

An interpretative phenomenological analysis of exercisers' use of music during workouts

Abstract

This study explores exercisers' use of self-selected music. Ten participants (7 female, 3 male) aged 26-58 years who exercised regularly took part in semi-structured interviews about their exercise and music use. Interviews explored how they sourced, selected and experienced music during exercise. The recorded data were transcribed, and analysed using Interpretative Phenomenological Analysis (IPA) to identify common patterns while also recognising individual experience. Four themes were identified: *Taking control*, referring to overcoming internal and external challenges through music; *It's all about me*, involving self-identity and social positioning; *Exercise music literacy*, concerning musical judgement and technological skills; and *Embodiment*, concerning body-music-hardware interactions and synchronisation. The results provide examples of circumstances under which music provides exercisers with both positive and negative experiences. The findings contribute to understanding of the effects of music in exercise and demonstrate the individuality of preferences and usage.

Keywords: Exercise, iPod, mp3, motivation, health

Exercise has therapeutic and preventative effects for physical health (Myers, 2008; Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010) and mental health (Donaghy, 2007; Stanton, Happell, & Reaburn, 2014). Governments in the UK, US and Australia recommend a minimum of 150 minutes weekly of moderate-intensity exercise (Weed, 2016), with UK guidelines also including two strength training sessions. Nevertheless, inactivity levels are high; in the UK, 39% of adults do not meet government recommendations, and 60% are unaware of them (British Heart Foundation, 2017). Evidence from clinical populations suggests that music played during exercise can improve adherence to exercise programmes (Alter et al., 2015; Mathews, Clair, & Kosloski, 2001). Music use may, therefore, help address inactivity.

Everyday music listening

Research into everyday music listening suggests listeners' selection processes are dynamic, and dependent on sociocultural background, mood and environment (Bull, 2007; Heye & Lamont, 2010). Mood is related to concepts of affect and emotion, and all are central to music choice and listening. Following Juslin and Sloboda's (2011) definitions, affect is used here as an umbrella term in relation to evaluative or valenced assessments, while emotion is used to mean short-term, intense and attributable to a specific cause, and mood is applied to longer-lasting states with non-specific cause. Terminology is maintained in participants' quotes.

Responses to music involve complex interactions; Hargreaves, in his reciprocal feedback model (2012), presents physiological, cognitive and affective responses to music, interacting in varied ways, leading to individual musical preference. Although some listeners

are more adept, or “musically sophisticated,” than others (Müllensiefen, Gingras, Musil, & Stewart, 2014), DeNora (2000) notes that all listeners are skilled at finding the ‘right’ music for their general listening requirements. Skånland’s participants described an interactive process of choosing music that “felt right” (2013, p. 6), enabling reflection on their current mood. Listeners regulated affect and controlled their environments by creating a soundtracked private space so that, for example, stress-inducing crowds became “masses of fine people” (p. 7). This suggests music affects how individuals draw meaning from their external environment, indicating interplay between extrinsic and intrinsic factors.

Heye and Lamont’s (2010) study of MP3 listening during travel similarly identified the personalisation of listening, creating a private environment that simultaneously enhanced awareness of surroundings. The varied choices among 422 participants were predicated on familiarity and liking. Bull also emphasised personalisation, describing it as “privatisation of public space” (2007, p. 4); technology confers control, allowing construction of a personalised, exclusionary environment.

The main contributors to music selection comprise individual and situational factors (Greb, Schlotz, & Steffens, 2017). Greb et al. (2017) explored self-chosen instances of everyday music-listening collected through an online survey, with 5% of the 1761 instances across 587 participants involving listening to music during exercise. Selection of exercise music was predicated on wellbeing and motor synchronisation, although elsewhere synchronisation has been found not to be a priority in self-reports on music and exercise use (Hallett & Lamont, 2017). Krause, North and Hewitt (2016) found that creating a particular level of arousal is key to choice of exercise music, supporting a link between psychological arousal and movement intensity.

Listening to music while exercising

The term “exercise” has been used inconsistently in the literature. Here, the definition proposed by Casperson, Powell and Christenson (1985), specifying structure and repetition of movement in the pursuit of physical fitness, is used. This definition includes a wide variety of activities in a range of settings, encompassing government recommendations, existing literature and participants’ own concepts. “Workout” is used to refer to any structured session meeting Casperson et al.’s definition of exercise.

As shown above, listeners have distinct criteria for selecting music in different contexts (Bull, 2007; DeNora, 2000) and exercise introduces particular requirements, most notably for motivation, arousal and in some cases, distraction (Hallett & Lamont, 2015). A theoretical model for the motivational effect of music in exercise (Karageorghis, 2016) suggested that intrinsic musical features such as rhythm, alongside personal associations and cultural contexts, would, via motivation, affect arousal and rate of perceived exertion. This updated an earlier influential model proposed by Karageorghis, Terry, and Lane (1999) by incorporating greater reciprocity between factors.

Physical effort may be associated with both negative and positive affect (Bellows-Riecken, Mark, & Rhodes, 2013; Ekkekakis, 2009). For example, positive affect may arise from biological processes such as the release of cannabinoids (Boecker et al., 2008; Raichlen, Foster, Gerdeman, Seillier, & Giuffrida, 2012), or from psychosocial elements such as a sense of achievement or meeting social needs (Bellows-Riecken et al., 2013). Negative affect, on the other hand, is associated with feeling obligation, the exercise environment, and the discomfort of exertion (Bellows-Riecken et al., 2013; Ekkekakis, 2009). There is qualitative evidence that exercisers choose music to manage affect (Hallett & Lamont, 2015;

Priest & Karageorghis, 2008). Additionally, media use, such as listening to music or watching TV during exercise, has a distracting effect from effort and may also create the perception that time spent exercising is passing more quickly (Hallett & Lamont, 2015).

Selecting music for exercise

Previous research has tended to use researcher- or peer-selected/rated music in controlled experiments, rather than participants' own choices. For example Bird, Hall, Arnold, Karageorghis, and Hussein (2016) used peer ratings to identify motivational musical stimuli for a study of music and affect in recreational exercisers. In cases of self-selection (where music is chosen by the listener rather than a researcher or instructor), constraints are sometimes employed; for example, in a study of performance, mood, feeling state (affect) and physiological outcomes, Terry, Karageorghis, Saha, and D'Auria (2012) offered elite triathlete participants 100 tracks to choose from to facilitate the necessary synchronisation of running cadence. These examples demonstrate the compromise between experimental control and participants' varied music preferences.

Qualitative research has examined music listening in gyms, covering both other-selected and self-selected music. Kinnafick et al.'s study of a High Intensity Interval Training (HIIT) intervention (2018) found that the other-selected music went unnoticed or was not engaged with, although evidence suggests other-selected music played in gyms can still be perceived positively even if not congruent with preferences (Hallett & Lamont, 2015; Priest & Karageorghis, 2008). The latter two studies included other-selected and self-selected music, but neither explored music use in other exercise contexts, such as outdoor running. Hallett and Lamont (2017) explored a broader range of exercise types and environments,

but the analysis was quantitative. The present qualitative study was designed to be complementary, drawing a small number of participants from the same sample.

Technological opportunities

The possibilities for creating, curating and transporting large music libraries on small devices have increased rapidly over recent decades. Personal listening devices, or PLDs (Fligor, 2009; Peng, Tao, & Huang, 2007; Worthington et al., 2009), are ubiquitous and enable the creation of enjoyable, self-selected exercise accompaniment. Listeners tend not to use all available functions (Heye & Lamont, 2010), adopting simple processes to transfer music from computer to PLD, selecting specific artists or shuffling, but eschewing playlists and streaming (this may reflect limited streaming options and internet access at the time of the study). Krause and North (2016) found technological identity relates to practices such as streaming, and confidence with new listening technology influences how music is accessed (see also Heye & Lamont, 2010).

Disliked music may lead to workouts being curtailed (Priest & Karageorghis, 2008), reflecting Bellows-Riecken et al.'s (2013) findings that environment can provoke negative affect. Self-selection helps ensure that music heard is strongly liked. While there is substantial research into everyday PLD use (Bull, 2007; Greasley & Lamont, 2011; Heye & Lamont, 2010; Krause & North, 2016; Krause, North, & Hewitt, 2015), use of self-selected music in exercise contexts has received less coverage (Hallett & Lamont, 2015; Stork, Kwan, Gibala, & Martin Ginis, 2015). Pleasure and control during listening are linked (Krause & North, 2017) and technology facilitates control; the authors compared lack of control over broadcast music compared with using a PLD. Of their 6275 reported music-exposure

locations, 61 were in gyms, and 182 of 6379 activities were exercise (including that outside of gyms). Mean arousal levels, and liking of and engagement with music heard, were higher when analysed for exercisers than for gym attendees, perhaps reflecting greater control over music choice away from a gym (e.g., running outside with a PLD). A qualitative approach could explore underpinning reasons.

Music choice reflects an intention to manage arousal levels (Krause et al., 2016; Laukka & Quick, 2013) and to support movement (Greb et al., 2017). These are quantitative survey studies with relatively little qualitative data, but the findings are consistent with the reciprocal feedback model of musical response (Hargreaves, 2012) where musical fit is judged in terms of genre and style. The model recognises the importance of highly individualised familiarity and reference systems. Preference for control over and personalisation of the auditory environment indicates that the best-fitting music in such circumstances reflects individual differences, and generic “exercise music” is therefore likely to entail some compromise. It is, however, unclear whether this is due to musical characteristics and associations, or whether control is itself an element of music enjoyment.

Little is known about how exercisers utilise music for their own aims outside laboratory settings where physiological and performance outcomes are the focus, and extensive searches found few qualitative studies of music use in exercise. This study aimed to understand better the factors influencing exercise music choices by exploring the experiences of exercisers. A qualitative approach offered scope to extend understanding beyond previous gym-based literature, allowing participants to describe their priorities. The research questions were (1) How do exercisers experience the use of music during their workouts? and (2) how do they make choices regarding their music use during workouts?

Method

The study design used interpretative phenomenological analysis (IPA), because it focuses on subjective experience of and meaning for the individual, rather than assuming a knowable truth (Langdridge, 2007). The emphasis is on individual narratives, with different participants ascribing different meanings to similar situations, while the approach still recognises commonalities. IPA's ontology draws heavily on Heidegger's *Dasein* (Heidegger, 1962), which argues for an intersubjective "being-in-the-world," meaning individual existence and experience is centred on interaction with the environment and others. Merleau-Ponty's (1996) emphasis on the body as conduit for intersubjectivity is also influential (Smith, Flowers, & Larkin, 2009). Throughout interactions, people strive to derive meaning from their experiences, ranging from simple, literal meanings to implications for their identity and life's meaning (Smith, 2019).

IPA's epistemology involves attempting to understand a participant's world, conveying their experience (Larkin, Watts, & Clifton, 2006). Phenomenology refers to the interpretation of phenomena, the content of *Dasein* (Heidegger, 1962). However, since only the individual can access their own full *Dasein*, it is inevitable that hermeneutics affect interpretation. As a result, researchers bring their own *Dasein* to their interpretation, as do readers of resulting research papers (and, indeed, reviewers and editors).

IPA maintains an ideographic approach, basing findings on scrutiny of individuals' descriptions of their worlds, which are carefully compared to identify similarities and differences. This does not exclude generalisation, but the process of generalising involves gradual, careful building (Smith et al., 2009). This contrasts with the nomothetics of

quantitative analysis by which generalisations are made through statistical tests, prioritising group rather than individual. IPA emphasises individual participant experiences while maintaining recognition and acknowledgement of limitations.

Design

Smith et al.'s approach to IPA (2009) was followed, as it has strong connections with applied psychology, and scope to discover deep, rich meanings within data. Semi-structured interviews explored music use in exercise as individuals experience it. Reflexivity, a fundamental element of IPA, considered the influence of researcher experience and preference on data interpretation. The project was carried out by the first author, including all data collection and analysis. The second author provided supervision throughout, checking the resulting themes.

Participants

Ten participants were interviewed using semi-structured interview schedules, their data transcribed, and analysis carried out following the suggested procedures of Smith et al. (2009). Smith et al. consider three to six participants an adequate sample for IPA research; this slightly larger sample size offered scope to explore a broader range of experience. The multiple perspectives provide triangulation through contrasting viewpoints (Smith et al., 2009). All participants had previously completed an online survey on their use of music in exercise (Hallett & Lamont, 2017) and provided email contact details to indicate willingness to participate in a semi-structured interview. Opportunity sampling was carried out using the contact details provided while also checking survey responses to ensure participants

with a variety of sporting experience, achievements, music preferences and music usage levels were invited. Potential participants were emailed until a sufficient number had been recruited, as many who were initially approached did not respond. Eight participants took part in face-to-face interviews, and two further participants were interviewed by phone. The sample consisted of 10 adults (7 women and 3 men, $M_{age} = 38.4$, $SD = 8.96$, age range: 26-58 years), who participated in running, walking, fitness classes, swimming, cycling, gym-based workouts and team sports, although music was not universally listened to during all activities. The most popular activities were running, walking and cardiovascular machine use. Frequencies are shown in Table 1

Table 1. Exercise activities among participants

Activity (n)	Participants: Pseudonym and age									
	Amanda (31)	Andrew (39)	Belinda (47)	Charlotte (37)	Katie (26)	Martin (58)	Ruth (40)	Sarah (39)	Sophie (36)	Steven (36)
Running (8)		✓	✓	✓	✓		✓	✓	✓	✓
Aerobics classes (3)	✓			✓	✓					
Core stability classes (1)			✓							
Cycling (4)	✓	✓	✓					✓		
Gym cardiovascular machines (6)	✓		✓	✓	✓			✓		✓
Weights (3)	✓			✓						✓
Swimming (5)	✓	✓	✓	✓						✓
Team sports (1)		✓								
Walking (7)	✓	✓	✓			✓	✓	✓		✓
Yoga (1)							✓			

Ethical approval was given by Keele University Ethics Review Panel. Participants provided informed consent prior to semi-structured interviews. Forms were electronically submitted for the telephone semi-structured interviews, and hard copies were used for face-to-face semi-structured interviews.

Interview schedules and process

A generic outline semi-structured interview schedule (see Appendix A) was used, with notes added for each interview referring to survey responses to explore these further. For example, one participant had mentioned exercising when the gym music was “too loud” and this was noted so it could be explored. Interviews lasted 37-86 mins, with a mean duration of 60min 12s (SD = 14min 2s). The interview schedules were used flexibly, and responses were explored on an ad hoc basis. Participants were encouraged to lead the interview, focusing on what they felt was important about their experiences of using music during exercise. Interviews were recorded using an Olympus VN-4100PC digital recorder and transcribed using ExpressScribe software. Participants have been assigned pseudonyms.

Analytical process

The semi-structured interview and transcription process provided opportunities to reflect on the data, and observations were noted directly after interviews and during transcription. Transcripts were printed, read, re-read and the recordings listened to again. Colour-coded notes were made in the margins according to the initial stages outlined by Smith et al. (2009), highlighting key points, exploring language use and investigating deeper meanings.

Possible themes were identified and examples noted. This process was carried out on each transcript individually, with commonalities among transcripts also identified.

A mindmap of possible themes was annotated with quotes colour-coded according to participant; busy, “rainbow-coloured” areas indicated common themes. Using this framework, pertinent quotes were collated, and themes and subthemes refined, noting frequencies and possible overlaps, to produce four main themes. These reflected commonalities among participants, with individual experiences related to themes in different ways, enabling similarities to be considered alongside individual experience.

Results

Four main themes were identified: *Taking control* involved using music to induce or maintain positive affect, create a personalised exercise environment and achieve control; *It's all about me* emphasised individuality, differentiation and personalisation of listening through associations, life stage and motivations; *Exercise music literacy* reflected competence to source and select music suited to one's needs, and to convey it to a PLD; and *Embodiment* concerned body-music interactions and synchronisation. These themes and their subthemes are shown in Table 2, along with an indication of which transcripts they appeared in. Quotations from participants for each theme are presented in Tables 3 to 6, and cross-referenced from the text.

Table 2. Themes, subthemes and representation among participants

Theme	Subtheme	Participants: Pseudonym and age									
		Amanda (31)	Andrew (39)	Belinda (47)	Charlotte (31)	Katie (26)	Martin (58)	Ruth (40)	Sarah (39)	Sophie (36)	Steven (36)
Taking control	Internal challenges	✓	✓	✓	✓			✓	✓		✓
	External challenges			✓	✓	✓			✓		
	Achieving control	✓	✓			✓	✓	✓	✓	✓	✓
It's all about me	Differentiation from others		✓	✓	✓	✓	✓	✓		✓	✓
	Life stage and context			✓	✓	✓	✓			✓	✓
	Connections with others			✓		✓	✓		✓		
Exercise-music literacy	Musical judgement	✓	✓	✓	✓	✓		✓			✓
	Technological competence	✓	✓	✓	✓		✓				✓
Embodiment	Internalisation	✓	✓	✓	✓					✓	
	The challenge of synchronising			✓	✓	✓		✓	✓		
	"Hardware hassles"	✓	✓	✓		✓		✓		✓	✓

Taking control

This theme involved overcoming barriers by creating the "right" individualised environment.

Supporting quotations are presented in Table 3. These include subthemes of internal challenges such as low self-efficacy and negative feelings about training, external challenges such as uncontrollable environmental factors, and the recognition of achieving control via music.

Table 3: Quotations for 'Taking control'

Reference	Participant	Subtheme(s)	Quotation
Q1	Andrew	Internal challenges	"When I started running again I found, really I had no motivation to start running because I knew either that I couldn't achieve the kind of results that I was achieving before I got injured, so um I was far more relaxed about it, I was just running for fun if you like, so that's when I started listening to music but then it's kind of gone the other way now and I find that music motivates me to go out and run a little bit so when I go out ... if I go out running on my own, I really struggle to go out running on my own if I'm honest, I find that the, the I don't know the lure of listening to it, the accompaniment of music while I'm out running um is kind of part of the reason that I go out the door if you know what I mean because I can listen to it loud on my earphones and enjoy the music while I'm running."
Q2	Steven	Internal challenges	"I certainly can't do long distance stuff, I can't marathon-train without music on, you know, unless I'm with others, I always think that I'm going, I'm, I'm slower without to be honest"
Q3	Ruth	Internal challenges	"I thought that it would get me round because it was really effort, really hard work. I thought 'Well, if I'm listening to music, it'll get me round.'"
Q4	Ruth	Internal challenges	"[Counting is] quite relaxing, it's quite therapeutic, because it stops all the other thoughts coming in."
Q5	Charlotte	Internal challenges	"If it does get to a point and I feel I'm starting to feel a little bit tired and I've still got however long to go, then I tend to sort of say to myself 'Well, just focus to the end of this song' and then that might be a couple of minutes away for example and then by the time the song's finished and another song's come on, I've almost forgotten that I felt a bit lacking

in motivation ... I think that's partly due to the variety of the music and because I have it on shuffle so I don't know what's coming next”

Q6	Belinda	Internal challenges	“I'm usually trying to distract myself as much as possible, because it takes half an hour to do 5k on the rowing machine and that is really dull isn't it? ... I will do things like, 'Right I'm not allowed to look at the numbers on the screen until this track's finished.'”
Q7	Katie	External challenges	“It is sometimes a thing of get control ... there's been a lot of music on that I don't like. It is quite distracting to have that going on in the background so having your own music, say preparing to bring your own music in to get back control because it doesn't really matter what goes on around you, so you don't have to listen in to what everyone else is listening to, you can kind of have your own little bubble.”
Q8	Sarah	External challenges	“I don't like it when in the gym where they've got loud music blasting out that kind of drowns you out though, because I want my own cocoon rather than what they tell, what they're playing ... I find running in the gym when people are around you, I find it a little bit claustrophobic, so the music is part of create a little bubble around myself to protect me from the gym world.”
Q9	Katie	External challenges	“I find especially with if they do like spin classes, often they're done in studios and they're quite claustrophobic and they can be quite dark ... they put on this pumping sort of house music ... I suppose it's quite a claustrophobic kind of atmosphere and the music sort of makes me feel like I'm in a nightclub that I can't really escape from.”
Q10	Katie	Achieving control (of pacing)	“Les Mills [organisation providing 'off the shelf' classes for instructors] were absolutely fab ...I prefer the ones where they're actually using the music as a way to kind of structure the track ...I know how many repetitions I've got left because of where I am in the track, I know what the next move is going to be, I know when the vocals start back in and changing sides

or something like that ... it would be easier to pace yourself because you've got certain markers in a track where you, you think oh, I know that I'm halfway now."

Q11	Steven	Achieving control (of mood)	"I feel, um more unbeatable if when I'm running and you know I've got that, I'm in that right frame of mind, the music's, the right music's on, the weather's lovely ... it provokes, that, that sort of feelings of greater confidence and self-belief if you like ... It might not last you know within a few hours of being back in, in at home in the real world, you know I might be a grump again ... whilst I've got that music on and I'm running at even if it's a slow pace, you know, I might feel great about that, about the world."
Q12	Andrew	Achieving control (of workout duration)	"I suppose I choose it [music] because I know it works for me when I'm out running, it's got the desired effect on me while I'm running, you know, it takes me into that kind of zone where I'm just enjoying it and I'm enjoying the music and it helps me enjoy the running and I think that's why I choose it ... it kind of is a distraction really, which is, which is kind of what I'm looking for ... not taking my mind off the running, but it's making it a more enjoyable experience ... if I wasn't listening to music I probably wouldn't be out as long, so the music is helping me stay out there and therefore helping me improve."

Internal challenges relating to self-efficacy, tiredness and boredom were overcome with music. Andrew (Q1) described how the “lure” of listening to music helped overcome reluctance to begin a run and to take control of the exercise session, avoiding the temptation to cut it short. Steven also stated that music helped him complete longer runs (Q2) and that this was not feasible without music, which appeared to have facilitated self-efficacy. Ruth had originally tried to run with music, expecting it to help overcome a sense of effort (Q3), but abandoned it for various reasons (see Q22 and Q35 in subsequent sections) in favour of a music-free, counting strategy used to dissociate (Q4). Ruth’s focus on something other than physical activity, in order to dissociate, is comparable to other participants’ use of music.

Both Charlotte (Q5) and Belinda (Q6) used music to set short-term endurance-related targets. Charlotte challenged herself to continue at high intensity for the remainder of a track while Belinda did not allow herself to check progress on a machine display until a song finished. Belinda described this as using music intentionally to “distract”, possibly relating to a strategy to manage rowing, which she found “dull”. In Charlotte’s case, the dissociation helped overcome tiredness.

Participants also used music to help them gain control over external challenges, particularly other-selected music broadcast in gyms. Both Katie (Q7) and Sarah (Q8) described listening to music on their PLDs to create a private “bubble”, shutting out music imposed on them in favour of their own selection. Katie, in contrast to the “bubble” described in Q7, vividly expressed the experience of being in a spin class where she disliked the other-selected music, conveying an unpleasant lack of control of the environment (Q9).

While the classes may have been designed to replicate a 'fun' club environment, Katie was experiencing something very different. This was not applicable to all her classes; she also noted managing exercise intensity through familiarity with class music she liked (Q8).

Steven and Andrew described particularly positive experiences of achieving control through combining running and music; for Steven (Q11), this related to mood, and elevated feelings of confidence and self-belief, while Andrew (Q12) described being in a "zone" where enjoying the music helped him complete a longer run.

It's all about me

This theme concerns music use to reflect self-identity, to differentiate from others and construct a social identity through music-invoked memories. There were three subthemes: differentiation from others, lifestage and context, and connections with others. Supporting quotes are provided in Table 4.

Participants emphasised their individuality when talking about their exercise music. Sophie stated that she was less reliant on music than many of her friends (Q13), while Katie described herself as not an "album type" (Q14). Charlotte considered herself unusual in not synchronising to the beat of the music (Q15). Steven had found an online source for music mixes; having initially described the creator as a "kindred spirit" because of shared unusual musical preferences (Q16), he described excluding tracks that he considered unsuitable, attributing this to "personal taste".

Table 4: Quotations for 'It's All About Me'

Reference	Participant	Subtheme(s)	Quotation
Q13	Sophie	Differentiation from others	"I don't rely on it, obviously some people do, but no, I don't rely on it all the time."
Q14	Katie	Differentiation from others	"I'm not the kind of person that wants to listen to an album from start to finish, I'm too picky and kind of fickle."
Q15	Charlotte	Differentiation from others	"I'm probably quite unusual in some ways in the way that I run because I tend to have a sort of comfortable speed really ... so the only time I would really pay attention to the actual speed of the music as such would be if I was doing something where a particular song came on that was just slightly faster, slightly faster beat than I was currently running at ... it's not something that I do on purpose. I think I'm quite unusual. I think a lot of people try and run in a rhythm to the music, whereas I find that my rhythm is quite different."
Q16	Steven	Differentiation from others	"It's like wow, a kindred spirit, I don't think there's many people who would have the music I do to run to ... actually, because I, there was only a few songs I thought would be good, so I didn't want his mix so then I had to basically go through his, his things and see which ones they were ... so I've not downloaded his mix cos there was lots on there that I didn't, that I wouldn't have ran to or been, you know, been comfortable running to ... it's personal preference."
Q17	Sophie	Life stage and context	"That's student days I suppose, a lot of those songs probably have yeah, quite a lot of different memories and things and that's kind of real yeah extension of them I suppose because I suppose with my running a lot of the time particularly since I've had the children

Q18	Belinda	Life stage and context/connections with others	<p>it's thinking time and just, you know half an hour, an hour to myself, so sometimes it's nice, I suppose you do reminisce a bit.”</p> <p>“It's just a feeling ... if the Communards come on, because we used to, because that's an association with exercise and socialising and feeling good, it was, because there used to be four of us ... We used to all trot up, go to - it was so healthy - go to aerobics, come back, call in at the bar, have a pint or two, trog all the way back to the flats, shower, get changed, go back into the bar and into the club bit of the bar and dance all night, and that was every Tuesday and Thursday we used to do that.”</p>
Q19	Sarah	Connections with others	<p>“[Husband] and I had an evening where we just went through random CDs picking out songs and making some playlists just for fun, like he put some songs on that he knew that I didn't know and so that when I was listening to them they'd kind of like have a 'oh, this is what he picked' kind of, and it would just kind of keep me going ... there was one, my favourite one which is one called 'Only Losers take the Bus' which is like every time I hear it, it just makes me laugh, he put it on so I would like, no, you're not taking the bus, you're going to keep running and it kind of ironically appears when you're going up Anchor Road ... it's a really kind of like pushing you on kind of ... I'm not getting the bus, I'm not getting the bus, so that sort of, kind of happy association songs.”</p>

Participants drew on an autobiographical sense of self through music to promote positive affect. Sophie described escaping from current responsibilities to take time for herself, running to tracks that brought back memories of university (Q17). Belinda also listened to exercise music playlists that evoked memories of university, involving “exercise, socialising and feeling good” (Q18) and interactions with university friends. Sarah used music to remind her of social connections (Q19), choosing a track selected for her by her husband, “Only Losers Get the Bus”, to encourage herself to persevere with more challenging sections of her runs and gaining a sense of his encouragement from it. This reinforcement of identity and social ties was purely for the individual; music was listened to through headphones, perhaps indicating a private reassurance of identity, rather than articulating identity through group listening.

These examples show music choice reflecting a sense of self, carried over to an exercising-self differentiated from known and unknown others. Participants constructed their identities socially while simultaneously promoting their individuality, conveying both who they were and the social worlds to which they belonged.

Exercise-music literacy

Exercise-music literacy might be defined as “the wide range of skills and competencies that people develop to seek out, comprehend, evaluate and use music to make soundtracks to increase quality and/or enjoyment of exercise,” an adaptation of Zarcadoolas, Pleasant and Greer’s definition of health literacy (2006). Creating playlists requires technological competency alongside musical judgement to select appropriate exercising tracks. This theme shows how music is selected to address workout quality through regulating physical

output, for example selecting more upbeat or intense music for faster running. It reflects preparation for exercise. Within the theme, there were subthemes of musical judgement, where preferences were recognised and music selected for its potential to enhance exercise, and of technological competence to manage electronic music libraries and PLDs. Supporting quotations are provided in Table 5.

Participants were able to explain their preferences for particular music for exercise. Katie's description of "pumping house" having too little musical variation, and requirement for "peaks and troughs" (Q20) are examples. However, Ruth's approach of choosing music she enjoyed in other settings (Q21) resulted in a running playlist that was unsatisfactory, and she found the tracks irritating in the different context (Q22). Ruth was highly engaged with music, and a trained musician who listened to popular and classical music radio stations frequently. The irritation and annoyance she described may have related to music raising her arousal levels, since she likened her running to meditation.

Amanda (Q23) and Charlotte (Q24) also had classical music training, but responded very differently to remixes of classical repertoire played in aerobics classes; Amanda enjoyed them as they were consistent with her identity as a "classical person", while Charlotte described how they did not feel "right", attributing this to her familiarity with the original scoring. These differences demonstrate varied preference even with a similar musical background, and how identity is constructed in relation to the music in different ways.

Table 5: Quotations for 'Exercise-Music Literacy'

Reference	Participant	Subtheme(s)	Quotation
Q20	Katie	Musical judgement	"It's too repetitive for me and the beat is too, it's too standard, there's no kind of peaks and troughs in it um and it's just not a, a preference in terms of what I like to listen to."
Q21	Ruth	Musical judgement	"I think I must have gone through what music we've got and gone, 'Oh, that'll be alright for running, I like that song, that'll be OK, I like that, I like that.'"
Q22	Ruth	Musical judgement	"I found that the songs were irritating me, so I got my iPod and I'd be like 'Oh, I don't want that one on, don't want that one on, don't want that one on' and would be quite irritated by it. It annoyed me."
Q23	Amanda	Musical judgement	"I've been to a few spinning classes where some of the choice has been quite interesting ... there is a particular song I remember, the one I really, really like ... is The Phantom of the Opera-esque, a dance remix of Phantom of the Opera and there's also a Bach Toccata and Fugue dance remix and as a classical person, these ones appeal to me quite a lot."
Q24	Charlotte	Musical judgement	"I think the thing about that particular track I've just described [Vivaldi] ... it's all been produced et cetera, and made into this sort of more rocky type thing. Because I know the original, I just think 'Oh no!' It just doesn't fit right with me because I know I've already played it, it's one of those and I just think no I can't, this isn't. I don't like the version of the track ... Because I know what it how it would have originally, I think that's how I know it's set, and that's how I know it most, I think that's why it puts me off a little bit I guess."
Q25	Steven	Musical judgement	"It just, it builds and builds ... to this epic crescendo, I mean that again if, if you and I had the same music, same track lists and at the same point and you just watched me on the

treadmill for an hour, you could probably say, he's listening to such a song, by the speed of my legs, because I probably speed up and slow down with the music ...something more emotional in my brain probably, it's so you know, it's difficult to pinpoint."

Q26	Martin	Musical judgement	"I like to have, yeah, sort of a mix of, I think I pick the mood, and I can change, I think it does change what speed I'm walking, well now because of having the stoma here I don't know, because you see I've got a double hernia done, and what was happening was if I walked over a certain pace, I'd get intense pain here."
Q27	Charlotte	Technological competence	"I have it on shuffle so I don't know what's coming next. I think if I had, if I did just do the playlist and just play each time, so the same each time, then I think that I'd, I don't think that would work as well for me, especially if, you know, there are hills and things and you think 'This song means my hill.'"
Q28	Belinda	(Lack of) technological competence	"I use my old iPhone at the moment because I haven't got, this is new and I didn't have the SD card or something, I'm hopeless and [daughter] sorts me out, but I've not managed to get any music onto it because with my iPhone I did it all from my CDs, loaded it onto iTunes and put it on my iPhone but I don't know how to do it on that one and [daughter] couldn't figure it out either because she always just downloads music, she doesn't have CDs, she just downloads everything so, she tried to do it for me and failed, because it was another format or something and so I have to just charge up my old iPhone and use that as an iPod, but the battery's gone on it so you have to charge it because it only lasts for about 12 hours and then it's all gone again."
Q29	Martin	Technological competence	"They send out, is it every week? Yes, this week's track as an email if you signed up for them, with a track on, say, listen to it ... so that I found good because I just go through it, think, "Oh that looks interesting," press it and it sends you on to a site where they send you off to another site or another. That's how I found them."

Q30

Amanda

Technological
competence

“The couch to 5k you need a certain length of playlist and I've got the audio spoken bits for when to walk and when to run and so I created a playlist to go with that, because I didn't like the playlist that was already with that... I have software that allows you to run the two together ... You can record your own speaking if you want but I don't, I use theirs, so you just download that, it's one track and then you put music in the second and then you merge them to make an MP3.”

Participants selected music for both higher and lower intensity. Steven described “speeding up” with music, attributing an emotional affect to its increasing intensity, although he struggled to articulate this, stating “It’s difficult to pinpoint” (Q25). Martin, in contrast, selected music where the “mood” would lead to him walking more slowly to avoid pain from underlying medical conditions (Q26).

Technological competence included using computer software and PLD functions to manage libraries and source and create tracks. Participants described finding suitable exercise music from a range of sources. Andrew browsed new music using Amazon, Spotify and iTunes, while Martin’s lack of funds drew him to sites such as InSound, which at the time offered free downloads. Amanda, Charlotte and Sophie described an evolutionary process of building playlists, changing them periodically to incorporate new discoveries, and removing tracks that they had tired of while keeping preferred tracks. Charlotte used shuffle (Q27) to avoid creating associations between certain tracks and locations on her running route.

Not all participants were technologically adept; Belinda, despite being able to pinpoint the pertinent musical qualities of her preferred exercise tracks, described difficulties in transferring the CD tracks to a new phone (Q28). Consequently, she continued to use an old phone with an unreliable battery in order to continue listening to preferred tracks during exercise. Other participants were more adept with technology, with Martin sourcing new music from music e-newsletter links (Q29) and Amanda using music software to merge preferred music with pre-recorded spoken training instructions for a Couch to 5k programme (Q30).

Embodiment

This theme encompasses the described experiences of internalising the music and beat entrainment. Hardware, in contrast, was often experienced as problematic, externalised and inconvenient, with the exception of Charlotte. In contrast to exercise music literacy, where the focus is preparation, embodiment refers to experience once exercise is underway.

Supporting quotes are provided in Table 6.

Andrew described how he needed the music to “really get in your head” (Q31) while Steven referred to “endorphins” and “physicality” of music (Q32), inferring body-music interaction, and Belinda talked about familiar music becoming “part of you” (Q33). These quotes suggest an experience of internalising the music. Nevertheless, entrainment of the beat sufficiently to synchronise with it presented challenges. Belinda considered her selection of synchronous music “a stroke of luck” (Q34), while Ruth, having selected tracks based primarily on liking, subsequently found the beats per minute were not the “right pace” (Q35). Katie felt she needed to run with the beat, but the tempo of selected songs did not correspond to her running cadence, leading to stumbling (Q36). Sarah described how she found herself unable to run in time to music even when using music designed to be the appropriate tempo, and noted she was also unable to clap in time to music (Q37). The latter indicates possible beat deafness (Phillips-Silver et al., 2011); while difficulties synchronising running could reflect inappropriate tempo, clapping is not similarly constrained. Sarah presented herself and her feet as different entities – “I’m trying...and *my feet*” – and there is a sense that her feet are autonomous, refusing to be controlled by the rest of her. This may also reflect a struggle to translate cognitive intention into physical action, and contrasts with the participants describing music as internalised.

Table 6: Quotations for 'Embodiment'

Reference	Participant	Subtheme(s)	Quotation
Q31	Andrew	Internalisation	"For me it's got to really get in your head and it's and I think you become kind of wrapped in that environment if you know what I mean? It's a difficult one, I'm not listening to the tracks; the music is in me, if you know what I mean. It's kind of a weird ... I just kind of feel like the music's just there and it's just part of the whole experience really. Running and the music are kind of intertwined."
Q32	Steven	Internalisation	"I love the endorphins of the physicality of what you're doing, I think it does, yeah, it can work in harmony."
Q33	Belinda	Internalisation	"When you know music really well, you almost stop thinking about it and I think you react quite instinctively to them, they're almost sort of part of you."
Q34	Belinda	The challenge of synchronising	"I am usually, I am sort of late 80s early 90s with my running cadence, I think, I think because I did, I did sort of work it all out once ... I must have got it [tempo of playlist items] about right when I did it originally, mustn't I? That was a stroke of luck."
Q35	Ruth	The challenge of synchronising	"I'd be running to the beat of the music and it's never at the right pace you want to go at."
Q36	Katie	The challenge of synchronising	"I can't work faster or slower than the beat on the track, so because I can't change the tempo on my iPod. If it doesn't match, like it will be upset me, if like when I'm putting my feet down it's off the beat, track, that makes me get a bit, throws me off balance a little bit, and I've like tripped over a couple of times, just trying to put my feet down at the wrong time."

Q37	Sarah	The challenge of synchronising	I was listening to those podcasts, those ones that are very specific beats per minute ... I just couldn't, you know? I always felt like I'm trying to and it's like, you know, make your 1, 2, 3, and my feet, I wasn't doing that. I'm trying, but my feet aren't doing that, so it was too much of a distraction ... I found it difficult to match my own running speed with the music speed ... I don't think I'm particularly rhythmic anyway. You know when everyone's clapping in time? I'm always the first one who loses the clap [laughs] ... everybody's in a concert all clapping in time, I will start off in time with everybody and then I have to stop a little bit later 'cos I realise I'm not in time anymore ... maybe that's why I can't run in time to music."
Q38	Sophie	Hardware hassles	"Sometimes you just don't want the extra bulk of carrying that thing [PLD] whilst you're running and it's just something else to delay you going out the door."
Q39	Ruth	Hardware hassles	"The earphones ... keep falling out and just irritate me, you know I'd be that there and having to keep putting them in, and then you can't hear anything else, you know, you just hear the music and just having those in your ears ... oh, it just irritated me."
Q40	Steven	Hardware hassles	"I seem to have strange-sized ears and nothing, I mean, these are my headphones now and they have a little thing that clip into the inner ear and they've been the best I've found so far that don't fall out, but yeah, I just fear that they're, the wires might get in the way and I'll pull it out or I'd be faffing forever and I don't want that when I'm racing."
Q41	Amanda	Hardware hassles	"I'll then either do weights after or before, but then I've not got the music in because I don't want to get the cables tangled, that's another reason at home for not using earphones whilst doing free weights. I'd worry that the headphones would get tangled."
Q42	Charlotte	Hardware hassles	"I would say a hundred percent the main reason why I have the iPod itself was the music ... I've got an iPod that I've had several years and it's all, it's seen better days and it's a little varnish is coming off and it's got all, sort of white stuff which is the salt, come off my skin and I can't quite get off properly anymore."

Hardware was often described negatively. Despite PLDs being able to transport huge libraries, providing flexibility for exercise music choice, they were experienced as inconvenient. Sophie referred to the “extra bulk of carrying that thing” (Q38) while Ruth described irritation with headphones that fell out (Q39) which had contributed to her abandoning listening to music while running. Other participants expressed concern with wires getting in the way in races (Steven, Q40), or becoming tangled while lifting weights (Amanda, Q41). The distinction between these comments and those of Charlotte was marked. As an early adopter of new listening technology, Charlotte described her journey with different devices and how her well-used iPod had become permanently marked by salt from perspiration which could not be removed (Q42); she had become engrained in her device.

Discussion

Ten participants who exercised regularly were interviewed to explore their experiences of using music during exercise as well as their selection and curation practices. Interpretative phenomenological analysis (IPA) was used to analyse the transcripts, and four main themes were identified. These were *Taking control*, *It’s all about me*, *Exercise music literacy* and *Embodiment*. Findings indicated sophisticated, personalised music selection and use applies in exercise, much as in other contexts. There were some frustrations and limitations in optimising music use, particularly regarding technological issues and synchronising activity to the beat.

Experiences of exercise music use

The themes incorporated similarities found across experiences and practices which were nevertheless highly individualised. Participants used identical expressions; for example, Katie and Sarah both referred to creating a “bubble” through listening to music, constructing a controllable environment in the context of an uncontrollable one. This echoes Bull’s findings regarding the use of personal listening devices (PLDs), and his description of the “privatised auditory bubble” (2005, p. 344). Music was also used to create a distraction, enabling dissociation from feelings of effort or boredom to gain control over internal challenges. This supports the findings of Priest and Karageorghis (2008) and Hallett and Lamont (2015), where dissociation was practised by participants using music or other media to distract from the effort of exercise.

Music was described as being “inside” the participant and sensed as embodied. The interaction of activity and music led participants to experience increased confidence and enjoyment; the motivation, arousal and reduced rate of perceived exertion identified as consequences of listening to music (Karageorghis, 2016) are evident here. Despite commonalities of purpose and experience, participants’ processes and preferences were very individual. This suggests that tailoring, rather than a homogenised approach, is likely to help generate optimum benefits.

The embodiment theme reflected participants experiencing music as “absorbed” and describing it as being within them. However, participants struggled to select and synchronise to an entrained beat, despite evidence suggesting listeners are adept at choosing music (DeNora, 2000; Skånland, 2013). This may be due to discrepancies in the beat as, for example, current dance music is typically 130 to 140 beats per minute (bpm), at

least 20 to 30 bpm too slow for a typical running cadence. Sarah described using music intended for synchronous running, but this ranged from 150 to 170 beats per minute (bpm), or a cadence of 75 to 85 strides per minute (a stride represents 2 steps, one left and one right). Hafer, Silvernail, Hillstrom, and Boyer (2016) found an average running cadence among their participants of 84.3 +/- 5.2 strides per minute, corresponding with 168.6 +/- 10.4 bpm, so 170 bpm may have been too slow (although Sarah described difficulties with non-exercise entrainment such as clapping along at concerts). Evidence suggested that synchronising arises through luck (Belinda), is struggled with (Katie and Sarah), or no attempt is made (Charlotte). While Greb et al. (2017) and Hallett and Lamont (2017) found that intentional synchronisation was not uncommon, findings here suggest otherwise (although the sample is small, and generalisation was not intended). Exercisers experienced some difficulty synchronising. This suggests that studies using synchronised movement may need to assist participants to achieve this, rather than assuming movement matches a headphone-delivered beat. Additionally, there is scope to increase awareness among exercisers of cadence and beats per minute.

Music selection

Practices of selecting music traversed themes, drawing on social identity (*It's all about me*), musical characteristics and accessibility of technology (*Exercise music literacy*). These indicated complex processes of selection, consistent with Hargreaves' reciprocal feedback model (2012) and Karageorghis' model of the motivational effect of music in exercise (2016). Participants could usually explain aspects of musical content underpinning their selections. This is consistent with the Goldsmiths Musical Sophistication Index (Müllensiefen

et al., 2014), demonstrating that selection is characterised by recognition of specific intrinsic musical devices rather than based on a 'hunch'. Several participants described specific social memories influencing their music choices, notably university (Belinda, Sophie and Steven); this related to self-identification within the private listening space created by headphone use, contributing to positive affect. Simultaneously, lack of awareness of others' individual exercise music choices, and a belief that broadcast gym music and class music represented typical listening practices, may have contributed to assumptions of being unusual in the *It's all about me* theme.

Selection was not always successful; Ruth's choices from non-exercise contexts did not 'fit' her running, although it is not clear whether this was the "wrong" music, or whether any music would have been over-arousing. Exercise-music literacy was not universal, particularly regarding technology. While technological challenges were pronounced in Belinda's struggles to rip CDs to a new phone, participants did not generally use their devices in particularly complex ways. This supports the earlier findings of Heye and Lamont (2010), despite recent advances in technology. Playlists were used, but participants reported having only one or two. Shuffle and manual scrolling/skipping were favoured as controls. Given that participants used self-selected music for a variety of different activities, it might be expected that they would compile playlists for particular types of exercise; this was not the case.

Music and the technology to play it were perceived as separate; music became embodied, while technology was often an inconvenience, although some participants were able to exploit it, such as Amanda's blending of spoken running programme instructions with her preferred music. The range of capabilities is consistent with that found by Krause

and North (2016). The exercise-music literacy theme encompasses both technology and choice of music, but within a relatively narrow context of exercise, rather than across everyday listening contexts. Lack of capacity to select music of appropriate tempo for a cadence is less relevant in non-exercise listening, and could be related to awareness, or simply reflect lack of time or concern among exercisers. It was surprising that Bluetooth headphones were not more widely used to avoid wires. Better designed, unobtrusive, widely-available technology may enhance the exercise experience.

Reflexive considerations

This section provides reflexivity from the first author, who carried out the project under the supervision of the second author. Reflexivity is important in IPA, and Willig's framework of personal and epistemological reflexivity (Willig, 2008) is used here. I am interested in both music and exercise, having studied music at postgraduate level and worked as an exercise-to-music and gym instructor. I am a keen runner of average ability, and my knowledge of running subculture conferred familiarity with technical terms and some of the events mentioned. This inadvertently led to assumptions; Charlotte's discussion of a particular marathon I had also taken part in was an important reminder of individuality, as she enjoyed a section that many runners, including myself, struggled with. My previous research indicated that my own approach to music use in exercise – multiple tailored playlists for different activities, often incorporating synchronisation – was unusual. Awareness that participants were likely to have quite different approaches to myself piqued my curiosity and I was keen to find out how and why they might contrast.

Epistemologically, geography affected who could be interviewed face-to-face.

Although two interviews were carried out by telephone, the sound quality made transcription more difficult and meant facial expressions and body language could not help guide the interviews. Recruitment, as with many such studies, was difficult and I had met six of the ten participants previously, although I did not know any of them well.

Limitations and future research

This study is historically positioned with particular technologies and music choices available. Fitness watch and smartwatch music control now reduces the need to carry additional devices. Bluetooth headphones were available at the time of the interviews, but were not used by the participants in this study. These devices could facilitate a more satisfactory experience with hardware than reported by some participants. Technology, music-using behaviours and preferences of exercisers are dynamic, and future research should document changes. While the present study reveals numerous interesting individual experiences, the individuality of the transcripts suggests that there are more practices among exercisers to be discovered and described. Given the dynamic nature of the field, a full picture of music use remains elusive. Additionally, all participants were UK-based, and practices may vary culturally.

There is scope to increase knowledge through further qualitative work, particularly using the grounded theory method (Charmaz, 2012; Glaser & Strauss, 1967; Strauss & Corbin, 1994) to build a more comprehensive model of music use in exercise with scope to develop music-based interventions for a range of exercise outcomes. Individual differences

were evident not only among the participants, but between participants and the researcher carrying out data collection and analysis. Further exploration could extend examples.

Better understanding of exercise-music literacy would also be useful. While this study presents examples of different competence levels, also documented by Krause and North (2016), there is not currently a measurement tool. Quantified exercise-music literacy might explain variance in intervention studies, and assist with further understanding of individual differences. Additionally, deploying factors such as associative properties of music might make exercise more enjoyable through generating positive affect; as yet, there is little evidence to connect enjoyment and adherence. Future research should explore this, and examine the potential for music enjoyment to assist with adherence.

Conclusion

The findings here underline the individuality of self-selected music use in exercise, particularly regarding personal associations. Some exercisers were frustrated by limitations in using technology and finding the best music for their needs, particularly for synchronous activity, while others had developed ways of enhancing their exercise with highly tailored, competently-curated music collections. Comments regarding personalising the environment, and regarding responses to broadcast music, are particularly relevant for the fitness industry where classes should be motivating, and background music can be obtrusive (Hallett & Lamont, 2015). Overall, indications are that exercisers are adept at using music to increase enjoyment of workouts, but that further understanding of technology and music characteristics could enhance this further.

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References

- Alter, D. A., O'Sullivan, M., Oh, P. I., Redelmeier, D. A., Marzolini, S., Liu, R., ... Bartel, L. R. (2015). Synchronized personalized music audio-playlists to improve adherence to physical activity among patients participating in a structured exercise program: a proof-of-principle feasibility study. *Sports Medicine - Open*, 2(1), 7. <http://doi.org/10.1186/s40798-015-0017-9>
- Bellows-Riecken, K., Mark, R., & Rhodes, R. E. (2013). Qualitative elicitation of affective beliefs related to physical activity. *Psychology of Sport and Exercise*, 14(5), 786–792. <http://doi.org/10.1016/j.psychsport.2013.04.002>
- Bird, J. M., Hall, J., Arnold, R., Karageorghis, C. I., & Hussein, A. (2016). Effects of music and music-video on core affect during exercise at the lactate threshold. *Psychology of Music*, 44(6), 1471–1487. <http://doi.org/10.1177/03057356166637909>
- Boecker, H., Sprenger, T., Spilker, M. E., Henriksen, G., Koppenhoefer, M., Wagner, K. J., ... Tolle, T. R. (2008). The runner's high: Opioidergic mechanisms in the human brain. *Cerebral Cortex*, 18(11), 2523–2531. <http://doi.org/10.1093/cercor/bhn013>
- British Heart Foundation. (2017). *Physical inactivity and sedentary behaviour report 2017*. Retrieved from <https://www.bhf.org.uk/publications/statistics/physical-inactivity->

report-2017

- Bull, M. (2005). No dead air! The iPod and the culture of mobile listening. *Leisure Studies*, 24(4), 343–355. <http://doi.org/10.1080/0261436052000330447>
- Bull, M. (2007). *Sound moves: iPod culture and urban experience*. Abingdon, Oxfordshire, UK: Routledge.
- Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical Activity, Exercise, and Physical Fitness : Definitions and Distinctions for Health-Related Research. *Public Health Reports*, 100(2), 126–131.
- Charmaz, K. (2012). The power and potential of grounded theory. *Medical Sociology Online*, 6(3), 2–15. Retrieved from http://www.medicalsociologyonline.org/resources/MSo-&-MSN-Archive/MSo_v.6/MSo-Volume-6-Issue-3.pdf
- DeNora, T. (2000). *Music in everyday life*. Cambridge, UK: Cambridge University Press.
- Donaghy, M. E. (2007). Exercise can seriously improve your mental health: Fact of fiction? *Advances in Physiotherapy*, 9(2), 76–88. <http://doi.org/10.1080/14038190701395838>
- Ekkekakis, P. (2009). The Dual-Mode Theory of affective responses to exercise in metatheoretical context: I. Initial impetus, basic postulates, and philosophical framework. *International Review of Sport and Exercise Psychology*, 2(1), 73–94. <http://doi.org/10.1080/17509840802705920>
- Fligor, B. (2009). Personal listening devices and hearing loss: Seeking evidence of a long term problem through a successful short-term investigation. *Noise and Health*, 11(44), 129. <http://doi.org/10.4103/1463-1741.53356>
- Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for*

qualitative research. New Brunswick and London: AldineTransaction.

<http://doi.org/10.2307/2575405>

Greasley, A. E., & Lamont, A. (2011). Exploring engagement with music in everyday life using experience sampling methodology. *Musicae Scientiae*, *15*(1), 45–71.

<http://doi.org/10.1177/1029864910393417>

Greb, F., Schlotz, W., & Steffens, J. (2017). Personal and situational influences on the functions of music listening. *Psychology of Music*, *44*(1), 129–147.

<http://doi.org/10.1177/0305735617724883>

Hafer, J. F., Silvernail, J. F., Hillstrom, H. J., & Boyer, K. A. (2016). Changes in coordination and its variability with an increase in running cadence. *Journal of Sports Sciences*, *34*(15), 1388–1395. <http://doi.org/10.1080/02640414.2015.1112021>

Hallett, R., & Lamont, A. (2015). How do gym members engage with music during exercise? *Qualitative Research in Sport, Exercise and Health*, *7*(3), 411–427.

<http://doi.org/10.1080/2159676X.2014.949835>

Hallett, R., & Lamont, A. (2017). Music use in exercise: A questionnaire study. *Media Psychology*, *20*(4), 658–684. <http://doi.org/10.1080/15213269.2016.1247716>

Hargreaves, D. J. (2012). Musical imagination: Perception and production, beauty and creativity. *Psychology of Music*, *40*(5), 539–557.

<http://doi.org/10.1177/0305735612444893>

Heidegger, M. (1962). *Being and Time* (J. Macquarrie and E. Robinson, Trans.). Oxford, UK: Blackwell. <http://doi.org/10.1353/mln.1998.0037>

Heye, A., & Lamont, A. (2010). Mobile listening situations in everyday life: The use of MP3

players while travelling. *Musicae Scientiae*, XIV(1), 95–120.

<http://doi.org/10.1177/102986491001400104>

Juslin, P. N., & Sloboda, J. A. (2011). Introduction: Aims, organization and terminology. In P. N. Juslin & J. A. Sloboda (Eds.), *Handbook of music and emotion* (pp. 3–12). Oxford, UK: Oxford University Press.

Karageorghis, C. I. (2016). The scientific application of music in exercise and sport: Towards a new theoretical model. In A. M. Lane (Ed.), *Sport and Exercise Psychology* (2nd ed., pp. 276–322). Hove, East Sussex, UK: Routledge.

Karageorghis, C. I., Terry, P. C., & Lane, A. M. (1999). Development and initial validation of an instrument to assess the motivational qualities of music in exercise and sport : The Brunel Music Rating Inventory. *Journal of Sports Sciences*, 17, 713–724.

<http://doi.org/10.1080/026404199365579>

Kinnafick, F.-E., Thogersen-Ntoumani, C., Shepherd, S. O., Wilson, O. J., Wagenmakers, A. J. M., & Shaw, C. S. (2018). In it together: A qualitative evaluation of participant experiences of a 10-week, group-based, workplace HIIT program for insufficiently active adults. *Journal of Sport and Exercise Psychology*, 40, 10–19. Retrieved from <https://journals-humankinetics-com.libezproxy.open.ac.uk/doi/pdf/10.1123/jsep.2017-0306>

Krause, A. E., & North, A. C. (2016). Music listening in everyday life: Devices, selection methods, and digital technology. *Psychology of Music*, 44(1), 129–147.

<http://doi.org/10.1177/0305735614559065>

Krause, A. E., & North, A. C. (2017). Pleasure, arousal, dominance, and judgments about

music in everyday life. *Psychology of Music*, 45(3), 355–374.

<http://doi.org/10.1177/0305735616664214>

Krause, A. E., North, A. C., & Hewitt, L. Y. (2015). Music-listening in everyday life: Devices and choice. *Psychology of Music*, 43(2), 155–170.

<http://doi.org/10.1177/0305735613496860>

Krause, A. E., North, A. C., & Hewitt, L. Y. (2016). The role of location in everyday experiences of music. *Psychology of Popular Media Culture*, 5(3), 232–257.

<http://doi.org/10.1037/ppm0000059>

Langdridge, D. (2007). *Phenomenological psychology*. Harlow, UK: Pearson Education.

Larkin, M., Watts, S., & Clifton, E. (2006). Giving voice and making sense in Interpretative Phenomenological Analysis. *Qualitative Research in Psychology*, 3, 102–120.

<http://doi.org/10.1191/1478088706qp062oa>

Laukka, P., & Quick, L. (2013). Emotional and motivational uses of music in sports and exercise: A questionnaire study among athletes. *Psychology of Music*, 41(2), 198–215.

<http://doi.org/10.1177/0305735611422507>

Mathews, R. M., Clair, A. A., & Kosloski, K. (2001). Keeping the beat: Use of rhythmic music during exercise activities for the elderly with dementia. *American Journal of Alzheimer's Disease and Other Dementias*, 16(6), 377–380.

<http://doi.org/10.1177/153331750101600608>

Merleau-Ponty, M. (1996). *Phenomenology of perception*. Delhi, India: Motilal Banarsidass.

Müllensiefen, D., Gingras, B., Musil, J., & Stewart, L. (2014). The Musicality of Non-Musicians : An Index for Assessing Musical Sophistication in the General Population.

PLoS ONE, 9(2), e89642. <http://doi.org/10.1371/journal.pone.0089642>

Myers, J. (2008). The health benefits and economics of physical activity. *Current Sports*

Medicine Reports, 7(6), 314–316. <http://doi.org/10.1249/JSR.0b013e31818ee179>

Peng, J.-H., Tao, Z.-Z., & Huang, Z.-W. (2007). Risk of damage to hearing from personal listening devices in young adults. *Journal of Otolaryngology*, 36(3), 181–5.

<http://doi.org/10.2310/7070.2007.0032>

Phillips-Silver, J., Toiviainen, P., Gosselin, N., Piché, O., Nozaradan, S., Palmer, C., & Peretz, I.

(2011). Born to dance but beat deaf: A new form of congenital amusia.

Neuropsychologia, 49(5), 961–969.

<http://doi.org/10.1016/j.neuropsychologia.2011.02.002>

Priest, D. L., & Karageorghis, C. I. (2008). A qualitative investigation into the characteristics and effects of music accompanying exercise. *European Physical Education Review*,

14(3), 347–366. <http://doi.org/10.1177/1356336X08095670>

Raichlen, D. A., Foster, A. D., Gerdeman, G. L., Seillier, A., & Giuffrida, A. (2012). Wired to run: exercise-induced endocannabinoid signaling in humans and cursorial mammals

with implications for the “runner’s high.” *Journal of Experimental Biology*, 215(8),

1331–1336. <http://doi.org/10.1242/jeb.063677>

Skånland, M. S. (2013). Everyday music listening and affect regulation: The role of MP3

players. *International Journal of Qualitative Studies on Health and Well-Being*, 8(1),

(online only). <http://doi.org/10.3402/qhw.v8i0.20595>

Smith, J. (2019). Participants and researchers searching for meaning : Conceptual

developments for interpretative phenomenological analysis phenomenological

analysis. *Qualitative Research in Psychology*, 16(2), 166–181.

<http://doi.org/10.1080/14780887.2018.1540648>

Smith, J., Flowers, P., & Larkin, M. (2009). *Interpretative phenomenological analysis*. London, UK: SAGE.

Stanton, R., Happell, B., & Reaburn, P. (2014). The mental health benefits of regular physical activity , and its role in preventing future depressive illness. *Nursing: Research and Reviews*, 4(May 2014), 45–53. <http://doi.org/10.2147/NRR.S41956>

Stork, M. J., Kwan, M. Y. W., Gibala, M. J., & Martin Ginis, K. A. (2015). Music enhances performance and perceived enjoyment of sprint interval exercise. *Medicine & Science in Sports & Exercise*, 47(5), 1052–1060.

<http://doi.org/10.1249/MSS.0000000000000494>

Strauss, A., & Corbin, J. (1994). Grounded theory methodology. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 273–285). Thousand Oaks, CA: SAGE. <http://doi.org/10.1007/BF00988593>

Terry, P. C., Karageorghis, C. I., Saha, A. M., & D’Auria, S. (2012). Effects of synchronous music on treadmill running among elite triathletes. *Journal of Science and Medicine in Sport*, 15(1), 52–57. <http://doi.org/10.1016/j.jsams.2011.06.003>

Warburton, D. E. R., Charlesworth, S., Ivey, A., Nettlefold, L., & Bredin, S. S. D. (2010). A systematic review of the evidence for Canada’s Physical Activity Guidelines for Adults. *International Journal of Behavioral Nutrition and Physical Activity*, 7(39).

<http://doi.org/10.1186/1479-5868-7-39>

Weed, M. (2016). Evidence for physical activity guidelines as a public health intervention:

efficacy, effectiveness, and harm – a critical policy sciences approach. *Health Psychology and Behavioral Medicine*, 4(1), 56–69.

<http://doi.org/10.1080/21642850.2016.1159517>

Willig, C. (2008). *Introducing qualitative research in psychology* (2nd ed.). Berkshire, UK: McGraw Hill/Open University Press.

Worthington, D. A., Siegel, J. H., Wilber, L. A., Faber, B. M., Dunckley, K. T., Garstecki, D. C., & Dhar, S. (2009). Comparing two methods to measure preferred listening levels of personal listening devices. *The Journal of the Acoustical Society of America*, 125(6), 3733–3741. <http://doi.org/10.1121/1.3125798>

Zarcadoolas, C., Pleasant, A., & Greer, D. (2006). *Advancing health literacy*. San Francisco, CA: Jossey-Bass.

Appendix A

The outline below was used as a starting point for each semi-structured interview schedule. It was tailored and augmented to reflect participants' survey responses so that these could be explored in further depth.

Exercise generally

- what you do
- sticking to plans
- what happens without music if you normally use it
- how music fits in, level of priority

Talk about music in exercise

- how it feels to exercise with it
- era, style, bpm, associations, different sports
- selection process
- playlist – what's on it? Why? What effect does each track have on you?

Dissociation or focus? [*i.e. is music used to dissociate from activity or complement it?*]

Shared references in classes? [*i.e. does music have similar cultural meaning to different attendees in the same exercise class?*]

Where other people choose it

Where it's worked particularly well

Where it hasn't worked particularly well

Music outside exercise – is it different?