluntary

[65] Interviewed as part of the larger study. He will feature in the second data subset in Chapter 3.

movements by modulating motor programs stored in the motor cortex and elsewhere in the motor hierarchy' (Knierim 2020). This last statement explains why retraining was described in terms of an argument: the cortex sends the instructions for the voluntary movement but the basal ganglia 'gates' the signal and sends the habitual (faulty) movement signal instead. This could explain the perceived disconnect from their fingers.

Participant reports revealed some correlation between observational and experiential language and recovery status. This is absent from research literature due to the lack of phenomenological studies of mFHD. The only participant to exclusively use observational language completed his recovery decades ago. A mixture of observational and experiential language was used by those who have recovered more recently or are still recovering. Experiential language was used exclusively by the participant who was not near full recovery. This correlation between recovery status and language choice merits further exploration. Although Smith *et al*. recommend IPA studies have three to six participants (Smith *et al.* 2009: 106), further investigation of this theme would necessitate a larger cohort.

2.4.2 Identity

The culture of silence surrounding musicians' injuries was highlighted by some of the participants. They discussed the general reticence that certain musicians have about their injuries. Although they openly discussed their own problems during the interviews, they mentioned other performers who desired anonymity. This accords with findings from Guptill's (2011) phenomenological study of the lived experience of professional musicians with PRMDs, as this excerpt illustrates: 'There's some people who I don't want them to know that I'm hurting. I'm not gonna jeopardize what somebody thinks of the way I might play and interpret it in light of 'well he's hurt,' you know' (Guptill 2011: 91). Olson-Moser's (2021) MA dissertation interviews highlighted another reason for secrecy: 'it's not something that you want out there … because it's such a stigma, you know?' (Olson-Moser 2021: 17). One participant in this study stated that it is 'almost an embarrassment' to consult a colleague for help. This has been explained elsewhere: admitting problems might be interpreted as 'a sign of deficient technique' (De Kock *et al*. 2023: 10; Ioannou and Altenmuller 2015: 140). Additionally, a participant explained that pointing out poor technique is not 'given the green light' (i.e. is not socially acceptable). These attitudes have negative ramifications:

individuals are missing opportunities to improve their awareness with outside insight; musicians may think being injured is unusual, therefore they must have 'deficient technique' (Ioannou and Altenmuller 2015: 140); they may not realise treatment is available, or that being injury-free is an option; they may not appreciate that they may need to see several therapists before a solution is found, either because they need someone with a particular specialisation, or because some doctors do not take such complaints seriously (Zaza *et al*. 1998: 2019 & 2021); if they feel unable to seek it help due to a stigma, they may not feel a sense of relatedness. It has been reported that some musicians do not even feel that they can rely on friends during times of injury (De Kock *et al*. 2023: 9). Several sports injury studies have concluded that athletes with a combination of both good social support and psychological coping skills recover better from injuries but are also less likely to get injured (Johnson 2007: 357; Williams and Andersen 1998: 16-7). There are currently no equivalent studies for musicians, so it is impossible to infer how well these results transfer to other populations, but it is likely that the culture of silence among musicians aggravates the problem.

According to psychology's self-determination theory (SDT), there are two categories of motivation: extrinsic motivation 'refers to the performance of an activity in order to attain some separable outcome and, thus, contrasts with *intrinsic motivation*, which refers to doing an activity for the inherent satisfaction of the activity itself' (Ryan and Deci 2000: 71). A participant cured his focal dystonia because he 'could never conceive myself not playing an instrument' (Paraskevas), not because he wanted to maintain his performance career. This is intrinsic motivation, because he values the activity itself (Ryan and Deci 2000: 69), whereas the need to continue the livelihood is extrinsic motivation. A person may experience both intrinsic and extrinsic motivation simultaneously. Two participants explicitly expressed internal motivation: they wanted to continue playing for the sake of playing, rather than continuing their career. A third did not state a similar intent, but began working on his cure after retiring from performance due to arthritis at the age of 80, so his professional life was not the motivation.

Certain themes emerged within the interviews that can be analysed in terms of Self-Determination Theory (SDT). It identifies three needs that must be addressed in order for people to maintain motivation (Ryan and Deci 2000: 68) and, in relation to the current discussion, achieve full recovery. The first is autonomy, or the feeling of having control over one's situation (Van den Broeck *et al*. 2010: 981). When

musicians experiencing a performance-related injury feel that such injuries are not taken seriously by medical professionals, they may feel at a loss for what to do next, therefore losing a sense of autonomy. The second is competence, or 'feeling effective' at the given tasks (Van den Broeck *et al*. 2010: 981). A sense of effectiveness may be undermined if musicians are halted at the first step toward recovery by an unsympathetic doctor. Their sense of competence may be further affected if they believe they are injured due to poor technique because this may make them feel inadequate (De Kock *et al*. 2023: 10) and fear a relapse if they recover but are unable to change their technique. Finally, relatedness is the sense of belonging to a group, or feeling cared for (Van den Broeck *et al*. 2010: 981). Doctors rejecting a musician's request for help may weaken their relatedness by making them feel unworthy of help, and isolated. Dystonic musicians need to be aware that networks of dystonic musicians exist because, as has been shown above, being part of one may satisfy the need for relatedness and thus sustain their motivation.

Key points emerging from analysis of first hand reports in this chapter are: the notion of seeking help as taboo; notions of noble suffering; assumptions that musicians do not and should not share their problems. Habitus is a sociological concept relating to traits, behaviours, and patterns of action/reaction that become embodied through socialisation and lived experience (Edgerton and Roberts 2014: 195; Becker 2010: 130). Such phenomena constitute a subconscious tendency rather than something totally intentional or determined (Drew 2022; Edgerton and Roberts 2014: 198; Becker 2010: 130; Swartz 1997: 108). Scholars have addressed the habitus of listening to music (Becker, 2010), and the habitus of playing music (Herbert & Parkinson, forthcoming), but it is equally possible to think in terms of a habitus of performance-related injuries, understood as a network of influences that shape subjectivity when dealing with injury. The habitus of PRMDs is shaped by cultural backgrounds both within and outside of musical cultures.

A 'no pain, no gain' attitude, evident in these accounts, is widely reported today (Panebianco 2017: 67; Kreutz *et al*. 2008: 9; Zaza *et al*. 1998: 2019; Paull and Harrison 1997: 12; Quarrier, 1993: 91). Leisner explains in his book:

> The widely accepted work ethic – 'no pain, no gain' – is at the root of the problem of musicians expending too much effort too much of the time. The belief that hard work can solve most problems

contributes to the judgment that taking the easy route is lazy.

(Leisner 2018: 5)

At one end of the continuum is the belief that a substantial work-load is always preferable. At the other end is the belief that 'suffering for their art is the normal price to be paid for excellence' (Ioannou and Altenmuller 2015: 140). Leon Fleisher, when speaking of his injury, said: 'There was something macho about practicing through the pain barrier. Even when my hand was exhausted, I kept going. Although I thought I was building up muscle, I was, in fact, unravelling it' (Fleisher in Mencimer 2003). This can be seen in the accounts of musicians with dystonia practising more because they think their hand 'forgot muscle memory (Olson-Moser 2021: 16), as well as the extremely high but self-imposed workloads. The ideal of the suffering artist is thought to originate from the religious fervour of the Middle Ages (Kris & Kurz 1979: 114). This attitude of nobility through suffering conflicts with the need to keep it secret [66].

The habitus of secrecy affects those who wish to recover from injury. Data from this study shows evidence of support networks among dystonic musicians, but they do not include all musicians. Since few people speak of their problems, many may not realise how common these problems are and believe themselves in a tiny minority, perhaps questioning their suitability for the occupation. They may be unaware that treatments are available (Zięba *et al.* 2019: 118; Gasenzer *et al.* 2017: 6) or that there are therapists who specialise in PRMDs rather than sports injuries. 'Horror stories' of unsympathetic doctors who trivialise their plight because they do not consider music a 'real job' may deter people from seeking treatment (Zaza *et al*. 1998: 2019), or they may have had previous bad experiences of failed treatments. All these factors contribute to a habitus of suffering in isolation.

While it is possible that a musician may consider themselves to be in a unique situation due to their injury, it is also possible that individuals subconsciously perceive injuries as a taboo subject simply because they do not hear them spoken of, without anybody declaring a 'don't ask, don't tell' policy. This habitus of silence is, therefore, self-sustaining: it is both a 'structured structure' because it influences those existing

[66] Unless suffering in silence is seen as the pinnacle of nobility.

in its field, and a 'structuring structure' because the actors within the field contribute to it further (Edgerton and Roberts 2014: 198).

For the full-time musician, injury can be catastrophic for several reasons: musicians are not eligible for disability benefits in some countries such as Canada (Guptill 2010: 273; Zaza 1998: 1020); it can have enormous adverse effects on mental wellbeing because, for many musicians, music is their sole occupation and focus (Olson-Moser 2021: 15), and a large part of their identity. Identity may be defined as:

> an individual's sense of self defined by (a) a set of physical, psychological, and interpersonal characteristics that is not wholly shared with any other person and (b) a range of affiliations (e.g., ethnicity) and social roles. Identity involves a sense of continuity, or the feeling that one is the same person today that one was yesterday or last year (despite physical or other changes). Such a sense is derived from one's body sensations; one's body image; and the feeling that one's memories, goals, values, expectations, and beliefs belong to the self.
>
> (American Psychological Association 2018)

When a musician is injured, their identity is challenged strongly because a large portion of one's daily activity is no longer possible. When their sole occupation and focus is taken from them, they may no longer feel that they are entirely the same person, so it is not surprising that this can trigger an identity crisis (De Kock *et al*. 2023: 8; Guptill 2011: 84). Among other things, involvement in music has been shown to aid feelings of vitality, empowerment, and belonging (Hargreaves *et al.* 2017: 17), therefore an enforced loss of music can affect many aspects of mental health. Although similar levels of interconnectedness are reported in sports (Carless and Douglas 2013: 701), non-musicians, including health professionals, may not be able to comprehend how closely intertwined a musician's identity is with their instrument. Indeed, the two can be almost inseparable (Rickert *et al*. 2013c: 126) and so being cut off from playing can be devastating (McCready and Reid 2007: 140; Zaza *et al*. 1998: 2013). Musicians often start training at an early age so this identity is firmly established during the formative years (Guptill 2011: 84; MacDonald and Saarikallio 2010: 732). Musicians' social connections may be mostly musical, especially if they play in an orchestra or attend a musical institute where they would have opportunities to meet many musicians.

Being unable to play could, therefore, cut off many social opportunities (Rickert *et al*. 2013c: 126; Guptill 2011: 88) such as socialising after rehearsals and concerts. If sports science research findings are transferable here, this social isolation would not just affect mental wellbeing, but also hinder recovery (Johnson 2007: 357; Williams and Andersen 1998: 16). Indeed, cognitive evaluation theory (CET), a sub-theory of SDT, has demonstrated that 'social environments can facilitate or forestall intrinsic motivation by supporting versus thwarting people's innate psychological needs' (Ryan and Deci 2000: 70). This is because people need a sense of relatedness, that is, 'feeling accepted by one's social milieu' (Ntoumanis *et al.* 2021: 215-6; Ryan and Deci 2000: 71). This suggests that a supportive network is vital to maintain levels of motivation for the injured musician during plateaus, when motivation is likely to wane. Further, musicians may feel the instrument is an extension of their body (Simoens and Tervaniemi 2013: 171), and that not playing would be like 'cutting off my whole way of communicating' (Guptill 2011: 88). Many people learn an instrument at school and then stop, but maintain an interest in music for the rest of their lives. They may even

> return to it fairly intensively in later life, which is not true to the same extent of many other subjects studied at school. This confirms the role of music as an important means of identity development throughout the life span.
>
> (Hargreaves *et al.* 2017: 15)

Thus, music is an integral part of a musician's livelihood and identity, and injury can have profound negative effects.

Playing through long-term injuries can be arduous, since pleasure is reduced due to pain or the need to play conservatively to avoid pain. This complicates the relationship between musician and instrument. Musicians have said that continuing to play despite the pain it causes can be likened to the experience of staying with an abusive partner, whereas the need to persist is like a drug addiction (Guptill 2011: 88) – they could not stop even if they wanted to. One professional musician in a series of interviews about living with PRMDs said 'I was just so in love with [playing], I didn't want to give it up. It was so worth it to me

somehow, in a very strange way, to continue to suffer through it … It's sort of like a drug that you have to take in moderation' (Guptill 2011: 88). Despite this, musicians continue to play through pain:

> a drummer who has sore wrists from playing too much with carpal tunnel building up, will [be told to] stop playing for six months. That's an unacceptable solution. Now you've wasted an hour going to see the doctor to be told to stop playing which you're not going to do because you need to play.
>
> (Zaza *et al*. 1998: 2019)

Another participant in Guptill's interviews said that stopping 'could be also a relief to not be doing the things that have taxed your body or your emotions' (Guptill 2011: 89), again demonstrating that the experience of being a musician can constitute a mixture of pleasure, pain, and addiction.

Two participants realised how much time was spent on playing only after their injury onset, with one going on to pursue other activities during his recovery phase. Musicians' need for continual improvement is very time consuming; hours of practice must be done every day, and other activities are often planned around the practice (Olson-Moser 2021: 15), although some musicians have expressed that they do very few non-musical activities (Olson-Moser 2021: 15). When there is still practice to be done that day, or what has been done is deemed not good enough, the musician may find it difficult to concentrate on or enjoy other things (McCready and Reid 2007: 144). Sometimes musicians do not realise how much of their life is occupied by music until they experience a period of enforced time off (*ibid.*).

2.4.3 Strategies

A comparison of the strategies employed by these participants to those outlined in the mFHD research literature reveals some overlap but also some differences. It is estimated that about 30% of mFHD cases result in terminated careers (Ackermann and Altenmüller 2021: 310). All the participants presented in this chapter were able to continue or resume their performance career, with only one giving up playing (i.e. thinking they would never play again) temporarily before eventually finding his cure. Many strategies for curing mFHD have been explored, including: thalamotomy; injections of botulinum toxin (botox); drugs that affect neurotransmitters; repetitive transcranial magnetic stimulation (rTMS); and retraining. Because

of the differences of symptoms and onset patterns and because people respond differently to different interventions, the literature recommends multifaceted approaches (Ackermann and Altenmüller 2021: 310).

Various workarounds were used by the participants in this study to circumvent their problem before they dealt with what they believed to be the root cause. These included seeking repertoire that is less challenging for the affected hand while still showing virtuosity in the unaffected hand, or avoiding using the dystonic fingers. Similar strategies were mentioned in Olson-Moser's interviews (Olson-Moser 2021: 18). Other such workarounds have been reported that offer a change of sensory stimulus that allow some relief from symptoms. These include wearing a glove or holding an object between the fingers (Altenmüller and Jabusch 2010: 32). These do not address the root problem, so are workarounds rather than cures.

Deciding whether a strategy is a workaround or a cure is complex. Provost's refingering is arguably a change of technique, but it only worked temporarily because he was still using the affected finger and maintaining his shoulder tension, whereas Leisner had success refingering because he stopped using the affected fingers altogether. Refingering was not an option for Paraskevas or Garcia since their whole hand was affected. Leisner had no success when he tried flipping the guitar and swapping the roles of his hands. Because the majority of the movements in both hands come from the same joints – the metacarpophalangeal joint, not the interphalangeal joints, Leisner was still relying on the same muscles. Leisner mentioned a violinist who was successful with this technique, but for that instrument the technique used by the left and right hands/arms are markedly different. This could explain why this method did not work for him, although it remains to be determined and could be an area of future research. Despite his lack of success, this was arguably a change of technique rather than a workaround since it would have meant retraining to play from scratch. Using his aforementioned 'gross motions' shifted the focus from the hands to the shoulder muscles. This new approach was so radically different that it was sufficient distraction to allow the hand tension to dissipate.

These participants rehabilitated themselves or significantly improved their condition through retraining, with three of them focusing on relaxation. As has already been mentioned, retraining methods

have been scientifically investigated, yielding encouraging results [67]. Such methods mention four approaches used in combinations:

- Splinting fingers so that the dystonic (unsplinted) finger works better (Berque *et al*. 2010: 153);
- Gradually increasing speed at a slow enough rate that dystonic movements do not recur (Berque *et al*. 2010: 153; Sakai 2006: 25);
- Strengthening weak muscle groups (Vugt *et al.* 2014: 8);
- Teaching postural balance, and 'an integrated flow of action from a stable scapula through a mobile elbow joint complex to dextrous hand function … consistent with the proximal to distal biomechanical models often referred to as the kinetic chain in sports' (Ackermann and Altenmüller 2021: 313).

There seems to be no mention of focusing on relaxation techniques, which, as the experiences described by participants in the current study indicate, is an area meriting investigation in the future.

From the accounts of these participants, there is no indication just how interconnected the mFHD support networks are. One person named only one other person that they turned to for help (Garcia), while another said he spoke to many people (Paraskevas). Olson-Moser mentioned only one trusted person for each of the four musicians interviewed in their study, although that was moral support rather than dystonia advice (Olson-Moser 2021: 18). The data pool is currently far too small to gain any insight into how many connections someone might make, although somebody with connections to other experienced musicians might make referrals when they feel it beneficial.

Participants discussed their own poor experiences with doctors, a phenomenon that has been highlighted in research literature: 'Another reason for not seeking help was exposure to other musicians' 'horror stories' of physicians trivializing their problem, and telling them to 'just stop playing' and 'get a real job' ' (De Kock *et al*. 2023: 9; Zaza *et al*. 1998: 2019). However, literature also indicates that elite musicians will not stop playing, and that therapists must understand this (De Kock *et al*. 2023: 9). If the

[67] See 1.2.5.3 Focal dystonia treatments.

doctor does not consider the profession legitimate, they might deny them sick leave and disability compensation. It has also been mentioned that some doctors do not understand that a musician's identity is defined by playing, so their mental wellbeing was not being considered (Zaza *et al*. 1998: 2021). Some of the most accessible sources for laypeople to consult claim that dystonia is a lifelong condition with no mention of recovery (National Health Service 2018). However, the scientific literature reports that only about 30% of mFHD cases result in terminated careers (Ackermann and Altenmüller 2021: 310). Some musicians have found that when therapists are willing to help them, they do not fully understand the situation and apply 'conventional mainstream knowledge', including cessation of play, whereas a different approach is needed to accommodate their lifestyle (De Kock *et al*. 2023: 9). Such things contribute to this distrust of doctors.

Dystonia was almost unheard of when some participants contracted it. A literature search might have yielded Bianchi's account of successfully treating 'dyscinesiae' [68] by injecting strychnine (Bianchi 1878: 88), but participants would have found it difficult to find someone willing to inject them due to strychnine's high toxicity. By the late 1990s research into the condition was emerging, but the testing of treatments was not reported until much later.

Dystonia's aetiology is currently considered multifactorial (Altenmüller and Jabusch 2010: 31), so there may be different types of dystonia, each with different causes, even among musicians. One participant stated that it is necessary to retrain the hand for the specific faulty movement(s) rather than merely following a generic method. This idea is compatible with the diverse findings identified so far:

- There are dystonia genes, but some people carry them asymptomatically (Edwards 2016, 6: 30);
- Scans of six patients found cortical reorganisation in only three people (Bara-Jimenez *et al.* 1998: 830);
- There are differences in symptoms:
    - Fingers may move involuntarily (Hallett 2011: 2);

[68] The word 'dystonia' is more recent in origin.

- Attempting to move one finger will cause others to move in a process called overflow (Hallett 2011: 2);
- Movements may be stiff and awkward due to 'simultaneous contractions of agonist and antagonist muscles' (Quartarone 2011: 166).

These confounding findings and heterogenous symptoms contribute to the lack of understanding of this condition, and why there are various treatment strategies that show promise.

2.4.4 Attribution

These classical guitarist participants developed their own hypotheses based on their own lived experiences and their encounters with other dystonics. This need for attribution occurs because people need to explain the causes of events, especially negative or unexpected events, in the hopes of gaining more control over future incidents (Rees *et al.* 2005: 190). It has been shown that those who accept responsibility for injury (internal attribution) have been found to have less mood disturbance than those who blame others (external attribution; Tracey 2003: 280; Brewer 1998: 221), in part because they feel they have more control over their lives. These participants mostly attributed mFHD to how they had been playing, rather than poor teaching practices or excessive touring or external pressures.

Stability may be the most important attribution dimension, because it increases the perception of certainty of future outcomes (Rees *et al.* 2005: 194). Three participants in the current study were certain they had addressed their root cause and had either recovered or were nearly recovered, therefore were certain of a stable outcome. The fourth did not explicitly say, but after around 20 years of work the outcome seems unstable.

Three of these participants explained that they were under a high workload, and thus practising a lot, at time of onset, although they did not attribute dystonia to this. Tubiana's work with 600 dystonic musicians since 1975 showed that 'a period of especially intense musical activity' coincided with onset (Tubiana 2003: 166) and Passarotto *et al*.'s study suggests that pianists with mFHD had increased daily practice duration in the years preceding onset (Passarotto *et al*. 2023: 1561). Social media platforms such as YouTube arguably contribute to a drive toward perfectionism, and thus increasing practice time, because it is easier than ever to compare one's playing to highly edited versions of performances for free. This

potentially exacerbates the trend of injuries through increased playing time, repetition, and stress, because people also expect to hear flawless live performances (Provost). All of these factors can increase playing time as well as raising stress levels. A survey of 213 injured musicians (both tertiary students and professionals) revealed that circa 12% of musicians may attribute their own PRMDs to playing too much without sufficient rest (Stanhope *et al*. 2022: 1545-6). This evidence suggests that the extremely high workloads of these participants contributed to their dystonia.

Interview data suggests that the oft-repeated idiom 'practice makes perfect' has damaging implications. As was reported by participants in the current study, repetition of material, or a movement pattern, does not automatically improve it, rather, it ingrains it as habit. Since the habit learning process of the basal ganglia (Knierim 2020) has no discernment, it learns and repeats whatever motion patterns it is frequently presented with. This suggests that learning healthy and efficient movement patterns is more important than merely repeating phrases.

One participant stated that there is 'nothing wrong with a dystonic's brain'; rather that it is the poor practice habit that is the sole cause of dystonia. This may not be true in all cases. Around 30 dystonia genes have been identified, although it is not clear what impact these have (Edwards 2016, 6: 30). Musicians have greater neuroplasticity than non-musicians in the form of enlarged cortical representations of fingers, increased synaptic quantity and effectiveness, more grey matter (Rosenkranz *et al.* 2007: 5200), and better ability to grow new dendrites and neurones (Münte *et al.* 2002: 476). However, dystonics have extreme levels (Edwards 2016, 16: 55; Quartarone 2011: 163; Altenmüller and Jabusch 2010: 34; Bara-Jimenez *et al.* 1998: 828). Brain scans of a small number of dystonics have shown blurring and rearranging of the brain sectors responsible for moving each finger [69] (Byl *et al.* 1997: 269), demonstrating that something atypical occurs in the brains of some dystonics.

There is a clear theme of tension being part of the aetiology in these accounts – these classical guitarists believe that playing with tension eventually made it impossible for them to play any other way.

[69] See 1.2.5.2 Physiology & aetiology of focal dystonia.

There is also the belief that tension in areas far from the affected hand could contribute to or cause the issue. This belief is supported by findings from recent literature, such as Détári's interviews with 14 therapists with a good deal of experience working with dystonic musicians:

> Most practitioners agree that the problem is usually more widespread physically than the dystonic limb or facial muscles. Musicians with [dystonia] generally carry a lot of muscular tension in their bodies and have inefficient postures both when playing and in everyday life.
>
> (Détári 2023: 6)

The musicians are unaware of the tension because they have never felt the absence of tension (Détári 2023: 6-7; Berg 2008: 25). Stanhope *et al*.'s survey revealed that almost 20% of musicians attribute their PRMDs to excess tension (2022: 1546).

Participants mentioned that musicians tend toward being impatient with regards to improving their playing, a trait that has been mentioned elsewhere: Trush's onset happened when preparing a concerto 'in such a hurried state, where I felt I needed to nail every [technically demanding area] perfectly' (Trush 2017, 0:20). It has also been suggested that, since music is unique in the way precision is combined with intense emotions, it is uniquely connected to the pathophysiology of dystonia. In addition to the emotions that musicians try to convey through their playing, there is also the joy of performing that conflicts with a fear of playing badly (Altenmüller and Jabusch 2010: 34).

One participant observed that dystonic musicians seem particularly detail-oriented and perfectionistic, and such traits are mentioned in the literature. Psychological studies of dystonia show that affected musicians have exaggerated perfectionism and increased social phobia compared to healthy musicians (Altenmüller and Jabusch 2010: 33). A study comparing 44 professional musicians with mFHD to 45 healthy musicians and 44 healthy non-musicians found that those with mFHD scored higher on the State-Trait Anxiety Inventory (STAI) and NEO Five-Factor Inventory (NEO-FFI). Due to lack of correlation between anxiety and dystonia duration, they concluded anxiety is not caused by dystonia but 'share[s] a common pathophysiological mechanism' (Enders *et al*. 2011: 539). Thus, there are

psychological traits that are common among dystonics.

2.5 An mFHD hypothesis

On reviewing the literature and data from this study, it is possible to offer a hypothesis for both the aetiology and recovery characteristics of mFHD: the complex multifactorial nature of mFHD is reflected both in the lived experiences of participants as well as the wider literature. As with other over-use disorders, stress, anxiety, perfectionism and social isolation are thought to contribute to its aetiology and further development. These psychosocial factors, when combined with the physiological hyper-plasticity of the brain observed in people with mFHD who do not incorporate relaxation into their playing, may result in uncontrollable spasms or loss of the ability to relax muscles when playing. In line with the mFHD literature, this suggested cause is multifactorial.

Data in this study suggests that developing interoception is not typically part of musical training; so musicians focus on sounds, not body use or bodily sensations. Because of this, some of the participants in the current study attributed their dystonia to playing with tension in the long-term, thus training their brain to create solely tense movements when playing. Retraining themselves out of dystonia gave these classical guitarists the awareness that they would have benefitted from at the start of instrumental learning. Such self-awareness may have served to prevent the condition or reduce symptoms when it first became apparent.

Workarounds employed by these participants distracted them so their tension was temporarily released. Participants tried altering their technique in a small way in the hopes of being able to maintain their accustomed level of play. Such workarounds may have allowed the hand to work for a while because trying an altered technique distracted participants from the tension for a time. Since the changes were only slight, once the new idea started to feel familiar the tension would return.

2.6 Summary

Results from this inquiry provide clear empirical evidence regarding the following key issues in the lived experiences of guitarists with mFHD:

- Dystonia onset patterns and symptoms vary, as do treatment needs. The treatment must be specific to the needs of the individual. The retraining strategies described by these participants were

different from those described in the literature;

- The presence of onset indicators is not mentioned in the literature and merits investigation in future qualitative studies.
- Dystonia made participants feel disconnected from their fingers. Participants spoke about the fingers, self, and brain as three separate entities, each with their own agency suggesting a level of alienation from their own body parts;
- Musicians may dissociate themselves from the condition after achieving recovery;
- A musician's identity is strongly attached to their instrument so being unable to play is devastating to the point where it can destroy inter-personal relationships. Musicians have described their relationship with their instrument as being abusive, like a drug addiction, and this obsession can make it hard to enjoy other activities. They are so desperate to maintain their playing they will try any workaround, treatment, or training strategy;
- Amongst professional classical musicians living with injuries, there is a culture of silence. Asking for advice is seen as somewhat embarrassing, and offering unsolicited advice is taboo, yet sharing such information could reduce long-term suffering;
- There is a distrust of medical professionals, and those with mFHD will seek help from other musicians instead. This breaks the culture of silence, although such discussions are still kept between peers and hidden from the public;
- Psychological and psychosocial factors contribute to the development of mFHD. Although it is not yet known whether cortical changes are caused by faulty movement patterns or vice versa, these participants all believe it was faulty movements that caused cortical changes. Participants accepted most or all of the blame for their predicament, citing how they had been playing to be the cause;

This enquiry possesses some limitations. First, participants were relying on retrospective recall (in some cases dating back several decades). Second, this was an exploratory study using a small, all male sample, meaning that results cannot be generalised to broader populations.

A key emergent theme from this study of classical guitarists' lived experiences of mFHD was that of

excess tension, including how issues in the fingers can be caused by shoulder tension. One way in which participants made sense of their injury was that shoulder tension radiated to their hand. It has also been mentioned in the wider literature that dystonic musicians hold a lot of tension in their bodies. These observations informed the design of an intervention study (discussed in chapter 4), which aimed to provide a method of holding the guitar in a more relaxed way via the creation of an instrument support while meeting other important criteria (e.g. being very compact and easy to transport). To set that study in better context, this thesis will explore the topic of posture-related injuries.

Chapter 3: Musicians' Lived Experiences of Posture-Related Pain Injuries

3.1 Introduction

Low back pain (LBP) is 'the leading cause of disability worldwide' (Hartvigsen *et al.* 2018: 2356), yet remains poorly understood. Back pain affects not only physical function and mobility; recurrent and chronic pain impacts upon mood, sense of wellbeing, quality of sleep, job security, and wider social relationships (World Health Organisation 2023b). A study of 716 healthcare and distribution employees younger than 30 who did not have LBP lasting at least seven consecutive days filled in a baseline questionnaire, completed shortly after commencing their job. One year later participants completed another questionnaire to assess how their health had changed (Van Nieuwenhuyse *et al.* 2006: 45). By that time, 12.6% had suffered LBP lasting more than seven consecutive days (Van Nieuwenhuyse *et al.* 2006: 47). Two postural factors were identified that coincided with 'twofold increased risk' of LBP (Van Nieuwenhuyse *et al.* 2006: 49): working with the trunk in a bent and twisted position for over two hours per day (similar to classical guitarists using a footstool), and the inability to change posture regularly (Van Nieuwenhuyse *et al.* 2006: 48). Conversely, a different study of 2,404 factory and office workers concluded that one of the risk factors for sciatic pain was 'plenty of trunk-twisting' rather than static positions (Miranda *et al*. 2002: 1104). This highlights how poorly understood LBP is.

Since most guitarists sit to play, it is worth examining pain prevalence figures from occupations with similar seated positions. They vary from 17.6% in truckers (Guo *et al.* 1999: 1030) to between 36.3% and 60.1% in dentists (Hayes *et al*. 2009: 159). The seated athletic pursuits that are most comparable to musicians are kayaking and white-water rafting, where the legs are relatively static while the arms work. A key difference is that these sports feature a lot more twisting. Here, 20.8% of kayaking guides have reported 'back pain lasting longer than 1 week' (Jackson and Verscheure 2006: 162). The prevalence of LBP among

sedentary office workers has been reported as being between 33% (Janwantanakul *et al.* 2008: 436; Omokhodion and Sanya 2003: 287) and 60% (Harcombe *et al.* 2009: 437; Spyropoulos *et al*. 2007: 651). Reports from other seated occupations include truckers at 17.6% (Guo *et al.* 1999: 1030) and dentists between 36.3% and 60.1% reporting back pain (Hayes *et al*. 2009: 159). Surveys amongst amateur, student, and professional musicians playing plucked strings report a range of back pain prevalence among classical guitarists: Rigg *et al.* (2003: 150) report 17.2% for pop guitarists (N=261); Roset-Llobet (2000: 170) reports 33.8% (N=1,639); Marques *et al.* (2003: 12) report 53.1% (N=32). Marques *et al.* also report a rate of 53.1% among flamenco guitarists (N=32). This suggests that LBP has similar prevalence rates in guitarists as in certain seated athletic pursuits and other seated occupations.

3.2 Participants

This chapter comprises a subset of data from the same interview series as the previous chapter, using the same interview schedule [70] and IPA methodology. However, the interviews of the four participants appearing in this chapter were able to be conducted in the participants' home since they live in England, allowing for a more relaxed atmosphere. Therefore, the interview schedule and methodology are not repeated here. The focus of chapter 2 was musicians' focal hand dystonia – a pain free condition. By contrast, the data in this chapter relates to posture-related pain, a topic warranting a separate examination. There was no crossover of experience between those with posture-related pain and those with mFHD [71], so the participants appearing in this chapter are different. Main demographic details are summarised in table 7, and a brief biography of each guitarist is included here to demonstrate their high levels of accomplishment:

5) Richard Durrant studied at the Royal College of Music, London, and has released 13 solo albums (richarddurrant.com 2022) plus other collaborative albums. He composes most of the music he performs, and some of these have featured on BBC and ITV;
6) John Mills studied with John Williams and Julian Bream. He has performed around the world and

[70] See Appendix 1: Semi-structured interview schedule.
[71] Why there is no overlap is unclear. There were instances of upper extremity injuries in both groups, but not postural pain. The demographics of age, career length, etc. are similar in both cohorts, but the quantity of participants is too small for comparison.

Name	Born	Onset Age	Degree of Affect	Recovery Status
Durrant, Richard	1962	Circa 19	Crippling	Recovered
Mills, John	1947	Circa 68	Crippling	Recovered
Vishnick, Martin	unknown	Circa 60	unknown	Occasional pain
Wade, Graham	1931	unknown	unknown	Recovered

Table 7: Participant Information for chapter 3

released six albums. He held a professorship at the Royal Academy of Music, London, as well as being head of guitar studies at the (then) Welsh College of Music & Drama (Mills n.d.);

7) Martin Vishnick studied guitar at the London College of Music, where he also taught for a time. He has since toured internationally to promote his nine albums (Vishnick 2023; British Music Collection n.d.). He has had numerous compositions commissioned and published;

8) Graham Wade has performed and lectured globally. He is an examiner for the Royal Welsh College of Music & Drama, the Royal Scottish Academy of Music, Dublin Conservatoire, and Leeds University, and has adjudicated international guitar competitions. As one of the foremost authorities on the history of the classical guitar he has published numerous books about influential musicians and guitar history. He writes CD liner notes for the most renowned music labels and has contributed to the New Grove Dictionary of Music & Musicians.

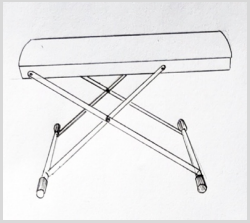

Fig. 3.01
A footstool

Fig. 3.02
An A Frame

Each participant has experienced posture-related pain, the successful treatment of which has included cessation of playing with a footstool in favour of a guitar support of some sort. Here, the definition of a footstool (see fig. 3.01) is a device that holds one foot above the floor, whereas a guitar support is defined as a device that holds the guitar above one leg (see fig. 3.02).

3.3 Results

As stated earlier, this chapter explores one data subset (focused on lived experiences of posture-related pain) from the larger study. Overarching group experiential themes (GETs) are listed below, with most of them subdivided into subthemes:

Embodiment

- GETs: Awareness
- GETs: Habit
- GETs: Posture
- GETs: Symptoms

Strategies

- GETs: Education & Learning
- GETs: Treatment

Attribution

(There are no subthemes for this group.)

3.3.1 Embodiment

Virtuosic musical performance is an intense physical activity, therefore how musicians perceive and process their embodied experience is an important topic for understanding injury from the perspective of the player. This section explores a range of experiential phenomena, including how self-awareness is changed by certain stimuli, such as painful injury, and how this brings awareness of one's own lack of knowledge regarding body-use.

3.3.1.i GETs: Awareness

Achieving full musical potential requires significant attentional focus, but data suggests that this is often mostly directed at the sounds created, failing to encompass the sensations, use and needs of the body. In some cases, this lack of interoception (self-awareness) eventually leads to pain problems.

One participant stated that teaching improved his awareness:

> When you start teaching, you see pupils sitting there all crouched and of course, you know, it's

> worrying then because you don't want young people to be, especially in their teens or something, to be *crippled* by the instrument. And you become physically aware and mentally aware of everything to do with them and with you as well: you're not sitting in the right position either.
>
> (Wade)

Teaching made Wade more aware of the physicality of playing, and because he had not been very focused on this before starting to teach, he became aware of his own poor posture. He sensed that certain positions can be damaging – 'crippled' is a potent word, suggesting more than losing the ability to play guitar, but having activities of daily living (ADL) affected too. Although teaching encourages an examination of one's own techniques and postures, this does not always bring full awareness:

> If you gradually work yourself into a bad position, you'll probably keep that as well, to some extent … You're doing the very things that you're telling pupils not to do … And if you go for a lesson with someone, they tell you, and you say "What? Am I doing that?! I tell everybody not to do that!" Extraordinary.
>
> (Wade)

He suggested that postural decline can come imperceptibly slowly with the phrase 'gradually work yourself'. He showed awareness that someone may falsely believe they have addressed a problem: 'You may feel that you're playing in a way that alleviates the tension, but in fact, some of the old tensions are still there' (Wade). This suggests personal experience, that perhaps he thought exchanging the footstool for a cushion would reduce his postural tension, but later realised he was maintaining tension that he no longer needed. This data indicates that, although teaching can bring more awareness of one's own positions and movements, it is not always enough.

Two participants discussed how, as young men, they lacked awareness of the potential problems that certain postural traits carry. Mills possessed a posture habit that he was either unaware of, or did not consider important:

> I remember, er, one of the very first Wigmore Halls I did and John Duarte [72] was sitting in about sixth row and he came up afterwards … he made some nice comments about the concert, he said, "but, do you realise you lean to the left?" I said "Well, Jack, it feels, it feels good. It feels fine." He said, "One day that might catch up on you." And he was right.

Mills did not state clearly whether or not he was aware of his 'lean', simply that he felt no discomfort at that time. He even said it felt good, meaning he was comfortable in that position, although that could come from familiarity rather than it being a naturally comfortable position. Similarly, Wade spoke as though when he was unaware as a young man that posture-related problems could arise, but learned the hard way that this was not the case: 'I think the impact of posture is really fundamental and you find that out later'. When he noted that 'bad posture, sometimes you do get away with things, actually. It catches up in the end, but for a while when you're young, you can certainly get away with a lot more than when you're older' he was almost certainly speaking of his own back pain. When asked if imitating the Bream Crouch caused any problems at the time, he replied: 'I don't think at the time, no, and I think I carried on with that for some time into my twenties'. At the time of the interviews, Mills had been playing pain-free with a Dynarette for some time. For him, a moment of better awareness came when he tried the footstool again out of curiosity: 'I tried the other week playing just, I thought, "I'll try with the footstool." I couldn't do it. I could *feel* it was wrong. It *felt awful*'. His time using a different device gave him new awareness of how unbalanced the body is when using a footstool. By changing his posture, he was given new awareness of how posture can affect the body.

Durrant mentioned an awareness of his lack of awareness:

> You kind of switch off pain when you're playin'. This is probably a very, very interesting, erm, thing to dwell on, actually, because, when you go on stage and play, nothing matters … You get your call, you wait at the side of the stage, you walk on it and that's it. If you got any aches and pains, you're feeling under the weather, you're feeling tired, that just goes. And quite possibly that's, that's

[72] A celebrated classical guitarist and composer.

> dangerous.

Durrant was talking about performing, not practicing, but for those with a busy performing schedule, this 'switching off' could be problematic: when physical sensations such as early pain signals are obscured, repetitive strain injuries may develop, a danger that Durrant signalled he was only partially aware of with the phrase 'quite possibly that's dangerous'. Durrant also showed awareness for more regular problems of his own:

> I have a tendency to have a very stiff upper back, which I'm constantly working on. And upper back stiffness and lack of movement there can often result in in pain in the lower back, quite severe pain. And I've been laid flat for weeks on end in years gone by.

Here he showed awareness that problems can have distant causes. Although the excerpt resembles a statement about back pain aetiology in the general population, Durrant was likely speaking entirely about himself. The interview data suggests that he learned this as part of his back therapy. Another thing he was aware of was that he is not the most naturally physically poised person: 'some people are more graceful, naturally'. He mentioned his wife, who has the advantage of being a trained dancer, but also mentioned a previous description of himself:

> As my teacher pointed out my first year of college, I walk on stage like a gorilla, apparently, lookin' like a gorilla. [With a different voice, imitating his teacher:] "You look like a gorilla, Durrant, you always will!" But I've become aware of that as well, and I see it as a challenge to try and be a little bit more graceful when I move around. And certainly now, having spent five or six years playing all my concerts standing up and recording standing up as well, I think I've got a little bit more awareness of my body.

He used this frank observation to attempt to change his natural movement patterns away from the brutish, with a suggestion of an association between gracefulness, body awareness, and ease of movement. Durrant

has demonstrated partial awareness of the dangers of playing, and the dangers of not being aware enough.

Injury made some participants aware of the importance of understanding the body, and also aware of how little they knew. When Durrant was asked if he thought it was important that teachers understand the human body, he answered:

> Well [pauses a few seconds]. Of course it's important [pauses more]. It's extremely important [pauses more]. I'm, I'm, I'm only hesitating because it makes me wonder how much I actually understand. I've learned *so much* from the guy that sorted my back out in the last five years. Er, and I feel that I'm very much a beginner at standing up. I love standing up and I can feel the changes made to my body. But how much I actually understand physiology is [laughs] is a question!

Although he feels he's learned a lot in recent years, he realises there may be a great deal of important information he does not yet know. Standing is a seemingly basic activity that many people do thoughtlessly, so realising in his 50s that he is not very good at it must have been startling. Mills also admitted to knowing little about his body. When asked if he had tried learning about the anatomy of playing, he responded: 'I should have done. Very, very little. I should have done that'. When asked if having injuries had made him learn more, he responded emphatically: 'Yes. Oh yes'.

Injury, and the recovery processes, encouraged some participants to learn more about their bodies. Durrant's experiences of reduced pain through therapy and postural change have encouraged him to seek further knowledge: 'I'm reading my Alexander Technique book at the moment: Indirect Procedures. Fantastic book, and musicians never stop learning'. Many musicians realise that there is always more to learn about music, but this research suggests that musicians do not realise they ought to learn about their own bodies too. Vishnick was made more aware of how he moved quite early on in his career:

> I was lucky at the London College of Music, I was studying with a guy called Oliver Hunt, who is no longer with us, and he was very aware of factors that could help guitarists. He had a friend who was a yoga specialist, so he used to traipse all of, all of his students for yoga sessions … Jack, the guy who was taking the sessions, gave us some exercises to do … So I became aware of yoga and what that

can do for movement.

This was not enough to avoid pain or make him question the footstool, however, which he continued to use well into the 21st Century when pain forced him to consider other options. Wade gradually became aware that using the footstool was not ideal through meeting teachers of Alexander Technique:

> But I think eventually one became aware of the Alexander Technique and that sort of thing. And you met people who taught the Alexander Technique and gradually became aware of the sort of redistribution of the body. I mean, the footstool was really one of the first things that you started noticing because everybody used footstools in those years, I think. And then you noticed people suddenly using different erm, ways of holding the guitar. And so that gradual awareness came, I think.

The phrase 'eventually one became aware' suggests a gradual awakening to the ideas of Alexander Technique (AT), one of which was the 'redistribution of the body', because footstool use shifts bodyweight to one side. AT encourages people to find more balanced and symmetrical postures. Until the 1980s the footstool was the only device for positioning the classical guitar. When Wade noticed people using guitar supports such as the Dynarette [73] cushion he began questioning the footstool's efficacy. Durrant found that merely standing to play has changed his attitude and approach to posture:

> And when you stand and play, you *have* to think about issues that you were discussing … so you actually think much more about, about a more kind of holistic physicality than if you're just stuck on a chair, playing whichever way, you know?

It may be that it is not the act of standing that encouraged him to think differently, but the drastic change of posture. After playing seated with a footstool for decades, he made the bold change to stand and was really pleased with the results: 'I love standing up and I can feel the changes made to my body'. Since

[73] A firm, specially-shaped cushion that raises the guitar off the thigh.

ceasing footstool use, Durrant has experienced a drastic reduction in back pain, and this has encouraged him to learn more about his body to maximise his success.

Sometimes awareness comes later than is ideal. Wade explained that people tried to emulate Julian Bream's intensity by mimicking his posture:

> I know in the 50s we used to favour, some of us, the sort of Bream Crouch. We were crouching over the instrument. So this wasn't a good idea, really. And it created a lot of er, inbuilt tension, which you had to get rid of later on. Sometimes never.

At the time, he may not have been aware of the tension required to stop complete postural collapse when crouching over his guitar. This tension needs to be dealt with to stop it becoming a habit that continues away from the instrument, but as he noted; sometimes the tension was not eliminated. He mentioned Yehudi Menuhin trying to counteract the effects of playing violin: 'he used to do yoga to recover his sort of postural equanimity. But I think it's something that comes, well, in my particular case, I think something came rather too late, probably'. Wade noted with a little regret that he did not take more care to better align his body sooner.

3.3.1.ii GETs: Habit

As has been mentioned [74], the ability to create muscle engrams (habits) is an important part of being a musician. However, when a long-established movement pattern must be replaced, the process is extremely difficult, as some participants attested.

When Wade starting learning guitar, he found a way of playing with the footstool that allowed him to play as he wished:

> I think this er, business of getting a position … which seems workable at the time, erm, which does actually serve all your purposes and you know, you can give your concerts and things. I think that's that becomes a kind of habit which is difficult to throw over.

[74] See 2.3.4.ii GETs: Habit.

Although his posture facilitated playing well enough to perform internationally, when he eventually felt he needed to stop using the footstool due to back pain, he found changing posture very challenging. Vishnick, although younger than Wade, also admitted that it had been difficult to stop using the footstool:

> Sometimes it's easier, sometimes just to put, use a footstool for a little while. Sometimes I do it. Sometimes I find myself in a situation and I just use the footstool. And it's, it's still sort of like the comfort zone, but I am getting used to it.

He felt the urge to use it because, after decades of use, it feels comfortable, even though he knew that long term use caused him pain and that there are better alternatives for him. He explained that the discomfort he feels when using the cushion is not because it is a physically uncomfortable position, but that it is due to the novelty of the change:

> I don't think it's physical. I think it's, I mean … it's physical in the sense of getting used to a different position, but because I know it's a better position, it's not really an issue. Erm. But breaking that habit, you know, and er, having all sorts of things in my in my mind, from my experiences just seeing how wonderful people could play [laughs] using a footstool, and how I'm always trying to reach those goals. Erm, quite a few things at play really, but just the, you know, the comfort and the human habitual, sort of, and how difficult it is to break a habit.

Vishnick was aware that the reason he felt uncomfortable in the new position was entirely in his head. It was not because the position itself is uncomfortable, but because it is different from what he was used to. This was not his only problem in coming to terms with the need for a different posture; he has seen many amazing guitarists play for decades with footstools and feels a tension between knowing it worked for them but that it does not work for him. He persevered with the new position, despite its strangeness, because he knew the cushion allowed him to sit in a better position that would ultimately grant him more pain-free

playing. Unfortunately, he felt his playing had to regress for a time while he adjusted: 'I'm getting used to the cushion now, and I'm getting to feel that I can be *me* with the cushion [laughs]'. So, after a long period of acclimation to the cushion, he eventually felt able to express himself through playing once more. Durrant adjusted completely to his new posture, expressing no difficulties in realising his musical ideas and even speaking enthusiastically about standing, yet he admitted that sometimes he still used a foot support:

> I don't sit to record and I don't sit at all [to play], now, but I've, unless I'm sitting around chatting. I might, I might have a little noodle if I'm sitting around chatting and then I may well put my foot up on something. So old habits die hard.

Three of the participants expressed that it was difficult to let go of their habit of footstool use, admitting to using it on occasion after deciding to switch to another device.

Wade believed that players who start with good posture have more chance of maintaining it throughout their career, but he also believed that posture seldom improves with time: 'I think very often if people have a good posture when they start off, then it keeps like that. But if you, if you gradually work yourself into a bad position, you'll probably keep that as well, to some extent'. He did not think people develop a good posture naturally, rather, that posture either stays the same or worsens.

3.3.1.iii GETs: Posture

Several aspects of posture were discussed during the interviews, such as how certain postures can cause tension or improve the quality of playing. Participants discussed explained how changing posture improved their quality of life, and the frustration of being injured by a posture that seemingly does not affect other people. Despite all of this, there was a lack of clarity in their definition of what constitutes good posture.

Two participants spoke of footstool posture in mixed terms, at times citing it as good, at others, bad. When Wade spoke of 'perfect posture', it seemed at times that he was referring to a position that allowed the player to achieve their musical goals, rather than something that allows long-term pain-free playing in addition to achieving musical goals. At one point he noted that 'the best posture is the most natural posture.

So straight back, no strain on the hands', whereas earlier he had stated that 'you couldn't play the correct technique without the correct posture, obviously'. Here he was saying that bad posture always prevents the fingers from effective function, and that if the fingers are working well, the body posture must therefore be correct. Wade talked about the method used by many for finding the perfect posture, that of imitating a master:

> The perfect posture is the one that allows you to, do the, thing you want to do with the most efficiency. And for that, we look at someone like Williams and we think, well, that's probably the perfect position, the perfect hand position the perfect this, that and the other. And that's all you can do.

Wade, who stopped using the footstool some years ago, believed Williams' footstool posture was perfect:

> Williams doesn't seem to show any tension. He doesn't crouch. He doesn't suddenly move into a different position while he's playing. Some players take on a different position as the as the concert goes on. Segovia didn't and Williams doesn't. Whatever he's playing, he's in the same position. That position must therefore be totally efficient. Therefore, I don't think anybody could ever criticise what he does.

However, a posture cannot be described as perfect unless it facilitates full musical freedom and also allows pain-free playing for a lifetime. Durrant, who no longer uses a footstool explained that using one is not a good idea, and not a natural way to sit:

> … spending many, many hours, *years* sitting like this with one leg raised up in an unnatural position. The only good thing is that you, you learn to have a nice straight back. If you're playin' well, you need to be a little bit distanced from the guitar. So that's good and you kind of become aware of certain things. But that that isn't good, sitting [with a footstool] isn't good.

He has inferred that there are several drawbacks to the footstool and only one upside – that of learning how to keep a straight back. However, this contrasts with both his own and Wade's mention of imitating Bream's

crouch (see below). Even if using a footstool enabled Durrant to play with a straight back, it was not sufficient to prevent pain for him.

Drawbacks of certain postures and benefits of others were discussed. Wade spoke of guitarists trying to emulate Bream's intensity by mimicking his posture: 'in the fifties we used to favour, some of us, the sort of Bream Crouch. We were crouching over the instrument. So this wasn't a good idea, really'. He explained that 'It created a lot of inbuilt tension, which you had to get rid of later on. Sometimes never'. He was aware that tension can linger even after the posture has changed, and that sometimes people failed (or perhaps did not try) to release it later. He was also aware that sometimes attempts at reducing tension are misguided: 'The Alexander boys will always tell you, you know, when they teach the Alexander Technique, that sometimes by trying to straighten up or do this or that, you're actually inducing tension'. He went on to explain that players begin with tension that often increases with time: 'when you learn at first, you put certain tensions into the activity and they multiply over the years, in many ways'. It has already been noted in chapter 2 that data points to musicians focusing on the music to the exclusion of the functioning of their own body. Mills spoke of the difference he has observed in students' playing after spending time with an AT teacher: 'Fantastic! And hear how the performance improves. *Almost* immediately … They relax more. They're aware of their bodies'. AT brings more awareness of one's body, how it moves, and unnecessary tension. This awareness helps the player to reduce tension, which may be easier on the body, but also allows the music to flow better. Durrant was aware of some of his tension problems: 'I have a tendency to have a very stiff upper back, which I'm constantly working on', however, Wade also explained that reducing tension can be difficult because we may not have enough awareness to realise it is still there: 'You may feel that you're playing in a way that alleviates the tension, but in fact, some of the old tensions are still there'. Whereas Wade spoke more generally about tension in the third person, Durrant spoke much more clearly about his own experiences in the first person. Durrant was aware of his own tension problems and was actively trying to reduce unnecessary tension. Since Wade was far more experienced as a teacher than Durrant (who is almost exclusively a performer), he was drawing on both personal reflection and a wealth of teaching experience. These participants have all observed various benefits and drawbacks of certain postures, both from teaching and their own playing.

Although some found changing posture difficult, the benefits eventually became apparent to each participant. Wade had consulted a therapist about his back pain as a young man, but he did not stop using the footstool for a long time: ‘I didn't abandon the footstool for years. All I did was eventually to get the ‘rugby ball’. The Dynarette. I got one of those eventually. And that made quite a difference, I think’. He did not elaborate on how the change affected him, but others did. Durrant expressed a big change to his quality of life: ‘I've been laid flat for weeks on end in years gone by … and standing up to play has absolutely turned that around. It's … taught me how to move my body and to understand my back better’. It should be noted that Durrant went from using the footstool to standing, without using any guitar supports. Perhaps this is helping him to move more gracefully as well as reducing his pain levels: ‘I love standing up and I can feel the changes made to my body’. Vishnick, whose pain was not as severe, also reported reduced pain from ceasing footstool use: ‘it has certainly helped with my shoulder, with less tension and aching going on in my shoulder’. He has also found that playing without the footstool is easier on the body in general: ‘It’s certainly less stressful, using the cushion’.

Mills was the only participant to describe non-pain problems associated with the footstool. He spoke about how much better he could position the guitar since he changed to using a cushion:

> With the cushion, the guitar is brought that way and you're more centralised … Definitely more, more centralised. And those couple of inches made *all* the difference.

He found that the cushion pushes the guitar slightly further to the right so the centre of the strings is closer to the central line of the player. This makes things easier for the left hand without adversely affecting the right, so he found playing became freer. It also allows the upper arms to align more symmetrically. There was another problem he no longer experiences:

> I was finding with the footstool that the leg was actually raised and there was a, there’s a like a dip here [indicates upper left thigh]. [The guitar] was literally falling into the dip, that was *awful*. And you kind of feel that you want to hug it, and it's not the best for sound anyway.

Due to the left leg being raised with a footstool to bring the guitar higher, he found that the bottom edge of the instrument slipped back towards his hip. This would change how both hands feel against the instrument due to changing the angles at the wrists, as well as taking away the possibility of using the arm's weight to assist barré chords to alleviate strain on very small hand muscles. Another important improvement is that his new posture reduces contact with the guitar body, which allows a bit more resonance from the back of the guitar body. It was not until Mills broke away from the footstool that he discovered it is possible to play without these issues that previously were ever-present. Durrant also found benefits of an altered guitar position:

> I'm always finding new ways to make the sound, you know, and instead of it just meaning that I send my hand down to the bridge [75]. I might do something different with the guitar. I can make the guitar sound different by holding a different way or little movements and expressive movements. Easy access to certain notes. It's wonderful.

When seated with a footstool or leg support, the only option for repositioning the guitar is to raise a leg, meaning that reaching certain notes usually requires contortion of the spine to reposition the shoulders and alter what the hands can reach. When standing with a shoulder strap, bending the spine moves arms and guitar together. Therefore, instead of contorting the spine, the guitar can be shifted: putting the right leg forward may tip the front of the guitar upwards; neck elevation angle can be adjusted by tipping the instrument and sliding the strap over the shoulder; or the instrument can be shifted left or right across the torso. These shifts make it possible to improve access in certain circumstances without bending the spine. Vishnick found new expressive possibilities from his new posture:

> I've started to feel like, um, I can use more of my body in my guitar playing, not just my hands and forearms. I'm starting to feel like, um, there's more power when I need it, and more sort of fluidity in

[75] Plucking the string at different points along their length changes the timbre by exciting the partials of the harmonic series differently.

> my movements, my body movements and hopefully that translates to the music. In my imagination it does [laughs].

Of course, it would be difficult to ascertain if these changes could be perceived by an audience, but the crucial point was Vishnick's identification of a greater sense of comfort and expressivity, since this confidence would translate to better performances. Durrant also explained a performance benefit: that of feeling more connection with his audiences:

> It has given me the freedom to communicate and be heard and seen by an audience, which is very important when you're a concert guitarist.

> There's nothing wrong with the way I'm sitting here. And I could play anything. I've got access to everything, but I wouldn't feel that I'm giving my all to the audience. I want to let you know! I want to stand up and I want you to hear what I'm playing and see what I'm playing and to, you know, I feel like I welcome people more when I stand up.

By standing, the guitar is higher so the sound can project over the audience instead of potentially getting absorbed by the front row. It also gives a better view to the whole audience who may be fascinated by the deft movements of virtuosic fingers. Beyond the improvements to the health and quality of life of these guitarists, they found that changing their posture led to improvements in their playing as well.

Two participants explained that the transition away from the footstool was difficult, but worth the effort. Vishnick found that 'it took a while to get used to the idea of having, planting my feet on the ground, and gradually I felt I was more grounded and in a better bodily position'. It is peculiar that the very normal state of having both feet on the ground seemed odd to him. It seems that Wade took time to be convinced to make the change:

> I had concerts to do, what I used to do, about five or ten concerts a month sometimes, I found it wasn't so comfortable after all those years of playing with the footstool. And so you went back to what you knew.

However, Wade subsequently committed to the cushion: ‘but now I wouldn't use a footstool. I’ve only used the Dynarette now for the last few years’. Given how enthusiastic Durrant and Mills were about the new possibilities since their change, it seems unlikely they would return to the footstool either: ‘I find it strange that I spent all that study time and all those, all that, majority of my life sitting down with the footstool though, it’s odd, it's really odd. I don't understand why it's a sit-down instrument’ (Durrant). So, despite the difficulties experienced in changing posture, they all saw benefits, including reduced pain and improved playing.

Two participants articulated a mismatch between their own experiences of pain problems from playing in the same manner as well-known guitarists who themselves were believed to have experienced no problematic consequences from idiosyncratic postures:

> There are people like Segovia … who went through years and years and years, decades and decades of playing and never seem to have any problems. He had problems with his eyes. Well, I never heard of Segovia having a problem with his hands or his back.
>
> (Wade)

Wade sounded surprised that Segovia could play for so long with no playing-related issues. Vishnick stated that part of the reason he found it difficult to stop using the footstool was the confusion from ‘just seeing how *wonderful* people could play [laughs] using a footstool, and how I'm always trying to reach those goals’. These guitarists expressed confusion about why they should have to change posture when so many others did not have to.

3.3.1.iv GETs: Symptoms

Participants described their backpain onset, which ranged from a slow progression to very sudden, and also occurred at very different stages in their lives.

Durrant’s backpain started when he was still young: ‘I had my back trouble when I was at college, actually … it started in my second year at music college’. This means it took around ten years to manifest.

For Mills and Vishnick it took around thirty years. Duarte had warned Mills about the perils of leaning in the mid 1970s [76], but it was not until '2005, something like that, when it first hit me'. This demonstrates that the onset of posture-related pain can be very varied.

Two of these accounts use vivid language to describe very different onset rates. Vishnick decided to investigate alternative methods of positioning the guitar when 'arthritic issues … reared their head … in my right shoulder and my back' in his 60s. He did not talk about his backpain as much as Mills, and there are two explanations for this: Vishnick's pain did not reach crippling severity; it began slower than Mills' sudden onset. Mills had been writing an email when it first happened: 'It just hit me out of the blue! I did that [leans back]. Just did that, to just stretch the back. *Crrrrrk*, it went. Ohhhh [makes pained face]'. 'Hit me' and 'out of the blue' are potent phrases describing an instantaneous and unexpected event. This contrasts with Vishnick's rather slower, but menacing, metaphor of 'rearing its head', which is more like a warning of impending danger.

Two participants depicted severe bouts of pain. Mills described his episodes as 'catastrophic', and this powerful word is justified by the statement that he was 'almost paralysed … I was in such agony'. Not only did he use a very strong word for pain, but he accentuated it by saying '*such* agony.' Durrant and Mills seem to have experienced similar levels of pain, with instances causing them to cease or drastically alter ADL: 'the sort of pain I had, you had to stop everything, really' because 'I've been laid flat for weeks on end in years gone by' (Durrant). Although Durrant was not diagnosed with herniated IVDs and Mills was, and even though they were affected at very different ages, Mills also described being unable to continue ADL:

> that was three weeks I couldn't move. In bed. It was so bad it took half an hour to turn over in bed. Half an hour to actually get out of bed. Just literally just move just almost like that, an inch at a time. It's not just a stiff back, I think people don't often realise how *ghastly* it is. It's *agonising* pain, not being able to sleep at night.

[76] See 3.3.1.i GETs: Awareness.

Again, Mills highlights the severe pain he experienced (‘agonising’). After some time, he was able to resume his life: ‘After about three weeks, gradually it came back and was fine till it happened the next time’. Over the following years he had ‘about five or six back spasms’: ‘I'd get these spasms about twice a year, getting out of a car, suddenly [makes a nasty crunch noise and groans]’. He added that ‘there’s no warning when it's going to come back. It might go for two years, no problem’. Living with the threat of another spasm is reminiscent of the story of the sword of Damocles, knowing that at any moment the pain may return and require weeks of bed rest again.

With therapy and a posture change, Durrant and Mills had greatly reduced their pain. Durrant still experienced ‘occasional back pain’, although his situation improved since ceasing use of the footstool. Mills also had fewer problems, but there were lasting effects because one of his lumbar IVDs had herniated and a second was ‘showing signs of going’ and ‘it will quite possibly will get worse’. This had caused damage to the sciatic nerve, so that ‘the right foot, now, I've only got half the feeling in it. Feels like sponge’. The spine specialist he consulted told him that he ‘cannot lift anything remotely heavy’ because ‘as the specialist said: “The damage is there. It's been done. So you've got to be very, very careful” ’. Mills had reduced the frequency of his backpain, whereas Durrant had reduced the severity and frequency of his.

3.3.2 Strategies

This section explores how participants discussed the strategies of learning to play, and how these approaches do not necessarily work optimally, as well as strategies for dealing with injury.

3.3.2.i GETs: Education & learning

The standard teaching method for instruments is that of ‘master and apprentice’, where the student is instructed by the teacher and may even learn by imitation. Why this may be problematic will now be explored in the words of the participants. Wade noted: ‘in the fifties we used to favour (some of us) the sort of Bream Crouch. We were crouching over the instrument’. It has already been stated that he later thought this posture mimicry a bad idea [77], suggesting that imitation learning is not always ideal. When asked why

[77] See 3.3.1.iii GETs: Posture.

they had done this, he explained:

> Well, I think you thought that was part of the intensity of the music, because he was so intense with the music. And you wanted to be like him to some extent. And he was the one who was the first model for me. And he's the first guitarist I saw, erm who could really play brilliantly in a way that was totally convincing.

As noted previously, he used a third person mode of description even though he was referencing personal experience. Given the impact Bream had on the young Wade, it is understandable why he chose to mimic him. Naturally, this mimicry extended to other notable players:

> But the perfect posture is the one that allows you to erm, do the er, thing you want to do with the most efficiency. And for that, we look at someone like Williams and we think, well, that's probably the perfect position, the perfect hand position the perfect this, that and the other. And that's all you can do. You can look at people who play perfectly and say, “Well, that's how they do it.”

Whereas some wanted to match Bream’s intensity and expression, Williams was an inspirational model due his unparalleled technical precision. Wade spoke as if he thought copying Williams’ posture was a good thing, although the only difference is that Williams never changed his posture while Bream sometimes curled over the instrument:

> He doesn't suddenly move into a different position while he's playing. Some players take on a different position as the as the concert goes on. Segovia didn't and Williams doesn't. Whatever he's playing, he's in the same position. That position must therefore be totally efficient. Therefore, I don't think anybody could ever criticise what he does.

Both Bream and Williams used a footstool and leaned forwards and left. Although Wade spoke as if copying Bream was bad and copying Williams was good, Wade eventually stopped using the footstool due to postural pain. The posture he had imitated served him for many years until it started to cause too much

pain.

Two participants said that a focus on posture and handling of performance injuries was not part of the curriculum during their studies (Vishnick; Durrant), while Mills (who is slightly older), admitted: 'I can't remember anything … I don't recall ever being told'. When asked if they considered it important that teachers understand anatomy and injury causes etc., they responded affirmatively:

> Of course it's important. It's extremely important.
>
> (Durrant)

> Yes! Extremely! [laughs]. But it's very, *very* hard sometimes to convince schools to bring this about. I have a *very* hard time … promoting this concept at Manhattan School of Music.
>
> (Leisner)

Leisner explained that, although they already have optional posture and movement courses, the School was resistant to making them part of the main syllabus:

> Many of them deny the existence of injuries. Er, as members of a couple of the larger departments in the school said to me: "Well, we don't have problems with injuries." … I was told after I'd spoken to these teachers, I was told by other people who were instrumentalists of that, of those departments er, there were *plenty* of injuries!
> Interviewer: Is it denial?
> Leisner: I suppose it is, or maybe they just don't know.

Mills explained that he had seen change in institutions over the decades to include information on 'mainly postural issues', but again, these are optional. Paraskevas believed the education system needs significant change because the teachers are uneducated:

> I think, you know, the teachers, they should be educated, *re*-educated … It's very important to, to have sessions that they're training teachers on this … Every institution needs to um, to promote this,

> this courses for teachers in the beginning … I think, you know, every institution from now on should help teachers, send them to places to get, you know education about injuries, about all these things that they can pass along to their students.

The theme of teachers not being knowledgeable enough on this topic came up at other times. Garcia, who believes that impatience is a major contributor to injury [78], suggested:

> A teacher, or some check, on what you're doing, is very good indeed. As long as the teacher knows what they're doing.
> Interviewer: That's the problem. How do you find a teacher who knows what they're doing?!
> Garcia: [exasperated] How *do* you find a teacher who knows what they're doing?

Garcia was largely self-taught, but the majority of participants in both interview subsets went through high-level guitar performance education before going on to teach at conservatoires. Given that such highly accomplished musicians knew so little about maintaining healthy function of their own bodies before their injuries, it is logical to assume that finding a teacher who is knowledgeable on this topic will be difficult. During my interview with Mills, he switched roles to be the interviewer for a moment:

> Mills: How many how many teachers do you know who … go through exercises with the students about rotating the shoulders and all this, and wrists, and-?
> Interviewer: Nobody ever did it with me.
> Mills: Nobody?
> Interviewer: No.
> Mills: I think: very few.

His point was that, in his experience, many teachers focus on the performance of music and do not cover warm-up strategies in preparation for playing challenging repertoire, potentially leaving students lacking

[78] See 2.3.4.iv GETs: Psychology.

knowledge that they even need to warm up. This data points towards a lack of education concerning musicians' health and longevity in music performance teaching.

3.3.2.ii GETs: Treatment

One participant went into great depth about his backpain treatments, whereas the others focused more on other elements of their story. When Mills consulted a specialist after his first painful IVD herniation he was faced with a difficult decision:

> I had a scan. The MRI. Saw the specialist a couple of days later, and he said, "Well, we can operate next week if you want." [laughs] "Or you can take painkillers. Or you can take time off work and just relax." I said: "I think I'll take the relaxation option, if you don't mind!" because the operation was going to be £4,000. Going private. I was in such agony, I couldn't wait.

He had decided to go private rather than rely on the NHS because he did not want to wait for consultations and treatment, although waiting is precisely what he did – he chose to wait and rest instead of having the operation, the reason being that the recovery time from the operation was very long:

> I said to this specialist, "Can you not push the disc back?" "No, mate," he said. "it's done. You can't do that. It's chop chop." It's *so small*. But he said "If we do the operation, then you're probably gonna be, you can't work for half a year."

Mills was surprised at how such a small changed to his IVD can create so much pain. He was told that if he rested for three weeks the pain and inflammation would subside enough that he could resume life and work, which he tried:

> Initially two days with the tablets and whatever painkillers and then off them, just, that'll get you through that first 48 hours of agony and then relax.
> Interviewer: So how long was it before you were able to play again?
> Mills: Ahh, about three weeks. But it's not bedrest, but, but it's keeping mobile. Keep, just walking. Nothing too aggressive, but just, yeah. It's worse just to sit there and [laughs] complain.

His goal was to stop recurrence without resorting to risky surgery that would force him to take six months off work, so he tried other, less invasive options: 'I tried physiotherapy. What are the other similar things? I've tried many over quite some time and with lots of bone crunching and things, but nothing really seemed to change'. These failures were obviously frustrating, but after one recurrence the spine specialist made a helpful suggestion:

> I went to the outpatients eventually and there's a very good chap there and he said, "Well, I see from your notes that you've tried this, this, this and *this*. Any good?" I said, "Well, not really, don't want to keep on taking pills." "Right. Have you thought about acupuncture for this?" "No." And that day I'd almost crawled in on my knees and I walked out after an hour.
> Interviewer: Hmm. From your first acupuncture?
> Mills: Yes, the first one. And he said each session, maybe it doesn't work quite as well, but it'll build up. Some people find it doesn't work at all. But certainly in that respect, it was marvellous.

He was quite enthusiastic about this treatment: 'acupuncture worked very well to relieve the symptoms of the back. It's not a, it's not a cure, but it, it's a helluva help [laughs]. It really is'. He laughed at the memory of how rapidly and successfully his pain was relieved, and this, combined with a posture change has allowed him to continue playing without pain for some years.

Durrant did not outline how his therapist worked with him, other than prescribing stretches to do between sessions: 'But I found a guy that that I have that understands the problem and has given me stretches, and I see him regularly, and standing up to play has absolutely turned that around'. He gave significant credit to his changed posture for his improved health, although he did not minimise the importance of therapy and regular stretching.

In contrast to the experiences of the classical guitarists considered in chapter 2, a distrust of medical practitioners was not evident among these participants with posture-related pain. As was mentioned above, Mills saw numerous therapists that failed to help him. Nothing improved until he tried acupuncture, but he was not comfortable about the therapy: '[I] tend not to look while they're doing it! [laughs]'. Nor did he

enjoy looking at scans of his IVDs: ‘Makes you feel quite queasy, actually’ and he did not want to take painkillers unless he was desperate: ‘[I] don't like filling myself up with pills’ because ‘all these ibuprofen and stuff, I don't want to keep taking those, they're not good for the stomach’. It was not that he thought the pills would not work, but he feared possible side effects. Vishnick also discussed his arthritis with physiotherapists and cardiologists [79]:

> basically, I brought it up with any medic that I was in front of. Um, directly related to the arthritic issues, you know, GP … And physiotherapists would, you know, try and give me exercises to alleviate the, you know, particular issues. Cardiologists would give me particular pills to try and stop [laughs] to try to work out what the headaches were.

These interventions did nothing for Vishnick’s arthritis; it was the change of posture that helped. Despite all this, neither guitarist mentioned distrusting or losing faith in health practitioners.

These musicians did not seek help until pain forced them to:

> We spoke about with [the spine specialist] with the posture. What would be the best posture would be.
>
> (Mills)

> I stopped using the footstool because I was starting to have arthritic problems moving into my sixties, early sixties, and I sought help and did some research, help from various people.
>
> (Vishnick)

> I've learned *so much* from the guy that sorted my back out in the last five years.
>
> (Durrant)

Mills did not think to change his posture until repeated back spasms made him realise a change was

[79] How cardiologists fit into his story is complicated and not relevant to this topic.

necessary, and then he asked his spine specialist for advice. Although Durrant had back problems since college, he did not learn about how to care for his back until his early 50s. It is unfortunate that these individuals did not realise that they needed to care for their bodies in order to prevent pain, only learning of that necessity when symptoms had become severe.

3.3.3 Attribution

In some accounts there were inconsistencies concerning the sources that participants attributed as responsible for back problems, with posture and a range of other factors mentioned.

Two accounts contained contradictory opinions concerning the positive and negative impacts of posture, plus use of the footstool. Wade's back pain began at a time when he did a lot of horse riding. Thinking that the physical impact of riding was the cause, he sought treatment:

> I've had back problems and I used to do a lot of horse riding at one time. And I went to a, um, chiropractor and she said, well, you know, it's … in fact, not horse riding that gave me this back, it's guitar playing … it was the guitar playing that was actually, um, really destructive.

Since he believed that 'horse riding's not good for your back necessarily' he was surprised to be told that the impact-free activity of sitting was to blame. As mentioned before, Wade had concluded that Williams' footstool posture was perfect:

> The perfect posture is the one that allows you to do the thing you want to do with the most efficiency. And for that, we look at someone like Williams and we think, well, that's probably the perfect position.

He also said that playing guitar as much as professionals do makes problems inevitable:

> A lot of the people of my generation did have back problems … this, I think, was just because they worked too hard. I don't think it was because they were in a bad position necessarily. But I think it was just if you do too much of anything, over the years, you pay the price. Er, and all that you can [accomplish] by sitting, you know, in the correct position, can't necessarily help because as I said

> earlier, you know, problems are induced, whether you like it or not, by the mere fact of playing the guitar.

Here he stated that back problems were inevitable and that better posture may not have benefitted them ('the correct position, can't necessarily help'), but when asked if he thought his contemporaries could have avoided back pain for longer if they had better posture, he replied: 'Well, I think yes, if they hadn't had the footstool, they would have been better off'. Although he considered Williams' footstool posture 'perfect', he also mentioned the period in which he started to doubt its value:

> But I think eventually one became aware of the Alexander Technique … and gradually became aware of the sort of redistribution of the body. I mean, the footstool was … really one of the first things that you started noticing.

This happened after a therapist told him that guitar playing was to blame for his back pain. Finally, when he spoke of replacing the footstool with a cushion, he said it 'made quite a difference' to his long-term back problems [80].

Durrant contradicted himself as well, at times attributing his back pain to moving equipment, at others to use of the footstool. He cited 'leaning into the backs of cars to lift out amplifiers' as the main cause: 'I think the cause was probably carrying heavy stuff *caused* it, but it's exacerbated by [the footstool]'. Yet he also stated that stopping footstool use has dramatically improved his situation: 'I've been laid flat for weeks on end in years gone by … and standing up to play has absolutely turned that around' but he did not say he had stopped moving amplifiers. At times, Durrant shared some strong opinions about the footstool:

> I had quite bad back problems, actually, which is connected with my guitar playing, erm, connected with spending many, many hours, *years* sitting like this with one leg raised up in an *un*natural position.

[80] After criticising Wade here again, I'd like to reiterate my high regard for this very accomplished man.

> But that that isn't good, sitting [with a footstool] isn't good
>
> … that's crazy, using the footstool. It's mad. Unnatural

Although he originally stated that moving equipment caused his back pain, he still carries heavy equipment when on tour. At other times he only connected his pain to footstool use, and he mainly attributed recovery to stopping use of the footstool. In contradiction to this, he has a recent video on his YouTube channel that gives advice for footstool use with no warnings of the potential problems (Durrant 2021) [81].

The two eldest participants mentioned age-related degradation as being a contributing factor. Mills recounted the information relayed to him by the spine specialist: 'as you get older, [IVDs] get less malleable, less flexible, and they begin to pop. The sideways [leans left], and it goes that way [points right]. And it touches on the sciatic nerve'. What he was explaining was that leaning to the left compresses the left side of IVDs so that pressure pushes against the disc wall on the opposite side. Wade's description sounded less scientific and more personal experience: 'your bones and your body structure does stiffen up when you get older, usually. So, things are not working so well'.

Mills expressed no doubt or confusing as to the cause of his backpain, citing the information given him by the spine specialist, who explained that it was not just his age, but also his posture that was to blame:

> He said, "It's actually," he said, "What's happening to you as you get older, It's in fact is quite 'normal' [adds air quotes] for people in that sort of profession where your, the back is under stress and so on."
> Interviewer: So he said, this is normal for a guitarist?
> Mills: This is er, in his experience, yes. Or for people … whose work involves odd positions of the back.

Here, 'odd positions' include the leaning and twisting commonly associated with footstool use.

3.4 Discussion

[81] In light of this criticism, I also wish to state my admiration for Durrant and his accomplishments, including his incredible playing.

3.4.1 Embodiment

Findings highlight the role of an increase in embodied awareness and an understanding of efficient 'holistic' use of the body (including effective posture) in the management of posture-related pain injuries.

As with the participants in the mFHD data subset, accounts pointed towards the common experience of a lack of bodily awareness, together with lack of knowledge of strategies that would enable optimal long-term physical functioning. The ignorance of the musician about the needs of their own body is, to the best of my knowledge, seldom covered in research literature, and first hand reports from participants in the present and previous chapters indicate that many musicians are not even aware that the cultivation of embodied awareness is advantageous, both in terms of playing skills and general health. Indeed, one study concluded that musicians have poor health in general: by giving medical exams to 70 professional orchestral players and then comparing the results to those of 28 marketing workers (thereby comparing two seated, sedentary occupations), it was found that the musicians had double the incidence of general health conditions (Črnivec 2004: 140), including endocrine disorders and cardiovascular disease (Črnivec 2004: 142). This could be because musicians are so 'highly motivated with their projects and related stresses, their physical condition comes second to playing' (Abreu-Ramos and Micheo 2007: 98) so they tend not to engage in physical exercise (Sakarya *et al*. 2022: 4). As one musician said in Ackermann *et al.*'s phenomenological study: 'Music is my life, I don't do anything else' (2014: 7). This lack of awareness and lack of engagement in healthful activities leaves them more susceptible to injury.

One participant acknowledged that the dampening of awareness when playing might be dangerous. This dampening is mentioned in Guptill's phenomenological study: 'the experiences of the participants demonstrated that they experience a dampening of their awareness of their bodies when engaged in playing music' (Guptill 2011: 90). The thought of musicians playing through dampened or ignored pain sensations and thus exacerbating an existing problem is particularly worrying, but may be all too common since injury rates are so high [82].

The difficulty of changing postural habits was mentioned by three participants. They each described

[82] See 1.2.1 Injury prevalence in the general musician population.

how easy they found it to use a footstool or object of similar height even after deciding they should discontinue its use in favour of a support. One of them unconsciously raised his foot when demonstrating something on the guitar during the interview, rather than standing up to use the fitted strap. With changing habits being so difficult, people may need a particularly strong impetus to make this change. This means some people not yet experiencing significant pain may not be sufficiently motivated to attempt to change ingrained habits.

The concept and understanding of 'perfect posture' among these participants was vague, sometimes defined as allowing someone to play well, but not always including the need for player longevity. There are also mentions of 'a nice straight back', something criticised by AT teachers for increasing tension around the spine because it has four curves when at rest (Phillips 2021; Jennifer 2012). When people address the topic of 'good posture' in a public forum this often results in a few people adjusting themselves to be 'sitting up straight' (Harscher 2019: 7:10), increasing their postural tension. The idea that good posture requires 'sitting up straight' or 'standing to attention' is a common mistake that seems to originate in 16th century military documentation, and this somehow worked into the public consciousness (Gilman 2014: 58-9). The back should not be straight because the spine has several natural curves that are visible externally in most people (Taylor 2016: 10; Medoff 1999: 213-214). It is likely that these participants meant 'generally straight as opposed to slumped over the instrument with obvious rounding of the whole back'.

Classical guitarists, who commonly sit to play, must maintain certain positions with their back and shoulders for prolonged periods. Static positions over long periods may overwork muscles due to constant tension that restricts blood flow and reduces metabolite removal (Savino *et al*. 2013: 853; Garg and Kapellusch 2009: 39; Abreu-Ramos and Micheo 2007: 97-98; Črnivec 2004: 140; Culf 1998: 20-23; Ramazzini (1713) in Franco 2001: 1380). Lambert cites these as 'major aetiological factors' in the development of musician's injuries (Lambert 1992: 265).

Among these accounts there is no consideration for how raising one leg tilts the pelvis diagonally, this affecting lumbar vertebral positions (Upjohn 2016). Iznaola explains that

> the continued static flexion of the left hip, and the counteracting muscular effort in the back and or the right limb, causes strain to the surrounding musculature. It is, therefore, not surprising that many guitarists that use this sitting position end up with lower back pain problems, sometimes of a paralyzing intensity.
>
> (Iznaola 2013: 52)

The author also notes that four contact points are needed for guitar stability – both thighs, the chest, and one arm, and that without all four the guitar will topple (Iznaola 2013: 55). Added to Mills' assertion that using a footstool makes one want to 'hug' the guitar, which is 'not the best for sound', this suggests there may be superior ways of positioning the guitar that improve stability (thus improving ease of playing and facilitating expression), longevity of the player, and resonance of the instrument.

Risk of disc herniation may be exacerbated by certain postures, as was claimed by Mills' spine specialist. A study tested 25 ovine lumber spine segments for herniation by positioning them with 2° axial rotation plus 7° flexion and increased the pressure within the nucleus by slowly injecting fluid (Veres *et al.* 2010: 1468). Although it did not increase the incidence of rupture, they found that torsion in addition to flexion induced herniation in significantly fewer loading cycles in discs already at risk of rupture (Veres *et al.* 2010: 1469). They also note that 'mature segments … were significantly more likely to suffer disc failure than immature segments' (Veres *et al.* 2010: 1470). This suggests that guitarists are at higher risk when they allow the lumber spine to flex (straighten) while twisting to the left, and, unsurprisingly, that the risk increases with age.

Durrant did not mention IVD damage, so had non-specific LBP, which accounts for 90% of cases (Koes *et al*. 2006: 1430). There is some evidence that this could be due to a bent and twisted posture (Van Nieuwenhuyse *et al.* 2006: 48), or static positions (Davis and Kotowski 2014; 1,249). Durrant had pain that went away with therapy and a change of position that also allows much more mobility. The saying 'the best posture is your next posture' (Opsvik n.d.) conveys the idea that there is no ideal posture, but that being mobile is preferable. Although the relationship between sitting behaviour and LBP remains controversial (Bontrup *et al.* 2019: 1), there are studies supporting this idea. One study found a direct correlation between

severity of back pain and time spent sitting if it exceeded three hours (Omokhodion and Sanya 2003: 287), which is less than professional musicians play per day. Indeed, eight to ten hours per day with no holidays has been reported (Détári *et al.* 2022: 7). A study took data from pressure mats on 62 office workers' chairs (Bontrup *et al.* 2019: 3). They found that those reporting chronic LBP moved less than those without pain (Bontrup *et al.* 2019: 4). Another study of 37 call centre operators used reminder software to encourage workers to change their posture (interval between reminders was not stated) over 2 weeks. 'Significant' reductions in back and shoulder discomfort were reported (Davis and Kotowski 2014; 1,249). Thus, a posture that allows more freedom of movement than what is available with a footstool may be beneficial to guitarists.

Although Wade said that Williams shows no tension, sitting is inherently tense for the spinal erectors, since when transitioning from standing to sitting only about 60º of movement comes from the hips, the rest from flattening of the lumbar curve (Caglar in BBC 2006; Mandal 1981: 20). Maintaining an upright spine in this position requires either secure external support or a great deal of spinal erector tension. Pictures of Williams playing often show him leaning forward and left, as well as being twisted. Leaning forward and leaning sideways both require tension to stop the torso collapsing. Twisting requires contraction to achieve and maintain. Therefore, it cannot be said that Williams' posture is fully relaxed.

Poor posture seemingly does not affect everybody; there are numerous cases of elite guitarists with 'poor' posture who were not known to have had complaints. As found in the ovine spine study above, poor posture caused earlier disc failure in susceptible discs but did not affect more robust discs. In vivo, there is seldom a warning of impending disc failure because nerves are found only in the outer layers of the disc wall (García-Cosamalón *et al.* 2010: 3), so pain is signalled only in advanced stages of degradation. Players would be unable to ascertain the susceptibility of their IVDs, and onset can vary from years to decades to never.

3.4.2 Strategies

This section covers how participants discussed the strategies of learning to play, and how they do not necessarily work optimally, as well as strategies for dealing with injury.

The ‘master and apprentice’ model is the main method for instrument tuition. This can feature ‘direct instruction’ (Davis 2018: 135), where the teacher gives directions and explanations to the student, or ‘modelling’ (Haston 2007: 26), where the teacher demonstrates how to play something. The master and apprentice model has been ‘criticised as a model based on the authority of the master, an authoritised model that promotes imitation learning’ (Hyry-Beihammer 2010: 162). As was shown above, sometimes this involves the student attempting to copy things not suited to their body, although it may take years or decades for problems to become apparent. When there is an element of idolisation on the part of the student it may encourage them to play through pain to a further degree because they believe that the maestro’s way must be the best. It has been observed that music education culture favours adhering to traditions rather than questioning inefficient or potentially harmful technique (Shoebridge *et al*. 2017: 831).

Participants reported little to no mention of health as part of their music education, and the literature also mentions that some musicians are not even aware that they could be injured through playing (Kock *et al*. 2023: 10). Performance education often focuses on the musical outcome, which is important, but this comes at the expense of the mental and physical needs of the performer (Shoebridge *et al*. 2017: 831-2). This, ultimately, can hinder the musical outcome by, at best, reducing musical flow and expressivity or, at worst, injuring the player. This is evidenced by the ‘inordinate amount of remedial work musicians needed on entering university’ (Shoebridge *et al*. 2017: 831-2). When people with no health education go on to be teachers, they would surely still not be aware of the need for health education until they sustain their own injury, thus passing on practices that may be injurious to others, either long-term or short-term. This idea is supported by Wahlström-Edling and Fjellman-Wiklund’s finding that 77% of the 47 instrument teachers in their study reported injury within the preceding 12 months, and that problems tended to ‘be long-lasting and to progress over time’ (2009: 113). This suggests that injuries are a self-sustaining problem, and that the master and apprentice model may not be ideal since tutors can pass on practices that worked for them for decades that will not, in the long term, suit all students.

The level of distrust of doctors is not evident here as in chapter 2. In chapter 2, participants saw therapists or medical professionals who failed to help them, but this failure was attributable, in part, to the

condition being so poorly understood. In Mills' and Durrant's case, treatments made no difference because these guitarists persisted in using the posture that caused the issue.

Self-determination theory (SDT) discussed earlier [83], describes three innate needs that enhance motivation: autonomy, competency, and relatedness can be seen to contribute to each other in these accounts. We can see evidence that participants attempted to maintain autonomy throughout painful experiences. When Mills sought private therapy for his herniated IVDs his main motivation was to have more control over his schedule so that he could resume ADL and work as soon as possible. He may also have believed he would receive higher quality treatment with private care, but that was not mentioned. Relying on the NHS would have meant being on a waiting list for some time, whereas private health care was available much sooner. This was also part of the reason he chose three weeks of rest rather than surgery followed by six months off work: aside from avoiding a risky surgery, it meant less enforced time off. Durrant had been standing to play for some years at time of interview, and he stated that he felt it change his body. Vishnick, although he found changing posture difficult, also saw reductions of pain quite quickly. In these three cases their sense of autonomy and competency were reinforced by positive feedback – they could feel that they were in control of their recovery because their strategy was seen to be working.

Two participants noted that their experiences led to them learning more about their bodies, with one saying that his learning was ongoing, even though he believed his difficulties were largely resolved. Body learning, and the cultivation of an embodied awareness, can improve musicians' sense of competency relating to recovery, and also contribute to autonomy, because they understand more about the recovery process and what the body needs to avoid relapse so they can take better-informed preventive steps. Cognitive evaluation theory (CET), a sub-theory of SDT, argues that factors such as positive feedback can enhance feelings of competence, and thus boost intrinsic motivation for that action (Ryan and Deci 2000: 70). Mills found a more stable position without a footstool, which will have improved his sense of performance competency by making him feel more confident that his guitar would stay in place. This could

[83] See 2.4.2 Identity.

also contribute to his sense of autonomy by reassuring him that the change of posture is beneficial in other areas in addition to spine health. There are other examples of similar positive feedback that may boost motivation to continue with the new posture: Vishnick explained that after a while he could feel that using a support put him in a more grounded and 'better bodily position'; Mills tried the footstool again and found that the posture now simply felt wrong, demonstrating a new level of awareness of his body.

A tension between seeing other guitarists play wonderfully with a footstool and suffering no physical problems, and the personal experience of needing to stop using the footstool was expressed. This could affect perceived competency by making classical guitarists wonder if there is something wrong with their body, in that it failed while using a posture that they consider 'normal'. This could also affect their sense of relatedness by making them feel they are no longer part of that group that uses the traditional footstool.

Another sub-theory of SDT is organismic integration theory (OIT), which explores different forms of extrinsic motivation (Ryan and Deci 2000: 72). One of the categories within OIT is 'regulation through identification', which 'reflects a conscious valuing of a behavioural goal or regulation, such that the action is accepted or owned as personally important' (Ryan and Deci 2000: 72). This is evident in Durrant's account of his teacher saying he walks on stage 'like a gorilla'. This external locus became Durrant's internal motivation to be more graceful, even though he is not expecting praise from a teacher he had several decades ago.

3.4.3 Attribution

According to Stanhope *et al*.'s survey of 213 injured professional and student musicians, nearly 50% of musicians attribute their PRMD to posture (2022: 1548). In the present study, one participant was confident in his attribution of his pain to his posture, because a spine specialist told him that was the cause. He did not specifically blame the footstool, but blamed his habit of leaning. However, as an online image search demonstrates, this is a particularly common trait of footstool users. Two others were inconsistent in their attribution, despite changes of posture providing a good deal of relief from chronic pain. Two reasons that these guitarists avoided direct attribution to the footstool are: knowing that the videos would be disseminated online, they avoided blaming a traditional aspect of playing classical guitar for fear of public backlash; to attribute pain to footstool posture is to admit that one has been doing something wrong for

years. One participant said that problems are inevitable for professional guitarists, which is in line with this hypothesis. Why these participants avoided self-blame when those in chapter 2 did not is unclear.

3.5 Summary

Low back pain is exceedingly common in many occupations, including being a classical guitar performer, yet the causes remain poorly understood. Results from this inquiry provide clear empirical evidence regarding key issues, together with the importance of attitudes, beliefs, and bodily awareness of the negotiation of difficulties experienced. These results also build on the themes discussed in the previous chapter. In summary, findings from this chapter indicate that:

- Musicians often do not develop sufficient self-awareness of their own body before an injury forces them to do so. This aligns with findings in the previous chapter regarding musicians' lived experiences of focal hand dystonia. Although teaching others may foster more self-awareness in the teacher, it may not be enough to promote a proactive approach towards injury prevention;
- Musicians often do not learn what their body needs for optimal function and longevity until injury forces them to do so. Similar to the findings of chapter 2, these musicians only became aware of the impact certain body-use patterns can have through their own injury, and then went on to learn about back and spine health;
- Although the role of posture in back pain is controversial [84], since these participants have reduced their pain levels through changing posture, it suggests that some postures are detrimental for some (if not all) people;
- Participants' definition of good posture appears to be vague;
- A position that feels comfortable may cause damage that takes many years to manifest;
- Some participants avoided blaming posture pain on footstool use, even though ceasing its use significantly reduced their pain, and even if they subsequently refused to use a footstool;
- The onset time of severe back pain can span years or decades;

[84] See 4.2.1 Discussion.

- Back pain can be debilitating to the point where bed rest is the only course of action.

Considering the findings that some postures eventually cause pain, and that adoption of a new posture has formed part of effective treatment strategies, the next step is to examine recommendations for postures beneficial to the spine. To this end, chapter 4 begins with an overview of key findings from posture literature to inform a posture suitable for playing guitar. Following this, a support device must be created that facilitates this. Since changing posture habits is difficult, if a support is less convenient to use and transport than a footstool there is scant encouragement to make the change for those experiencing little or no pain. For this reason, the best support allows good posture, but is also easy to use and transport. Various support designs exist, but they do not satisfy these criteria, as they are either cumbersome to transport, awkward to use, unreliable, or suffer from a combination of these drawbacks [85]. The Delta was developed to meet these criteria, and the bulk of chapter 4 evaluates its effectiveness with a pilot study.

[85] See Appendix 2: Evaluation Of Existing Guitar Supports.

Chapter 4: A New Guitar Support: The Delta

In light of the findings that altered posture has been part of successful treatments of both musicians' focal hand dystonia and classical guitarists' postural pain, this chapter explores a more balanced and symmetrical method of positioning the classical guitar than the footstool. There is much resistance to changing traditional elements relating to the guitar, such as moving away from the footstool. This chapter begins with a brief outline of the history of guitarists' posture, which is compared to the history of the violinist's chin rest, showing that footstool use may not be as traditional as people think. Examining the literature relating to back pain and posture in the general population and amongst musicians yields some insight into why certain asymmetrical postures may be problematic for some. Based on this, guidelines for comfortable and safe posture are outlined. This highlights the need for a guitar support design that is better than those currently available, one which meets the needs of travelling guitarists. Since the evaluation of currently available supports did not fit the narrative flow of this thesis, the information can be found in Appendix 2: Evaluation of existing guitar supports. Drawing upon the literature and personal experience, a list of criteria for a better guitar support was developed and presented here. This led to the development of the Delta guitar support, which was pilot tested by volunteer guitarists and findings presented towards the end of this chapter.

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4.1 Classical Guitarists' posture throughout history

There is a strong sense of tradition surrounding the classical guitarist's footstool, and because so many virtuosos use (or used) them seemingly without issue, contemporary players feel a certain pressure to use the same device, as is evidenced in Vishnick's story [86], in which he explained that he felt conflict

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[86] See 3.3.1.III GETs: Posture

between his own experience of pain from footstool use when there are so many great players who seemingly had no issues. In fact, footstool usage by guitar players is a practice developed relatively recently, and is not an age-old tradition. For example, in El Maestro, a progressive collection of music for the vihuela (an ancestor of the guitar) published in 1536, the musician depicted on the cover is in a standing position (fig. 4.01). Other historical images of vihuela players reveal musicians standing with only very few sitting. The classical guitar as we know it today was developed from the start of the nineteenth century (Summerfield 1992: 12), and there were several notable virtuosos whose works are still standard repertoire. However, they each had different ideas about how to hold the guitar. The Florentine composer Mateo Carcassi (1792 – 1853) wrote the most popular guitar method of the nineteenth century. This publication (1825) was so popular it outsold his compositions. It contains an image of Carcassi supporting his left foot with a cushion (fig. 4.02), a precursor to the footstool. The book cover of Bennett's 1828 guitar method (fig. 4.03) shows two players using footstools, one for the right foot, the other for the left, with both players using ribbons attached to either end of the guitar. Footstool usage was not universally endorsed, as demonstrated by Fernando Sor's (1738-1839) Méthode Pour la Guitare published in 1830, which contains a section about why he disapproved of the footstool, which he claimed was mainly used by the French and Italians. Sor explained:

Fig. 4.01
El Maestro
(OMI n.d.)

Fig. 4.02
Mateo Carcassi
(Tecla Editions n.d.)

Fig. 4.03
Two 19th century guitarists using footstools and straps
(Grove Music Online n.d.)

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> It forces me to push my right shoulder forward in an embarrassing way, my arms, which have no support, can't find a fixed position for the hand, the tendons pull continually to maintain the unnatural arm position … it often gives me pain … the left arm is elevated for a long time … the wrist must

remain in contraction to stay bent.

(Sor 1830: 12, translation: Bonner)

Sor searched for something to put his foot on to raise that knee yet he also wanted a more stable position but 'found nothing better than a table' (1830: 11, translation: Bonner). Fig.6 in his method (1830) shows him resting the guitar on the edge of a table while his feet remain symmetrical (see fig. 4.04). One of Sor's closest friends, Dionysio Aguado (1784 – 1849) invented a device that was known as the 'Tripodion' [87] (fig. 4.05) to improve stability and allow the instrument to be held without the player holding the guitar, as this dampens the sound and reduces projection. However, in the original Spanish publication of his *Nuevo Método para Guitarra* (1843) he states that it allows 'complete use of physical faculties of both hands', as both hands are free to roam the instrument as needed because the guitar is held in a stable position. Aguado claimed that 'someone that learned with the tripod would find it difficult to play well without' (Aguado 1843: 4). Despite his claim that the 'posture of the guitarist is natural and airy and more convenient and elegant for the ladies' (*ibid.*) as well as satisfying Sor's desire for a stable and centralised guitar position (and being easier to carry than a table) it unfortunately never caught on at the time. More recently however, stands in the same vein have become available [88]. During the mid-nineteenth century the guitar experienced a big decline in popularity. Francisco Tárrega (1852 – 1909) played a large part in reviving the instrument with his arrangements and compositions, and also standardised the use of the footstool (Summerfield 2002: 17). Use

Fig. 4.04
Fernando Sor using a table
(Sor 1830, fig.6)

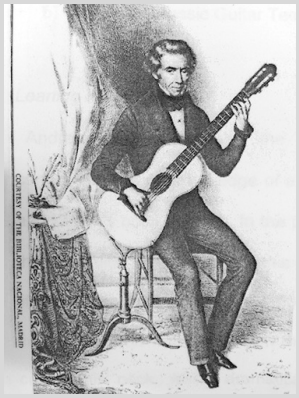

Fig. 4.05
Dionysio Aguado with his Tripodion
(Gil De Avalle 2013)

[87] It is only referred to as '*trípode'*, meaning 'tripod', in his original text.
[88] See Appendix 2: Evaluation of existing guitar supports.

of the footstool was far from universal until the end of the nineteenth century.

A comparison between the histories of the guitarist's footstool and the violinist's chinrest highlights similarities and differences in terms of its acceptance as a traditional part of playing the instrument. The violin appeared in 1546 (Hart 1875: 24) and was held differently to how the violin is held in the present day. When violin repertoire became more demanding in the second half of the eighteenth century and the left hand needed to be moved up and down the strings more, musicians sought methods of increasing instrument stability (Cnop *et al.* 2019: 48). Since merely resting the chin on the edge of the violin was deemed too uncomfortable, various add-on parts were developed (*ibid.*). The chinrest did not become commonly used until the end of the nineteenth century. During this period, there was still a great deal of resistance from certain influential players (Cnop *et al.* 2019: 71). Indeed, even in the 1920s there was much opposition to adding a shoulder rest underneath the violin (Cnop *et al.* 2019: 71).

The guitarist's footstool has had shorter period of tradition that the violinist's chinrest. The violin had 200 years of tradition before chinrests were first developed and it took at least 100 years for the chinrest to be commonly accepted. The vihuela was played standing for around 250 years before it evolved into the classical guitar, which took over in popularity. The footstool was used sporadically for nearly 100 years before it was standardised. Both devices were developed as a method of positioning the instrument to facilitate more demanding repertoire. The chinrest (and later, the shoulder rest) was an attempt at remedying the discomfort of lowering the chin to the instrument. The footstool, despite not being the most stable tool for positioning the guitar, won out over other methods such as the Aguado's tripod. The size and cost of a footstool compared to Aguado's Tripodion could be factors that contribute to its continued usage. Now, a little over 100 years after the standardisation of the footstool, there is much resistance to replacing it.

4.2 Investigating posture & pain

The prevalence of low back pain (LBP) is poorly understood, but has been demonstrated to be a major global problem. It is considered to have the highest prevalence of all musculoskeletal conditions, putting a high economic burden on societies (WHO 2023). A 2012 meta-analysis of surveys estimated point prevalence at 11.9% (+/- 2.0%), and 1-month prevalence at 23.2% (+/- 2.9%) (Hoy *et al.* 2012: 2028). LBP

is defined as activity-limiting pain located between the gluteal folds (the lower buttock edge) and the ribs (although it can also radiate down one or both legs) that lasts for at least one day (Hoy *et al.* 2012: 2028).

At least 90% of cases are classed as non-specific LBP (Henschke *et al.* 2009: 3072; Koes *et al*. 2006: 1430) because the cause is undiscernible. It was suggested as early as 1946 that such cases stem from emotional trauma (Sargent 1946: 427; Sarno 1977: 353). A study of 571 people with LBP compared to 5,210 pain-free individuals of 32-33 years of age found evidence that 'psychological distress more than doubles later risk of low back pain' (Power *et al.* 2001: 1671). Van Nieuwenhuyse *et al*.'s study found that those with 'fear of pain-inducing movement' (kinesiophobia) were twice as likely to experience pain (Van Nieuwenhuyse *et al.* 2006: 50). The researchers suggest that fear caused heightened physical awareness (Van Nieuwenhuyse *et al.* 2006: 50). These findings fit the Biopsychosocial model of illness that states that illness and health are manifestations of an interaction between biological, psychological, and social factors. (Wade and Halligan 2017: 995). Other risk factors for LBP include previous injury or inflammatory disorders (Hartvigsen *et al.* 2018: 2358); genetics (Ferreira *et al.* 2013: 957); obesity (Shiri *et al.* 2010a: 154; Webb *et al*. 2003: 1195); smoking (Ferreira *et al.* 2013: 957; Shiri *et al.* 2010b: 87.e35; Power *et al.* 2001: 1671); and increased thickness and adhesions of lumbar connective tissues or fascia (Langevin *et al*. 2011: 204, 212). Its aetiology is poorly understood but considered multifactorial (Power *et al.* 2001: 1671).

A common clinical finding is that pain is found to be provoked by certain postural positions such as leaning forwards, rather than the process of moving (Mulholland, 2008: 622). The PRMD literature often mentions the importance of balanced, symmetrical posture because it is long-term use of certain postures that are most frequently reported as the cause of occupational diseases among musicians, at least in Italy (Savino *et al*. 2013: 853). This is pertinent to classical guitarists, who may sit in the same position for long periods, often leaning forward and twisting to the left while using a footstool. How the footstool can contribute to postural pain will be discussed below.

In a study by Portnoy *et al*. (2022) 25 guitarists were filmed with six cameras, playing a given tune both seated and standing while wearing visible markers placed around their bodies (Portnoy *et al*. 2022: 4). They found that players were more likely to lean forward when sitting (Portnoy *et al*. 2022: 8), and that

those ‘who reported maintaining physically comfortable postures during playing, had fewer painful joints’ (Portnoy *et al*. 2022: 7). The authors did not elaborate on the meaning of ‘physically comfortable postures’ or why certain individuals did not do this. The study also found that better posture corelated with less pain in both the low back and shoulders (Portnoy *et al*. 2022: 7). A study of 158 Swiss and UK conservatoire musicians found that musicians with an asymmetric playing position reported higher levels of pain (Cruder *et al.* 2018: 63). Similarly, a survey of 47 instrument teachers in Sweden found that those with asymmetric postures had double the incidence of pain in the upper back, shoulders, and neck, and slightly higher in the low back (Wahlström Edling and Fjellman-Wiklund 2009: 117). Similarly, a study of 83 professional orchestra musicians reported that poor posture was the most common aggravating factor mentioned by the participants (Abreu-Ramos and Micheo 2007: 102), and that a change of posture was an important part of alleviating pain (Abreu-Ramos and Micheo 2007: 104). Another study comparing neck muscle EMG data and neck position in nine violinists with neck pain and nine without found that greater deviation from the neck’s neutral position was associated with pain (Park *et al.* 2012: 188). These studies provide evidence that certain postures cause postural pain in musicians.

To test the exertion of different playing postures, Baadjou *et al*. spoke to 18 musicians who had been treated by postural exercise therapists for ‘nonspecific musculoskeletal pain’ (Baadjou *et al*. 2011: 218). By testing changes in metabolic rate, they found that ‘playing a musical instrument in a posture according to postural exercise therapy leads to higher energy expenditure as compared to a nonoptimized body posture’ (Baadjou *et al*. 2011: 218). Conversely, the interviews revealed that the musicians perceived **‘**the instructed body posture [to be] less troublesome and less fatiguing when compared to playing in their former body posture’ (Baadjou *et al*. 2011: 219). The researchers concluded that correct posture is more active than non-optimal postures, using postural muscles isometrically (Baadjou *et al*. 2011: 222). The authors did not explain the sense of reduced effort the participants reported. There was no mention whether the sense of greater fatigue in the less than optimal postures was local to a specific area or systemic. Local fatigue might be reduced when muscle activity is distributed across a range of muscles. Another experiment attempted to measure changes in trapezius activity after five professional violinists attended an eight-week course of Basic Body Awareness Therapy, consisting of simple movements to ‘restore postural balance,

grounding, co-ordination and to free the breathing', compared to violinists who received no training (Fjellman-Wiklund *et al*. 2004: 357). Although no change was found in muscle activity (Fjellman-Wiklund *et al*. 2004: 359), the violinists attending the course 'perceived a greater harmony and stillness, a freer breathing during sessions, and better concentration prior to performing' (Fjellman-Wiklund *et al*. 2004: 364). This study only investigated activity in the trapezius, therefore sheds no light on joint stress or the numerous other muscles and tissues involved in posture and playing.

A pioneering study by Valenzuela-Gómez *et al.* (papers published in 2018 and 2020 from the same study) compared the postures of classical guitarists while using three types of guitar support: a footstool, a cushion, and an adjustable guitar support. The project used a chair with adjustable height, the same guitar for all nine participants, and a specially written musical exercise covering low, middle and high frets (Valenzuela-Gómez *et al.* 2020: 893). Players' postures were videoed from three angles and assessed via two methods (Valenzuela-Gómez *et al.* 2020: 893): Rapid Entire Body Assessment (REBA), an observational system requiring comparison of limb positions to images on a chart, accruing scores based on joint angles and level of activity (Middlesworth, M. n.d.); and 3D Static Strength Prediction Program (3DSSPP), a software tool that generates stress and load information based on a person adjusting an avatar in software to match photographs of a person's posture. Finally, the participants were questioned to see which device they preferred. The postural analysis scored the thigh support and footstool at similar perceived risk levels and the cushion slightly higher (Valenzuela-Gómez *et al.* 2020: 897). The final part of the assessment, self-efficacy, suggested that the footstool was preferable due to better fretboard visibility and ease of access to the higher notes (Valenzuela-Gómez *et al.* 2020: 897-8).

A key limitation of the Valenzuela-Gomez *et al*. (2018 & 2020) study is the assumption that well-designed ergonomic equipment is an instant corrector for poor posture, and that individuals understand how to use their body effectively and pay attention to how they are using it while playing. It must be stated that in Valenzuela-Gomez *et al*.'s figures, the participants can be seen slumping and curling over and around the instrument. Whether no attention was given to posture, or whether participants were asked to use their usual posture remains unclear.

Another limitation of their study is its reliance on observational skills. A screenshot of the 3DSSPP user interface (Valenzuela-Gómez *et al.* 2020: 897) shows that the avatar does not accurately mimic the photographs of the player since the latter's right shoulder is lower than the left, yet the avatar has level shoulders. The head position has not been replicated, and the torso rotation has also not been matched. It is possible that the screenshot was taken part way through the matching process but this is not stated. Although the seat was supposed to be adjusted so that hips and knees of each player were at 90º they measured different amounts of hip flexion with the guitar cushion (91.5º) and thigh support (89.9º) (Valenzuela-Gómez *et al.* 2020: 897). As these two devices enable the feet to rest on the floor this indicates that they did not set the seat up the same for each stage of the test.

Another limiting factor is that participants all used the same guitar (Valenzuela-Gómez *et al.* 2020: 893), which would feel and sound different to their own. This is, at best, slightly confounding for the player, but may make them feel the need to look at what they are doing more, thus changing their posture. This could also add a little stress to the already alien condition of playing a novel musical exercise in a laboratory, increasing tension and further affecting posture.

The self-efficacy part of the study showed that most participants felt more comfortable with the footstool. However, since seven of the nine participants were already footstool users (Valenzuela-Gomez *et al.* 2018: 330), this finding includes a significant degree of bias towards the use of a footstool. Asking participants to comment on comfort is not effective as they may say it feels strange, even uncomfortable, merely because it is different to what they are accustomed to (Upjohn 2016), therefore may result in confirmation bias. The participants agreed that the footstool facilitated access to the higher notes (Valenzuela-Gómez *et al.* 2020: 898) but they did not say if this referred to the notes near the guitar body (9^{th} to 12^{th} frets) or the *really* high notes over the body (13^{th}+), which are used more rarely. Regardless, this indicates the guitar is further to the left, making playing in the more frequently used lower positions harder due to greater shoulder abduction, although this was not mentioned. The authors suggest that allowing musicians more time with the guitar supports could reduce a possible bias in their perception (Valenzuela-Gómez *et al.* 2020: 900). This is a valid point, but does not address the lack of instruction on how to sit

well.

It is not just how guitarists sit that is important, but how they position the guitar and the impact this has on their arms. It has been proposed that raised arms increase the risk of problems in the upper limbs (Nyman *et al.* 2007: 370) due 'to a high intramuscular pressure which impedes local muscle blood flow' (Wahlström Edling and Fjellman-Wiklund 2009: 113), as well as narrowing of the subacromial space potentially causing impingement syndrome (Portnoy *et al*. 2022: 8). This is 'one of the most common causes of shoulder pain, accounting for 44% to 65% of all shoulder complaints' (Portnoy *et al*. 2022: 8).

Comparing these studies described above indicates that there is great heterogeneity across guitarist' posture studies, without clear definitions of what is considered a postural fault, and strong reliance on visual observation rather than accurate measurements, making it difficult to truly assess the relationship of posture and pain in music (Rousseau *et al*. 2023: 11).

4.2.1 Discussion

Postural studies with musicians indicate that an asymmetrical posture may contribute to musicians' pain. In contrast, in the general population, posture appears to play a lesser role in LBP. A meta-analysis (Roffey *et al*. 2010: 92-93) of 27 low back pain studies included a total of 69,980 participants covering 44 different occupations from administration to postal workers, concluded there was no causal relationship between 'awkward' postures and LBP (Roffey *et al*. 2010: 97). As yet, there seems to be no explanation as to why there is such a difference between conclusions of general population studies and those of musicians.

Studies on musicians, and information from participants in chapter 3, provide evidence that posture could play a role in both causing and reducing pain. There are few high-quality studies on musicians' posture that include such things as comparisons to a control group, but the studies that currently exist point to posture contributing to pain in musicians. There are various reasons that bad posture could cause pain, such as: (a) Sagging posture or asymmetry concentrates forces on smaller areas of intervertebral discs (IVDs) rather than spreading the pressure evenly over the whole surface (McNally and Adams 1992: 71); (b) Sitting with knees at hip height usually involves loss of lumbar curvature (Mandal 1981: 20), which can almost double the pressure on IVDs (Newell *et al.* 2017: 421). There are various ways to achieve sitting

posture that Alexander Technique (AT) teachers recommend, but they tend to reduce the lumbar curve, meaning that sitting usually places different stresses on the IVDs to standing, and adaptions from too much sitting could make standing uncomfortable; (c) Over time, and with age-related degeneration, this could make people more susceptible to herniations; (d) Some ligaments intended to stop the spine bending too far would be under constant stretch while phasic muscles (used for movement) may be called upon to supplement the tonic muscles (used for posture) to support the unbalanced posture. This could cause muscle imbalances to increase to counterbalance the strain, resulting in atrophy of the antagonists (Ackermann *et al.* 2002: 34). The constant sub-maximal load could gradually overload them so that 'micro fibril tears might develop into tendonitis' (Garg and Kapellusch 2009: 41; Kendall *et al.* 2005: 52); (e) Habitual spinal flexion may bring about various long-term changes: IVDs may thicken on the posterior side to increase support; anterior ligaments may shorten while posterior ligaments lengthen; anterior muscles might shorten; myofascial continuities may adapt in length and/or thickness. Similar things would occur with laterally bent postures, and such alterations could make adopting better posture difficult, thus compounding the issues bad posture causes; (f) Static positions over long periods may overwork muscles due to constant tension that restricts blood flow and reduces metabolite removal (Savino *et al*. 2013: 853; Garg and Kapellusch 2009: 39; Abreu-Ramos and Micheo 2007: 97-98; Črnivec 2004: 140; Culf 1998: 20-23; Ramazzini (1713) in Franco 2001: 1380). Lambert cites these as 'major aetiological factors' in the development of musicians' injuries (Lambert 1992: 265). This is particularly relevant for guitarists, whose shoulders and arms have to maintain certain positions, and seated musicians whose lumbar spinal erectors are working for the duration of playing sessions. Even when playing has stopped and the arms have relaxed, if the player remains seated the spinal erectors continue working, contributing further to their overuse.

4.3 Posture guidelines

Posture guidelines help the individual to find a balanced posture that suits them, although the guidelines need to be adapted to the type of musician as well as to the individual. What follows is an exploration of why such guidelines are important for the musician, and also to understanding why certain postures are unfavourable. This information is vital in demonstrating the need for a better alternative to the footstool, and served to inform the development of the Delta guitar support and its pilot study.

4.3.1 The importance of posture guidelines

The human body is a complex system with different and distant body parts connected to each other. A common theme in literature is that malfunction in one area can have negative ramifications somewhere else in the body (Myers 2012: 2). Physical therapists stress the importance of ensuring that nerve impulses and blood flows are not restricted so that the body can keep up with the demands placed upon it during exertion (Sahrman, 2017). Based on the findings in chapter 2 that teaching postural balance has formed part of dystonia treatment methods [89], and the findings in chapter 3 that poor posture causes pain for some musicians, and that better posture improves concentration and reduces perceived exertion, the next stage is to examine what constitutes good and bad posture in order to inform future posture intervention studies.

Findings from a conservatoire-based study suggest that posture is not being taught to young musicians effectively. An innovative survey used a panel of postural experts to visually inspect and assess pictures and videos of 100 musicians at play. Their ages ranged from 18-38 with the mean age being 23.9 years (Blanco-Piñeiro et al 2017b: 316). The panel found poor posture in 70% of musicians when standing and 73% when sitting (Blanco-Piñeiro et al 2017b: 316; Blanco-Piñeiro *et al.* 2015: 569). Despite piano and many wind instruments having the potential for the most optimal posture, these were found to be the most likely to slump**.** In the standing positions, it was common to exaggerate the spinal curves (Blanco-Piñeiro et al 2017b: 318; Blanco-Piñeiro *et al.* 2015: 571). In both postures it was common to lean forwards and round the shoulders **(**Blanco-Piñeiro et al 2017b: 322; Blanco-Piñeiro *et al.* 2015: 571). Asking the participants to adopt 'correct' posture did not always resolve postural imbalance as this resulted in 43% of them rigidly 'standing to attention' (Blanco-Piñeiro *et al.* 2015: 569). This is similar to the idea mentioned in chapter 3 [90] that 16th century military documentation and military practices still somehow influence the public's perception of the postural ideal (Gilman 2014: 58-9) and suggests that musicians are not being taught good posture effectively, if at all.

Many people are unaware of the postures they adopt when playing. Musicians spend a lot of time

[89] See 2.4.3 Strategies, and 2.4.4 Attribution.
[90] See 3.4.1 Embodiment.

concentrating intensely while playing instruments that do not change shape, creating the 'tendency for the body to shape itself around the solid instrument' (Myers 2012: 209). Ramella *et al*.'s study of 148 conservatory students aged 10-18 years (mean age 15.1 years, SD 1.9) in Italy (Ramella *et al*. 2014: 20) included a wide range of instrumentalists (orchestral strings, wind, brass, piano, percussion, and guitar) (Ramella *et al*. 2014: 19). Their postures were assessed during play by two physiatrists [91], one of whom was experienced in PRMDs (Ramella *et al*. 2014: 20). The authors found 59% of musicians accentuated postural defects when playing (Ramella *et al*. 2014: 22), and that none showed improved posture with their instrument (Ramella *et al*. 2014: 20). This suggests that adaption to an instrument becomes a postural habit that even continues when not playing, a trend also noted by Myers (2012: 209). This adaption was 7% more prevalent among those playing asymmetrical instruments (Ramella *et al*. 2014: 20). These kinaesthetic adaptations happen gradually:

> for most people their sensation of being upright and balanced is not very reliable. The spine becomes accustomed to its usual amount of misuse, the surrounding muscles become used to contracting and compensating, the way a person habitually stands or sits feels so right and normal to that person that he assumes it must be 'correct'.
>
> (Culf 1998: 42)

These findings suggest that people get used to postures adopted during practice sessions that eventually feel 'normal' through repetition.

Good or correct posture could be thought of as a continuum of fluid and relaxed movement patterns, rather than a rigid single position, as is reflected in the phrase 'the best posture is your next posture' (Opsvik n.d.). Phrases such as 'good posture' and 'bad posture' shall be used here as conveniently concise terms, although they are disliked by many due to connotations of rigidity (sustained isometric contractions, either maximal or sub-maximal), when mobile fluidity is preferable (Harscher 2018, 7: 10; Kendall *et al.* 2005: 52). In fact, rigidity in a posture that looks balanced might be worse than fluidity with poor posture

[91] A physiatrist is a medical doctor who specialises in pain management and rehabilitation (Begum 2023).

(Harscher 2018, personal correspondence; Kendall *et al.* 2005: 52). This is a particular conundrum for seated classical guitarists, whose lower bodies are fixed in place while sitting. Wind players use their hands (and in some cases, neck or shoulder straps) to position the instrument at the mouth so can move their torso without changing the spatial relationship between themselves and the instrument. The same is not true for guitarists since the instrument rests on the legs. Although the majority of their weight is on their buttocks, their feet cannot move much because it would move the legs. The guitar is always resting on the thighs, either directly or indirectly: when using a footstool, the guitar is on both thighs (resting directly); when using a guitar support the instrument is partially on one thigh (resting directly) and partially on the support which rests on the other thigh (therefore the guitar is resting indirectly on the leg). These factors severely limit how much movement a classical guitarist can make while playing.

The perils of static positions were reported as far back as 1713 by Ramazzini, who wrote:

> Standing, even for a short time, proves so exhausting compared with walking and running, though it be for a long time. It is generally supposed that this is because of the tonic movement of all the antagonist muscles, both extensors and flexors, which have to be continually in action to enable a man to keep standing erect.
>
> (Ramazzini (1713) in Franco 2001: 1380)

Ramazzini also warned of the dangers of long-term sitting (in Franco 2001: 1380). The problem with sitting is that it almost always causes changes to the spine, and habitual maintenance of these positions can bring about long-term changes (Myers 2012: 22):

> 'the outermost vertebral ligaments are kept pulled apart and contract a callosity, so that it becomes impossible for them to return to the natural position. . . . These workers, then, suffer from general ill-health . . . caused by their sedentary life. . . .'
>
> (Ramazzini (1713) in Franco 2001: 1380)

This is a recursive process as the body adapts to local conditions, but these alterations have body-wide

ramifications that further affect local conditions (Myers 2012: 23). Muscles and ligaments are under more strain to maintain a seated position, and as soon as muscles become fatigued, the body makes long-term changes to make the position easier to hold (Myers 2012: 22). The dangers of sitting, and static positions, were first reported over 300 years ago, with more recent studies supporting the notion (Davis and Kotowski 2014; 1,249).

4.3.2 General posture guidelines for seated musicians

Since good posture contributes to a sense of reduced exertion during play [92] and can reduce the risk of postural pain in musicians [93], postural guidelines and best practice regarding posture will now be explored. These guidelines will inform a further study in this thesis, the Delta postural intervention for classical guitarists. Additionally, the impact of footstool use will also be evaluated. Postural guidelines informed the instructions given to Delta study participants for a pilot study of the lived experience of classical guitar players using the Delta, a novel ergonomic device. It is generally accepted that poor postural habits can hinder the optimal use of ergonomic equipment (Farrell 2015b; Culf 1998: 42). Another key issue is that postural advice should be taken as guidance rather than being understood as prescriptive, and must be adapted to the individual (Loram 2016). It should also be remembered that an 'effective playing position will be comfortable, but not vice versa: a comfortable position is not necessarily effective' (Grindea 1995: 194). Shoebridge *et al*. interviewed professional musicians, physiotherapists and AT instructors and concluded that:

> Maintaining mobile limbs with stable, responsive body alignment, a balanced base of support to minimize stress and maximize efficiency, and being able to re-align after necessary postural deviations is considered desirable posture for musicians.
>
> (Shoebridge *et al*. 2017: 822)

Postural guidelines commence by considering the position of the feet, which should point roughly

[92] See 4.2 Investigating posture & pain.
[93] See 4.2 Investigating posture & pain.

forwards (Medoff 1999: 214), although some people's feet naturally flare outwards. Telling someone to shake their legs out and then stand without mentioning their feet should ascertain their natural angle. Placing one foot back underneath the body (as when using a footstool) or crossing one leg over the other (as most flamenco guitarists do) both tilt the pelvis diagonally (Loram, 2016), shifting the weight towards one *ischia* and affecting the lumbar spine, which could result in unnecessary tension in the legs or lower back (Culf 1998: 42). Upjohn (2016) warns that habitual leg crossers usually keep this uneven weight distribution when their legs are not crossed.

The weight should be evenly distributed across the *ischia*, or sitting bones, located just above the lower edge of the buttocks. The pelvis should also not be tilted forwards so the weight rests on the thighs, nor backwards so the weight is on the *coccyx* (tail bone). If the hips are tilted too far in either direction, this may have a direct impact on the spine because the hip bones are attached to the sacrum which forms the centre of the pelvis.

The ankles should be at approximately 90º (Kendall *et al.* 2005: 85), positioned directly below the knees, which are level with, or slightly below, the hip joints (Blanco-Piñeiro *et al.* 2015: 568-569; Medoff 1999: 213-214; MacDonald 1998: 58). However, when changing from standing to sitting, only about 60º of movement comes from the hips, the rest from flattening of the lumbar vertebrae (Mandal 1981: 20). Approximately 45º of hip flexion is the joint's optimal position (Mandal 1981: 20; Culf 1998: 41), placing the knees well below the hips, but this is not suitable to holding a guitar on the lap, therefore the thighs need to be parallel to the floor. This is useful information for sitting well in a standard chair. Unfortunately, maintaining lumber curvature in this position requires either secure external support (e.g. a firm cushion between the player and the back of the chair) or a great deal of spinal erector tension, whereas flattening the curve increases pressure on the front of IVDs and the sacro-iliac joint that links the spine and pelvis (Norris 2011: 31; Mandal 1981: 21). The distance between the feet affects knee position when legs are fully relaxed: putting the feet together encourages the knees to fall outwards, putting the feet far apart makes the knees fall inwards. A midway point can usually be found that allows the knees to balance above the ankles.

The spine's natural kyphotic and lordotic curves should be maintained so that the spine appears like

a soft S when viewed from the side (Taylor 2016: 10; Blanco-Piñeiro *et al.* 2015: 567; Medoff 1999: 213-214). Trying to 'sit up straight' or 'stand to attention' reduces the curves and requires extra tension, but is a common mistake stemming from 16th century military documentation that worked into the public consciousness (Gilman 2014: 58-9).

The spine should not be twisted: the shoulders, pelvis and head should all face forward (Kendall 2005: 107; Culf 1998: 40). It is impossible to isolate lateral flexion from rotation in the spine. Bending to the side causes vertebral rotation, while rotating the vertebrae causes them to tilt laterally (Kendall *et al.* 2005: 107; Palastanga *et al.* 2002: 512: 513: 518: 519: 521: 522), increasing the pressure on one side of the IVDs. This happens the most in the thoracic area, where 1º of lateral flexion is accompanied by almost 1º of rotation (Palastanga *et al.* 2002: 517). Since the ribs are attached to the spine, they are also affected by this rotation. The cartilage joining the ribs to the spine and sternum allows for some articulation, but the ribs must also bend, placing shearing forces on the sternum (Palastanga *et al.* 2002: 518). This deformation of the ribs will put differing pressures across the lungs, restricting their function, although this is unlikely to produce enough pressure to affect non-wind musicians. Non-neutral postures require uneven activation of the spine muscles (Pope 2002: 57; van Dieën 1996: 2651) and could lead to muscle imbalances, making it harder to achieve a symmetrical posture.

The load should go through the axis of the spine, so not only should it be straight and perpendicular to gravity when viewed from the front or back (Upjohn 2016; American Physical Therapy Association 1998: 3; Culf 1998: 40) but the weight of any carried instrument should be spread symmetrically. This allows posture to be maintained through balance more than tension. Although muscular activity is required to maintain this upright position, it will only be a minimal amount when all body sections are well aligned and balanced (Pope 2002: 57). The further the spine deviates from the vertical, the more effort is required from the spinal erectors to maintain its posture and to stop it from falling or flopping.

The spine meets the skull at the centre of the head, which should be above the shoulders and pelvis with the ears behind the collarbones (Taylor 2016: 2; American Physical Therapy Association 1998: 3). The head can balance and allow the neck muscles to relax (Blanco-Piñeiro *et al.* 2015: 568), although a

small amount of tone is required at the back because 'there's slightly more of your head (including the lower jaw) in front of the atlas joint (where the skull meets the spine) than behind it' (Farrell 2015a, Schafer 1986).

The lateral ends of the *clavicles* should sit further back than the medial ends, and at the same height (Blanco-Piñeiro *et al.* 2015: 568). The upper arms should be equidistant from the torso, which is important for keeping the load central to the spine's axis (American Physical Therapy Association 1998: 3). The constant forward shift of guitarists' right arms, which tends to move less than the left, can cause changes to the resting posture and movement of the right shoulder blade when not playing (Shah et al. 2016: 424). This could eventually lead to a chronic pain syndrome called SICK, which stands for **S**capular malposition, **I**nferior medial border prominence, **C**oracoid pain and malposition, and dis**K**inesia (Shah et al. 2016: 422).

4.3.3 Deviations from the ideal posture when playing classical guitar

Using a footstool, therefore raising one foot, causes a chain of disruption: it does not allow the feet to be aligned symmetrically and equally share the task of stabilising the body; it tilts the pelvis diagonally, thus curving and twisting the lumbar spine and loading it at angles to its axis; it does not keep the spine perpendicular to gravity. These factors mean that excess tension is required to maintain the posture. In short, it meets few, if any, of the criteria set out above. However, when using a suitable guitar support, very few deviations from the above guidelines are necessary to play the guitar, mainly because they allow symmetrical foot positioning and no leaning. The angles of the thighs relative to the floor, and the angles of the ankles, knees, and hips are dictated by the chair height relative to the player's limb lengths. There are two necessary deviations: (1) due to the size and shape of the guitar body, which is necessary for tone and volume, the right arm must reach forward and over the instrument to reach the strings in a way that facilitates good tone production; (2) if the majority of playing is spent with the left hand at the lower frets, the left upper arm will be further from the body than the right.

4.4 The need for a new support design

Chapter 3 discussed the lived experience of posture-related pain. All participants reported that they stopped using footstools in favour of a more symmetrical posture as part of their successful treatments, suggesting that avoiding the footstool is a good strategy. These findings are supported by public comments

in response to video excerpts of the interviews from chapter 3 made publicly available on a commonly used video-sharing platform, with kind permission of the study participants, as well as comments in response to lecture videos on the subject of posture, written and presented by myself.

Specific ways in which online data is treated depends on many factors, including the particular platform on which it appears and the context in which users post (AoIR 2020). As such there is not one universal guideline as to whether data should be anonymised, informed consent obtained, or whether or not to anonymise the collected data (AoIR 2020). In this case, online comments were used because they contribute more lived experience that adds to this discussion of PRMDs. Given that these videos were framed as part of a PhD research project it could be assumed that commenters were aware of the nature of the context in a research domain. Comments were posted freely in direct response to videos without pre-emption by me: I did not intervene in a group, nor request information. Comments were posted in response to recommendations for improved health, and so were put forth as support for others. They can be seen as relatively public because they can be viewed without need of an account, unlike platforms such as Facebook. Nevertheless, since the topic relates to pain and suffering, these comments are still somewhat sensitive, therefore, names have been changed. This is done drawing on the tradition of digital ethnography, using these anonymisation techniques in the absence of informed consent. This comes under the banner of contextual integrity, which is the principle that privacy is upheld when the flow of information adheres to the norms of appropriateness and distribution specific to a given social context (Nissenbaum 2004: 141). Contextual integrity suggests that users know they are posting in the domain of research, and that they expect this data will be used as part of a research project.

These comments and responses by viewers (including professional musicians) serve as a retrospective analysis of online content that generated additional interesting and relevant lived experiences worth taking into consideration. It must be acknowledged that, given the small participant size, findings cannot be generalised to a larger population. Sixty respondents voluntarily shared information about their own

physical problems, and these percentages [94] are shown in table 8 [95].

Symptoms reported in comments and responses to videos about PRMDs	Prevalence
Shoulders, arms, and/or hand pain	15 (25%)
Back pain	15 (25%)
Focal hand dystonia	8 (14%)
Unspecified pains (these respondents did not state a specific problem, or said they have had 'most of what you mention' in a particular video)	10 (17%)
Hip and/or leg pain	5 (8%)
Footstool advocates claiming no issues (these people claimed to have used the footstool for many years with no issues)	4 (7%)

Table 8: Issues reported by respondents to videos

Twenty respondents (33%) reported back pain from footstool use. When Kay [96] posted that 'I've been using the footstool for fifty years, nothing wrong with my spine !' it prompted the following response from Utah: 'I used to be an adventurer like you, then I got the pain in the knee'. In calling footstool users 'adventurers', Utah is suggesting that using the footstool shows a bold and risk-taking attitude, as if hindsight gave Utah the clarity to see that this posture goes against safe use of the body. Others, like George, persisted with the footstool for some time before changing:

> I used a footstool for about 10 years. Back pain, leg pain were part of that. Anyone who used one knows this is true. Not to mention the rest of the body takes on a level of uncomfortableness. Body symmetry is not possible while playing guitar. Using a footstool and raising a leg only adds to the imbalance. I got a Sageworks guitar support a month ago and cannot deny the extreme difference in comfort and balance. No leg pain, no pain whatsoever. The guitar feels more balanced, feels lighter. I found myself being able to play and practice longer. The only reason a footstool would be used is to apply an aesthetic to a performance, in my opinion. Never going back.

[94] The percentages have been rounded to the nearest integer.
[95] Posts merely stating interest in and appreciation of the videos were discounted, as were purely humorous or off-topic responses.
[96] All names in this chapter are anonymised.

George has noted that the asymmetry of footstool use causes a chain reaction of discomfort and tension to other parts of the body.

Ten respondents (17%) stated that the posture videos encouraged them to change their posture and explore alternatives: ‘Thanks for posting … I've now watched the [posture] series and it's made me more mindful of my posture and to explore options other than the foot stool’ (Leslie). One respondent shared benefits beyond merely being more comfortable: ‘Your work is useful and I have put techniques shared in early clips into practice with rewarding results … Longer ability to practice/perform without hand wrist and thumb aches developing’ (Angel).

Perhaps most worthy of note is that 7 (12%) respondents wrote that the recommendations presented in my videos helped to ease or eradicate their pain complaints. At first, Sam was grateful for gaining insight into the cause of their pain:

> This is an informative video that helps me understand the physiology of why my lower back is always sore and tight. Thank you for posting it. I am realizing that I need a good chair and need to be more conscious of how I seat myself in that chair.

A few months later Sam returned to report: ‘I bought one of those leg cushions … It is much more comfortable and I no longer find a twist in my back after a practice session. I am pleased!’ Keagan was encouraged to try a footstool alternative and made the change surprisingly quickly:

> Thanks so much for this Michael. Because of your video I bought a cushion. I couldn't believe the difference! The guitar feels much more balanced and I use less energy keeping it stable. I am making sure that I don't lean as every now and then I drift toward the left. … Finally, let me say it took no time at all to get used to it. I practiced with it last night for the first time and performed for about 90 minutes with it today. The only thing different was no back pain.

Chapter 3 explored how participants found it difficult to move away from the footstool after years of use[97]. Since Keagan mentioned giving a 90-minute performance we can assume they have played for a considerable time. That makes it all the more surprising that they were able to perform with a support after only one practice session.

These responses correspond with the themes discussed in chapters 2 and 3. These comments exemplify an attribution of posture to pain experiences, since small changes to posture yielded improvements very quickly. The respondents are seemingly breaking a culture of silence around chronic pain experiences amongst musicians by writing in the comments section, where their words can be read by anybody with internet access, without needing an account to access that platform. Although some respondents had anonymised user names, some are much more easily identifiable, with videos of their playing on their own channels. The contributions and comments by these identifiable musicians could be helpful in, and contribute to, normalising chronic pain experiences as well as highlighting the role that adjusting posture can have on reducing chronic pain.

These lived experiences shared online, as well as the findings presented in chapters 2 and 3, indicate that a symmetrical posture is associated with reduced tension and reduced pain, supporting the idea that footstool use, with its inherent asymmetrical posture, may be associated with tension and pain. A number of different guitar support devices have been developed to enable the maintenance of a more symmetrical posture. The limitations of these guitar support devices are evaluated and discussed in appendix 2.

4.5 Criteria for a better guitar support

It has been shown that classical guitarists experience posture-related pain, and that changing to a more symmetrical, balanced posture can mitigate this. There are many different types of guitar support available that can help to achieve better posture than the footstool, however, they do not adequately meet the needs of the travelling guitarist. Despite the criticisms made earlier about the methodology of Valenzuela-Gómez *et al.*'s study (2018 and 2020), they did devise a useful set of criteria and design recommendations for a

[97] See 3.3.1.ii GETs: Habit.

new support which aligns with the postural guidelines set out above [98], as well as my own experiences as a performing guitarist. This suggests that some of those authors have a certain amount of personal experience of playing classical guitar. The criteria are as follows:

- Adjustable height. The guitar positioning device must allow the first fret of the guitar to be at eye level with the guitarist;
- The device must be stable;
- The size of the device's support zone must fit the size of the anatomical area on which it rests; For example, if the guitar is resting on the thigh, then the device must accommodate the curved shape of the thigh.
- The material of the device support zone should be soft and cushioned.
- The device should facilitate an inclination of the guitar between 45º and 55º, and be made from a semi-rigid material or a system to tilt the guitar in different directions in a small range of movements. Furthermore, a reliable holding system should be used to fasten the guitar, using a soft material to avoid pressure on the instrument.
- The device should not damage the instrument (Valenzuela-Gómez *et al.* 2020: 900).

Valenzuela-Gómez *et al.* also collated a list of postural traits that a new design should avoid:

- Asymmetrical foot position;
- Torso lateral bending;
- Torso flexion;
- Hip flexion;
- Neck flexion;
- Excessive shoulder abduction;
- Ischemia by compression of body tissues;
- Rigid posture (Valenzuela-Gómez *et al.* 2020: 900).

[98] See 4.3.2 General posture guidelines for seated musicians.

Additional criteria were devised to enable the design of the Delta, a novel guitar support device. The device would need to:

- Allow the player to sit in a neutral posture on a standard chair so they are not forced to:
  - buy a special chair;
  - carry this chair with them;
- Not require any alterations to the instrument, because most players would not wish to do that;
- Attach to the guitar securely and reliably, and be able to stay attached long term without damaging the wood or the varnish. This means it must be able to fit inside the case when attached, for convenience when travelling to and from lessons, rehearsals, and concerts;
- Be simple to use;
- Be durable.

Appendix 2 contains an evaluation of available ergonomic guitar support devices and concludes that the majority of devices have the same limitations: long-term use reduces the effectiveness of the attachment mechanism, meaning that leaving them attached to the guitar during storage drastically reduces the reliability of the attachment mechanism; most of them are too large to be stowed in the guitar case, and some are so large as to be inconvenient to pack in bags. Supports should be easy to use, reliable, and compact for transportation in order to encourage their use by those not yet experiencing pain. These are the reasons why the Delta was created.

4.6 Classical guitarists' subjective experiences of using the delta

The aim of this pilot study was to evaluate the lived experience of classical guitarists using the Delta, a novel guitar support device (see fig. 4.06). This study used written-response questionnaires before and after a trial period, and therefore followed a different methodology to the previous lived experience study. The Delta prototypes were made by a local metal fabricator. Details of the design and build process are in appendix 3: Designing the Delta.

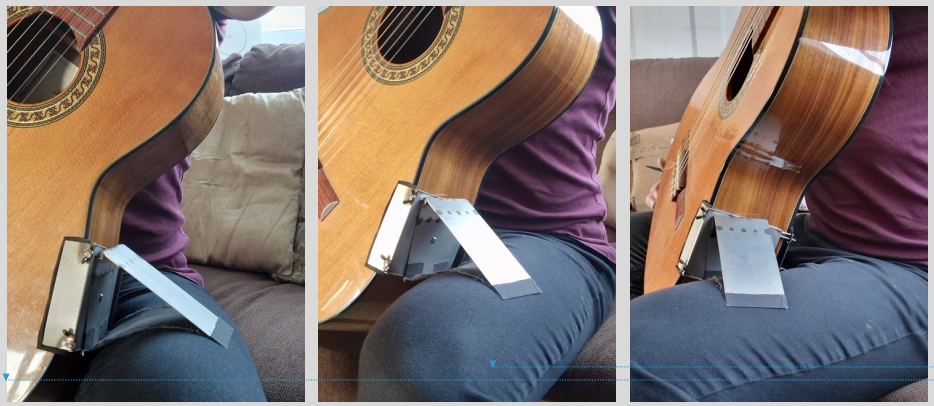

Fig. 4.06
The Delta guitar support prototype.

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4.6.1 Data & method

4.6.1.i Participants

Participant ID	Age	Years Played	Sex	Devices Tried	Current Device	Weekly Hours	PRMD[99]
Cody	49	8	m	A frame; footstool; Gitano; cushion (not Dynarette)	Large Dynarette	28	Occasional back pain, back seizes up: cannot play. Last occurrence: >2 months.
D'Arcy	38	28	m	Dynarette cushion, footstool, Guitar Lift, Gitano, strap	Ergoplay	25	Ganglion cyst; shooting pains in RH wrist; back pain and tingling Last occurrence: <1 month.
Iden	40	31	f	Dynarette, ErgoPlay, footstool	Gitano, Kiwi guitar support	Up to 10	Shoulder & back pain. Last occurrence: >2 months.
Pat	31	20	m	Footstool	Footstool	20	Sore wrist; right hip pain. Last occurrence: <2 months.
Quinn	35	10	m	Barnett (sageworks), Ergoplay, De Oro, A frame, Dynarette	Murata	5	None

Table 9: Delta study participant information

[99] Performance-Related Musculoskeletal Disorder

Nineteen participants were initially recruited. Since there were only four Delta prototypes made, a waiting list to receive a Delta was prepared with participants added in the order of response. Twelve participants failed to respond, or chose to drop out of the trial when their turn came, leaving seven people who actually participated. Of these seven, two failed to return the Delta and did not complete the exit questionnaire, while five returned the Deltas with a completed exit questionnaire. Their demographic information is shown in table 9.

Participants were recruited online through an announcement (see appendix 4) on the specialist website ClassicalGuitarDelcamp.com calling for UK-based (to reduce postage costs and delivery times) volunteers to take part in a two-week trial using a prototype guitar support. The criteria for inclusion were that individuals should play classical guitar almost every day while in a sitting position. No exclusion criteria were given.

All participants provided written informed consent for their information to be used with anonymisation. Ethical approval was granted by the University of Kent's Research Ethics Advisory Group for Human Participants (ref.0102021). Participants' names have been anonymised.

4.6.1.ii Method

This was a pre-post study design, using a questionnaire based on Berque *et al.*'s (2014b: 14) validated Musculoskeletal Pain Intensity and Interference Questionnaire for Musicians (MPIIQM) and adapted for guitarists, featuring a significant number of open-ended questions. The MPIIQM has been translated into at least two other languages and then successfully re-validated in those languages (Zão *et al.* 2023: 368; Möller *et al*. 2018: 1). For this study, the MPIIQM was modified to suit classical guitarists rather than the orchestral players the original testing instrument was designed for. The original MPIIQM is in appendix 5, while appendix 6 details the changes made to the MPIIQM for the purposes of this study. The customised questionnaire that was used at the start of each trial is in appendix 7.

Following the return of completed baseline questionnaires via email, each participant received a custom-made prototype Delta guitar support device by post to test for two weeks as part of their normal practice schedule (to the exclusion of their normal footstool or guitar support) before returning it with a prepaid postage label. No minimum or maximum usage time was given within this 2-week period. Two

links to videos created by me were included: the first demonstrated how to fit the Delta to a guitar; the second showed how to sit with symmetry and balance. Lastly, a second post Delta usage questionnaire (see appendix 8) was completed at the end.

Due to the type and volume of data generated by the written questionnaires compared to the lived experience interviews, IPA was not an appropriate form of analysis. However, since the questions focused on the lived experience, the free text responses were analysed thematically.

4.6.2 Results

Three of the five participants reported posture-related pain at least one month prior to the study, as listed in table 9. Cody, the only self-reported professional in the group, had a recurring problem, although they did not experience it within two months of the study: 'I sometimes get back pains - occasionally it seizes up so I can't play at all for a day or two. Other times I just can't play for very long.' Pat reported soreness in the wrist and right hip within the previous 2 months, but not at a level that affected their playing because it was present after practice had ended. D'Arcy had previously changed posture due to pain:

> When I used to practise 5+ hours a day and used a mixture of footstool and sitting in modern flamenco position (right leg crossed over left knee with guitar supported on lower thigh angled away from the body), I suffered from a lot of back pain and tingling which was when I changed to supports.

4.6.2.i Physical sensations

In terms of how using the Delta affected participants, the most important finding is that the only footstool user in the group found that their legs and lower back felt better:

> What I felt was … a lack of pain or discomfort after an hour or more of playing. This is what I normally experienced when playing with the footstool. While I did find myself still getting a bit restless or fatigued in the sitting posture after one and half hours, I still found it better than the stool.
>
> (Pat)

One other participant reported the same amount of back pain with the Delta as with a cushion:

> I did not have any aches and pains in my arms, legs, shoulders while using the Delta. However I did still experience lower back ache which I reported in Questionaire 1. I think this is probably more [due] to me getting tense while playing even when I'm in a relaxed position.
>
> (Cody)

Cody's observation that excess tension may be the root cause demonstrated a degree of self-awareness that was not present in other participant accounts.

Four of the five participants used the standard support-on-left-leg position the Delta was intended for, and reported that it was comfortable to use, feeling much like any other support. Although Cody habitually used a support on the left leg (as is standard), they chose not to use the Delta this way, reporting that it was 'Very comfortable. I was used to having a support on my left leg but the Delta went comfortably on my right leg. It felt more comfortable on my right leg for some reason' (Cody). This changed the posture of their right arm:

> I did feel a slight less twisting forward of my right shoulder due to the support being on my right leg (thus the guitar being slightly further to my right when playing. This also felt like my right hand/arm was not having to come round over the guitar as much.

For Cody, putting the Delta on the right leg felt better for the right shoulder because the right arm did not have to reach around the guitar as much.

Two participants (Cody and Pat) explained that they felt more comfortable with both feet on the ground. One of these was a footstool user prior to taking part in this study: 'It felt nice to use the Delta. It was nice to not have to raise my left foot when playing classical guitar and be a bit 'cockeyed' with my posture' (Pat). Whether this participant had always felt that the asymmetry of footstool use was odd, or taking part in this trial brought about that realisation is unknown. Cody also noted that 'There was less twisting of my upper body than with a footstool'. Despite the novelty of having both feet on the ground after years of footstool use, Pat reported the posture to be comfortable.

4.6.2.ii Feedback on the design of the Delta device

All participants reported that they were able to position the guitar how they wanted and felt comfortable while playing, suggesting that this is successful in its function as a support. D'Arcy noted that 'there was sometimes [a] backwards-forwards wobble. Not sure If I would want to rely on it in a concert!' The other participants said they would use the Delta long-term if the design were refined to eliminate sharp corners. Pat, the only footstool user, stopped using the footstool at the end of the trial period in favour of a guitar support.

The participants also provided feedback on areas for improvement. D'Arcy reported the butterfly nut digging into the thigh. Iden solved their only issue relating to the design: 'Occasionally the part where the metal and the black tape (or whatever it is that sits on your upper leg) meet felt a bit sharp, sticking in my leg, but that was fixed once I found the right position to mount it.' Iden also complained about the mounting process:

> I found the process of mounting it quite nerve racking because of all the sharp edges and screws that were sticking out. I kept worrying about damaging either the guitar or other objects. Also, even though you told me the pressure couldn't damage the guitar, I felt a bit uneasy screwing it tightly enough.
>
> (Iden)

A comprehensive list of all suggestions for Delta design improvements made by participants, which mostly concern aesthetics, can be found in appendix 3.

4.6.3 Discussion

It is important to note that this was a pilot study. A follow-up survey with a larger cohort of classical guitarists is now warranted, to ensure a representative sample which could be generalised to the wider population of classical guitarists. However, given that only one of the five participants was a footstool user, it is possible that some participants already had a bias towards being conscious of the need to find a better posture. A follow-on study from this pilot could exclusively recruit footstool users. Other intervention studies on musicians have lasted much longer, ranging from 11 classes (one per week) to spanning an academic year or even having a follow-up after 24 months (Laseur *et al*. 2023: 180), suggesting that the

follow-up time-line for a future Delta study should be longer.

A theme that emerged in chapters 2 and 3 was how injury could be a catalyst for musicians, prompting an increased awareness of body use. Injuries may thus be understood as an example of the impact of an internal factor that contributes to more relaxed and efficient movement patterns, including posture. In this 4th chapter I explored how altering an external factor through changing the guitar support can immediately affect posture awareness. However, by itself this external factor is not sufficient. For this reason, use of the Delta was combined with information given to participants via a video about how to achieve a more balanced, symmetrical seated posture. This was intended to encourage an optimum posture and postural adaptations, thus synthesising these internal and external factors.

Three out of the five participants reported posture-related pain in the past, which had prompted two of them to stop using a footstool. This had already contributed to easing their posture pain. One participant reported back pain during the trial, citing habitual tension as the probable cause. While this may be true, it is also possible that it is because spinal erector tension is unavoidable without a back support when the thighs are parallel to the floor, which is necessary to stop the guitar slipping.

While there are numerous studies investigating the effects of changing office furniture layouts such as repositioning visual display terminals (VDTs), there are other studies showing that educating office employees is also of great value. A systematic review of studies using ergonomic training and counselling found that these approaches improved comfort levels and reduced pain (Leyshona *et al.* 2010: 343-4). Mehrparvar *et al*.'s 2014 study made ergonomic adjustments to office spaces for 83 participants while giving a workplace stretching exercise program to a separate group of 81 participants (Mehrparvar *et al*. 2014: 3). The exercise group occupied a different building to avoid the other group copying the exercises and thus contaminating the experiment. They found that the exercise program was more effective at reducing LBP (Mehrparvar *et al*. 2014: 4-5). This is not to suggest that education should be given to guitarists in lieu of encouraging them away from the footstool, but to support the idea that changing the equipment is not an 'instant fix', and that alternative equipment should be used in conjunction with postural education.

While it is beneficial to look at office-based studies, the question of how this information could be presented to guitarists must be raised. It is possible that it would be easier to convince office workers that having the VDT at face height is preferable than it is to persuade guitarists to sit with both feet on the floor. If this is the case, it could be for several reasons, such as: there is less element of tradition in VDT placement; VDT placement affects how the head is held, and so a correlation to neck pain is easily understood. The feet are further away from the spine so the choice to use a footstool may not seem important.

Two areas of concern were raised by Delta study participants. One reported that the butterfly nuts dug into their thigh, but this could have been avoided if they had attached the support the other way around so the nuts were at the front of the guitar. Another participant reported feeling uneasy about the process of tightening the attachment screws to mount the Delta. However, as discussed above, chin and shoulder rests are mounted on violins with a clamp as a standard practice without detrimental consequences for neither the musician, nor the instrument.

4.7 Conclusion

Posture pain in classical guitarists is multifaceted, therefore, any intervention or management strategy needs to be multifactorial and should include alternatives to footstool usage, combined with postural education and exercise education. The Delta device is a promising intervention in facilitating improved posture while attaching reliably to the guitar in the long-term and being compact and easy to transport.

Chapter 5: Conclusions & Summary

The findings from all studies presented in this thesis will now be integrated to demonstrate their contribution to our understanding of musicians' performance-related injuries (PRMDs). Overall, data suggests that musicians with PRMDs often lack interoception, otherwise known as awareness of their own bodies. This lack of interoception is exacerbated by a culture of silence around PRMDs, as well as a lack of emphasis on optimum body use in individual music lessons and music education programs in the UK and the US. To the author's knowledge, at the time of writing, this is the first IPA study to focus on the lived experience of classical guitarists with PRMDs. Whereas one previous study sought guitarists' opinions on ergonomic aids without posture instruction (Valenzuela-Gomez *et al.* 2018), the Delta pilot study presented in chapter 4 is the first to evaluate musicians' experiences of using a guitar support device with participant guidance on adaptations in order to achieve an optimum posture whilst playing classical guitar.

While much of the literature acknowledges that PRMDs are a significant and common problem for musicians (Cruder *et al.* 2018: 53-55; Gasenzer *et al*. 2017: 6; Sousa *et al.* 2016: 8; Berque *et al.* 2016: 78; Steinmetz *et al*. 2015: 965; Ackermann *et al.* 2014: 7; Ranelli *et al*. 2011: 28; Kreutz *et al.* 2008: 3), the prevalence and impact on a musician's life and career are not well understood, particularly among professional classical guitarists. It is difficult to directly compare studies on guitarists due to methodological differences. There are multiple proposed contributing factors for PRMDs discussed in this thesis, including tension [100], poor posture, [101] stress, [102] pre-disposition to anxiety [103]; and overworking [104]. Crucially,

[100] See 2.3.4.iii GETs: Aetiology.
[101] See 3.3.1.iii GETs: Posture.
[102] See 2.3.4.iv GETs: Psychology.
[103] See 2.4.4 Attribution.
[104] See 2.3.4.i GETs: Over-working.

musicians' lived experience of PRMDs have received relatively little research attention to date, restricting scholarly and clinical understanding of the impact on musicians' quality of life, performance and careers, risk factors, self-management strategies and conventional as well as complementary treatments. All participants in the empirical study described in chapters 2 and 3 had experienced PRMDs, and all also knew of professional musicians who had a disorder that was severe enough to affect their performance or caused them to stop playing for a significant length of time.

5.1 Addressing the research questions

Informed by the findings of the original empirical studies discussed in this thesis, the research questions set out in chapter 1 shall now be revisited.

5.1.1 The lived experience of overuse injuries among professional classical guitarists

In order to be successful, musicians require, like athletes, a very particular set of skills and must train for years in order to achieve a level of 'perfection' in their performances. This requires physical and psychological strength, endurance, precision and dexterity, as well as the ability to play repetitively and rapidly day after day, over a period of years (Dawson 2011: 65). The desire and drive to continue playing, even throughout pain, is recognised in the literature (Zaza et al, 1998) and supported by the findings in this thesis: despite pain, muscular tension and a relentless schedule, musicians describe how they often continue playing and performing.

The classical guitarist participants' accounts of their lived experience suggest that music, rehearsals, performances, and the recording of music are considered to be of primary importance, with health considerations very much a secondary concern. This culture appears to be prevalent amongst musicians, and can result in ignoring pain and delaying seeking treatment for as long as possible, perhaps even until playing is no longer possible (Wilson *et al*. 2014: 683; Rickert *et al*. 2013c: 128). These observations are supported by several studies, such as one interview study of Irish traditional musicians, which highlighted an 'overarching theme … that PRMDs are an integral part of being a musician, and therefore, the music and the whole musical experience, was prioritised over the health of the musician' (Wilson *et al*. 2014: 682). Other phenomenological studies with classical musicians, such as the study by Zaza *et al*. (1998: 2019), reveal similar experiences and attitudes. Evidence indicates that musicians will simply not stop

playing, even as part of a treatment program (De Kock *et al*. 2023: 9; Gasenzer *et al.* 2017: 7; Zaza *et al*. 1998: 2019), with some musicians stating that they would continue to play through pain because of their love of music and their need and desire for constant improvement.(McCready and Reid 2007: 144) or to meet the expectations of a teacher (Guptill 2010: 276; Park *et al*. 2007: 93). Some musicians have described playing instruments as an addiction or an abusive relationship (Guptill 2011: 88): it is not that musicians do not necessarily consciously choose to keep playing; it is that they *cannot* stop.

The interviews presented and discussed in this thesis highlight the lack of health guidance in these classical guitarist participants' musical education. Mills was the only musician who received instruction about healthy musicianship, albeit not much [105]. Despite this, he still did not manage to implement this information. Because of these gaps in education systems, musicians often only learn about their body when they are injured. In some cases, injuries make them aware that they should have learned about health much earlier in their career and development as a musician.

Injuries affect a musician's mental wellbeing because injuries can challenge their sense of identity (De Kock *et al*. 2023: 8; Guptill 2011: 84). Hargreaves *et al.* (2017: 4) proposed that categories such as 'musician', 'composer', 'performer' etc. should be grouped under the umbrella category of Identities In Music (IIM). MacDonald and Saarikallio explain this definition by the use of illustrative statements such as 'I play first violin in the Berlin Philharmonic Orchestra' (2010: 730). By contrast, Music In Identities (MII) deals with how musicians use music within their overall self-identities (Hargreaves *et al.* 2017: 4), including music preferences and tastes (MacDonald and Saarikallio 2010: 730). Thus, IIM relates to how an individual actively engages with music (whether through listening or playing), whereas MII deals with how music fits one's mood and personality. A professional performer may also play music for enjoyment outside of their professional life, either by themselves or 'jamming' with friends. In such cases the IIM of 'performer' makes up an enormous part of their identity. When playing is no longer possible, and musicians can no longer think of themself as a 'performer', they may begin questioning who they are with that aspect

[105] See 3.3.1.i GETs: Awareness.

of themselves now removed. Additionally, large periods of time suddenly become empty, with the musician at a loss as to how to fill these. As was true for Leisner [106], being unable to play can leave someone feeling hopeless (De Kock *et al*. 2023: 8; Rickert *et al*. 2013c: 126), especially when they cannot even begin recovery because they cannot find appropriate help with managing PRMDs. Although studies have shown that being injured can leave musicians feeling isolated due to losing contact with their colleagues (Rickert *et al*. 2013c: 126; Guptill 2011: 88), the classical guitarist participants included in the studies in this thesis did not mention this. One explanation for this is that because they were mostly soloists, they are used to working alone. One was in a duet, but his musicians' focal hand dystonia (mFHD) did not stop him playing. Additionally, most of those with dystonia were able to find a support network. For some musicians, an additional factor adds yet more stress to an already strained mental state: they may not have access to income support. This could be because their GP does not believe 'musician' to be a legitimate profession (Zaza *et al*. 1998: 2021), or because musicians are not eligible in their country of residence (Guptill 2010: 273; Zaza 1998: 1020). All of these factors contribute to a decline in mental wellbeing of injured musicians through a challenged sense of identity.

The classical guitarist participants in chapter 3 learned posture by copying their predecessors, teachers or peers. This kind of copying of postures and techniques is common in music education (Wilson *et al*. 2014: 685). Participants had no clear concept of what constitutes good posture due to never receiving clear guidance. This led to them adopting postures that had to be changed quite late in life to manage pain. After many years using a particular posture, adopting a new one is not an easy transition, but they persisted because they knew it would ease their pain and allow more playing time. Since instrument teaching relies heavily on imitation learning, it highlights a gap regarding effective and healthy posture in the education systems.

Empirical findings indicate that classical guitarist participants found it easier to understand pain injuries than dystonia. Although they had been unaware that their bodies have certain requirements that must be met in order to remain in good health (such as balanced posture, or less muscle tension) prior to

[106] See 2.3.3.i GETs: Giving Up.

back pain onset, their experiences made them aware that poor usage patterns had contributed to their pain. However, for the dystonics it was harder to comprehend why, after so many years developing dexterity and control of their fingers' movements, their fingers and hands were suddenly behaving erratically without any prior warning, changes in sensation, nor pain. The participants in chapter 2 created rich and colourful similes and descriptions to try and make sense of their symptoms. To my knowledge, this difficulty in comprehending the loss of control does not appear in the wider dystonia literature, nor in research concerning dystonia in athletes or musicians.

The classical guitarist participants highlighted the difficulties they experienced in their engagement with health and medical practitioners. These findings are echoed in experiences discussed in the literature indicating the lack of information and support for injured musicians. Musicians expressed their frustration and difficulty in finding health practitioners with expertise in treating musicians (De Kock *et al*. 2023: 9; Wilson *et al*. 2014: 683; Zaza *et al*. 1998: 2019, 2021). Moreover, health practitioners report being similarly dissatisfied with the quality of care provision given to musicians (Molsberger and Molsberger 2012: 9). Due to this mismatch between the needs of musicians and the available care, the negative experiences recounted by colleagues that include inappropriate and unhelpful advice, or merely not being taken seriously by doctors, often reinforce their own apprehension or low expectation in receiving specialist care (Zaza *et al*. 1998: 2021). During the time frame in which these participants developed symptoms, dystonia was far less understood than today, so they chose the self-care route and developed their own treatment strategies based on advice from other colleagues. To my knowledge, the self-management approaches described in chapter 2 are absent from the literature, so there is need for better dissemination of information between therapists and those who have recovered from mFHD.

Management options for dystonia vary, ranging from invasive to non-invasive brain surgery (in the form of targeted radiation) to non-invasive cortical stimulation, and movement re-education methods ranging from slowed down practice, to finger splinting. However, since onset patterns and symptoms vary greatly, no gold standard treatment is currently recommended. Indeed, data in chapter 2 suggests that treatment should be tailored to the individual. Finding the right help can therefore be difficult and frustrating

for anyone with dystonia, but even more so for professional musicians.

The use of observational or experiential language used by participants in chapter 2 correlates with their recovery status. The IPA studies presented in this thesis found that participants felt disconnected from their fingers, and they may even dissociate themselves from the condition altogether after recovery. Unfortunately, the sample size is too small to draw anything more than a tentative hypothesis. Further interviews with other dystonics at various stages of recovery is warranted to test this hypothesis.

External stressors and certain psychological traits are two factors that combine to contribute to dystonia. Advances in digital recording technology, its increasing availability, as well as the ease of online sharing contribute to stress because it is now so easy to access and become accustomed to hearing highly processed 'perfect' recordings at any time. This has increased the pressure on musicians to attain ever higher levels of virtuosity and technical precision in live performances. Some musicians also feel the need to maintain very large amounts of repertoire for a variety of concert types (solo, chamber, etc). This can dramatically overwork and fatigue musicians, and is worse for dystonics, who have been found to have a tendency towards anxiety and extreme perfectionism (Altenmüller *et al.* 2012: 260; Enders *et al*. 2011: 539).

5.1.2 Framing lived experience: how existing health & illness models fit musicians with PRMDs

The characteristics of classical guitarists' experiences with performance-related musculoskeletal disorders (PRMDs) described above will now be compared to four different models of health and illness to assess how well these models fit musicians. Due to the small sample, extrapolation to a larger population should be approached with caution. The models are: the Biosychosocial model (BPS); Self-determination theory (SDT): the Health Belief model (HBM); and the Stages of Change model (SoC). These four models are commonly used in a range of different fields of research to explore people's responses to injury in terms of avoidance or acceptance, but from very different perspectives.

The Biopsychosocial model (BPS, Wade and Halligan 2017) was developed in response to the limitations of the traditional medical model, which was mainly focused on the biological or physical

dimensions of health. The BPS allows for an understanding of illness as a multifactorial phenomenon, consisting of biological, psychological, and social factors (Holopainen *et al*. 2020: 1; Wade and Halligan 2017: 995). For instance, in this thesis, classical guitarist participants attributed dystonia to tension, while the literature suggests an adaptation in brain plasticity (Quartarone 2011: 163; Altenmüller and Jabusch 2010: 34; Bara-Jimenez *et al.* 1998: 828) and/or genetics (Edwards 2016: 6: 30), all of which can be interpreted as biological phenomena. Furthermore, some of the classical guitarists presented in this thesis attribute their back pain to poor posture. Other contributing factors for LBP include genetics (Ferreira *et al.* 2013: 957), and obesity (Shiri *et al.* 2010a: 154; Webb *et al*. 2003: 1195). The second factor, psychological, is evidenced by the pressure to succeed seen in chapter 2 [107], as well as the high levels of anxiety and perfectionism found in dystonic musicians (Enders *et al*. 2011: 539; Altenmüller and Jabusch 2010: 34). The final factor, sociological, can be seen throughout chapters 2 and 3: the habitus of the culture of silence surrounding injury and technique [108]; as well as the pressure to retain 'traditional' methods such as the footstool [109]; and the external pressure to perform with technical perfection in concert [110]. The distinction between psychological and social factors is not always clear, and some aspects of experience appear to be influenced by both. For example, perfectionist tendencies may already exist in an individual, but could be exacerbated by external societal and environmental practices such as highly edited recordings [111]. Therefore, the impact of biological, psychological and sociological factors towards PRMDs should be considered in future research. The BPS accommodates these multifactorial aspects of participants' experiences well, with contributing factors fitting within the three factors of the model, and all three factors of the model containing topics addressed in the interviews. Thus, the BPS provides insight into understanding the lived experience of classical guitarists with PRMDs.

The BPS only addresses those factors that influence health, not topics such as the recovery process or management strategies. Self-determination theory (Ryan and Deci, 2017) (SDT), a branch of psychology,

[107] See 2.3.4.i GETs: Over-Working.
[108] See 2.3.2.i GETs: Culture Of Silence.
[109] See 3.3.1.iii GETs: Posture.
[110] See 2.3.4.i GETs: Over-Working.
[111] See 1.2.5.2 Physiology & aetiology of focal dystonia, 2.3.4.i GETs: Over-working, and 2.4.4 Attribution.

posits that there are three needs that must be addressed in order for people to maintain motivation and for rehabilitation to be successful (Ryan and Deci 2000: 68). These are: autonomy, or the feeling of having control over one's situation (Van den Broeck *et al*. 2010: 981); competence, or 'feeling effective' at the given tasks (*ibid.*); relatedness, or the sense of belonging to a group or feeling cared for (*ibid.*). In chapter 2, classical guitarist participants with dystonia explained how they lost their feelings of autonomy and competence when they tried various strategies that yielded no results, or showed some promise for a limited time before muscle spasms returned. Relatedness would have been difficult to experience for two of the musicians because the condition was so unheard of at that time and so they had no opportunity to form or join networks, whereas the other two, whose experiences were more recent, were able to form such connections. Relatedness and support networks are considered very important for the ability to progress (Ryan and Deci 2000: 70). Despite these three needs not being consistently met, the participants in this thesis continued their quests for recovery and management strategies for some time. This suggests that SDT may not be a consistently appropriate framework to make sense of musicians' experiences, possibly because their identity is so intertwined with their playing. However, SDT also argues that internal motivation ('doing an activity for the inherent satisfaction of the activity itself' (Ryan and Deci 2000: 71) can be more important in understanding motivation, rather than external motivation (e.g. doing an activity for the money, see Ryan and Deci 2000: 71). Here, SDT is a good fit for some participants, particularly those who expressed an intense *need* to play, with one saying he 'could never conceive myself not playing an instrument', with his performance career not being a consideration [112].

The Health Belief model (HBM) was developed in the 1950s, prior to SDT, by psychologists working in the US Public Health Service (Green *et al.* 2020: 1). This theoretical framework is focused on the thought processes of potential behaviour changes that people may take to avoid injury or illness and/or its recurrence. When the HBM is applied to PRMDs, a musician's thought process might proceed as follows (passages in quotation marks are examples informed by Green *et al.* (2020: 2) and the IPA analysis in this thesis):

[112] See 2.3.2.ii GETs: Professional identity.

One aspect of the HBM is the perceived susceptibility to a particular health problem, e.g. 'Am I at risk of injury?'. However, since the analysis of interviews presented in this thesis found that injury is so infrequently considered before onset, the question might rather be: 'Am I at risk for *re*injury?'. For instance, Paraskevas was confident that his process of re-learning to play with an increased awareness would make it impossible to be injured again [113]. The others either did not mention this, or were of the opinion that injuries are inevitable [114]; Another feature of the HBM is the perceived seriousness of the condition, e.g. 'How serious are PRMDs?', 'How hard would my life be if I had one?' or 'How bad would it be if it reoccurred?'. The participants in this thesis all experienced debilitating PRMDs and were aware of the seriousness of their condition, since they experienced the impact of PRMDs on the quality of their life and impact on their performance and career. A slightly different key element of the HBM is the belief in effectiveness of the new behaviour, for example, 'Taking frequent breaks allows my body to relax', 'Stopping footstool use and constantly checking that my posture is balanced puts less strain on joints'. One of the participants in this thesis believed that his new approach gave him full protection, at least from serious injury; A further aspect of the HBM are cues to action, e.g. the comments and responses to online interviews with musicians who speak about their PRMDs. These participants did not directly take cues from other musicians when experiencing PRMDs, rather, they felt forced to change when they experienced their own injuries. In the cases of posture-related pain, participants reported they only changed after realising that the problem would keep recurring without action. The perceived benefits of preventive action is another feature of the HBM, e.g. 'If I start learning new pieces with less tension, I can reduce strain on small muscles', or 'If I change my posture, I can avoid or reduce posture pain'. Participants mentioned that re-learning to play with reduced tension improved their playing. Other participants reported that ceasing footstool use allowed them to find new approaches to creating tonal variety, or that it gave them a better sense of being 'grounded'; Barriers to taking action are another key concept in HBM, e.g. 'The new posture feels weird', or 'Learning to play with reduced tension is time consuming and requires extra concentration'.

[113] See 2.3.1.ii GETs: Awareness.
[114] See 3.3.3 Attribution.

Some musicians in this thesis explained how difficult it was to change posture. One participant mentioned that, although their new posture was more comfortable, it took quite some time before he was able to really express himself. These aspects of the HBM can be applied to all musicians, but findings in chapters 2 and 3 suggest that musicians do not always respond immediately to injuries, and even avoid taking action or even thinking about them when they occur (Fjellman-Wiklund *et al*. 2004: 365).

The Stages of Change model (SoC) was developed by Prochaska and DiClemente in the 1970's. It was initially applied in a smoking cessation programme. The SoC model provides labels to the various phases of adjustment to new health behaviours (Green *et al.* 2020: 2). This framework appears to be a good fit to the musicians' experiences presented in chapters 2 and 3 of this thesis. One of the features of the SoC model is precontemplation, and is evident in chapter 3 during Mills' account where posture advice was given and ignored [115];. However, in chapter 2, precontemplation was not evident since nobody mentioned awareness of technique before mFHD onset.

A further element of SoC is contemplation, e.g. recognising the need to change one's posture or technique. In chapter 2 the dystonic musicians took a long time to get through this stage and progress to the next, since they used workarounds for long periods before they started re-education of movement and technique [116]. Although participants did not explicitly mention this in chapter 3, the process must still have taken place since all four participants changed their posture due to recurring pain. Even so, in some cases musicians suffered with years of pain before changing their posture.

The next stage in SoC is preparation, for example when considering alternatives. In chapters 2 and 3 participants spoke of researching and talking to colleagues for ideas on treatment or different support devices. This stage is followed by action, for example, a musician adopts a balanced posture or new technique. This stage was not explicitly discussed by participants in this study, since participants had already moved to the next stage of maintenance, for example when musicians had been using balanced posture or different technique consistently for six months or more. Some participants appeared to have been

[115] See 3.3.1.i GETs: Awareness.
[116] See 2.3.3.ii GETs: Workarounds.

in the maintenance phase for a number of years.

The next stage in the SoC model is the relapse, for example, occasionally using the footstool (Green *et al.* 2020: 2). Two participants mentioned using the footstool occasionally because it was so familiar [117], even though they were convinced that other devices were much better for them. It is also interesting to note that nobody in chapter 2 mentioned returning to their old dystonic technique for any reason, but that does not necessarily mean it did not happen.

All four models provide useful perspectives on different aspects of classical guitarists' lived experiences of chronic injuries and long-term rehabilitation. The BPS, SDT, and SoC are all very relevant for making sense of the lived experience of PRMD processes. The HBM is perhaps the least relevant fit, if only because musicians as yet uninjured scarcely consider the PRMDs (Fjellman-Wiklund *et al*. 2004: 365). However, it should be considered when formulating education programs for musicians.

5.1.3 Societal & physiological risk factors for PRMDs

Although it is beyond the scope of this thesis to investigate all risk factors contributing to PRMDs, the empirical data presented in this thesis highlight specific factors.

The incredibly high workloads and high-profile concerts detailed in this study resulted in particularly stressful periods or events which formed a societal risk for developing mFHD. One participant who works with dystonics noted that musicians often develop dystonia during, or soon after, a particularly stressful life event or period [118]. The psychological stress this creates can manifest as muscular tension. A further societal risk factor for all types of PRMDs (both dystonia and painful) is related to the intrinsic habitus of these musicians (Becker 2010: 130), in that more work is always better (Mencimer 2003), and that suffering for art is somehow desirable or noble (Panebianco 2017: 67; Kreutz *et al*. 2008: 9; Zaza *et al*. 1998: 2019; Paull and Harrison 1997: 12; Quarrier, 1993: 91). This attitude of nobility through suffering, stemming from the religious fervour of the Middle Ages (Kris & Kurz 1979: 114), conflicts with the culture of silence and secrecy, unless one adopts the interpretation that suffering in silence is seen as a key marker of nobility.

[117] See 3.3.1.ii GETs: Habit.
[118] See 2.3.4.iv GETs: Psychology.

A related societal risk factor is the reticence of musicians around providing or seeking advice. The empirical studies in this thesis found that professional musicians do not feel that they can advise other professional musicians, or even seek advice about strategies to manage PRMDs. It is this culture of silence which prevents musicians exchanging information about adapting techniques and injury management. This silence may be a risk factor for causing, exacerbating, and prolonging injuries for various reasons (Williams and Andersen 1998: 15): Musicians may feel that their condition is unique to them, and this perceived social isolation may hinder recovery and make reinjury more likely; Musicians do not tend to be aware that treatments for PRMDs are available, which further increases the barriers to receiving effective and specialised treatment from experienced practitioners; Paradoxically, when the culture of silence is broken and experiences *are* shared, findings presented in this thesis suggest this is not always helpful or productive. In the literature, musicians have reported being put off seeking help due to 'horror stories of physicians trivializing musicians' problems' (Olson-Moser 2021: 20; Zaza *et al*. 1998: 2019); The final societal risk factor presented in this thesis is the pressure to achieve ever greater feats of virtuosity and 'perfection' imposed by highly edited recordings [119]. It has been demonstrated that psychosocial risk factors are an important dimension of PRMD aetiology, although this area is still underrepresented in the literature (Guptill 2011: 84).

The musicians in this study were unable to recall any health instruction as part of their education, with some of them being confronted with an institutional resistance to health awareness and postural guidance in the curriculum today [120]. Beyond a high incidence of PRMDs, musicians also seem to have poor health in general (Črnivec 2004: 140, 142), possibly because musicians are so 'highly motivated with their projects … [that] their physical condition comes second to playing' (Abreu-Ramos and Micheo 2007: 98). This gap in education systems leaves musicians unaware of what their body needs for longevity.

Risks for dystonia are still only poorly understood, however psychology-based studies have found musicians experiencing dystonia have exaggerated perfectionism and increased social phobia compared to

[119] See 2.3.4.i GETs: Over-Working.
[120] See 3.3.2.i GETs: Education & Learning.

healthy musicians (Altenmüller *et al.* 2012: 260; Enders *et al*. 2011: 539). This was not explicitly evident in the interviews in this thesis, but that could be due to the limited sample size and the particular questions asked. Dystonia genes have been identified, but like many other genetic conditions it is possible to carry them asymptomatically (Edwards 2016: 6: 30). It is important to note that the participants in this thesis did not undergo genetic screening.

Participants in chapter 3 all changed their posture as part of successful treatment strategies for LBP. There are at least two biomechanical risk factors in the development of posture-related pain: a prolonged static position (Bontrup *et al.* 2019: 4; Pope 2002: 49); and an asymmetrical posture (Veres *et al.* 2010: 1468). The first factor is somewhat evident in chapter 3: one participant mentioned using yoga to counteract sitting for long periods during his education, but did not continue this practice into late adulthood. Another participant changed from sitting with a footstool to standing, which allows him to move more as he plays. These guitarists all began as footstool users, which always causes asymmetrical stresses on soft tissues due to the raised leg tilting the pelvis and lumbar spine, and requiring asymmetrical postural muscle activation (van Dieën 1996: 2651). Although there is evidence that asymmetrical stress increases the likelihood of intervertebral disc herniation (Veres *et al.* 2010: 1468), incidences are far less common than non-specific low back pain. However, this last disorder can be just as debilitating as herniation, as is shown in Durrant's account[121]. Asymmetrical footstool posture was used by all participants until they chose to change in order to manage their pain, leading to reduced pain in terms of frequency and severity.

5.1.4 Implications for prevention & management of PRMDs

The findings in this thesis have numerous implications for what we know about the prevention and management of PRMDs. The empirical data presented in this thesis suggests it would be useful to include postural guidance and health awareness in music education curricula. A systematic review of studies assessing injury prevention strategies found that some education programs were beneficial (Laseur *et al*. 2023: 181), as were some strength training interventions (Laseur *et al*. 2023: 180). A combination of strength training and education (including postural guidance) might be more effective in preventing PRMDs

[121] See 3.3.1.i GETs: Awareness.

(Laseur *et al*. 2023: 181).

Re-learning to play with relaxation and enhanced bodily awareness formed the basis of three participants' mFHD recovery. These experiences are insightful for health professionals, to support the development of discipline-specific approaches to the management of PRMDs. Some studies have assessed teaching bodily awareness to dystonic musicians through movement and relaxation with promising results (Ackermann and Altenmüller 2021: 309-314; Rosenkranz *et al.* 2009: 14627-14636; de Lisle *et al*. 2006: 105). It is also plausible that learning to play with relaxation from the start and maintaining this practice may have prevented the condition. The increased bodily awareness that comes from focusing on relaxation may enable players to become aware of the earliest signs of injury.

The HBM appears to be a feasible framework for teaching injury prevention to musicians. This ensures certain things are made clear to participants such as: explaining how severe PRMDs can be, with the intention that it encourages them to take pre-emptive action to prevent injury; addressing the barriers to taking action. This last point encourages them to feel that they are not alone in feeling uncomfortable with parts of the process because it is totally normal to be challenged by different ideas. There are other concepts that could be incorporated into music education, such as the need for regular breaks during long or intense periods of work. A further area is the need to increase awareness that classical music recordings may be heavily edited and may not be a realistic representation or model for a live performance. Attaining such virtuosic goals may be a very long-term project, and sometimes rest is better than more practice. Injury prevention could also highlight that injuries can take many years to develop before warning signs show. This thesis has highlighted various concepts that could form the framework of health education curricula for musicians.

5.2 Further insights

Certain insights arise from this thesis that are not directly related to the research questions, yet are relevant in further informing understanding of the topic area.

The heterogeneity of research methods used in guitarists' injury studies restricts direct comparisons between studies. The available data on PRMD prevalence among classical guitarists provides enough

information to confirm that incidence rates are high [122], but due to a lack of certain details, and differing methodologies, the data we can draw is limited.

Participants in chapter 2 attributed the cause of their mFHD internally, believing that how they played over years had caused the condition [123]. It is interesting to note that neurological imaging studies have found differences between dystonic and non-dystonic brains. Although musicians have greater neuroplasticity than non-musicians (Rosenkranz *et al.* 2007: 5200; Münte *et al.* 2002: 476), dystonics appear to have extreme levels of neuroplasticity (Edwards 2016, 16: 55; Quartarone 2011: 163; Altenmüller and Jabusch 2010: 34; Bara-Jimenez *et al.* 1998: 828). There is also some evidence that sectors of the brain responsible for controlling the fingers can become blurred and rearranged in dystonics (Meunier *et al.* 2001: 523; Bara-Jimenez *et al.* 1998: 830; Elbert *et al.* 1998: 3573). These findings have been contested by more recent scans (Sadnicka *et al.* 2023: 1511). Despite these findings, it is still not understood whether neuroplastic changes in the brain's cortical map cause dystonia, or if dystonia causes this cortical remapping (Hallett 2011: 1; Quartarone 2011: 167; Bara-Jimenez *et al.* 1998: 830). Other causes have been proposed, such as the sequencing of dystonia genes (Edwards 2016: 6: 30). It is also noted that music combines precision with intense emotion (Altenmüller and Jabusch 2010: 34) and is performed by people with a tendency towards anxiety and extreme perfectionism (Altenmüller *et al.* 2012: 260; Enders *et al*. 2011: 539). The above findings are not mutually exclusive and it is possible that all of these elements play a part in the aetiology of mFHD: most of these participants believed that it was their constant tension during play that produced changes in their brain.

In the empirical data presented in this thesis, four different dystonia onset patterns are reported [124], with differing treatments described. With only four participants, this demonstrates the great variety to the lived experience of mFHD in terms of onset, how it progresses, and how severe it can get. One participant experienced a finger that spasmed outwards in certain passages, while another had fingers that remained curled into the palm when away from the guitar. Some had issues with one or two fingers, another had

[122] See 1.2.3 Injury prevalence among guitarists.
[123] See 2.3.4.iii GETs: Aetiology.
[124] See 2.3.1.i GETs: Onset.

dystonia in the whole hand. One participant developed coping strategies for twenty years while others lost the ability to play overnight. Two of them experienced spasms when not playing. There are still more patterns of symptoms reported in the literature (Hallett 2011: 2; Quartarone 2011: 166). Just as the onset varies across the population, so to do treatment needs [125]. It is already known that there are different types of dystonia: it can be classed as primary (the spasms or contractions are the only symptom) or secondary (it is caused by another disease such as Parkinson's). Primary dystonia can be focal (affecting a single finger) or general (affecting multiple body parts (Standaert 2011: 149). Since it is possible to carry dystonia genes asymptomatically (Edwards 2016, 6: 30), and that cortical remapping has been observed in some people but not all (Sadnicka *et al.* 2023: 1511; Meunier *et al.* 2001: 523; Bara-Jimenez *et al.* 1998: 830; Elbert *et al.* 1998: 3573), data suggests that there are different subtypes of mFHD, each with differing onsets and different treatment needs. This study was not in-depth enough with regards to successful treatment methods, nor did it have a large enough data pool to draw comparisons between onset patterns, level of recovery, or how treatment methods might be matched to onset patterns.

This empirical data shows that even the highest-level guitarists can have a lack of awareness of their own body, and their own movement and usage patterns. Participants in chapter 2 only realised how much tension they were holding while playing after contracting dystonia [126]. Those in chapter 3 also spoke of a lack of awareness of their own posture and techniques, and how faults were sometimes pointed out when they themselves had lessons [127]. Another problem that was mentioned was the way awareness of physical problems seems to 'switch off' when playing [128], something also mentioned in the literature (Guptill 2011: 90). Empirical data and the wider research show that musicians experience reduced interoception when playing, thus losing the ability to detect injury warning signs.

Although a culture of silence has been reported by these participants [129] and various authors (Gasenzer *et al.* 2017: 6; Rickert *et al*. 2013c: 125: Guptill 2011: 91), there is a network among those with mFHD in

[125] See 2.3.3.iv GETs: Networking and also 2.3.3.vi GETs: Treatment.
[126] See 2.3.1.ii GETs: Awareness.
[127] See 3.3.1.ii GETs: Awareness.
[128] See 2.3.1.ii GETs: Awareness, and also 3.3.1.i GETs: Awareness.
[129] See 2.3.2.i GETs: Culture of silence.

which dystonic musicians share ideas and help each other. These networks may be small, and certain members still desire that their condition remains hidden from the public. A similar network was not mentioned among the posture pain participants, nor in the works of Gasenzer (*et al.* 2017: 6) or Rickert (*et al*. 2013c: 125). However, they were mentioned by Guptill (2011: 91), suggesting that if such networks exist for those with pain injuries, they are very small.

The standard teaching model of 'master and apprentice' for instrument performance has limitations and is criticised for promoting imitation learning (Hyry-Beihammer 2010: 162). As one participant noted, people may imitate the postures and techniques of their mentor, even if it does not suit their own anatomy. When there is an element of idolisation on the part of the student it may encourage them to play through pain to a greater degree because they believe that their mentor's way must be the best. Unfortunately, it may take many years for problems to become apparent. When students from this first generation go on to become teachers, unfavourable ideas may be passed onto future generations of guitarists before the first generation becomes aware of the detrimental impact of poor posture and a lack of movement education. Thus, imitation learning has drawbacks.

5.3 Limitations of the thesis & future research directions

The studies presented in this thesis consisted of limited sample sizes, meaning findings cannot be generalised to a broader population. It is important to note that the aim of phenomenological research is not to generalise, but to gain a deeper understanding of individual experiences (Guptill 2011: 84; Smith *et al.* 2009: 1). The small cohort employed here makes it unwise to generalise findings to broader populations.

The group of participants featured here come with limitations. Even though small cohorts of five to seven participants are recommended for IPA studies (Smith *et al.* 2009: 106), the participants presented in this thesis consist of male guitarists from the UK and the US. Future studies should include female guitarists and musicians from a wider range of backgrounds in order to gain a deeper understanding of the impact of PRMDs on a wider range of musicians. A number of themes warrant further investigation both with this group as well as additional participants (see below).

The Delta pilot study in chapter 4 also consisted of a relatively small sample size. A follow-up study

could include specific inclusion criteria such as currently being footstool users. Additionally, the Delta study only addresses issues of spine position and device portability. Future studies could include shoulder symmetry, which may not be straightforward while seated, due to the size and shape of the guitar body.

Some of the following suggestions for future research are expansions of themes identified in this enquiry, whereas others follow the broader theme of PRMDs without being limited to the lived experience, posture, or neurological issues that are central to this thesis.

5.3.1 Lived experience of injuries

Future phenomenological interviews should be used to develop the themes in this thesis, with interviews focusing on how psychological responses to injuries affect a musician's performance, possibly using a sport performance psychology framework (Heany *et al*. 2015; Goddard *et al*. 2021). Discussion topics could include biopsychosocial elements such as: state of mind and mood; how close social and personal relationships with a spouse or a teacher were affected; how working life was affected. For example, some participants in chapter 2 continued to teach performance even though they could not play. Diversifying the cohort from that used in chapter 2 would allow better insight and comparison. Future studies could include different types of musicians such as electric, folk or jazz guitarists.

A follow-on Delta study could further test the efficacy of the Delta on a larger group of classical guitarists. The duration of Delta usage by participants could be expanded from two weeks to four. Online video meetings could be included to visually observe the participants' posture. Most participants in the Delta pilot study used guitar supports rather than footstools, therefore another possible variation would be to only include musicians who use a footstool to gain insights into the experience of a significant posture change.

Some participants adapted their posture due to pain. A future phenomenological enquiry could investigate whether or how this change impacted their practice strategy in terms of duration, warm ups, or health behaviours. Similarly, future studies could investigate whether hand or arm injuries changed a musicians' practice strategy and playing techniques, including fingering techniques.

Participants all highlighted that prior warning signs of mFHD, if present, tend to be subtle [130]. A future qualitative interview study could focus on musicians with recent onset mFHD for better recollection. Questions around stressors, physical tension, numbness, decreased sensation, altered sensations, or increased workload prior to onset could be included.

5.3.2 Future studies on posture

The participants' experiences as well as the Delta study highlighted the complex relationship between body awareness, posture, and PRMDs. Non-guitarist participants could be recruited. Whether or not they have history of back pain is noted. Information is taken about any sport, fitness, or physical activities they engage in. Participants sit for 45 minutes in posture A (with a classical guitar and footstool mimicking the standard footstool posture), or posture B (with a classical guitar and A Frame, sitting symmetrically). During this time, they watch TV programmes of their own choosing. The benefit of this is to ensure they are engaged in programmes they really enjoy, to mimic the way musicians can get deeply engrossed in practice. Each participant sits in posture A for 45 minutes then posture B for 45 minutes with a minimum of 15 minutes break between postures. At the end of each 45 minutes they comment on any physical sensations they have felt during the study. This would investigate if footstool posture is found comfortable by footstool proponents due to long-term conditioning.

A quantitative study could include measurements of participant's weight distribution whilst seated using pressure sensors on a chair, comparing footstool usage with the use of a guitar support. Further comparisons could be made before and after postural guidance. Findings could be compared to Spahn *et al*'s (2014) similar study on violinists.

Future longitudinal questionnaire-based studies could focus on classical and flamenco guitarists at higher education institutions and conservatoires, across a number of years. The relationship between body posture and injuries could be explored.

The amount of muscle fibre recruitment in many common weight training exercises has already been

[130] See 2.3.1.ii GETs: Awareness.

assessed using electromyography. Large muscles such as those of the thighs have larger motor units (meaning that more muscle fibres are activated by a single motor neurone) compared to the smaller muscles of the hand, which are required for more finely controlled movements (Purves *et al*. 2001). Inspired by the new research around central nervous system (CNS) fatigue mentioned in chapter 1 [131], the same electromyography technique could be used to assess the quantity of motor units involved in playing guitar, and the information compared to weight training. If the load on the CNS (defined by how many motor neurones are used) is indeed comparable to certain athletic sporting endeavours, this information could be used to persuade musicians of the intense need for self-care for health and longevity.

5.3.3 Individual morphology

Participants in this thesis described a wide range of adaptations as part of their coping strategies. A future study could explore the relationship between the variation in proportion of musicians' hands and the difficulties some guitarists experience when playing barré chords. Measurements could include the thickness of the first interphalangeal joint and the middle of the second phalanx of the left hand 1st fingers and the ratios of these two points would be compared. Players with a large difference between these two measurements may find it significantly harder to play satisfactory barré chords due to the increased difficulty of applying pressure with the middle part of the second phalanx. Additionally, how much pressure they can apply at the second phalanx with barré technique could be measured on a guitar, and a subjective description of how well they feel they can play barrés could be used as comparison.

Another study could investigate a different aspect of why some guitarists may have a natural advantage. The angles between the metacarpal bones in guitarists' fretting hands could be measured and compared to the maximum finger abduction angles possible while playing to investigate if some people have a natural advantage in attaining wide reach. If a correlation between wider reach and more fanned metacarpal bones is found, this would suggest that some people are disadvantaged and perhaps more at risk of certain overuse injuries when attempting wide stretches.

Regular loading of joints causes the collagen of articular surfaces to thicken, increase in density, and

[131] See 1.2.2 Injury types among musicians, point 6.

form better fibre orientation (Arokoski *et al*. 2000: 186). Ultra sound scanning could be used to measure cartilage properties of guitarists' fretting hand fingers (i.e. load-bearing) and plucking hand fingers (i.e. non-load bearing) to see if years of playing has had significant impact on joint architecture. Inclusion criteria would therefore need to include a minimum duration of playing in terms of both overall years and time per day and/or week.

5.4 Summary

The main points highlighted by this thesis are:

The prevalence of PRMDs amongst elite musicians is poorly understood, despite this being a widespread problem. A direct comparison between epidemiological studies on injuries amongst guitarists is difficult due to heterogenous research methods including the variety of injury sites, highlighting the need for a more unified approach to future research.

A musician's identity is strongly attached to their instrument, so being unable to play is devastating to the point that it can adversely affect inter-personal relationships. Musicians are so desperate to maintain their playing that they will try any workaround, treatment, or training strategy. Unfortunately, this is hindered by the fact that many, but not all musicians distrust medical professionals, either because they have previously had bad experiences or they have heard bad reports from friends and colleagues. This can lead to them delaying the seeking of treatment for many years.

Psychological and psychosocial factors contribute to the development of mFHD, but there may also be a genetic component. However, the classical guitarist participants in this study all believe it was faulty movements that caused cortical changes that led to their dystonia. A key theme was excess tension, including how issues in the fingers can be caused by shoulder tension. Onset patterns and symptoms vary, as do treatment needs, with the participants in this study successfully (or partially) treating themselves with methods not described in the literature.

There are gaps in educational strategies and curriculum design that hinder many musicians from developing sufficient self-awareness, or learning what their body needs, for optimal function and longevity until injury forces them to do so. This is complicated by the fact that onset times for PRMDs vary from

months to decades. Back pain is exceedingly common in many occupations, including guitar players, yet the causes remain poorly understood. Although the role of posture in low back pain is controversial, this study supports the idea that it plays a role for musicians. The solution to posture pain in classical guitarists is likely multifaceted, consisting of different guitar positioning equipment combined with postural and exercise education. The Delta shows promise in facilitating improved posture while attaching reliably to the guitar and being compact and easy to transport, which is vital for elite guitarists who travel frequently.

There is a need for a mixed methods approach to the study of injuries - one that includes phenomenological research as well as quantitative studies on prevalence and severity. These mixed research methods would be able to acknowledge that injuries occur within a network of interacting variables as recognised by the Biopsychosocial model. The inclusion of the three aspects of the BPS (biological, psychological, and social) shows how the lived experience of injuries constitutes a novel framework in assessing and shaping rehabilitation strategies as well as early education strategies.

The studies presented in this thesis exploring the lived experience of professional classical guitarists with PRMDs have provided an interdisciplinary synthesis, combining insight from psychology, sports rehabilitation, anatomy and ergonomics with interpretative phenomenological analysis of semi-structured interviews. The empirical data has been compared to experimental models from public health research. Findings demonstrate that a lack of awareness of one's own body is intrinsic to the lived experiences of musicians with PRMDs. The sharing of lived experiences of musicians' PRMDs can enable musicians to normalise their personal experiences of injuries, change their perspective on their own experiences, take control of their condition, or even prevent career-threatening injuries. After all, the importance of music to the life and identity of a professional musician cannot be overstated:

> Talking about musicians, when they are injured, they don't think of anything else except their injury. There is nothing else in the world. I've seen families being destroyed. Relationships being destroyed … it *is* a devastating thing to be injured.
>
> (Paraskevas).

Glossary 1: Abbreviations & initials

A

ADL – activities of daily living.

B

BSM - Biosychosocial model.

C

CNS - Central Nervous System.

CTS – Carpal Tunnel Syndrome.

D

DOMS - Delayed Onset Muscle Soreness, occurs several hours after exercise and usually peaks after 48 hours.

F

FHD – task specific Focal Hand Dystonia..

H

HBM - Health Belief model.

HMS - HyperMobility Syndrome

K

Kilopascal – a unit of pressure. One kilopascal is equal to 0.145 PSI.

L

LBP – Low(er) Back Pain.

M

MCP - MetaCarpoPhalangeal joints – the various knuckles of the fingers.

mFHD – Musicians' task specific Focal Hand Dystonia.

MSD - MusculoSkeletal Disorders.

O

OA – Osteoarthritis.

P

PRMDs – Performance-Related Musculskeletal Disorders.

R

RAM – Royal Academy of Music, London.

ROM - Range Of Motion.

S

SoC - Stages of Change model.

SDT – Self Determination Theory

Glossary 2: Anatomical terms

A

Achilles tendon – the large tendon on the back of the ankle.

ACL (Anterior Cruciate Ligament) – a ligament behind the knee cap.

Actin - a protein that makes up muscle together with myosin.

Action Potential – an electrical impulse from a motor neuron that stimulates muscles contraction.

Anterior Cruciate Ligament (ACL) - a ligament behind the knee cap.

Anthropometrics – the study of human proportions.

Atlas joint – where the neck meets the skull.

B

Biceps – a muscle on the front of the upper arm that bends the elbow.

Brachialis – a muscle under the biceps that assists in bending the elbow. It is most visible on the outside edge of the upper arm between the biceps and triceps.

Bursa / Bursae – a fluid sac that cushions joints.

C

Clavicles – the collar bones.

Concentric contraction – the shortening cycle of muscle contraction.

Cubital Tunnel Syndrome – pressure on the ulnar nerve causing numbness or tingling in the ring and small fingers, pain in the forearm, and/or weakness in the hand.

D

Deltoids – the shoulder muscle encapsulating the top of the arm.

E

Eccentric contraction – when a muscle elongates but resists the elongation (usually the double ‘c’ is pronounced ‘ss’)

Elastic – a material that can be stretched and quickly returns to its previous state.

Erector Spinae – a group of long muscles running the length of the back of the spine.

F

Flexor digitorum profundis (FDP)..

Flexor retinaculum – a retaining ligament in the wrist that holds the flexor tendons in place.

Forearm flexors.

G

Glenohumeral joint – the shoulder joint where the upper arm meets the collar bone.

Gluteal folds - the lower edge of the buttocks.

H

Hamstring – muscles on the back of the thigh responsible from bending the knee and/or pulling the thigh back.

Hip flexors – the iliacus and psoas major run from the pelvis and spine respectively to the femur.

Humerus – the upper arm bone.

I

Illiac crest – the curved top of the pelvis, the hip bone.

Iliacus – a hip flexor muscle that runs from the pelvis to the femur and raises the thigh in front of the body.

Insertion – the end of a muscle furthest from the heart.

Interosseus – muscles in the hand.

Ischemia – restricted blood flow, and therefore restricted oxygen as well.

Ischia / ischium – the sitting bones, located just above the lower edge of the buttocks.

Isometric contraction – when a muscle works to maintain a certain length.

K

Kinaesthesia – the sense of movement.

L

Lumbricals – muscles inside the hand that assist in pulling the first phalanx towards the palm.

M

Metabolite – waste products of bodily functions.

Metacarpal – the long, thin bones in the palm of the hand.

Myosin – a protein that, in combination with actin, makes up muscle.

N

Neurone (British spelling) or neuron (US spelling) - message relays between the brain and body.

O

Origin – the start of a muscle closest to the heart.

P

Paraesthesia – abnormal sensation, usually referring to tingling or pins and needles.

Pectoral or pectoralis major – the main chest muscle.

Pectoralis minor – lies under the pectoralis major and runs from the ribs to the shoulder blade and pulls the shoulder blade and shoulder forward.

Phasic muscle – a muscle designed for short periods of contraction for movement rather than posture.

Phalanges (singular: phalanx) – a bone of the fingers.

Phalanx (plural: phalanges) – the bones of the fingers.

Plastic – a material that adapts slowly and is not very elastic.

Pronate – turning the wrist to face the palm down.

Proprioception – the sense of where our limbs are in space.

Psoas major - a hip flexor muscle that runs from the lower spine to the femur and raises the thigh in front of the body.

Q

Quadriceps – muscles on the front of the thigh responsible for straightening the knee.

R

Radial deviation – bending the hand in the direction of the thumb, the opposite movement to ulna deviation.

Radialis – one of the forearm bones. It runs from the elbow to the wrist on the side of the thumb.

Radiculopathy – a range of symptoms produced by the pinching of a nerve root in the spinal column.

S

Sacro-iliac joint – links the spine and pelvis.

Sarcomere – a contractile unit within muscle fibres.

Scalenes –muscles extending from the top rib and bottom of the neck to the top of the neck.

Scapula – the shoulder blade.

Serratus Anterior – muscles that slide the shoulder blade around the rib cage towards the side of the body. They are visible beside the nipples just under the armpit.

Soleus - a deep muscle of the lower leg that moves the foot.

Sternum – the breast bone, where the ribs meet at the front.

Supinate – turning the wrist to face the palm upwards.

T

Tendinopathy – any disease or injury of a tendon.

Thalamus – an area near the centre of the brain.

Thenar – the area around the thumb's base on the palm.

Thoracic – thorax; the chest area.

Tone – random firing of motor units to create a low-level of tension.

Tonic muscle – a muscle designed for long-term isometric contraction to sustain posture.

Trabeculae – bands or columns of connective tissue.

Trapezius – the muscle across the top of the shoulders, also running from mid back to the back of the head.

Triceps – a group of three muscles on the back of the upper arm that straighten the arm at the elbow.

Twitch – the whole muscle process of taking up the slack, contracting, and relaxing.

U

Ulna – one of the forearm bones. It runs from the elbow to the wrist on the side of the pinky finger.

Ulna deviation – bending the wrist to bring the pinky finger closer to the forearm as if using a hammer or screwdriver.

Ulna nerve – the funny bone.

W

Wave summation: action potentials are sent so frequently that the fibres don't have time to relax so the force adds up.

Glossary 3: Guitar terminology

A

A-Frame – a type of folding guitar support that attaches to the side of the guitar.

Apoyando – (pronounced *apoJANdo*) rest stroke.

F

Free stroke – the direction taken by the plucking digit means it passes over the adjacent string.

Fret – the metal bars perpendicular to the strings.

Footstool – anything used to raise one foot above the other.

N

Neck droop – when the weight of the headstock pulls the neck down towards parallel with the floor.

P

Position (first, second, etc.) – which fret the first finger is placed at.

R

Rest stroke - the direction taken by the plucking digit means it comes to rest on the adjacent string.

S

Support – any method of elevating or holding the guitar to avoid raising one leg, from cushions to straps.

T

Thigh Support - any method of elevating or holding the guitar using a device between thigh and guitar.

Tirando – free stroke. The direction taken by the plucking digit means it passes over the adjacent string.

Appendix 1: Semi-structured interview schedule

General

1) Whom do you think is more at risk: cleaners, musicians, athletes (in non-contact sports, e.g. runners, swimmers, bodybuilders, etc.), office workers?

2) How important is posture?

Musician's Health

3) How common do you think RSI's are amongst musicians?

4) What do you think are the most common causes of RSI's in musicians?

5) What is your idea of correct posture for playing?

Teaching

6) How important do you think it is that teachers have detailed knowledge of physiology, posture, common injuries, common causes of injuries and their prevention?

7) What recommendations do you make to your students about positioning the whole body, arms and fingers?

8) Have you encountered RSI in your guitar students?

9) When/if you encounter students with RSI or other pain symptoms, what is your course of action?

10) Have you ever thought a student might be at risk of developing and injury?

11) When you encounter students that you think may be at risk of developing an RSI, what is your course of action?

Personal Experiences – Focal Dystonia

12a) When were you struck down with Focal Dystonia?

12b) How did it manifest?

12c) Looking back, were there any warning signs?

12d) What causes FD?

12e) How long did recovery take?

12f) What did you try in your attempts at recover and how useful were they? Did you try playing guitar in a different position? Different chair? On your lap?

12g) What needs to be done to fix it?

12h) What needs to be done to avoid it?

Personal Experiences - RSI

You might consider the following section to be rather sensitive in nature. You can remain anonymous or not answer them as you wish.

13) Have you ever suffered from an RSI?

13a) How much practice were you doing per day/week at that time?

13b) What were the symptoms?

13c) What do you think contributed to this injury? Was it aspects of your playing, or were there other non-music contributing factors (e.g. computer usage)?

13d) How severe were the symptoms? For example, was it a small niggle or did it impede your playing?

13e) Was it present during playing?

13f) Was it present after playing?

13g) Was it present during other activities?

13h) How long were you experiencing problems before you sought treatment?

13i) What treatment did you get?

13j) Did you recover?

13k) How long did recovery take?

13l) Has dealing with this injury changed your perception of what causes RSI's or how you view RSI's in general?

14) How many days per week do you practice now?

15) What's the most practice you would do in one day?

16) How long do you normally practice before taking a break?

17) Bearing in mind how people often contort their bodies around their guitar, how open do you think the classical guitar community would be to a new instrument design (assuming it still sounded like a good classical guitar) that attempts to reduce the strain on the player?

18) Would you be interested in playing this new guitar design?

Appendix 2: Evaluation of existing guitar supports

There are different types of commercially available devices for positioning the guitar, here classified as follows:

- Footstools (used to raise one leg);
- Supports (used to raise the guitar off one leg);
  - Cushions;
  - Clamps;
  - Suction cups;
- Straps (used to hang the guitar around the shoulders);
- Stands (free standing devices that hold the guitar. They seem to be designed for standing, so are not assessed here).

With the focus of this thesis being health, it is very important to assess how each support can affect the body when used well, because no matter how good the design of a support is, good posture is only attainable with knowledge, constant observation, and adjustment. It is also important to evaluate how it affects the (possibly very expensive) instrument. The importance of all other considerations (including the cost) is subjective. The following section is a critique of the readily available supports compared to the criteria set out in 4.3.2 General posture guidelines for seated musicians, with these additional criteria:

- The postures it makes available for the player;
- The stability of the instrument;
- Changes to the instrument's sound;
- Ease of use: how easy it is to adjust the support to achieve the desired position;
- Ease of use: whether or not it fits in the case when attached to the guitar, as portability is important

to some;

- Ease of use: whether or not it can be stored in the case when not attached, as portability is important to some;
- Whether or not the support causes damage to the guitar's varnish;
- Whether or not modifications to the guitar are necessary to use the support;
- The need for, and ease of, getting replacement parts;
- How easy it is to obtain, irrespective of cost.

Since there are no effective scientific studies on these devices, they are assessed here by my observation and teaching/playing experience, further informed by the findings laid out earlier in this thesis. Therefore, this is my informed opinion that serves as a foundation for the development of a new support. An assumption is made that the guitar will be positioned similarly with all devices – that is, with the sound hole roughly central to the body rather than towards the right like modern flamenco players.

Footstool

- Cost: £6

Fig. A2.01
A footstool

Advantages:

The footstool (fig. A2.01) is seen as the traditional tool for classical guitarists. Ornate wooden ones are available at considerable cost, but the metal model shown in fig.4.01 is cheap and readily available at many guitar shops. Alternatively, a stack of books will suffice and not require financial outlay if the player already owns some.

This type of stool usually has a wide adjustment range and is easy to adjust, although one must set the guitar aside to do so. If looked after it can last a lifetime.

Due to its low cost, it is readily available in instrument shops and online.

Disadvantages:

It was demonstrated in chapters 3 and 4 that prolonged use causes severe pain in some people. Possible reasons are: spinal twist; disruption of the spinal curves; loading on the front of the spine; uneven distribution of weight on the pelvis, and therefore the lumbar spine; non-symmetrical arm positions, which

load the spine asymmetrically; excessive tensions across the back from the head to the pelvis and shoulder to shoulder from leaning forwards and sideways. The twisted torso will disrupt the Spiral Line of the myofascial continuities (Myers 2012: 135), while the various tensions will cause adaptions in various other fascial meridians. The instrument is not very stable, requiring four contact points to stop it slipping off the legs: both thighs; chest; either hand. The wide contact area of the edge of the guitar against the thighs has a slight damping effect on volume and tone, and there is usually contact with the back of the instrument as well.

Classical guitar cases tend to be a similar shape to the guitar, meaning there is no room inside to store the footstool, but it does fold flat so fits into other bags easily. For the regular traveller, this is one extra thing to remember to pack.

Supports

Rather than raising one foot off the ground, supports raise the guitar above the leg.

Supports: Dynarette Cushion

- Cost: £25

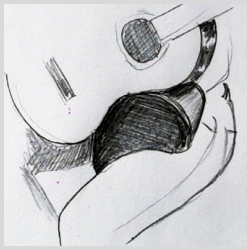

Fig. A2.02
Dynarette Cushion

Advantages:

The idea behind this cushion (fig. A2.02) is to allow the player to keep both feet flat on the floor, so it does help the player to achieve a more neutral seated posture but may not allow a symmetrical arm position without spine rotation.

No modifications to the instrument are needed, and prolonged use will not affect the guitar. They are easy to obtain online, although one could also make one with rags or paper, and sticky tape.

Disadvantages:

The Dynarette cushion is not adjustable (home-made versions as described above are); instead, different sizes are available, which is not a practical solution. As it does not attach to the guitar or the leg, it is not very stable. Just like using a footstool, there is a lot of contact with the edge of the instrument, causing a slight change to its volume and tone.

Portability is an issue, as it is too large to fit in guitar cases and does not fold to fit in bags.

These cushions might not be stocked in smaller instrument shops.

Supports: Suction Cups

Advantages:

There are many designs that rely on suction cups to attach the support to the guitar. They all provide the same potential for neutral sitting postures, the contact points with both thighs and the chest providing sufficient stability for most players so that the arms are able to move freely.

As contact with the instrument is limited to a small area on the edge of the guitar, the dampening effect is less than when using a footstool. Also, it is usually possible to allow the back of the guitar to vibrate, depending on the players anthropometrics.

To get the best attachment, the cups need to be slightly moist. The moisture present in the air is not enough. Licking them often makes them too wet, causing them to slip. Breathing on them as when steaming up glass works best.

Disadvantages:

The major drawback of this type of support is that suction cups are unreliable. They tend to disconnect in the middle of a piece, but be difficult to remove when desired. Most guitars have a high-gloss finish on the edges, but for those without a high-gloss finish, they are unusable. For those that have a high-gloss finish that comes from shellac (a light-weight varnish used on many hand-made professional level guitars) they become unusable in time as the varnish loses its lustre. This is either caused by continually trapped moisture between suction cup and varnish, or a reaction between the shellac and suction cup material. Mass-produced guitars tend not to use shellac, and do not suffer this issue, making them less viable for professionals than casual players or students. To combat the issue of degrading surface finish of the varnish, some of these supports come with a glossy, adhesive plastic square to attach to the guitar. Some players may not wish to use this. I cannot comment on the efficacy of these plastic squares since they were not readily available in the period when I used an A Frame.

These supports (or similar designs) are rarely available in instrument shops, but readily available online.

At first, suction cup supports may appear to have identical advantages and disadvantages, but this is

not the case. Although they share the benefits and shortcomings listed above, they have additional strengths and drawbacks, which are presented below.

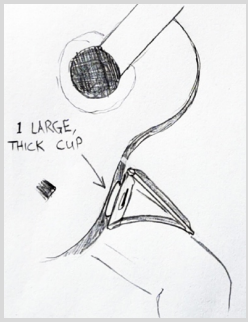

Fig. A2.03
A Frame, one suction cup

Supports: One Suction Cup - A-Frame Guitar Support

- Cost: £27 plus shipping

Advantages:

The one-cup model (fig. A2.03) is small enough to be kept in the storage compartment or pocket of most cases. The degree at which the guitar is tilted back is adjusted by attaching the support to the body at a different angle.

Disadvantages:

This support is small enough to remain attached to the guitar inside of some cases, but this will cause any degradation of the varnish to occur much sooner. Replacement suction cups are not available, as this model requires its own special cup. The main problem with this particular model is that they do not last long. What causes them to fail is unclear, but they seem to fail suddenly.

Having only one suction cup means that there is no back up: when it comes unstuck it is completely disconnected from the instrument, which is then suddenly balanced rather precariously.

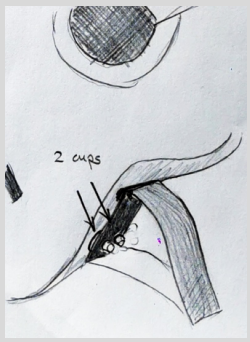

Fig. A2.04
A Frame, two suction cups

Supports: Two Suction Cups - A-Frame Guitar Support

- Cost: £27 plus shipping

Advantages:

The model shown in fig. A2.04 is noticeably more compact than the above support when folded, so is small enough to be kept in the storage compartment or pocket of a case, or even in a gap between the instrument and the edge of the case.

The main advantage of this type of support over that shown in fig. 4.03, is that shower curtain suction cups can easily be used as replacements. Additionally, the two cups act as backup – when one comes unstuck, there is still one attached. It will probably only last for a few more seconds, but it may give the

player time to reach a good place to pause and push the cup back against the body. This may be sufficient to stay attached until the end of the piece.

The degree at which the guitar is tilted back is adjusted by attaching the support to the body at a different angle.

Disadvantages:

The main drawback with this model is that sometimes the suction cups slide along the guitar, although this is preferable to detaching and is usually caused by too much moisture.

Supports: Three Suction Cups - Ergoplay Guitar Support

- Cost: £36

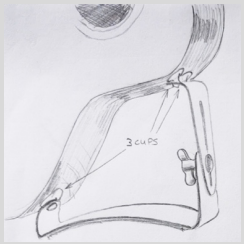

Fig. A2.05
Ergoplay

Advantages:

Shower curtain suction cups can easily be used as replacements for the ergoplay (fig. A2.05). Additionally, the three cups act as backup – when one comes unstuck, there are two more attached.

It is slightly easier to adjust the angle of tilt with this model, as it features a lockable pivot. Adjusting the neck angle is slightly more awkward than with the A Frames due to the size, which limits the range of attachment points along the edge.

Due to its larger size, it is better suited to the taller player.

Disadvantages:

This support is too large to be practical; it cannot be stored in the case whether attached to the instrument or not. Being thick (from front to back) and unfoldable means it always takes up a lot of space.

As can be seen in fig. 4.05, there is a lot of metal of the support to the player's left side. This is sufficient to destabilise the guitar so the neck can drop when unsupported, even though the support is resting on the thigh. It is so large it holds the guitar too high for people of less than average stature, making it much harder for them to keep a neutral plucking wrist position. This is not an issue for the very tall.

Supports: Three Suction Cups - Mundo Guitar Support

- Cost: £60 (excluding the optional Kling-On, which is an additional £6).

Advantages:

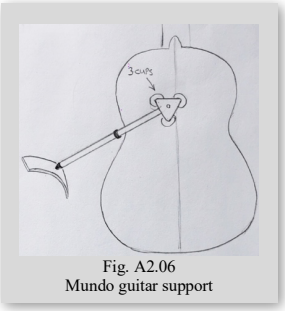

Fig. A2.06
Mundo guitar support

As with other suction cup designs, a neutral sitting posture is easy to achieve with the Mundo (fig. A2.06), and the guitar will be stable with three contact points. This is probably the most adjustable design, as it features a telescopic arm with a ball joint at the base.

As the back of the guitar resonates when unobstructed, attaching the Mundo to the centre might hamper its sound, so attaching it nearer the neck joint would be better, if the telescopic arm can extend far enough.

The makers claim the unit can be stowed in the case or gig bag, although it looks too large to fit in a hard case. Spare suction cups are also available through the manufacturer, although they are a unique design and cost more than the shower curtain variety.

Disadvantages:

The Mundo website explains that the suction cups react with some varnishes so it would be necessary to use their 'Kling-On' Protector (sold separately), which 'can be removed safely and repositioned over and over, or simply left in place' (Mundo, n.d.). They also explain that it does not work on guitars varnished with shellac or a satin finish. Other sticky backed plastic sheets can be used, but they warn that they can cause varnish damage or leave a residue.

These supports are only available from the manufacturer, so it is unlikely people will stumble upon these in a casual search.

Suction cups are always problematic. Since with the Mundo (which probably does not fit in most guitar cases) the cups are on the back, if they come unstuck the guitar will drop to your legs. When using an A Frame or Ergoplay, when the suction cups unstick the guitar is still resting on top of the support.

Supports: Four Suction Cups - Guitar Lift

- Cost: €85 plus shipping and customs.

Advantages:

As with other suction cup designs, a neutral sitting posture is easy to achieve with the Guitar Lift (fig. A2.07), and the guitar will be stable with three contact points.

There are many positions on the plate that suction cups can be attached, although they recommend putting them near the edge reduce dampening. When the varnish in one spot is compromised, another spot can be used instead. It comes with clear adhesive pads intended for satin finish guitars, but they could be used to prevent varnish degradation.

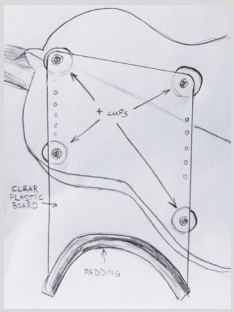

Fig. A2.07
Guitar Lift

Disadvantages:

Once all the suction cup positions have been used, the support will not work without revarnishing.

Adjusting the support requires detaching at least 3 of the 4 swivelling suction cups. They are attached via a hex nut, meaning shower curtain suction cups cannot be used as replacements.

The plate holding the suction cups is about half the size of the back surface of the guitar, meaning it takes up a lot of space in bags. It cannot remain attached in the case.

Supports: Clamps - Murata

- Cost: £60 ($78) plus shipping and import tax.

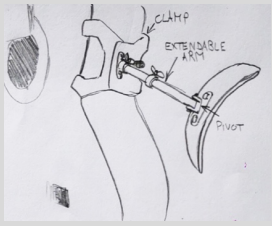

Fig. A2.08
Murata guitar support

Advantages:

As with the suction cup supports, the Murata (fig. A2.08) allows the guitar to be stable with three contact points for the majority of players, allowing the player to adopt a neutral posture.

Contact area with the instrument is minimal, so the sound will not be affected. The padded clamps are unlikely to cause an adverse reaction with the varnish. No modifications to the instrument are necessary, and no servicing or replacement parts are likely to be needed.

Disadvantages:

The player is unlikely to be able to adopt a symmetrical arm position, but general adjustments should be easy to perform.

Due to its size, it will not fit in guitar cases whether attached or not, and it is not available in many shops.

I saw a similar design circa 1999 where the clamp remained on the guitar but the leg rest was

removable. The height was adjustable by turning the leg rest on a screw thread. It took the player a long time to set up each time the guitar was removed from the case because the height was set by rotating the thigh pad on the screw shaft.

Fig. A2.09
Guitar with cello spike

Supports: Cello Spike

- Cost: unknown.

Some high-profile players have had their guitar fitted with a cello spike (fig. A2.09), which shall be discussed even although it is not commercially available because it is an important and fairly well-known development in guitarists' posture.

Advantages:

Minimal contact with the instrument improves resonance.

Disadvantages:

It requires significant modifications to a guitar.

The left arm needs to be held high for playing low frets. This position is risking cubital tunnel syndrome AKA cellist's elbow AKA cell phone elbow due to having a very bent arm. This is a nerve entrapment syndrome causing tingling and/or numbness of the fingers. Those without great body awareness will end up leaning and twisting to the left to observe the left hand. Indeed, an image search reveals this to be a common postural trait in players using these guitars.

Straps

Straps are commonly associated with standing, but can also be used while sitting, so that is how they are assessed here.

Advantages:

Adjusting guitar height is relatively easy and changing neck angle is very easy.

Disadvantages:

Few classical guitars have strap buttons fitted, and most guitarists will not wish to have their instrument modified.

Some strap length adjustment buckles slip easily and do not maintain their position.

Straps: Neotech Guitar Support Harness

- Cost: £77.47 ($96.99) including shipping. It may be subject to additional import tax.

This complex system of straps and support struts aims to distribute the weight of the instrument over most of the body. A padded strap goes over each shoulder, while another (inelastic) strap goes around the lower rib cage. Two straps descend from the shoulders to a hook that attaches to something at the back of the guitar (fig. A2.10, top). Two hooks hold on to the edge of the sound hole, their straps passing around to the back of the guitar to where the hook connects (fig. A2.10, bottom).

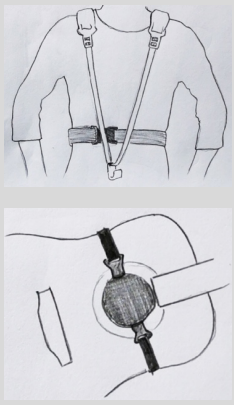

Fig. A2.10
Neotech guitar harness

The padding in the shoulder straps conceals seemingly unnecessary aluminium strips. Neotech's claim that it 'conforms to your body' seems erroneous, as the player must bend them to fit themselves, whereas it would happen automatically if the metal strips were omitted.

Advantages:

This harness is only available online, but replacement parts should not be needed unless the plastic buckles break.

Disadvantages:

Even with all those straps, the guitar is not very stable as it hangs from a single point.

The aluminium strips in the shoulder pads would make this difficult to store in cases or bags.

Straps: Shearer Classic Guitar Strap

- Cost: £46.09 ($57.80) including U.S. sales tax, shipping, and import tax.

Shearer describes his strap as 'Perhaps one of the most innovative and practical means of supporting the guitar' (2009: 19). This is simply a strap with hooks, and Velcro™ patches glued to the body and neck of the

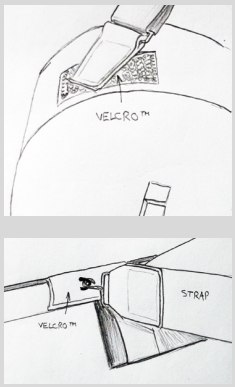

Fig. A2.11
Shearer Classic Guitar Strap

guitar (fig. A2.11). Alternatively, it includes a hook that needs a hole to be drilled into the neck of the guitar.

Advantages:

Adjusting the position of the instrument will be fairly easy and the strap will fold inside cases with no problem.

Disadvantages:

Many people would be unwilling to glue things to their guitar. Velcro™ wears out with repeated use and it would surely not be long before the Velcro™ cannot hold the weight of the instrument. This is not innovative or practical. An alternative eye hook is included to replace the Velcro™ at the neck, but this needs a hole to be drilled into the neck, but even then, the other end of the strap still relies on Velcro™.

This support does not seem to be available anywhere other than Shearer's own website. When the Velcro™ wears out it will need to be carefully removed from either the strap, which may require unpicking stitches, or the body of the guitar, which requires stripping off the glue.

Straps: Simple Sling

- Cost: less than £5.

YouTuber Carsick Phil (2013) shared this simple idea, although it is not his invention: a strip of fabric approximately 180cm long is joined at the ends to form a loop. This is slung over one shoulder like a sash, which cradles the guitar, as shown in fig. A2.12.

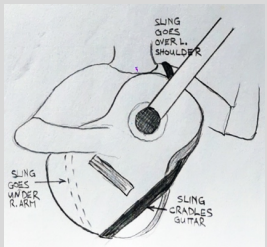

Fig. A2.12
Simple guitar sling

Advantages:

Storing the sling will be very easy, no modifications to the guitar are needed, and it will not damage anything. Obtaining the material from a haberdashery is easy and cheap, or it could be made from old cloths or two belts buckled together.

Disadvantages:

Adjusting the height could be a long process of experimenting and pinning the fabric, but once the right height is found no more adjustments would be required unless the fabric stretches. Using two belts

buckled together makes this process easier.

The only real problem is that there is nothing more than the friction between the cloth and the guitar to prevent neck dive. Since the support points are all to one side of the centre of gravity, this can be an issue. Guitar strap sleeves are available with extra grip, that may solve this.

Appendix 3: Designing the Delta

Formalising the Delta's design so that somebody else could make a prototype took quite a few steps. This process is outlined below.

Design brief

To satisfy the criteria set out above, these are the ideas I started with before sketching began:

- A mechanism that gently but firmly clamps around the edge of a classical guitar body so that it can be left on long-term, even when the guitar is in a hard case, without damaging the guitar or its varnish;
- A quick-release mechanism is not necessary as the idea is for the support to stay attached long-term, so one can simply grab the guitar and play, as it will remain set up to the player's satisfaction;
- The surface area that makes contact with the guitar will be padded with foam rubber, so even if the clamp is tightened a little too much it will not damage the varnish;
- The clamp is fitted to the edge of the instrument, where it is strongest, so there is no danger of structural damage. Chinrests are attached to violins in a similar method, so guitarists should not be concerned;
- A fold-out support arm functions the same as an A Frame.

Designing the clamp – version 1

Two plates are needed to clamp the guitar at the front and back. Part A is a plate bent at 90º to fold across the side edge of the guitar, this is where the fold-out support arm will be located. Part B is a flat plate that provides counter pressure to plate A.

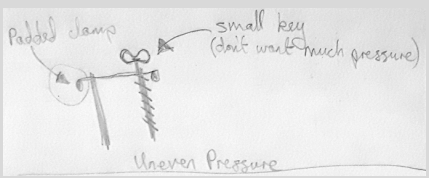

Fig. A3.01
First sketch of clamp mechanism.

The first idea was to have one screw-threaded post on one side of the clamp, the other side sliding along a stabilising bar (see fig. A3.01). The screw would have a small butterfly bolt head so it cannot be tightened too much.

Problem:

The pressure applied will be uneven.

Solution:

The tightening screw must not be at one side.

Designing the clamp – version 2

The second idea was to have one screw-threaded post in the centre of the plates for tightening the clamp, the left and right edges sliding along stabilising arms. The screw would have a small butterfly bolt head so it cannot be tightened too much (see fig. A3.02).

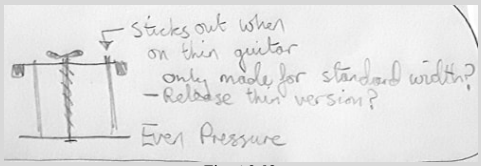

Fig. A3.02
Second sketch of clamp mechanism

Problem:

Depending on placement of the support, a central post may get in the way of the curve of a guitar body, causing damage to the varnish.

Solution:

Put an adjustment screw at either side.

Designing the clamp – version 3

Version 3 features two screw-threaded posts at the edges of the plates for tightening the clamp. The screws would have small butterfly bolt heads so they cannot be tightened too much (see fig. A3.03).

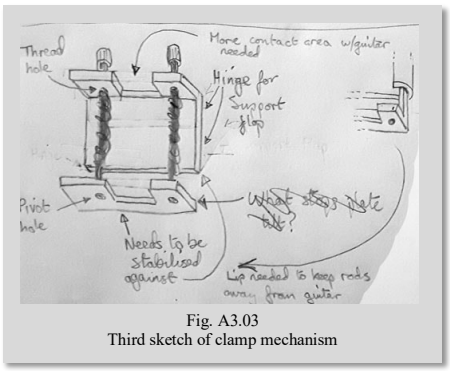

Fig. A3.03
Third sketch of clamp mechanism

Problem:

Although the plates are stable in one plane and can provide even pressure (so long as the screws are

adjusted correctly), Plate B will tilt because the screws apply pressure applied along the edge of the plate. Strain will be put on the edges of the holes holding the posts, thus damaging the screw threads.

Solution:

Stabilising arms need to be added.

Designing the clamp – version 4

The fourth version has two screw threaded posts at the edges of the plates for tightening the clamp plus 2 additional stabilising arms (see fig. A3.04). The screws would have small heads so they cannot be tightened too much. A sleeve covers both the stabilising arms and screw thread posts.

The areas that connect with the guitar will be covered with soft rubber so there is plenty of cushioning against the instrument.

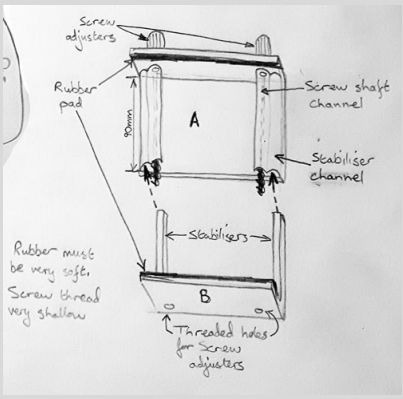

Fig. A3.04
Fourth sketch of mechanism

Problem:

As the screws are tightened the ends will protrude further, meaning they can catch on clothing or press into the thigh.

Solution:

The adjustment range will be small. Anyone using a guitar thinner or thicker than standard will need different post lengths.

Meeting with a fabricator

I had a meeting with Oli Monks, a Fabricator Welder at Fabweld Metalworks in Walmer, Kent, to discuss building a prototype support.

It is important to keep costs to a minimum; therefore encouraging people to choose the product without adversely reducing the effectiveness of the design. A discussion of manufacture processes revealed that time is more expensive than parts and materials. Therefore:

- Welding is time consuming and expensive and should be kept to a minimum;

- Folding is faster and cheaper than welding so should be the main construction technique;
- Laser cutting is fast and cheap;
- Using prefabricated parts (e.g. hinges) may reduce costs.

These discoveries lead to some alterations in design:

- Stabiliser and screw shaft channels should not be curved but straight edged with right-angle bends. This is because they have a machine that stamps sheet metal into a 90º bend, which needs a certain amount of space to operate;
- Due to this same machine the top and side of the stabiliser and screw shaft channels might need to be the same length;
- Due to the previous point, having the stabiliser and screw shaft side by side might not be practical. Unfortunately, having the stabiliser and screw shafts on top of each other increases the height of the unit and means that it cannot stay attached in a case.

Review of clamp v.4 prototype

Fig. A3.05 shows the first prototype of the clamp section attached to the edge of a guitar. Because the unit is made from a scratched, slightly rusty sample of waste metal that suction cups do not stick to for long, a sheet of glossy plastic has been glued on the surface for the attachment of an A Frame for test playing .

Fig. A3.05
Clamp prototype attached to a guitar

Monks felt certain changes were necessary during production:

- The stabiliser channels were made from separate sheets and spot welded to the edges of Plate A instead of being folded edges of the same sheet. For mass production a simple specialist tool could be made for folding Plate A from one piece, but for small production runs welding three parts together is the best option. For medium production runs it might be more cost effective to make a jig so the parts can be dropped into place (as if solving a very easy three-piece shape sorter) and welded together quickly;
- The stabilisers need to be the same thickness as the screw threads to reduce time spent shaping the

stabiliser channels.

When made from 2mm sheet metal the unit is unnecessarily heavy. Although this weight can help to keep the neck up (by pulling the body down) I feel the weight could be reduced by using thinner metal, which will also make it easier to fold in production. Making the unit from plastic would be much lighter, but it would require very thick materials, possibly making it too bulky to fit in cases when attached. It would also increase the carbon footprint. Additionally, I do not know anyone that could make it for me in plastic. There are standard thicknesses of sheet metal available: 1.2mm may suffice, whereas 0.9mm might be too thin and render the unit too flexible.

The screws sometimes feel like they are approaching maximum tightness, but a further twist reveals this to be internal friction, not too much pressure on the guitar. This is probably because the screw thread is welded on the end of the shaft and is therefore not perfectly straight, although ensuring all moving parts are lubricated helps. I suggested widening the clearance holes on the edge of Plate A but Monks felt a better option would be to use a ready-made screw shaft, which might also lower costs slightly. He also suggested that adding a washer between the butterfly nuts and Plate A might help.

I found that having the butterfly nuts on the player's side can be uncomfortable if the angle of the two prongs of the nut is such that one of the prongs can press into the thigh (as in fig. A3.06). Having the butterfly nuts on the audience side reduces this problem.

Fig. A3.06
Rear view of Type 1 prototype

How it fits against the lid and bottom of the case is also important. The butterfly nuts and the ends of the screw shafts stick out up to 10mm on either side of a guitar. The butterfly nuts do not protrude more than the depth of the bridge and strings but the screw shafts can be shortened so they do not damage the guitar case lining. This means that one or both screws might have to be disconnected from part B during attachment to an instrument if the screw threads are not long enough to give sufficient clearance between the body and padding material. The stabilisers can remain in their channels at all times, therefore shortening the screws does not really affect the ease of attaching the unit.

Designing the support – version 4.1

The next stage was to add the support arm (part C) that holds the guitar above the leg. The support arm is prevented from opening too far due to a sheet of fabric glued in place. This fabric will be the contact point with the thigh. The support arm needs to rotate to accommodate the guitar leaning back against the player's body. Fig. A3.07 shows the final design sketch for the Delta. Part C is attached to Part A via a

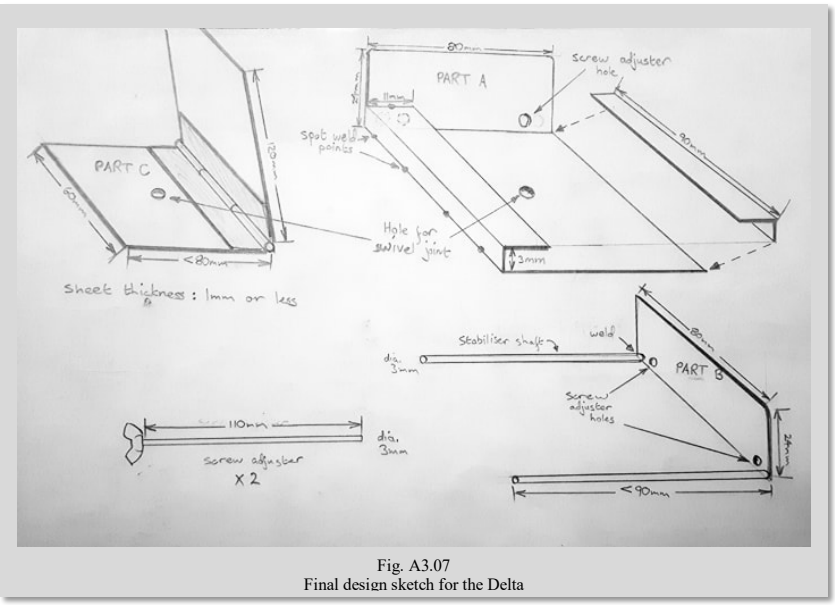

Fig. A3.07
Final design sketch for the Delta

loose rivet. It was originally intended to be a lockable pivot, but the weight of the instrument would be sufficient to stop free rotation. Additionally, this makes it simpler to both make and use.

Review of delta v.4.1 prototype

Fig. A3.08 shows the first prototype of version 4.1 of the Delta, while fig. A3.09 shows it attached to the edge of a guitar.

Some changes were made during production as Monks felt they were necessary:

- Due to the use of 1.2mm thick stainless steel instead of the previous 2mm, nuts were added to

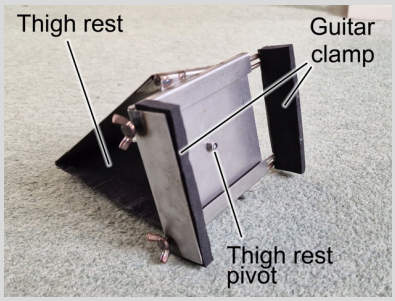

Fig. A3.08
The Delta prototype

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Fig. A3.09
The Delta guitar support prototype attached to a guitar.

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the outside of Part B to increase the depth of the screw thread while keeping the weight as low as possible. This extends the life of the unit by reducing the chance of the threads getting stripped.

- Initially, Monks fitted a nut and bolt for the pivot joint. When he noticed it loosened very quickly, he exchanged it for a rivet. This makes the joint stiff enough to hold its position when the guitar is not in position. A nut and bolt could work with the addition of soft rubber washers, but this increase the parts count, parts cost, and assembly time.

Although much thinner sheet metal has been used for this prototype, it is still much stronger, and heavier, than necessary. Using thinner material would reduce costs because thinner sheet metal is cheaper. Weight could be further reduced by removing material from parts A and C, but this would increase production cost and possibly affect guitar stability through reduced ballast.

Although the unit is far thicker than a standard A Frame in hand, it is more compact when fitted to a guitar as most of the thickness comes from the width of the clamp plates, which overlap the guitar. This means it can stay attached to the guitar and fit inside the case with room to spare.

The fabric used on part C works sufficiently but frays quickly. A fray resistant fabric would be needed for production.

Delta 4.1 - summary

- Cost: unknown because it depends on quantity of units produced, but it can certainly be priced

competitively with A Frames.

Advantages:

The player can sit in a neutral position with both feet flat on the floor. With a little experimentation a stable position can usually be found that requires only three contact points with both thighs and the chest. The additional weight of the unit near the bottom of the guitar helps to stabilise it. As there is less contact area on the edge or back of the instrument than when using a footstool, the guitar is able to resonate at almost its full ability.

If one wishes to align the strings centrally with the body, the guitar can be placed on the plucking side leg and the support will not detach, if the clamps have been tightened sufficiently.

The support has been designed to remain attached to the guitar long-term without causing damage to the instrument or varnish, and is slim enough to fit inside guitar cases.

Disadvantages:

Although the support is strong enough to hold the instrument when positioned on the plucking side leg, the guitar will not be as stable due to having one less contact point with the player.

It is not very easy to adjust the height of the instrument, as both clamps need to be loosened sufficiently to allow it to move, then tightened sufficiently to test the new position. A quick release mechanism was not used because it was designed to stay in position long-term.

Problem:

When lifting the guitar off the leg, the support arm swings and clatters against the rivet. This is not really a problem, just an annoyance.

Solutions:

- Deform the hinge with a hammer so that it is stiffer. Monks tried this method but found it wasn't effective;
- Put a hole in the support arm opposite the rivet. This probably means that the support arm will clatter against edge of the pivoting part instead;
- Use a stiff fabric so it slows down the descent of the support arm. This would need to be very stiff, like leather, which would make it unsuitable for vegans;

- Add a self-adhesive rubber pad.

The rubber pad is probably the best solution.

Delta 4.1 – participant suggestions for improvements

The following suggestions were given by participants in the Delta pilot study:

- The fabric that sits on the leg needs to be sturdier (DS03; DS04; DS16);
- Metal did not look nice (DS03; DS16; DS17);
- Round the corners (DS04; DS17);
- Cover the edges and the stabiliser covers (DS04; DS17);
- Shorten the screws (DS09).

Appendix 4: Delta guitar support study advert

Will You Be Part Of My PhD Study?

As part of my PhD on the injuries of classical guitarists I'm running a trial to assess people's perception of an ergonomic guitar support device that I designed. If you wish to participate, please send me a private message. Read on for details about this project.

The criteria for inclusion in this study are simple, all I ask is that:

- You are UK based (to reduce postage costs and delivery times);
- You play classical guitar almost every day while sitting. It doesn't matter whether you use a footstool or any type of ergonomic support.

Why Am I Doing This Study?

Performance-related injuries amongst musicians is a poorly understood phenomenon, but there is evidence supporting the idea that bad posture, especially when asymmetrical, is a contributing factor. The

classical guitarist's footstool places the player's spine in an asymmetrical position because raising one leg tilts the pelvis and kinks the spine. To avoid this, there are many devices that raise the guitar off the legs so the feet can remain level on the floor. The A Frame is the most compact design and allows a decent amount of adjustability of guitar position but, like most designs, it relies on suction cups, which are unreliable and degrade some guitar varnishes, particularly on hand-made instruments. The Delta guitar support was designed to retain the best aspects of the A Frame (compactness and adjustability) while eliminating the problems associated with suction cups. It is small enough to remain attached when the guitar is stored in a hard case without damaging the varnish.

After completing a baseline questionnaire, each participant will receive a Delta by post to test for 2 weeks before returning it with a prepaid postage label. A link to a video demonstrating how to fit the Delta will be included, as will a link to a video about how to sit well, because ergonomic aids aren't a cure for bad self-use. A second questionnaire will be completed at the end. These questionnaires are at the very end of this post. The results will form part of a PhD thesis as well as a journal article. I expect the trial to start towards the end of January.

Participation & Opting Out

Participation is entirely voluntary and you will receive no compensation. You can leave at any time without giving a reason provided that you return the Delta in the pre-paid return envelope.

Health & Safety

There are no foreseeable risks to your participation, but you may learn a bit about how to use your body more efficiently, comfortably, and safely.

Due to COVID-19 the device will be sanitised before you receive it. For your safety and peace of mind please sanitise it yourself before using it and wash your hands after touching the packaging.

Data Protection

Your details will be kept confidential in an encrypted file. Any references to you in videos or articles

will be anonymised.

Ethics

The study has been ethically approved by the Humanities Research Ethics Advisory Group of the University of Kent.

N.B.: Questionnaires 1 (appendix X) and 2 (appendix X) were included at the end of the advert.

Appendix 5: The MPIIQM

1. What is your age? _____ years

2. Gender: Male Female

3. What instrument do you play in the orchestra? _____

4. With respect to your position in the orchestra, do you work: Full time - Part time

5. For how many years have you played your instrument? _____ years

6. For how many years have you played professionally in an orchestra? _____ years

7. On average, how many hours per week do you spend playing your instrument in the orchestra (this includes rehearsals, performances, recordings)? _____ hours per week

8. On average, how many hours per week do you spend playing your instrument outside orchestra duties (this includes individual practice, chamber music, solo performances, demonstration when teaching, gigs, other)? _____ hours per week

Playing-related musculoskeletal problems are defined as ‘pain, weakness, numbness, tingling, or other symptoms that interfere with your ability to play your instrument at the level to which you are accustomed’. This definition does not include mild transient aches and pains.

9. Have you ever had pain/problems that have interfered with your ability to play your instrument at the level to which you are accustomed? Yes No

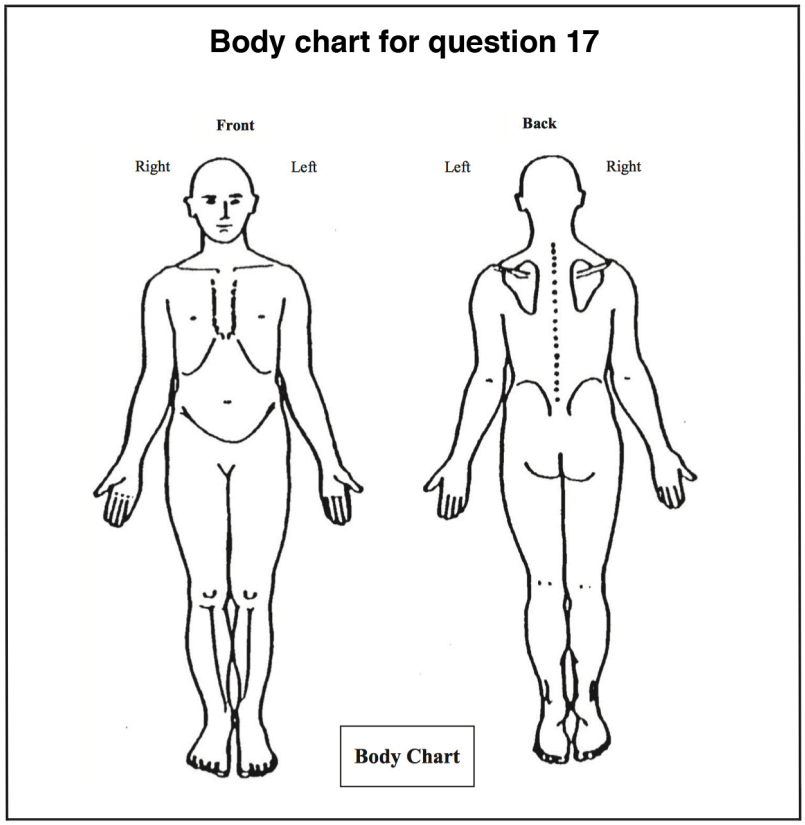
10. Have you had pain/problems that have interfered with your ability to play your instrument at the level to which you are accustomed during the last 12 months? Yes No

11. Have you had pain/problems that have interfered with your ability to play your instrument at the level to which you are accustomed during the last month (4 weeks)? Yes No

12. Currently (in the past 7 days), do you have pain/problems that interfere with your ability to play your instrument at the level to which you are accustomed? Yes No

If your answer to questions 11 and/or 12 is YES, please continue. Otherwise stop here, and hand your survey back or post it back using the stamped addressed envelope provided.

13. On the body chart, SHADE IN each of the areas where you experience pain/problems. Put an X on the ONE area that HURTS the most.



The next four questions relate ONLY to PAIN. Please answer with reference to the ONE area that you marked with an X on the body chart. Otherwise go to Question 18.

14. Please rate your pain by circling the one number that best describes your pain at its worst in the last week.

0 1 2 3 4 5 6 7 8 9 10

No pain - Pain as bad as you can imagine

15. Please rate your pain by circling the one number that best describes your pain at its least in the last week.

0 1 2 3 4 5 6 7 8 9 10

No pain - Pain as bad as you can imagine

16. Please rate your pain by circling the one number that best describes your pain on average in the last week.

0 1 2 3 4 5 6 7 8 9 10

No pain - Pain as bad as you can imagine

17. Please rate your pain by circling the one number that tells how much pain you have right now.

0 1 2 3 4 5 6 7 8 9 10

No pain - Pain as bad as you can imagine

The remainder of the survey relates to both PAIN and/or PROBLEMS.

For each of the following, circle the one number that describes how, during the past week, pain/problems have interfered with your:

18. Mood

0 1 2 3 4 5 6 7 8 9 10

Does not interfere - Completely interferes

19. Enjoyment of life

0 1 2 3 4 5 6 7 8 9 10

Does not interfere - Completely interferes

For each of the following, during the past week, as a result of your pain/problems, did you have any difficulty (please circle ONE number):

20. Using your usual technique for playing your instrument?

0 1 2 3 4 5 6 7 8 9 10

Does not interfere - Completely interferes

21. Playing your musical instrument because of your symptoms?

0 1 2 3 4 5 6 7 8 9 10

Does not interfere - Completely interferes

22. Playing your musical instrument as well as you would like?

0 1 2 3 4 5 6 7 8 9 10

Does not interfere - Completely interferes

Thank you for your participation. Please hand your survey back or post it back using the stamped addressed envelope provided.

Appendix 6: Modifications to the MPIIQM

The following adjustments were made to the MPIIQM (appendix 5):

- The question 'What instrument do you play in the orchestra?' was changed to 'What guitar styles do you play?'
- The questions 'On average, how many hours per week do you spend playing your instrument in the orchestra (this includes rehearsals, performances, recordings)?' and 'On average, how many hours per week do you spend playing your instrument outside orchestra duties (this includes individual practice, chamber music, solo performances, demonstration when teaching, gigs, other)?' were combined into: 'What percentage of your classical playing time is as part of a duo/group?'
- Questions 4 and 6 were omitted for being irrelevant to guitarists due to their orchestral specificity.
- Questions 14 – 22 were omitted because pain intensity and mood disturbance were not of particular interest in this study.

Because the MPIIQM was created for orchestral musicians, the following questions were added related specifically to classical guitar:

- What device do you normally use to support the classical guitar?
- What other devices have you tried?
- What other instruments do you currently play?
- Have you had any significant time off (more than 2 weeks)? Why? When?
- Would you describe yourself as professional, semi-professional, or amateur?

More questions were added to obtain information about early onset of symptoms that are currently not interfering with playing. Although such symptoms do not fall within the definition of PRMDs, they were

deemed pertinent since the exit questionnaire includes questions about physical sensations, not just pain. These questions are based on those in MPIIQM:

- Have you **ever** had pain/problems present during or immediately after playing that have **not** interfered with your ability to play your instrument at the level to which you accustomed?
- Have you had pain/problems present during or immediately after playing that have **not** interfered with your ability to play your instrument at the level to which you are accustomed during the **last 2 months**?
- Have you had pain/problems present during or immediately after playing that have **not** interfered with your ability to play your instrument at the level to which you are accustomed during the **last 4 weeks**?
- Have you had pain/problems present during or immediately after playing that have **not** interfered with your ability to play your instrument at the level to which you are accustomed during the **last 7 days**?
- Were these symptoms present **while** you played?
- Were these symptoms present **after** you played?
- On the body chart, shade in each of the areas where you experience(d) pain/problems. Put an X on the ONE area that hurts (or has hurt) the most.
- Have you ever had treatment for these problems? If so, which ones?

Appendix 7: Questionnaire 1: your experiences with injury

This is the modified version of the MPIIQM used for gathering the data for chapter 5. See appendix 5 for the unaltered MPIIQM, and appendix 6 for the list of changes made to create the questionnaire shown below:

To be completed before starting the study. By completing this questionnaire the participant confirms their informed consent to a part of this study.

1. What is your age? _____ years
2. What is your gender:
3. What guitar styles do you play?
4. For how many years have you played? _____ years
5. What device do you normally use to support the classical guitar?
6. What other devices have you tried?
7. What other instruments do you currently play?
8. Have you had any significant time off (more than 2 weeks)? Why? When?
9. Thinking about the total time spent practising and performing, how many **days** per **week** do you play classical?
10. Thinking about the total time spent practising and performing, how many **hours** per **week** do you play classical?
11. What percentage of your classical playing time is as part of a duo/group?
12. Would you describe yourself as professional, semi-professional, or amateur?

Playing-related Musculoskeletal Disorders

Playing-related musculoskeletal problems (PRMPs) are defined as 'pain, weakness, numbness, tingling, or other symptoms that interfere with your ability to play your instrument at the level to which you are accustomed'. This section relates to problems that fit this definition. Questions 20 onwards related to problems that **did not** affect your level of playing.

13. Have you **ever** had pain/problems that have interfered with your ability to play your instrument at the level to which you accustomed?
14. Have you had pain/problems that have interfered with your ability to play your instrument at the level to which you are accustomed during the **last 2 months**?
15. Have you had pain/problems that have interfered with your ability to play your instrument at the level to which you are accustomed during the **last 4 weeks**?
16. Have you had pain/problems that have interfered with your ability to play your instrument at the level to which you are accustomed during the **last 7 days**?
17. On the body chart (below), shade in each of the areas where you experience(d) pain/problems. Put an X on the ONE area that hurts (or has hurt) the most.
18. Have you ever had treatment for these problems? If so, which ones?
19. If you've been affected by pain, can you describe how it affected your relationship with your instrument?

Problems That Don't Affect Your Playing

This section relates to problems that **did not** affect your level of playing.

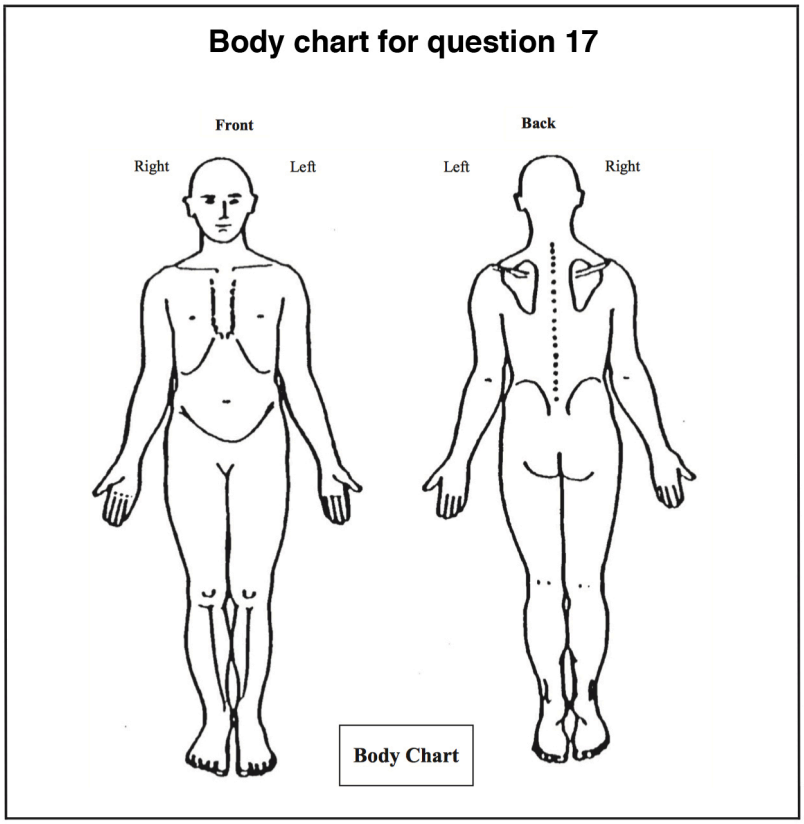
20. Have you **ever** had pain/problems present during or immediately after playing that have **not** interfered with your ability to play your instrument at the level to which you accustomed?
21. Have you had pain/problems present during or immediately after playing that have **not** interfered with your ability to play your instrument at the level to which you are accustomed during the **last 2 months**?
22. Have you had pain/problems present during or immediately after playing that have **not** interfered with your ability to play your instrument at the level to which you are accustomed during the **last 4 weeks**?

23. Have you had pain/problems present during or immediately after playing that have **not** interfered with your ability to play your instrument at the level to which you are accustomed during the **last 7 days**?

24. Were these symptoms present **while** you played?

25. Were these symptoms present **after** you played?

26. On the body chart (below), shade in each of the areas where you experience(d) pain/problems. Put an X on the ONE area that hurts (or has hurt) the most.



27. Have you ever had treatment for these problems? If so, which ones?

Appendix 8: Questionnaire 2: your experience with the Delta

These questions were created for the gathering of data for chapter 5 and were not based on any pre-existing questionnaire. The questionnaire is as follows:

To be completed at the end of the study.

1. How did it feel to use the Delta over the course of the trial?
2. How did it feel for your legs, back, arms, hands?
3. Did you experience sensations in your back/arms/hands during the trial that were different from before?
4. If you previously had unresolved issues reported in Questionnaire 1: were they affected by this trial?
5. Does the Delta enable you to position the guitar how you want?
6. Would you consider using the Delta long-term?
7. Do you have any suggestions for improvements for the Delta?

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