

Considering musicians' health and wellness literature through the lens of the Behaviour Change Wheel

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Abstract

Performing Arts Medicine (PAM) specialists have identified a variety of health conditions that interfere with musicians' careers and leisure activities. To date, health promotion initiatives have emphasised education and training to try and help musicians understand their bodies and persuade them to engage in health-promoting behaviours: such initiatives often focus on isolated bodily systems (e.g. musculoskeletal, vocal or hearing health, or psychological wellness). Outcomes of interventions have been mixed and the prevalence of performance-related conditions remains persistently high. PAM specialists have started to recognise that effective health promotion requires a sound theoretical framework that accounts for the interplay between myriad factors that influence musicians' lives. Behaviour change specialists have made significant advances in establishing frameworks synthesising influences on behaviour and what can be done to change behaviour. The Behaviour Change Wheel (BCW) revolves around the idea that an individual's *behaviour* is influenced by their physical and psychological *capabilities*, physical and social *opportunities*, and *motivation* (the 'COM-B' model). This framework places individual factors into a societal context and fosters consideration of the body as an integrated system. The current review focuses on considering PAM literature through the lens of the COM-B model to determine what has been achieved, identify research gaps, and provide information to support the behavioural diagnosis phase of new interventions. Readers will also be introduced to subsequent phases of the BCW including nine strategies ('intervention functions') for changing behaviour known as ('Education', 'Training', 'Persuasion', 'Environmental restructuring', 'Modelling', 'Enablement', 'Restriction', 'Coercion', and 'Incentivisation') and criteria for selection of the smallest building blocks that combine to form BCW interventions ('behaviour change techniques'). This review will be of interest to performers, educators, organisations that employ and support musicians, healthcare practitioners, and musicians' health and wellness researchers.

1. Performing Arts Medicine and the Behaviour Change Wheel

The positive influence of music on health and wellness cannot be denied; however, as Gembris notes, there must be a balance between ‘health as a resource for making music and making music as a resource for health’ (2012: 371). It is now well established that musicians can be adversely affected by health conditions relating to work, study or leisure activities and environments; these conditions can be referred to collectively as ‘Performance-Related Problems’ or PRPs (see Norton, 2016). Musical activities may include performance (e.g. as a performing musician or conductor), developing or facilitating music education (e.g. as an instrumental or vocal teacher, classroom teacher or musicologist), creating or enabling access to particular musical resources and materials (e.g. as a composer or music technology specialist), or using music in a therapeutic context (e.g. as a music therapist). To date, the majority of Performing Arts Music (PAM) research has focused on professional and pre-professional performers but there is increasing awareness of the need to work with musicians from a range of disciplines to enable cultural change across musical populations.

The discipline of PAM began to develop formally in the 1980s (Chong et al., 1989) and there is now a wide range of disciplines, organisations, and publications dedicated to investigating, documenting, treating, managing and preventing PRPs. Research indicates that PRPs affect musicians physically, psychologically, socially and financially (Guptill, 2011; MacNamara, Holmes and Collins, 2006; Paarup, Baelum, Holm, Manniche and Wedderkopp, 2011; Schoeb and Zosso, 2012). PRPs are often categorised according to the bodily system that they relate to: for example, those affecting the musculoskeletal system (often referred to as ‘performance-related musculoskeletal disorders’ or PRMDs; see Zaza, Charles and Muszynski, 1998), the hearing system (including noise-induced hearing loss and other hearing conditions), the vocal system (including inflammatory conditions and vocal fold pathologies), and more psychological and/or socially influenced conditions such as Music Performance Anxiety (MPA) or generalised anxiety or depression. However, researchers and healthcare professionals are increasingly emphasising the interdependence of bodily systems and the need to consider health and wellness holistically rather than in relation to isolated bodily systems. Doing so calls for inter-disciplinary collaboration between PAM and music specialists and a theoretical framework that considers influences on the whole person.

PAM research is increasingly able to describe the symptoms of PRPs as well as the factors most likely to put musicians at risk of developing certain conditions (for a review, see Norton, 2016: 7-22). Some factors are not directly modifiable but others relating to musicians’ behaviours or environment can be changed. For example, vocal disorders can be caused by behaviours that misuse or abuse the voice, such as talking excessively, rapidly, or loudly (see Heman-Ackah, Sataloff and Hawkshaw, 2013; Watson, 2009). Posture and technique are often identified as contributing to the development of PRMDs (Blanco-Piñero, Díaz-Pereira and Martínez, 2015; Ramella, Fronte and Converti, 2014). Behaviours that modify exposure to loud noise can help musicians avoid hearing problems (Olsen, Gooding, Shikoh and Graf, 2016). Kenny (2011) states that MPA can affect musicians regardless of age, training, or ability and being fully prepared for performance is not a guarantee against experiencing MPA; however, she also states that behaviours used to prepare for, deliver, and reflect on performance can affect musicians’ reactions to the demands associated with performance. This paragraph identifies just some of the many behavioural risk factors that have been linked to the development of musicians’ PRPs.

Identification of musicians’ behaviours as factors associated with PRPs has led to many suggesting that such behaviours should be the target of health promotion interventions; related research papers are reviewed in this article. Behaviour change is occasionally identified as the focus of investigations and research in the PAM literature, but usually the intention to address behaviour is implied through the type of interventions used rather than stated at the outset. Unfortunately, many PAM specialists have fallen prey to designing interventions that follow the ‘ISLAGIATT’ model: i.e. ‘It Seemed Like A Good Idea At The Time’ (credit to Martin Eccles for this term). Very rarely is a theoretical framework for behaviour change identified, which means that intervention designers (IDs), however well-

intentioned, are likely to fall foul of six behaviour change common errors identified by Kelly and Barker (2016:110-113):

1. Changing behaviour ‘is just common sense’
2. Changing behaviour is ‘about getting the message across’
3. ‘Knowledge and information drive behaviour’
4. ‘People act rationally’
5. ‘People act irrationally’
6. ‘It is possible to predict accurately’

Despite PAM researchers’ engagement with a range of disciplines – including music psychology, performance psychology, sports psychology and medicine, occupational health and well-being, and general medicine – a recent systematic review of PAM research states ‘the absence of theory-driven research limits the progress that can be made in this field and the development of evidence-based interventions’ (Willis, Neil, Mellick and Wasley 2019: 16). Clark and Lisboa (2009) support this conclusion, highlighting the need for interventions to be based on conceptual frameworks. This problem is not unique to PAM, as evidenced by the Medical Research Council’s guidance for developing complex interventions that asks the following questions: ‘Does your intervention have a coherent theoretical basis? Have you used this theory systematically to develop the intervention?’ (Craig, Dieppe, Macintyre, Michie, Nazareth and Petticrew, 2008: 4). It is therefore necessary to identify appropriate contemporary approaches that can respond to the activities and environments encountered by performing artists. Some PAM researchers¹ have started to engage with a range of theories and research² from the disciplines of health psychology and behaviour change. The Behaviour Change Wheel (BCW) is one such approach that synthesises 19 behaviour change frameworks collated from the research literature (Michie, Atkins and West, 2014a). The BCW is contemporary, grounded in a thorough review of relevant literature, developed by experts in behaviour change, ‘sufficiently broad that it could be applied to any behaviour in any setting’ (Michie et al., 2014a: 17), and is already widely applied within general health settings: for these reasons, this model could be ideal for use in PAM.

The Behaviour Change Wheel is the result of a systematic process that included evaluation of existing frameworks and the synthesis of a new framework that is comprehensive, coherent, and linked to overarching behavioural models (Michie, van Stralen and West, 2011). The initial paper has been cited over 1500 times to date and high demand led the authors to produce the 2014 publication ‘The Behaviour Change Wheel: A Guide to Designing Interventions’ (Michie et al., 2014a). When depicted as a figure, the BCW is structured in three concentric layers. Three main sources of behaviour comprise the central ‘hub’, which is known as the ‘COM-B’ model: Capability (Physical and Psychological), Opportunity (Social and Physical), and Motivation (Automatic and Reflective). Nine ways of influencing the sources of behaviour (known as intervention functions) surround the central ‘hub’: Education, Training, Persuasion, Environmental restructuring, Modelling, Restrictions, Enablement, Incentivisation, and Coercion. Finally, an outer layer identifies seven policy categories: Communication/Marketing, Service provision, Environmental/Social planning, Regulation, Legislation, Guidelines, and Fiscal measures.

¹ See publications by Ackermann (2019), Andersen, Roessler, and Eichberg (2013), Araújo, Wasley, Perkins, Atkins, Redding, Ginsborg and Williamson (2017), Chan and Ackermann (2014), Clark and Lisboa (2013), Hackworth (2007), Laursen and Chesky, 2014; Matei, Broad, Goldbart and Ginsborg (2018), Olsen, Gooding, Shikoh and Graf (2016), Parker, Jimmieson and Amiot (2019), Perkins, Reid, Araújo, Clark and Williamson (2017), and Shoebridge, Shields and Webster (2017).

² These include behaviour change techniques (Michie, Abraham, Whittington, McAteer and Gupta (2009), health literacy (Nutbeam, 2000, 2008; WHO, 2016), the Health Settings Approach (Dooris, Cawood, Doherty and Powell, 2010), Health Belief Model (Orji, Vassileva and Mandryk (2012), Health Promotion Model (Pender, 2011), Theory of Planned Behaviour (Ajzen, 1991) Transtheoretical Model of Health Behaviour Change (Prochaska and Marcus, 1994; Prochaska and Velicer, 1997), Precaution Adoption Process (Weinstein, 1988), Implementation Science/Research (Bhattacharyya, Reeves and Zwarenstein, 2009; Damschroder et al., 2009), Conservation of Resources (Hobfoll, 1989), Self-Determination Theory (Gagné and Deci, 2005), and others less formally named (Baranowski, Cerin and Baranowski, 2009; Dehar, Casswell and Duignan, 1993; Jurg, de Meij, Van der Wal and Koelen, 2008; Stetler et al., 2006).

Michie et al. (2014a) identify three stages when designing BCW interventions:

- i. Understanding the behaviour,
- ii. Identifying intervention options, and
- iii. Identifying content and implementation options.

To fulfil the first stage of this design process IDs must define the problem in behavioural terms, select target behaviour(s), specify the target behaviour (in terms of who does it, where, when, how often, and with whom), and identify what needs to change. Target behaviours relating to the development of PRPs have been identified by PAM researchers. These are often referred to as modifiable risk factors and include behaviours that influence PRPs across the physical and psychological spectrum (some examples were provided above). The aim of this article is to review existing intervention-style research (rather than design a new intervention) so specifying target behaviours is not possible. However, the final step in the initial design stage ('identify what needs to change') will be given considerable attention here as a result of the potential value of the COM-B model for understanding influences on musicians' health-promoting behaviours.

The COM-B model assumes that 'for any behaviour to occur at a given moment, there must be the capability and opportunity to engage in the behaviour, and the strength of motivation to engage in it must be greater than for any competing behaviours' (Michie et al., 2014b: 86). Capability relates to the psychological knowledge and skills that enable musicians to perform behaviours and/or the physical skill, strength and stamina required to do them: for example, a musician's ability to understand the role of good posture for health and performance and organise their posture accordingly. Opportunity relates to 'all the factors extrinsic to a person that either prompt the behaviour or allow enactment of the behaviour' (Michie et al., 2014b: 86), which can include physical and social opportunities. Physical opportunities are influenced by time, resources, access and environment, and social opportunities relate to norms and culture. For example, a musician's position within a space or the equipment that is available may affect posture, and the behaviours of those around may also exert an influence. Finally, motivation is defined as 'the processes in the brain that energise and direct behaviour' (Michie et al., 2014b: 86)³ which includes reflective conscious decision-making processes and more impulsive and emotional automatic processes. So a musician's emotional state may affect their posture or they may have set conscious goals to generate a particular posture.⁴ Capability, opportunity and motivation have a two-way relationship with behaviour but capability and opportunity can also indirectly affect behaviour by influencing motivation (see Figure 1 of Michie et al., 2011): for example, someone's motivation to play an instrument may be enhanced if they have an instrument or if they show capability with that instrument. Determining which of the COM-B domains is influencing target behaviours can be achieved by reviewing existing cross-sectional studies and interventions that identified and addressed target behaviours. Alternatively, IDs can collect primary data from the population of interest or key stakeholders using interviews, focus groups, or questionnaires (see Michie et al., 2014a: 67-71). It is important to consider whether there is a need for change across *all six* areas of the COM-B domain rather than just assume that change needs to occur in only *one* area. This vital behavioural diagnosis stage of intervention planning is not currently happening within most PAM research.

This review focuses mainly on considering PAM literature through the lens of the COM-B model to determine what has been achieved to date, identify research gaps, and provide information to support the behavioural diagnosis phase of new PAM interventions. The journal *Medical Problems of Performing*

³ To understand more about motivation and the various principles and theories that affect motivation read West and West's book 'Energise: The Secrets of Motivation' (2019).

⁴ Reflective motivation and psychological capability can be difficult to differentiate so the more finely grained Theoretical Domains Framework (TDF) can prove useful when considering these domains (Cane, O'Connor and Michie, 2012). In brief, psychological capability encompasses knowledge, cognitive and interpersonal skills, memory, attention and decision processes, and behaviour regulation whereas reflective motivation relates to identity, optimism, intentions, goals, beliefs about capabilities or beliefs about consequences of an action (Michie et al., 2014a: 92).

Artists (MPPA) is the only English-language publication dedicated solely to PAM. By reading the abstracts of all MPPA publications from the years 2000-2019 (volumes 15-34) I located 49 music-related articles that investigated the effect(s) of a particular behavioural intervention on musicians' health and wellness.⁵ None of these papers explicitly stated that they were addressing an aspect of the COM-B model so I coded the interventions by matching each study's primary focus (as expressed in the abstract) to COM-B model domains. From 2000 to 2019 the majority of – intervention-type research with musicians published in *MPPA* focused on trying to improve individual musicians' health and wellness by changing behaviours relating to physical capability. Research focusing on changing psychological capability and physical opportunity were next most prevalent with only rare examples of interventions focusing on social opportunity and none on motivation. A wider search for similar studies from the same time period in other journals that publish relevant material yielded ten additional studies⁶, most of which addressed more than one of the six COM-B domains. In addition to papers that include active intervention style research I also synthesised conclusions from 83 publications that make recommendations for future health promotion interventions for musicians. Recommendations from this final group of articles focused mostly on social opportunity, followed by physical opportunity, psychological capability and physical capability, with a low proportion of publications focusing on motivation. Publications relating primarily to capability, opportunity, and motivation are considered in the following sections followed by publications that relate to more than one COM-B domain or that are noteworthy for their use of a sound conceptual framework. Many health promotion initiatives for musicians are not recorded in peer-reviewed journals, so I have included relevant examples of commercial and charitable activities and resources commonly accessed by musicians to add practical content to this discussion. Following on from the analysis of PAM literature in relation to the COM-B model is an introduction to some of the further steps involved in designing an intervention using the BCW including a brief overview of intervention functions and behaviour change techniques relating to PAM contexts.

2. Capability

PAM publications often assume that musicians' engagement in health-promoting behaviours depends on changing their physical capability, which could be achieved through training and exercise programmes, movement optimisation, or surgery. Most commonly, researchers have focused on interventions that aim to reduce performers' pain or the prevalence of PRMDs using exercise or retraining programmes (Ackermann, Adams and Marshall, 2002; Andersen, Mann, Juul-Kristensen and Sogaard et al., 2017; Berque, Gray and McFadyen, 2010 and 2013; Cerveró et al., 2018; Chan, Driscoll and Ackermann, 2014; de Greef et al., 2003; de Lisle, Speedy and Thompson, 2010; Kava, Larson, Stiller and Maher, 2010; Lundborg and Grooten, 2018). Taking part in musical performance (including conducting⁷) involves high physical demands and, as a result, a high level of physical fitness and activity could be valuable for musicians (Drinkwater and Klopper, 2010; Wasley, Taylor, Backx and Williamon, 2012), particularly those who take part in particularly active musical ensembles such as marching bands (Beckett, Seidelman, Hanney, Liu and Rothschild, 2015; Moffit, Russ and Mansell, 2015). De Figueiredo and colleagues (2014) also reported an association between increased physical activity and decreased MPA, suggesting that physical stamina and strength may help musician's psychological health. Another common strategy has been to design interventions aimed at optimising physical movements and reducing energy expenditure to enhance performance quality (Baadjou et al., 2011, 2017; Dora, Conforti and Güsewell, 2019; Lee, Carey, Dubey and Matz, 2012; Wolf, Thurmer, Berg, Cook and Smart, 2017). There is also cross-sectional research that identifies aspects of musicians' physical capability that could be

⁵ To be included papers had to focus on musicians rather than other performing artists and have an active intervention-style component that sought to change musicians' behaviours to influence health and wellness.

⁶ These articles also focus on the effects of an active intervention designed to improve musicians' health and wellness by changing an aspect of behaviour and were published between 2000 and 2019 in journals that regularly publish PAM literature focusing on musicians: i.e. *Frontiers in Psychology*, *Psychology of Music*, the *International Journal of Music Education*, *Update: Applications of Research in Music Education*, and the *Journal of Voice*.

⁷ Jaque, Karamanukyan and Thomson (2015) published a rather unusual paper outlining a case study with two conductors that revealed high physiological demands associated with professional orchestral conducting.

targeted by future interventions: for example, postural flaws in upper string players (de Araújo, Cárdua, Másculo and Lucena, 2009; Park et al., 2012; Smithson, Smith, McIlvain, Timmons, 2017), bowing arm and torso movement in cellists (Hopper et al., 2017; Rickert, Barrett, Halaki, Driscoll and Ackermann, 2012), and head and spine position in pianists (Clemente et al., 2014). Less commonly, there are papers reporting on the outcomes of surgical interventions with singers (Caffier et al., 2017; Catani et al., 2016) and instrumentalists (Ell, 2002; Ragoowansi and Winspur, 2008). Two surgeons highlight the low proportion of musicians presenting with upper limb symptoms for whom surgery is an appropriate choice, but also emphasise the essential role that surgery can play in those limited cases (Winspur and Wynn Parry, 2000). For a cellist to achieve a full return to playing following surgery, Robinson (2003) emphasised the importance of addressing physical and psychological capability through patient education and physical therapy.

PAM researchers frequently state that capability to engage in healthy behaviours needs to be encouraged throughout musicians' development and professional careers and many have recommended improving musicians' capability through educational sessions and courses (see, for example, Barton et al., 2008; Miller, Stewart and Lehman, 2007; Olsen et al., 2016; Monino, Rosset-Llobet, Juan, Manzanares and Ramos-Pichardo, 2017; Vitzthum et al., 2013). These recommendations are often related to literature identifying poor awareness and understanding of PRPs, risk factors for PRPs, and how to prevent PRPs among various populations (Ling, Loo and Hamedon, 2016; Lonsdale, Laakso, and Tomlinson, 2014; Lozano, Yugero and Fenoll, 2008; McIlvaine, Stewart and Anderson, 2012; Spahn, Nusseck and Zander, 2014; Wilke, Priebus, Biallas and Froböse, 2011). The availability of educational sessions has increased as a result of the efforts of specialist charities such as the British Association for Performing Arts Medicine (BAPAM), music organisations, local music hubs, musicians' employers and educational institutions (see Manchester, 2007a, b, c). Matei, Broad, Goldbart and Ginsborg (2018) point out that a low proportion of health education programmes are formally evaluated even though such courses are available to many music students. Some capability-focused interventions situated within tertiary educational institutions have been evaluated and published (Árnason, Briem and Árnason, 2018; Barton and Feinberg, 2008; Martin Lopez and Martinez, 2013; Spahn, Hildebrandt and Seidenglanz, 2001; Zander, Voltmer and Spahn, 2010) and two papers report on interventions focusing on enhancing music students' psychological capability for engaging in protective hearing health behaviours (Curk and Cunningham, 2006⁸; Zeigler and Taylor, 2001). Similar courses are available to professional musicians but it is even rarer that they are evaluated and published: one exception is an article reporting the effects of participating in intensive opera training programmes⁹ on professional singers' performance, emotional regulation, self-esteem, shame, trait perfectionism and trait anxiety (Thomson, Jaque and Baltz, 2017). Considering the number of educational sessions and programmes available to musicians there are disproportionately few articles reporting evaluated and published interventions that focus on capability.

Music Performance Anxiety (MPA) can be a debilitating and career-threatening condition for performing musicians (Kenny, 2011). Interventions aimed at addressing MPA at an individual level often focus on enhancing a musician's physical and/or psychological capability using recognised techniques or approaches such as psychological therapies applied with or without pharmacological support (Berg, King, Koenig and McRoberts, 2018; Kenny, Arthey and Abbass, 2014; Juncas and Markman, 2016; Nagel, 2010), yoga (Stern, Khalsa and Hofmann, 2012), meditation (Chang, Midlarsky and Lin, 2003), relaxation breathing techniques (Su et al., 2010), virtual reality training (Bissonnette, Dubé, Provencher and Sala, 2015), or improvisation and desensitization (Kim, 2005). Psychological interventions often include a range of techniques: for example, an intervention with female high school musicians in Australia included 'psychoeducation, cognitive restructuring and relaxation techniques, identification of strengths, goal-setting, imagery and visualization techniques' (Braden, Osborne and Wilson, 2015:1).

⁸ This study included an additional physical opportunity component by providing participants with free hearing protection devices.

⁹ The OperaWorks curriculum included sessions relating to performance technique, acting, improvisation, coaching, Alexander Technique, yoga, conducting, physical theatre, audition preparation, career planning, and marketing alongside integrated performance opportunities

3. Opportunity

Research focusing on changing musicians' physical opportunity to achieve healthy behaviours has considered the player-instrument interface, physical environments, and available healthcare services. The most common approach is to investigate the effects of changing the instrument or the physical set-up and accessories used with the instrument to make it more ergonomic (Altenmüller and Jabusch, 2010; Kok, Schrijvers, Fiocco, van Royen and Harlaar, 2019; Piatek, Hartmaan, Günther, Adolf and Seidel, 2018; Price and Watson, 2018; Quarrier and Norris, 2001; Rabuffetti, Converti, Boccardi and Ferrarin, 2007; Steinmetz, Ridder and Reichelt, 2006; Wristen and Hallbeck, 2009; Young and Winges, 2017; Zaza, Fleiszer, Maine and Mechefske, 2000). There are also increasing numbers of commercial products that adapt either instruments themselves¹⁰ or the accessories used with them¹¹ with the intention of improving health outcomes. Most of these innovative systems have been developed by instrument makers, performers, and/or medical specialists who have witnessed or personally experienced a struggle to use instruments that are not tailored to the performer. With the exception of the ERGOBrass system evaluated by Price and Watson (2018) few commercial products have been the subject of empirical research. Instruments such as the Indian tabla and traditional Korean instruments demand seated positions that cause discomfort for players and which could be the focus of future ergonomic environmental interventions (Kim, Kim, Min, Cho, and Choi, 2012; Mishra, De, Gangopadhyay and Chandra, 2013).

The characteristics of a venue or performance space and the physical positioning of musicians within the space can affect health, wellness, and confidence. Bonshor (2017) investigated the effects of venue characteristics, placement of the ensemble within a performance and rehearsal space, the layout of the ensemble, and placement of individuals within the ensemble layout for adult amateur choral singers. Researchers have also studied violinists' body movements when standing or sitting to the left and right of a music stand (Spahn et al., 2014) and the effects of standing and sitting on the muscle activity and respiratory movements of brass players (Price, Schartz and Watson, 2014). Environmental conditions for marching bands are particularly interesting as they usually rehearse and perform outdoors with potentially hazardous weather conditions and high noise levels (Hatheway and Chesky, 2013; Yasuda and Ito, 2018). The Association of British Orchestras (UK) has published two reports about noise exposure among orchestral musicians, the latest of which (Wright Reid and Holland, 2008) responded to The 2005 Control of Noise at Work Regulations with information and guidance and an overview of steps taken to enhance hearing health in selected UK orchestras. The outcomes of this training and a review of literature culminated in three pages of 'Options for controlling noise' (2008: 25-27) that relate predominantly to changing physical environments within rehearsal and performance spaces. One such measure, 'Play less loudly', was explored further by Powell and Chesky (2017) through the use of an ambient information system that enabled six jazz ensemble directors to monitor sound levels within rehearsals.

Physical opportunity in the form of providing physiotherapy to professional orchestral musicians was the focus of research by Ackermann (2002) and Milanese (2000). A publication focusing on popular musicians' experiences of mental health services (Berg et al., 2018) also commented on musicians' satisfaction with care being linked to it being 'accessible, affordable, and delivered by professionals familiar with concerns' (2018: 124). The desire to enhance musicians' physical opportunity to access expert and affordable healthcare can also be seen in the provision of services such as the Association of Medical Advisors to British Orchestras (AMABO), face-to-face BAPAM clinics and phone consultations, and the employment of counsellors and Alexander Technique teachers at many tertiary music education institutions.

¹⁰ See, for example, Torzal Natural Twist guitars designed by Jerome Little (www.torzalguitars.com), the Pellegrina Viola made by David Lloyd Rivinus (read more here www.violinist.com/blog/laurie/20134/14618/), the Swan Head Flute Headjoint sold by Flute Lab (<https://flutelab.com/swan-neck-flute-headjoint/>), and the Wedge Mouthpiece for brass instruments (www.wedgemouthpiece.com).

¹¹ See, for example, the ERGObrass Support System (www.ergobrass.com), guitar supports and straps by Mundo Music Gear (www.mundomusicgear.co.uk), and violin chin and shoulder rests by the Artist in Balance project (www.artistinbalance.org/equipment)

Few researchers have enacted interventions aimed at enhancing *social* opportunity; however, many have investigated musicians' living and working environments to identify factors that are likely to affect musicians' health and wellness. Given the interactive nature of physical and social factors and the lack of clarity in existing literature it is difficult to separate studies that have focused purely on one or other aspect; therefore they are discussed together below. Three main themes have been identified from the literature:

- i. The role of others, including parents, teachers, and peers;
- ii. The effect of musicians' social and professional environments including student or touring lifestyles, religious differences and venue locations; and
- iii. The influence of different professional activities such as musical genre and the characteristics of rehearsal and performance environments.

Musicians' social environments involve many others who can enhance or detract from health and wellness including caregivers, teachers, peers and colleagues, and ensemble directors. Nagel (2009) highlighted the need for educational institutions and educators to enhance (rather than inhibit) creativity, growth, and career development in young students. Cross-sectional research has been conducted to investigate instrumental and vocal teachers' health-related knowledge (Atkins, 2013; Barrowcliffe, 1999; Brandfonbrener, 1989/1990; Gembris and Ebinger, 2015; Quarrier, 1995; Redmond and Tiernan, 1999; Rogers, 1999) and intervention studies designed to enhance teachers' capability through education and training (Hildebrandt and Nübling, 2004; Norton, 2016). To date, the primary aim of health promotion initiatives with teachers has been to enhance their pupils' health rather than the teachers' health: as a result, this research has been categorised as relating to social opportunity rather than capability. It is worth noting that if teachers' behaviours are chosen as the focus of an intervention then behavioural diagnosis must focus on the influences on teachers' behaviours, not the influences on their pupils. Researchers have highlighted the significant role that peers, colleagues, and ensemble directors play in creating musicians' social environments and therefore affecting their behaviours and beliefs (Brodsky, 2006; Hernandez, Russo and Schneider, 2009; James, 2000; Matthews and Kitsantas, 2012; Parker et al., 2019; Robson, 2004; Schneider and Chesky, 2011) but have yet to design interventions that aim to actively change those relationships to improve musicians' health and wellness. Similarly, the role of parents has been considered (Ackermann and Driscoll, 2013; Gembris and Ebinger, 2015; Pruett, 2004) but not actively manipulated in relation to health and wellness behaviours. IDs interested in musicians' psychological and social environments can draw on the significant body of Music Education and Music Psychology literature to access advice on teaching, learning, ensemble playing and directing and how different approaches affect musicians' well-being, motivation, and development.

Musicians' social environments are closely related to, and sometimes indistinguishable from, their musical activities. In particular, the intense, ever-changing environments that touring musicians experience can affect their general as well as performance health and wellness (Cizek, Kelly and Mattfeldt-Bemann, 2016; Dobson, 2010; Guptill, 2012). Noise exposure was found to be high among undergraduate popular music students as a result of both study-based *and* social activities (Barlow, 2010). Alcohol is often associated with the general public's perceptions of musicians' lifestyles but research with musicians has returned mixed results (Dobson, 2010; Guptill, 2012; MacDonald and Wilson, 2005; Saltychev, Vastamäki, Vastamäki and Laimi, 2016): it is clear that alcohol and 'professional sociability' are part of musical environments but it is not clear whether its use by musicians is always problematic (or more problematic than in the general population). One seemingly unique paper by Lonsdale and Abadi (2018) considered the effects of religious beliefs and customs (fasting during Ramadan) on woodwind players in terms of practice stamina and ability to play to their desired level. Musicians' working lives have been analysed using occupational health frameworks (Harper, 2002; Johansson and Theorell, 2003; Jacukowicz, 2016; Willis et al., 2019); results indicate the importance of social opportunity, and the corresponding need for health promotion interventions to address factors at an organisational and cultural level. Despite its potential uses as a means of reducing MPA (Cohen and Bodner, 2019) research has suggested that flow and other factors associated with group music-making (e.g. social pressure to

continue) can be a key factor in encouraging musicians to play through pain to the extent of damaging themselves physically (Anderson, Roessler and Eichberg, 2013; Guptill, 2012).

Physical and social environments can vary for a musician from one day, week or month to the next and between musicians in relation to what and where they play, why they play, and who they play with and for. Musical genre has received quite a lot of attention in the form of comparative research investigating differences between genres relating to musculoskeletal problems (Árnason, Árnason, and Briem, 2014; Marques et al., 2003), hearing outcomes (Chesky and Henoch, 2000; Kahari, Eklof, Sandsio, Zachau, and Moller, 2003) and experience of MPA (Nusseck, Zander and Spahn, 2015). Kenny, Driscoll and Ackermann (2016) also compared strength, MPA and workplace satisfaction among Australian musicians playing in stage and/or pit ensembles. Researchers have also compared musicians' anxiety levels when practicing without an audience with performing in front of an audience, either as a soloist or as part of an ensemble (Nicholson, Cody, Beck, 2015; Robson and Kenny, 2017; Yoshie, Kudo and Ohtsuki, 2008). Conversely, other researchers investigated the effects of anxiety-inducing conditions (an evaluator counting mistakes) compared with a control situation (no evaluation) on muscle activation and fatigue in trumpet players (Rumsey, Aggarwal, Hobson, Park and Pidcoe, 2015). Vellers, Irwin and Lightfoot (2015) conducted research that investigated the effects of genre and rehearsal/performance environments on heart rate, but body mass index was also found to have an effect (relating to physical capability). Recommendations made within these studies imply that certain environments facilitate behaviours that affect musicians' health and wellness.

4. Motivation

The influence of capability and opportunity on motivation means that it was not possible to determine whether researchers focused directly on changing motivation for a particular behaviour or worked indirectly to enhance motivation by improving capability and/or opportunity. I did not find any papers that overtly focused on changing musicians' motivation for health-promoting behaviours, but several noted the importance of motivational factors. For example, McCready and Reid (2007) commented on student musicians' social motivation to continue despite occupational disruptions and their motivation to excel as well as their desire to maintain a musical identity. Lacaille, Whipple and Koestner (2005) investigated goal types and concluded that, for musicians, performance goals are more likely to be related to performance anxiety than mastery-focused goals: this relates to motivation (goals and beliefs about consequences) but acting to change the type of goals that are set could involve enhancing psychological capability (behavioural regulation and decision processes). More recent research by Parker, Jimmieson and Amiot (2019) highlights the importance of musicians' motivational approach to their occupation – in relation to autonomous motivation ('I want to') and control motivation ('I need to') – in mediating their response to career insecurity and factors associated with wellbeing. Their results indicate that autonomous motivation better enables musicians to take advantage of social support resources that help them to thrive (or at least survive) in uncertain employment situations. Research by Spahn and colleagues (Spahn, Richter and Zschoke, 2002; Spahn, Strukely and Lehmann, 2004) includes comments directly relating to motivation in terms of the importance of music students believing in their capabilities:

[Music students] believe that their own behavior can influence their health...This highly marked internal locus of control may be due to, among other things, the experience gained by music students in their daily practicing to the effect that their own behavior can induce modifications...Music students probably can be motivated toward preventive behavior when recommendations and measures can improve their music making directly (Spahn et al., 2004: 31-32).

Research with Irish traditional instrumentalists highlights the unlikelihood of 'one size fits all' approaches to PRMDs yielding positive results for this community as a result of members' particularly strong 'sense of self and discrete identity' (Doherty, Wilson and McKeown, 2013: 181). A study with

marching band musicians reported on the association between having an athletic identity and reduced increases in BMI during the marching season and at a one-year follow-up (Levy, Statham, and VanDoren, 2013). Two papers published by Schmalenberger, Gessert, Giebenhain and Starr (2012a, b) also identify the vital role of identity and control over life and work for female musicians who underwent breast cancer treatment and their experiences of returning to work. The focus of these articles makes it clear that it is vital to consider and investigate the full diversity of motivational factors prior to attempting health promotion interventions.

Motivation plays a significant role in behaviour maintenance as people are more likely to maintain behaviours if they have at least one ‘sustained maintenance motive’ such as enjoying it, finding it satisfactory, or it aligning with their identity, beliefs and values (Kwasnicka, Dombrowski, White and Sniehotta, 2016: 283). Different types of motivation (e.g. intrinsic and extrinsic, see Ryan and Deci, 2000) would be important when investigating musicians’ initiation and maintenance health-promoting behaviours. Musicians may be more motivated to engage in behaviours that enhance their performance rather than those that are aimed at preventing injury or ill health (Spahn et al., 2004; Williamon, 2004). Music Education and Music Psychology researchers have investigated motivation in various musical contexts and further insights from those fields could be of value when designing motivational interventions for musicians.

5. Cross COM-B research

I identified four projects that actively address more than one domain of the COM-B model and/or were noteworthy as a result of the inclusion of a conceptual framework as part of the intervention design. The first three of these papers (Hackworth, 2007; Laursen and Chesky, 2014; Matei et al., 2018) focus on educational interventions that were designed to change musicians’ behaviours primarily by enhancing capability but with consideration of other influences on behaviour. The final project – entitled ‘Sound Practice’ – reports on a longitudinal Australian study that also focused mainly on capability but with added consideration of factors relating to physical opportunity. Following on from the overview of these four projects I will present selected cross-sectional research that has implications for the design of PAM interventions relating to all COM-B domains.

In 2007 Hackworth published a rare example of PAM research that actively considered the role of behavioural modification techniques on American music teachers’ health-related behaviours. The primary focus was improving teachers’ capability: one of the experimental groups received a one-hour vocal hygiene instruction whereas the other received an additional one-hour behaviour management technique session. It is hard to know whether they also aimed to change teachers’ beliefs, desires, wants or needs (i.e. their motivation) but the inclusion of a log book and incentive (cash prize) for completing log books hints at the potential role of motivation. Laursen and Chesky (2014) published an overview and evaluation of curricular changes based on a coherent theoretical basis that were implemented in a brass methods course at an American university. The over-arching structure is similar to other courses but session content (included in an appendix) indicates that course leaders were able to address more than capability: peer discussions enabled students to reflect on social norms; enabling students to try out instrument support systems changed their physical opportunity; and motivational aspects were addressed by encouraging students to reflect on their identity, and their beliefs about their capabilities and the consequences of their behaviours. A health education course for UK conservatoire music students was designed as part of the Musical Impact project (Matei et al., 2018). This course also had a sound theoretical basis, but less detail was provided in relation to content and delivery of sessions compared with that provided by Laursen and Chesky (2014). It appears the course focused mainly on enhancing students’ psychological capability by providing information about health-related topics and behaviour change strategies, and physical capability by including demonstration of practical warm-up and rehearsal techniques. It is unclear from the article whether aspects relating to other COM-B domains were addressed in the seminar program.

The Sound Practice project was a large-scale health promotion initiative aimed at improving the health and safety of professional orchestral musicians in Australia. A rigorous ‘formative and process evaluation methodology’ (Chan and Ackermann 2014: 2) was used to design interventions, which included ‘health education, onsite injury management, cross-training exercise regimes, performance postural analysis, and music performance biomechanics feedback’ (2014: 1). These are likely to have primarily addressed musicians’ physical and psychological capability and their physical opportunity to access qualified support as well as changes to the physical environment relating to noise exposure. The summary of general findings (Ackermann, Kenny, O’Brien and Driscoll, 2017) indicates that the authors also consider it important to encourage a ‘positive cultural health shift’ (2017: 11) as well as addressing social and motivational factors relating to hierarchical structures, bullying, work environments, and expectations of care; however, it is not clear whether these aspects were actively addressed by interventions included in the project.

A number of other publications have identified factors from multiple COM-B domains that could inform future health promotion interventions. An early review of psychological issues and treatment strategies for popular musicians (Raeburn, 1999; 2000) highlighted how the development and maintenance of psychological conditions is rooted in ‘individual, family, and sociocultural factors’ (1999: 172) and therefore interventions must address factors relating to opportunity and motivation. Over a decade later a qualitative study by Rickert, Barrett and Ackermann outlined factors within Australian professional orchestral environments that can lead to injury: the first part of this study addresses ‘the role of work organisation and psychosocial factors’ (2013), the second ‘organisational culture, behavioural norms, and attitudes to injury’ (2014), and the third ‘the role of psychosocial factors in the experience of musicians undertaking rehabilitation’ (2015). The authors identified factors that relate to a cross-section of the COM-B model with particular emphasis on aspects other than musicians’ personal capabilities. Similarly, a review of classical instrumental musicians’ job-related stressors (Vervainioti and Alexopoulos, 2015) indicates that many were outside musicians’ direct control: the seven categories identified in this study were public exposure, personal hazards, repertoire, competition, job context, injury or illness, and criticism.

Qualitative research with an inter-disciplinary group of participants that included music education experts, physiotherapists and Alexander technique teachers (Shoebridge, Shields, and Webster, 2017) has generated an optimal theory of posture for musicians by analysing interview responses with reference to the Theory of Planned Behaviour (Ajzen, 1990). ‘Minding the body’ highlights the interdependence of body and mind and sub-components of the theory relate to concepts from across the COM-B domain that were identified in previous research. For example, ‘Maintaining ease’ (minimizing effort) and ‘Finding balance’ (rebalancing the self with the instrument and environment) relate to developing a musician’s physical capacity and investigating factors in the physical environment that affect their capacity. The other three sub-components – ‘Expanding the framework’, ‘Barriers to change’ and ‘Challenging habits’ – relate more broadly to aspects of social opportunity and motivation. This illumination of posture as a behaviour that is influenced by a variety of individual and societal factors demonstrates the depth of behavioural diagnosis that is needed prior to designing an intervention that can effectively address musician’s posture: without this level of investigation vital factors might be missed.

In 2017 Ascenso, Williamon and Perkins published an influential paper that identified factors that enhance and challenge wellness among professional musicians using the PERMA model (Seligman, 2011): i.e. Positive emotions, Engagement, Relationships, Meaning and Accomplishment. Six professional musicians from varied classical music contexts (solo, orchestral, choral, chamber, conducting, and composing) highlighted the importance of shared musical emotions, identity formation and maintenance, social skills to support flourishing relationships, diverse musical interests and activities, and accomplishment relating to intrinsic goals and motivation. Perhaps this paper has drawn such attention because it provides a means of addressing influences on behaviour that have not previously received such dedicated attention: in COM-B terms, those relating to motivation and social opportunity.

Another paper provides an excellent resource for considering barriers and enablers for optimal health at UK conservatoires (Perkins, Reid, Araújo, Clark and Williamon, 2017). This research draws on health psychology literature and identifies three sets of enablers and barriers relating to lifestyle, support services, and environment. A key message relates to the need for health promotion ‘to focus not only on individuals but also on the daily practices and routines of conservatoires’, which the authors relate to going beyond a focus on enhancing musicians’ capabilities to engage in ‘radical scrutiny of the cultures of conservatoires’ (2017: 1). A Swiss study echoes the findings of these two studies and its use of the World Health Organisation Quality of Life (WHOQOL Group, 1998) questionnaire emphasizes the importance of considering four diverse dimensions of wellness (physical health, psychological health, social relationships, and environment) and leads to recommendations that relate to all COM-B domains (Philippe, Kosirnik, Vuichoud, Williamon, and von Roten, 2019). Further support for the importance of social opportunity comes from a large cohort of professional orchestral musicians in Germany (Gembris, Heye and Seifert, 2018) in which music reportedly acted as a primary source of strength and energy for combating stress at work, followed by partners, family, hobbies, friends, and sport or fitness.

The importance of support from colleagues and conductors in terms of coping with professional stress for these musicians further highlights the potential for interventions focusing on enhancing social opportunity to be effective. However, the role of motivation cannot be underestimated as Parker et al. (2019) assert that ‘it is the combination of social and motivational resources that really matters’ in terms of supporting musicians to thrive within insecure professional environments: again, research like this demonstrates the importance of conducting a thorough phase of behavioural diagnosis prior to designing interventions.

6. Beyond behavioural diagnosis: Designing the intervention

The above categorisation of PAM research highlights a range of complex and interacting factors that may affect intervention outcomes as a result of their influences on musicians’ behaviours. Designing interventions should start with identification and thorough consideration of the target behaviour(s) and factors influencing the chosen behaviour(s). Without this vital stage, which is almost always absent from existing PAM literature, it is likely that IDs will fall into the trap of designing interventions that fail to address factors that influence chosen health behaviours. However, understanding behaviour is only the first of three steps of designing an intervention using the BCW. It is beyond the scope of this article to outline PAM literature in relation to the remaining two layers of the wheel in similar detail, but the following paragraphs provide food for thought for those designing future interventions in the performing arts domains.

Following on from behavioural diagnosis, the next stage of the BCW involves choosing an intervention function that is suited to the chosen COM-B domain(s). Each of the nine intervention functions (education, training, persuasion, modelling, environmental restructuring, incentivisation, coercion, restriction and enablement) is linked to the six sub-categories of the COM-B model (see Table 2.3 on p.116 of Michie et al., 2014a). The focus within PAM literature on enhancing capability is often expressed in relation to the need to educate or train musicians. This may relate to the errors identified earlier that lead well-meaning researchers to believe that changing behaviour is driven by knowledge and information, based on rational choices, and related primarily to ‘getting the message across’ (Kelly and Barker, 2016). Ackermann et al. (2017) describe education as ‘the best form of prevention’ (2017: 11) but that depends entirely on the focus of an intervention and, while it may be a useful strategy, it is not the only one. For example, many musicians are now at least somewhat cognizant of how and why they should protect their health and wellness: therefore, providing educational interventions focusing on health-related topics is not necessarily an appropriate choice. Musicians may have relevant knowledge but have not yet changed their behaviours, which may mean they are not motivated to engage in healthy behaviours (or not enough to choose them over competing behaviours). Changing motivation *can* be achieved through education but persuasion, incentivisation and coercion are additional intervention functions for addressing motivation. Alternatively, it may mean that musicians would benefit from

education to improve knowledge of self-regulation and decision making processes: the ‘know-how’ of behaviour change and enhanced capability instead of the ‘know-what’. A move towards considering physical and social opportunity necessitates a move away from educating individual *musicians* to thinking at a broader organisational level with the potential to use modelling, environmental restructuring, and restriction to change social and physical environments. The recommendations from publications by Ascenso et al. (2017), Perkins et al. (2017) and Philippe et al. (2019) cannot all be addressed through education and training musicians: the BCW provides potential alternatives that could be of use when designing interventions to act on such recommendations.

Further to choosing an intervention function, the remaining stage of the BCW includes identifying behaviour change techniques (BCTs) drawn from the BCT Taxonomy v1 (Michie et al., 2013). These 93 BCTs are grouped into 16 categories: goals and planning, feedback and monitoring, social support, shaping knowledge, natural consequences, comparison of behaviour, associations, repetition and substitution, comparison of outcomes, reward and threat, regulation, antecedents, identity, scheduled consequences, self-belief, and covert learning.¹² Abraham et al. (2015) subsequently linked BCTs to the BCW intervention functions and identified which BCTs were more and less frequently used in published literature (see Michie et al., 2014a: 151-155). Having identified target behaviours for an intervention and chosen corresponding intervention functions, it is possible to identify a list of BCTs that could be included in the intervention. For example, if a PAM researcher wants to address a behaviour that may be influenced by social opportunity, for example warming up prior to a rehearsal, they may select modelling and enablement as intervention strategies and could then choose BCTs such as ‘demonstration of the behaviour’ (modelling) and ‘practical social support’ (enablement). Decisions made at each stage of the BCW framework can be negotiated using the APEASE criteria, which encourages IDs to evaluate options based on Affordability, Practicability, Effectiveness and cost-effectiveness, Acceptability, Side-effects/safety, and Equity (see Michie et al., 2014a: 23). This approach can help to reduce a seemingly overwhelming array of options down to those that are useful without falsely excluding ones that IDs simply have not thought of.

7. Conclusion

Performing Arts Medicine has developed as a discipline and advancements have been made in terms of understanding the types of problems that musicians encounter and factors that affect the development and maintenance of those conditions. There is now a drive to move beyond assessing and bemoaning the prevalence of such problems towards actively seeking to reduce their incidence across musical populations. To do this effectively, the PAM field should draw on lessons learned in disciplines dedicated to health psychology and behavioural change to design interventions that have a clear conceptual framework. One example of a relevant framework is The Behaviour Change Wheel, which synthesises previous research in an approach that is contemporary, comprehensive, coherent, and based on theory.

The first stage of the BCW involves engaging in a thorough diagnosis of the target behaviour(s) and influential factors using the COM-B model. It is particularly important to identify who is performing the behaviour and what influences the likelihood of them engaging in that behaviour. At present, this vital initial stage of intervention design is not regularly undertaken and/or reported by PAM IDs, but retrospective application of this model to the PAM bibliography has identified relevant work from across all domains that can serve as guidance for the design of new interventions. In 2013 Rickert and colleagues stated that ‘environmental, psychosocial, and cultural conditions that influence injury risk are underrepresented in models of injury causation and prevention for musicians’ (2013: 219). Results of the current review support this conclusion in relation to published examples of intervention-type studies

¹² The authors have developed an app with descriptions and categorisation of all 93 BCTs that can be downloaded from free on Apple or Android products called ‘BCTs Taxonomy’.

focused on improving musicians' health, the majority of which have focused on enhancing individual musicians' capability. When considering published recommendations relating to the design of health promotion interventions the focus shifts towards changing musicians' physical and social opportunities. Consideration of motivational factors is vastly under-represented, though this may relate to the influential relationship between motivation and capability/opportunity and a lack of clarity in planning or reporting the full scope of factors addressed by interventions.

Following on from the behavioural diagnosis stage it is encouraging to consider that there are nine types of intervention to choose from, as this breadth of options can enable PAM researchers to engage with recent recommendations to promote musicians' opportunity and motivation to engage in health-promoting behaviours. Crucially, the use of the BCW framework encourages IDs to follow a process that can help them overcome personal biases and assumptions and consider factors that may not previously have occurred to them, thus hopefully avoiding the tempting but ultimately unrewarding 'It Seemed Like a Good Idea At The Time' approach. The BCW framework also enables PAM researchers and practitioners to move beyond a siloed approach to health promotion in which musicians' health and wellness is considered solely in relation to one bodily system. Modern understanding of the human body and mind firmly indicates the need to consider a person as a whole to catch the nuances of how physical and psychological factors interact.

This is the first published paper to consider the PAM bibliography through the lens of the Behaviour Change Wheel. Developing a comprehensive picture of PAM using this approach will require repeated application of the model to populate it with information particular to musicians' health and negotiate its use to the field. Regardless of whether PAM intervention designers choose to use the BCW it is vital that they grasp the importance of designing interventions based on sound conceptual frameworks and reporting the nuances of that process in published material. In addition to locating health and wellness promotion for musicians within a chosen theoretical framework (the BCW) this review serves as a more general resource for identifying research that has investigated factors that affect musicians' behaviours, and thus their health and wellness.

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