

Institution: Royal College of Music
Unit of Assessment: 35 - Music, Drama, Dance and Performing Arts
Title of case study: ENHANCING MUSICIANS' HEALTH AND WELLBEING
1. Summary of the impact

Physical and mental health can shape how musicians pursue their art and the pleasure they take from it. The results of recent research, however, suggest that pain and ill health are widespread among musicians and that healthy approaches to making and working in music are far from uniform throughout the profession. Since 2000, the RCM Centre for Performance Science (CPS), led by Professor Aaron Williamon, has forged a distinctive programme of research designed to promote healthy music making and facilitate long, productive performing careers. Results have informed health promotion initiatives in music educational and professional contexts across Britain and internationally.

2. Underpinning research

The RCM's *Zoning In* project (funded by Leverhulme 1999-02) [G1] set out to enhance musicians' learning and performance through systematic training in neurofeedback, mental skills and aerobic exercise. While evidence for the robust and transformative impact of these interventions for musicians is well-documented (see Chapters 9-12 of Williamon's *Musical Excellence*, Oxford 2004), the research also revealed widespread health problems among music students. They commonly reported performance-related pain and discomfort, performance anxiety and occupational stress, all of which were experienced as significant barriers to achieving successful careers in music.

Consequently in 2003, Williamon and Sam Thompson (RCM Research Associate 2000-04) conducted a large-scale survey of the incidence and severity of music students' performance-related physical and mental health problems [1]. The findings confirmed that pain and discomfort relating to posture and excessive practising were frequent, as was performance anxiety. Furthermore, students showed a predilection to turn first to their instrumental teachers for guidance on health problems before seeking advice (if at all) from qualified health professionals.

Given the degree of problems documented, the focus of research shifted to explore the extent to which musicians promote their health in daily life. In collaboration with Jane Ginsborg (RNCM) and Gunter Kreutz (Oldenburg University), Williamon collected responses from approximately 300 musicians on inventories measuring the frequency and type of health-promoting behaviours and performance-related musculoskeletal problems [2]. Compared with age-matched non-musicians, the musicians scored significantly lower on three key health promoting factors: health responsibility, physical activity and spiritual growth. Moreover, they rated their overall health lower than non-musicians and reported a wider range of pain and fatigue symptoms, which they also rated as more severe.

Faced with this rather bleak picture of the state of musicians' health, the CPS has since embarked on an ambitious programme of applied research aimed at enhancing musicians' physical and psychosocial wellbeing. Recent studies have, for instance:

- i. demonstrated how short interventions of proprioceptive training can help restore the brain's sensorimotor organisation in pianists with focal dystonia (Williamon and Karin Rosenkranz, RCM Research Fellow 2007-08, with UCL Institute of Neurology) [3],
- ii. pioneered new avenues for analysing physiological stress signatures when musicians perform under pressure in public (Williamon and Lisa Aufegger, RCM PhD Student 2012- , with Imperial College Department of Electrical and Electronic Engineering) [4],
- iii. implemented a comprehensive hearing screening programme for student and professional musicians (Williamon, with UCL Ear Institute) [5],
- iv. examined the value and feasibility of implementing health promotion and physical fitness programmes for musicians in educational and professional contexts (Williamon and RCM

Impact case study (REF3b)

Research Fellows Tania Lisboa and Rosie Perkins, with University of Calgary Department of Clinical Neurosciences and Cardiff Metropolitan University School of Sport) [6].

Across this body of research, the CPS has set out to generate new knowledge of musicians' health and wellbeing, broadly defined. Contributions have been both conceptual and methodological, distinguished by an imperative to engage directly with issues of practical relevance to musicians and enabled by the RCM's vibrant musical environment. The CPS continues to exert its leadership in the field, as evidenced by two major AHRC-funded projects announced in 2013: *Musical Impact* [G2] and *Creative Practice as Mutual Recovery* [G3] (see Section 4).

3. References to the research

- [1] Williamon, Thompson (2006), Awareness and incidence of health problems among conservatoire students, *Psychology of Music*, vol.34, pp.411-430.
- [2] Ginsborg, Kreutz, Thomas, Williamon (2009), Healthy behaviours in music and non-music performance students, *Health Education*, vol.109, pp.242-258. See also Kreutz, Ginsborg, Williamon (2008), Music students' health problems and health-promoting behaviours, *Medical Problems of Performing Artists*, vol.23, pp.3-11. Kreutz, Ginsborg, Williamon (2009), Health-promoting behaviours in conservatoire students, *Psychology of Music*, vol.37, pp.47-60.
- [3] Rosenkranz, Butler, Williamon, Rothwell (2009), Regaining motor control in musician's dystonia by restoring sensorimotor organization, *Journal of Neuroscience*, vol.29, pp.14627-14636. See also Rosenkranz, Williamon, Butler, Cordivari, Lees, Rothwell (2005), Pathophysiological differences between musician's dystonia and writer's cramp, *Brain*, vol.128, pp.918-931. Rosenkranz, Williamon, Rothwell (2007), Motorcortical excitability and synaptic plasticity is enhanced in professional musicians, *Journal of Neuroscience*, vol.27, pp.5200-5206. Rosenkranz, Butler, Williamon, Cordivari, Lees, Rothwell (2008), Sensorimotor reorganization by proprioceptive training in musician's dystonia and writer's cramp, *Neurology*, vol.70, pp.304-315.
- [4] Williamon, Aufegger, Wasley, Looney, Mandic (2013), Complexity of physiological responses decreases in high stress musical performance, *Journal of the Royal Society Interface*, vol.10 (no.89), pp.1-6.
- [5] Backus, Williamon (2009), Evidence of noise-induced hearing loss among orchestral musicians, in Williamon, Pretty, Buck (eds.), *Proceedings of the International Symposium on Performance Science* (pp.225-230), European Association of Conservatoires (AEC).
- [6] Clark, Lisboa (2013), Training for sustained performance: Moving toward long-term musician development, *Medical Problems of Performing Artists*, vol.28, pp.159-168. See also Williamon, Wasley, Perkins, Ginsborg, Hildebrandt (2009), Profiling musicians' health, wellbeing, and performance, in Williamon, Pretty, Buck (eds.), *Proceedings of the International Symposium on Performance Science* (pp.85-90), European Association of Conservatoires (AEC). Clark, Williamon, Redding (2013), The value of health screening in music schools and conservatoires, *Clinical Rheumatology*, vol.32, pp.497-500. Wasley, Taylor, Backx, Williamon (2012), Influence of fitness and physical activity on cardiovascular reactivity to musical performance, *Work: A Journal of Prevention, Assessment and Rehabilitation*, vol.41, pp.27-32.

Grants

- [G1] Williamon (PI), with CIs Ritterman, Gruzelier, Taylor, Connolly (1999-02), *Zoning In: Motivating the Musical Mind*, The Leverhulme Trust, £288,500 (Ref. F/11/G).
 - [G2] Williamon (PI), with Co-PIs Redding, Ginsborg and CIs Wasley, Reid, Watson, Broad (2013-17), *Musical Impact*, AHRC, £802,740 (Ref. AH/K002287/1).
- Williamon (CI), with PI Crawford and CIs Brown, Hogan, Lewis, Manning, Wilson (2013-18), *Creative Practice as Mutual Recovery*, AHRC, £1.2 million (Ref. AH/K003364/1).

4. Details of the impact

Promoting musicians' health

CPS research has shaped attitudes and driven the health promotion agenda in higher music education and more broadly within the profession. In 2009 for instance, Williamon collaborated with staff of the Guildhall School of Music and Drama to design *Body Matters*, a module based on evidence-informed health initiatives at the RCM and since delivered to approximately 30 UG and PG students annually [S1]. Similarly in 2013, the Conservatorio della Svizzera Italiana (Switzerland) launched a module on musicians' health and fitness, designed by Williamon and delivered by performance scientists at the Conservatorio to over 50 UG students thus far [S2]. Since 2000, several health-related curriculum initiatives have emerged across the UK conservatoire sector, including those at the RNCM, RWCMD and Trinity Laban, informed by (and often mirroring) those instituted by the CPS within the RCM's own programmes. The CPS has also partnered with the UCL School of Medicine, British Association of Performing Arts Medicine (BAPAM) and Trinity Laban's Department of Dance Science to offer the world's first MSc in Performing Arts Medicine. Based at UCL and run in parallel with the RCM's MSc in Performance Science, the programme trains health professionals to identify and treat injuries and ill-health experienced by performing artists [S3]. Since 2011, over 20 health professionals have received training, supplying the next generation of doctors, physiotherapists, counsellors and so on to work within BAPAM and other international performing arts medicine clinics.

The impact of the CPS on the occupational health of professional musicians continues to be significant. Williamon is a founder member of BAPAM's Education and Training Advisory Group (2009); the Group's activities, which has included a nation-wide health promotion seminar series for music teachers and an online Health Advice Resources Area, has been directly informed by CPS research [S4]. Williamon also worked in an advisory capacity in the establishment of the Portuguese Association for Performing Arts Medicine, launched in 2010. Setting the agenda for the next decade, the CPS unveiled two major initiatives in 2013. *Musical Impact*, the largest study of its kind worldwide, is a four-year AHRC-funded project (awarded February 2013) that seeks to generate new knowledge of chronic and acute health problems of musicians and to test effective solutions [G2]. *Creative Practice as Mutual Recovery*, a five-year AHRC-funded project with the University of Nottingham Institute of Mental Health (awarded February 2013), builds upon the growing body of evidence showing that learning to make music can offer significant mental health benefits for NHS service users and older adults; less is known, however, about the benefits for the musicians who facilitate such work. This project directly examines the hypothesis that musicians *and* their learners can, through shared musical experiences, mutually enhance wellbeing and develop more meaningful and resilient lives [G3].

Protecting musicians' hearing

Arising from the health promotion research, the CPS has collaborated since 2008 with the UCL Ear Institute and the engineering firm Audio3 to conduct comprehensive hearing screening programmes for student and professional musicians and to develop noise monitoring procedures for beneficiaries including the Royal Opera House. The hearing research has informed the design of Audio3's *SoundScreener*, a new low-cost touchscreen audiometer tested in a first phase with 10,000 people through Deafness Research UK and now being tested in phase 2 exclusively with RCM musicians, prior to a planned roll-out across member institutions of Conservatoires UK in 2015. In addition, the noise monitoring research was the catalyst for the development of Audio3's *SoundBadge*, the world's smallest wearable noise dosimeter and sound level meter system [S5].

Addressing performance-related stress

Acknowledging the high incidence and profound effect of performance anxiety among musicians, the CPS collaborated with Imperial College Department of Bioengineering and the Royal Academy of Engineering in *Virtuoso Stress* (June 2008), an interactive concert at the Science Museum's Dana Centre featuring a live experiment using bioengineering equipment to measure musicians' heart rate, breathing rate and stress response as they performed [S6]. In 2012, the CPS unveiled its *Performance Simulator*; built in collaboration with the creative design firm Studiohead [S7], the simulator offers musicians a realistic space in which to 'practise' performing in front of an interactive, virtual audience or audition panel. The simulator was featured in a 30-minute

Impact case study (REF3b)

documentary, 'The scalpel and the bow', broadcast as part of the BBC Radio 3 series *Between the Ears* (January 2013), and on Radio 3's *Music Matters* (April 2013) [S9]. In July 2013, it was transported to the Cheltenham Music Festival and showcased as part of *What's it Like to be a Performer?*, where members of the public were able perform 'on stage' in front of the simulated audience [S9].

Developing dialogue

CPS research into musicians' health and wellbeing has been disseminated widely via the *International Symposium on Performance Science* (ISPS) and its associated published Proceedings. Founded by Williamon in 2007, in part to spark dialogue and debate on the very latest findings into musicians' health, the first ISPS was convened at Porto's iconic *Casa da Música*, with subsequent conferences in Auckland (2009), Toronto (2011) and Vienna (2013), all of which have been co-chaired by Williamon. Thus far, over 700 delegates from more than 30 countries have attended the conferences, a majority of whom are themselves performers, teachers or otherwise engaged in portfolio musical careers. At least one keynote speech at each event has addressed musicians' health, and through the many spoken papers, posters and workshops devoted to this topic, delegates have gained: (i) an increased awareness of the state of the art in the field, (ii) a forum for sharing and building good practice, drawn from international perspectives, and (iii) an online repository of research papers, freely available at www.performancescience.org.

It is common for research from the symposia to capture public attention, as evidenced with the recent 25-minute summary of ISPS 2013, *Performance Science: Die Wissenschaft entdeckt das Musizieren*, broadcast on Austrian Radio 1 (Ö1) [S10]. The forthcoming ISPS will be convened in Kyoto in 2015.

5. Sources to corroborate the impact

- [S1] Guildhall School of Music and Drama, Academic Studies:
www.gsmd.ac.uk/music/courses/undergraduate/academic_studies/electives_years_3_4.
- [S2] Conservatorio della Svizzera Italiana, Divisione Ricerca e Sviluppo:
www.artisticresearch.ch.
- [S3] UCL School of Medicine, MSc in Performing Arts Medicine:
www.ucl.ac.uk/surgicalscience/departments_research/iseh/msc_performing_arts_medicine.
- [S4] British Association for Performing Arts Medicine, Education and Training Advisory Group:
www.bapam.org.uk/teach_edu.html.
- [S5] Audio3 Ltd: <http://audio-3.com>.
- [S6] Science Museum, Dana Centre: www.danacentre.org.uk/events/2008/06/17/405.
- [S7] Studiohead Ltd: www.studiohead.com/?projects=musical-performance-simulator.
- [S8] BBC Radio 3, The Scalpel and the Bow: www.bbc.co.uk/programmes/b01ptw12;
BBC Radio 3, Music Matters: www.bbc.co.uk/programmes/b01rr6lc.
- [S9] Cheltenham Music Festival, What's it Like to be a Performer?:
www.cheltenhamfestivals.com/music/whats-on/2013/what-s-it-like-to-be-a-performer.
- [S10] Austrian Radio 1 (Ö1), Performance Science: Die Wissenschaft entdeckt das Musizieren:
<http://oe1.orf.at/programm/353941>.