

## The influence of age and music on ergogenic outcomes, energy and affect in gym-based exercise sessions

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### ABSTRACT

Music is frequently used to accompany group and individual exercise to help increase motivation and enjoyment. It has been suggested that to be motivating, exercise music should reflect the age of exercisers, but there is little empirical support for this in gym contexts. This study explores the area using mixed methods, with a qualitative study used to inform the design of a field-based within-participant quasi-experiment. Sixteen participants were interviewed about exercise preferences, motivations and media use during exercise and the data explored using thematic analysis. Results indicated that contemporary music was widely liked by a 'worker' group of exercisers into their late fifties, while a smaller 'socialiser' group, typically retired, were ambivalent towards music. Twenty-four participants undertook a treadmill protocol with measurements of distance covered, self-perceived affect and energy and liking for each of the three music conditions: contemporary pop (80-100bpm), contemporary dance (~130bpm) and 1960s/1970s pop (~130bpm). Data was analyzed by participant age with an over-45 and under-45 group. Although 1960s/1970s music led to slightly superior outcomes for the older group, it was disliked by the younger group and produced inferior outcomes to the other styles; there was a significant interaction between age and music preference. The 1960s/1970s music offers only a modest benefit for older exercisers and appears to alienate younger exercisers. Dance music, however, appeals to a broad age range and is recommended for gym use, although it may be advisable to reduce volume when attendance by retired members is high.

### I. INTRODUCTION

Gym facilities provide a convenient means of addressing cardiovascular fitness, flexibility and muscular strength and endurance through regular exercise. The benefits of exercise are well-established for both physical health (Myers, 2008) and mental health (Donaghy, 2007) but adherence to exercise programs is often poor (Weinberg & Gould, 2007) and exercise rates decrease with age (NHS Information Centre, 2008). There is therefore a need to understand motivation and find ways to increase adherence. Music may be a useful tool.

Research indicates that using music during exercise can impact positively on a range of outcomes compared with no-music controls (Terry & Karageorghis, 2006) and is perceived by exercisers to be beneficial even where impact on measurable outcomes is minimal (Tenenbaum et al., 2004). Karageorghis and Terry's review of the previous quarter century of music-in-exercise literature (1997) marks the start of considerable growth in research into music and physical activity, with Karageorghis and his colleagues particularly keen to address methodological weaknesses identified in the 1997 review. The Brunel Music Rating Inventory, or BMRI, (Karageorghis, Terry & Lane, 1999) and its successor BMRI-2 (Karageorghis, Priest, Chatzisarantis & Lane, 2006) have been adopted by many researchers for selecting music, but the

Inventory's application is dependent on first identifying appropriate tracks to motivate a particular cohort and then using the inventory to rate intrinsic musical properties such as tempo and rhythm. There are limitations through raters' understanding of musical concepts; melody is rated, but harmony is not as participants in its development (who were rarely musically-trained) were found to be unable to conceptualize harmony. Furthermore, Crust (2008) and Bishop, Karageorghis and Loizou (2007) found that music preference in exercise depended heavily on extra-musical characteristics such as personal associations.

Juslin's framework of emotional responses to music (2009) also emphasizes the importance of extrinsic characteristics, considering response as pertaining to musical, individual and situational factors. With regard to musical factors, Juslin emphasizes the importance of violation of expectation – the scope of music to create tension and resolution – which the BMRI-2 does not consider but which is important to music response. Nevertheless, manipulation of basic music parameters such as tempo can produce dramatic results: Waterhouse, Hudson and Edwards (2010) recorded a 3.5% increase in power output in a cycling test when music tempo was increased by 10%. Participants, however, were unable to identify differences between the conditions, reporting that the music sounded 'brighter,' suggesting that rating tempo, as required by the BMRI-2, may be problematic.

Synchronization of physical movements to a beat in, for example, running, is explored in the literature and appears to increase output. In unpublished research by Bacon, Myers and Karageorghis reported by Karageorghis and Priest (2008), it was found that synchronizing movement could result in a 7% lower demand for oxygen during exercise. Simpson and Karageorghis's study of sprinting to synchronous music (2006) demonstrates the difficulties with using synchronous music. The running cadence (steps per minute) varied across participants, resulting in the need to run a number of trials at slightly different tempi. In a gym context, where a wide variety of exercise is taking place, the scope for synchronization is limited as far as broadcast music is concerned. It is unknown whether exercisers using MP3 players and similar devices select music to synchronize with their activity, and this is worthy of exploration.

Juslin's individual factors (2009) concern demographics, a person's background, training and current mood. Age is of particular interest here, as it has been found to influence preferences. Holbrook and Schindler (1989) found that musical preferences are largely formed by age 24, while a recent study by North (2010) with over 36,000 participants found that age was the biggest influence on music preference. However, Lamont and Webb (2010) note that preference changes on a short- and long-term basis, with listeners having all-time and current favourites, and refreshing their listening preferences regularly, indicating a dynamic process. There is very little

research on how music is listened to across the lifespan, particularly regarding the use of iPods or similar devices either in an exercise context or more generally. Across the music-in-exercise literature, there is a tendency to focus on younger cohorts, largely due to the convenience for researchers of recruiting undergraduate participants, or elderly populations. There are exceptions: Crust's study of circuit class attendees (2008) had a mean age of male participants of 38 and female participants of 32, and found that older exercisers preferred quieter, slower music, although the definition of 'older' is not made clear. Bishop et al.'s study of young tennis players (2007) found that music was used in a sophisticated way to manage mood before competition, but it is not clear whether this extends to older populations. More generally, Bull reports the creation of a "privatized auditory bubble" (2005: 344) among iPod users aged from 17 to 41, but there is no specific reference to exercise and whether this practice might be extended to exercise contexts. While these studies go some way to explore how personal music players are used, their scope is limited and extrapolation to gym contexts and lifespan listening is unlikely to be valid.

Situational factors concern issues such as acoustics and the presence of others, and the context of music listening. The importance of these raises issues regarding experimental methods which often involve lab-based protocols. While this offers scope for rigorously-controlled environments, as advocated by Karageorghis and Terry (1997), the lack of ecological validity may compromise the extent to which findings might be applied to real-world gym and music use. Additionally, many people find gyms intimidating (Miller & Miller, 2010), thus collecting data in an environment unfamiliar to participants could also distort outcomes. Scrutinizing participants during protocols may further affect responses: Edworthy and Waring (2006) and Elliott, Carr and Orme (2005) took measurements during the experiment. It is possible that this impacted on participant anxiety, or may have resulted in them working harder than usual because of a sense of being scrutinized.

While there is much done to try to select motivational music during exercise, tastes vary and there has been little consideration of the impact of disliked music, although Priest and Karageorghis (2008) report that the 'wrong' music may lead to curtailed exercise sessions and in extreme cases cancelled memberships. Oudeterous music (considered neither motivational nor demotivational) produces comparable outcomes to music deemed motivational (Simpson and Karageorghis, 2006; Karageorghis and Deeth, 2002): music classified as motivational is that scoring highly on the BMRI-2 while oudeterous music is that which scores below the middle range. Dyrland and Wininger (2008) found that exercise enjoyment is greatest when music from a most preferred style is played (from classic rock, country, rap, hip-hop, alternative and oldies) so this may have some bearing on positive disposition towards exercise, and hence adherence.

The discussion above identifies a number of areas in need of further exploration. There is little study of the response to music of exercise participants aged between 30 and 60, and existing studies are typically lab-based. Protocols do not always reflect the kind of activities undertaken by the general public using gyms: 400m sprints (Simpson and Karageorghis, 2006) are not a usual activity among gym members, and it is

important that to be applicable in practice, relevant test protocols are used. There is anecdotal evidence that music played in gyms is disliked by some members, but the possible impact has not been explored. There is almost nothing in the literature regarding gym members' use of MP3 players and similar technology.

In order to explore these issues, a mixed methods approach was used to develop an initial qualitative study of music and motivation among gym users (Study 1), and the information from this was used to develop a field-based experiment (Study 2). Gym members, familiar with the equipment and environment, took part in a treadmill experiment similar to the activity they would normally carry out as part of their exercise programme. Through this, exercise and music use and responses were explored on an age basis.

## II. STUDY 1

### A. Method

1) *Sample*. Sixteen members of a local authority gym in the West Midlands were recruited to take part in semi-structured interviews. Participants were 8 males and 8 females aged 17 to 67 ( $M=44.6$ ,  $SD=16.6$ ). All participants had been using the gym regularly for at least a year, with the exception of one (Linda) who had recently returned to regular exercise after a period as a carer. Pseudonyms have been used instead of participants' names.

2) *Materials*. A semi-structured interview framework was developed with questions devised to investigate exercise habits, reasons for using the facility, preferred exercise types, use of media in the gym, social interactions and general likes and dislikes. There was a particular focus on the effect of music played in the gym and of personal music players on participants' exercising. Interviews were recorded using an Olympus VN-4100 digital recorder and transcribed using Express Scribe software.

3) *Procedure*. Participants were interviewed for 10 to 20 minutes using the semi-structured framework, departing from that as necessary to explore issues arising. All interviews except one were carried out on a one-to-one basis; the remaining interview was carried out with two members who exercise together. Interviews were carried out on the Leisure Complex premises, in the reception area when quiet and in a separate private room at busier times.

4) *Ethics*. Ethical approval was sought and obtained for both studies from Keele University School of Psychology Ethics Committee prior to all data collection.

5) *Analytic strategy*. Thematic analysis was used to identify themes in the data, using Braun and Clarke's six-stage thematic analysis framework (2006), identified as being flexible while also offering the potential to deliver rich data and complex understandings. Following an initial stage of familiarization with the data through transcribing and reading, transcripts were analyzed, coded and initial themes derived by moving forwards and backwards through analytical stages, refining and developing thematic maps to reduce the analysis to key themes.

## B. Results

Two main theme areas were identified: (1) environmental engagement and (2) focus and dissociation. Gym users fell into two main categories with regard to their environmental engagement: ‘socialisers’, who engage extensively with other people, and ‘workers’, who prefer to disengage from others to focus on their exercise. The focus and dissociation theme found that socialisers preferred to dissociate from their exercise through chat and TV, while workers used music to focus on the quality of their exercise.

1) *Environmental engagement.* Retired and long-term sick gym members showed different patterns of motivation and media engagement to those who were in work. For those who worked, the gym was somewhere to ‘switch off’, disengaging from the environment and in particular from other people. The quote below is typical:

“I don’t, erm, come to socialize at all.” (Carol, 54)

For instructors, headphones created a signal to members that this was their personal exercise time:

“I use an MP3 or use an iPod, erm, just put my own music on and that really, and that’s so, erm, so I’m not interrupted [laughs] so even if it’s battery low I put my earphones in.” (Craig, 22)

For retired members and a long-term sick participant, the gym provided the routine and social contact no longer available through work. David (46), long-term sick, described a main benefit of the gym as “Just getting out my flat for a couple of hours and meeting people,” and a similar need for social contact was evident in the following comments:

“I do find, I don’t know if this is any help, the social thing as well... do the Acorns charity shop Thursday afternoon, Friday morning...do the gym Monday morning, Wednesday morning and that’s the week through.” (Margaret, 67, retired)

The need for routine was echoed by another retired gym member:

“I think the pattern is more important now because I’ve given up teaching completely so, erm, the Monday Wednesday Friday thing is year as a routine is more important than it was previously.” (Martin, 60)

For the retired participants, there was a strong theme of interaction with others, while for younger participants still in work, there was a notable sense of withdrawal and detachment, along with the creation of a mini-environment for the self through headphone use. These contrasts appeared to have a direct impact on the use of media in the gym, particularly music, and this led to the identification of the second theme, focus and dissociation.

2) *Focus and dissociation.* For non-retired members, a pattern was found of sophisticated use of playlists for workouts and a rejection of much of the music played through the gym’s

PA system as unsuitable for exercise as it lacked stimulating qualities: this was the case for a wide range of ages:

“I find that the music that you play in the gym is just so— it’s a bit soporific; it makes you go to sleep a bit [laughs]. It’s not motivational at all! [laughs] So I’ve got, erm, the old dance music on there [MP3 player].” (Carol, 54)

Carol’s antipathy was echoed by a participant half her age:

“Some of the music that comes on is totally inappropriate for the gym...A lot of the James Blunt stuff. It’s just so demotivating, when you hear that stuff. You just don’t want to do anything.” (Ben, 23)

MP3 players offered the control to ensure music fitted the member’s requirements, and these generally concerned workout quality with a desire often expressed for music to help increase effort:

“It’s not that I dislike the radio. I don’t listen to it usually because you never know what’s coming on the radio and I know the music that’s on my iPod so I know that it’s going to get me motivated.” (Emma, 32)

Only two of the participants expressed strong liking for the music played in the gym and engaged with it. They were female, aged 48 and 52 and exercised together. The music reflected shared preferences and provided a vehicle for social connection:

Interviewer: So it’s more the radio, the chart stuff you’d—  
Elaine (52): Yes, yes if I’m honest.  
Karen (48): We sing along sometimes.

A male participant who did not want to be quoted directly described a group of male exercisers who did resistance work together wanting heavy metal to be played on the gym sound system, although the request was declined. This and Elaine and Karen’s use of music suggest the possibility of a third, ‘grouper’ category of exercise music user where music is used as a shared reference and may reflect group identity.

There was evidence that music was selected to fit certain activities, with dance music mentioned as particularly suited for cardiovascular activities. Carol described using dance music for cardiovascular activities and contemporary heavy metal bands for resistance training with weights, referencing System of a Down and Linkin Park:

“I’ve got to have something on the cardio that’s got to keep me moving...and then with the weights, you need something a bit more oomph...I feel more powerful when there’s summat heavy on, don’t you?” (Carol, 54)

Given the widespread use of synchronous music in the research, it was notable that only one participant described synchronizing his movements on cardiovascular machines with music, and this had arisen accidentally:

“The music that I’ve set up on my iPod is, it’s got the right beat for me to be doing the right revs, so when I’m on the cardiovascular machines, particularly the cross-trainer, I’m

doing about 70 or 80 revs and I seem to be doing it in time with the music... Not that I've done it on purpose either. It's just something that's fast but it ends up being about the right beats." (Nigel, 48)

Participants were asked about synchronizing, but all except Nigel reported that they did not, or were not aware of doing so.

Compared with the workers, the socialisers showed ambivalence to bringing in MP3 players:

"I don't listen to music. don't bring an iPod or anything along." (Martin, 60)

David described listening to a personal music player as "very, very rare" while Barbara, 65, said that "I mean I have got it, erm, a player but as I say it's easier just to plug in and look at it the television" (TVs integrated into the cardiovascular machines).

Both Barbara and Michael described the music played by the gym as often being too loud, while a semi-retired member did not consider it pertinent to him and often tried to ignore it:

"I'd say up to sort of erm, up to 30, 35-ish [age range] is generally what I would say it's pitching at... if I don't like it I can switch it off anyway, internally sort of switch it away." (John, 62)

For the socializer group, activities alongside exercise were frequently used to dissociate from the activity. David described how "I find talking to somebody time goes quicker" while John described dissociating through watching TV:

"There was one of these auction type programs on and I just caught into something on gold rings and things which just interested me, suddenly find I've done 5 minutes without realizing." (John, 62)

Margaret described watching the TV if there was nobody to chat to, with the same principle of making time pass more quickly, while Barbara also described using the TV to dissociate, referring to it as:

"A distraction, yeah, you don't realize that you're putting in more the effort and the pace in to go then." (Barbara, 65)

Younger exercisers rejected the TVs for precisely this reason:

"It's like a distraction, isn't it? If you're watching the telly then you might not be going as fast you know, trying to watch your pace and stuff so no, I don't watch the telly." (Craig, 22)

Overall, the use of the gym space and application of media to workouts demonstrated a divide between the workers and socialisers, with the former more focused on workout quality and the application of music to achieve this, and the latter looking for engagement with others, often using this to dissociate from the exercise itself.

## C. Discussion

The results indicate distinct styles of engaging with a gym programme which appear dictated by lifestyle. Participants in employment liked to focus on workout quality, using MP3 players and sophisticated selection of music to help facilitate workout effort. They had little interest in engaging with other members. Participants who were retired or long-term sick used the gym as a vehicle for routine and personal interactions and often dissociated from activity by talking to other members or by listening to the TVs. They had little interest in using music in their workouts. There were indications of a third possible category of people who use music as a vehicle for social bonding; this may be more common in class environments.

Contemporary music was widely referenced among participants from their teens to their fifties, with contemporary dance music referenced as particularly suitable for cardiovascular across this age range. This seems to contradict previous research (Holbrook and Schindler, 1989; North, 2010) and may indicate that music is chosen to fit the gym environment – the popularity of gyms being a relatively recent phenomenon – or that changes in dissemination have impacted on listening habits and tastes in recent years.

## III. STUDY 2

Study 1 revealed several contrasting patterns of use of music for exercise along with a range of preferences and dislikes. The design of Study 2 needed to incorporate explorations of age, since this was less influential on music preference than anticipated. Additionally, members were concerned with music being sufficiently upbeat, and many were keen to work hard, suggesting output was also an important factor and needed to feature in the experiment design.

It was vital to base the test protocol on an activity commonly carried out by participants as part of their regular exercise program in order for the results to be as relevant. The data from Study 1 indicated that cardiovascular exercise was generally preferred to weights, and treadmills were widely used; participants sometimes reported finding other machines difficult to operate or uncomfortable.

A further concern was to ensure the delivery of different music conditions was practical and fitted with the participants' usual experiences of media use. Headphone use was widespread, including among those who rarely listened to music in the gym, but who listened to TVs. Delivery of music conditions via headphones was therefore consistent with participants' usual gym experiences, and also offered scope for running the experiment in multiple sessions with participants listening to different music, while non-participating members could still listen to music through the PA system.

### A. Method

1) *Sample*. Participants were 24 members of the same gym as in Study 1 who used treadmills regularly. All participants took part in all conditions, and their data was then analysed by age, with an older (>45 years) group and a younger (<45 years) group: the gym's membership is concentrated in the 30-60 age range. Detailed matching was not practical, although efforts were made to recruit similar numbers of men and women and ensure a range of fitness levels were represented. The sample size is consistent with similar studies and represents the

minimum recommended powering according to G\*Power 3 (Faul, Erdfleder, Lang and Buchner, 2007).

2) *Variables*. The independent variable was the music condition. Three playlists were compiled of sufficient length that the protocol would finish during the final track. The order of presentation of the conditions was randomized. The conditions were:

- slower contemporary pop (~80-100bpm) reflected the usual gym environment where Smash Hits Radio is played. Tracks were selected from Smash Hits Radio's playlist ([www.smashhits.net](http://www.smashhits.net)) and were 80-100bpm in order to be below the minimum optimum tempo for exercising, described as 120bpm (Terry & Karageorghis, 2006);
- 1960s/1970s pop (~130bpm) used tracks from when the older group of participants would have been in their teens and young adults, reflecting the observations of Holbrook and Schindler (1989) that this is the period music preference develops. The tempi of the songs represented the 120-140bpm recommended by Terry and Karageorghis (2006) and was matched to the tempo of the third condition; and
- contemporary club-anthem style dance tracks, representing the style most referenced as suited to cardiovascular exercise by participants in Study 1.

Dependent variables were:

- distance travelled during the task
- liking for the music heard during the task, rated after task completion
- self-rated pre- and post-exercise energy levels
- self-rated pre- and post-exercise affect

*Equipment*. Matrix T7Xe treadmills were used to deliver the protocol, allowing speed to be adjusted from 0.8kph to 24kph. The displays were obscured and participants adjusted speed using buttons on the handrails. A distance reading was taken at the end of each test. Music was delivered through Sweex 2GB MP3 players clipped to participants' clothing. Participants were encouraged to use their own headphones to minimize discomfort affecting outcomes, with headphones provided where necessary with the choice of in-ear (Sweex), in-ear with clip (JVC HA-EBX-85P sport headphones) or over-ear phones with a neckband (Hama). Affect and energy were measured using an affect grid, reproduced in figure 1, chosen because it had been found to be reliable and have a high validity (Russell, Weiss & Mendelsohn, 1989). Liking for each music condition was rated using the 5-point scale in figure 2.

3) *Procedure*. Prior to participation, participants signed consent forms and rated their pre-exercise affect and energy levels by placing a cross in the corresponding square of the affect grid. The MP3 player was started with the condition prescribed by the randomization process, and a five minute warm-up commenced at 60% of the participant's usual treadmill pace. Participants were able to adjust volume but were asked not to skip tracks and to keep the speed of the

warm-up constant. Screen coverings made of black card repeated the instructions in writing and obscured the display.

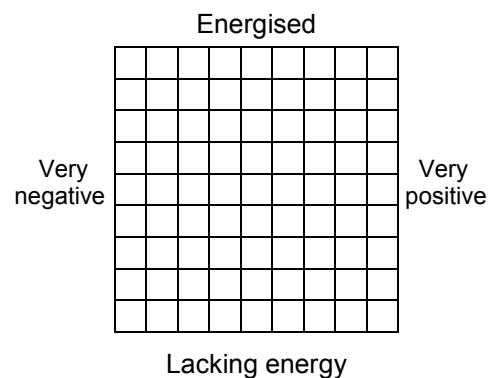


Figure 1. Affect grid used in Study 2

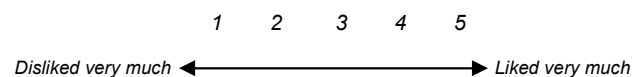


Figure 2. Scale to measure liking for music condition

Once the warm-up was complete, the treadmill was restarted for the 15 minute test and the participant advised to adjust the speed to whatever they preferred. The initial speed was 80% of the speed the participant described as their usual treadmill setting. Following completion of the test, a distance measurement was taken, and the participant was asked to rate their energy and affect on a second grid and to rate how much they liked the music they had just heard. The protocol was repeated on three separate occasions for each participant, with a different music condition each time, to create a within-participants design. Seven out of 31 participants did not complete the three tests, therefore full data was obtained from 24 participants. After the third occasion, participants were debriefed and were able to discuss their experience and performance with the researcher.

4) *Data analysis*. Data was analyzed using PASW Statistics 18 software to produce descriptive statistics and mixed between-within ANOVAs to compare dependent variables for the three music conditions and to look for possible interactions between music condition and age.

5) *Hypotheses*. It was predicted that participants aged over 45 would like the 1960s/1970s music condition most and that participants under 45 would like the dance music condition the most. It was expected that participants would prefer faster to slower conditions and that distance covered would be greater for the faster and preferred music conditions. An interaction between age and music preference was anticipated. It was predicted that energy level increases would correlate with the amount a condition was liked, and that post-exercise affect would be most positive after listening to liked music.

## B. Results

1) *Music preference.* A major impetus for the study was to establish the impact of liked and disliked music, and the descriptive statistics indicate a clear difference between responses to the three different conditions (figure 3). The means reflect an average score between 1 (disliked very much) and 5 (liked very much), with 3 representing a midpoint. Scores over 3 indicate some level of liking, while scores under 3 indicate some level of dislike. Among the over-45s, 1960s/1970s pop was the highest-rated of the three conditions, scoring an average of 3.61 out of a maximum of 5, while among the under-45s, contemporary dance was the favourite, scoring 3.77. All music conditions scored an average of over 3 for both groups, with the exception of the under-45s' rating of the 1960s/1970s pop, suggesting some level of dislike. A mixed between-within subjects ANOVA found no statistically significant main effect for music, but there was a significant interaction between age and music liking, with a large effect ( $F_{(2,44)}=4.113$ ,  $p=.023$ ,  $\eta_p^2=.157$ ). Post hoc analysis indicated that this effect was attributable to the 1960s/1970s pop condition. A repeated measures ANOVA exploring age found no main effect for music for the older group, but for the younger group there was a significant main effect for music:  $F_{(2,24)}=6.051$ ,  $p=.007$ ,  $\eta_p^2=.335$ . Pairwise comparisons showed this could be attributed to dislike of the 1960s/1970s condition.

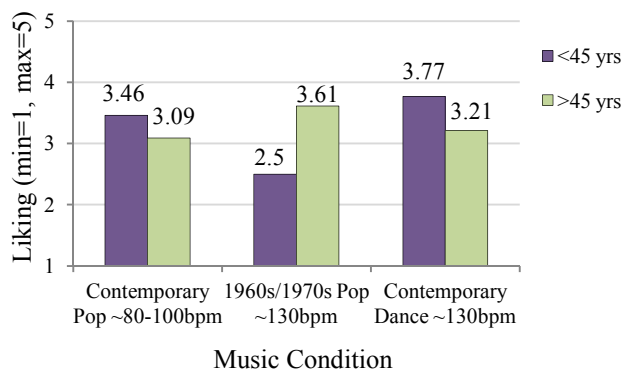


Figure 3. Mean liking for the three music conditions by age

2) *Ergogenic outcomes.* Distance covered was used as an indicator of exercise intensity. The results show noteworthy consistency in exercise output across the conditions (figure 4),

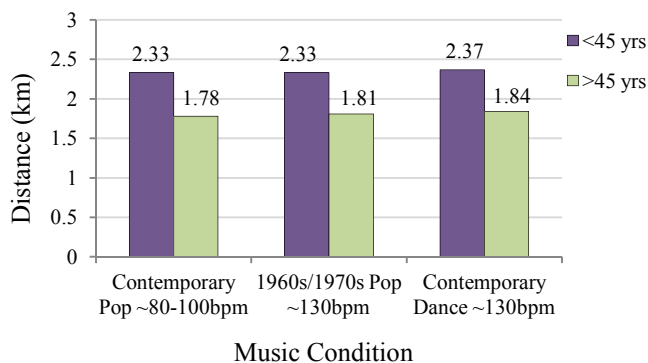


Figure 4. Distance travelled by condition and age

although the contemporary dance condition produced a slightly higher output compared with the other conditions.. There was no statistically significant main effect for music or for the interaction of age and music with regard to distance covered. The smaller distances covered by the older group were in accordance with the natural decline in performance over the lifespan.

3) *Energy.* For both energy and affect, increases over the exercise period were examined alongside final scores, since a high baseline score limits the scope to increase the score over the period of the test. The most marked increase was among the younger group in the contemporary dance condition (increase of 2.04 points), while the smallest increase occurred in the younger group for the 1960s/1970s pop condition, although this condition produced the largest increase for the over-45s (figure 5). Analysis found no statistically significant main effect for music, or for interaction effects between age and music.

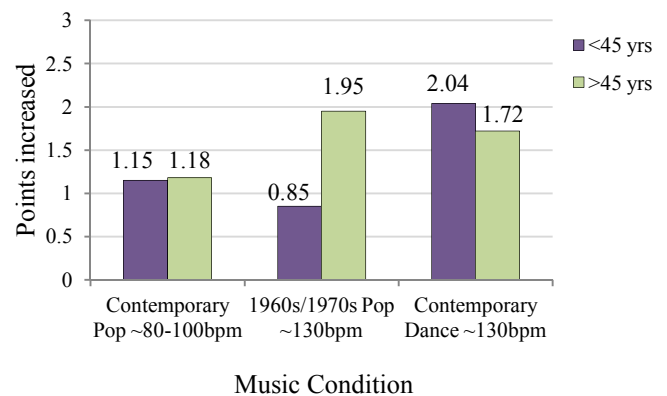


Figure 5. Energy increase by condition and age

For post-exercise energy (figure 6), contemporary pop had the most favourable outcome for the under-45s, with 1960s/1970s pop generating the highest scores for the over-45s.

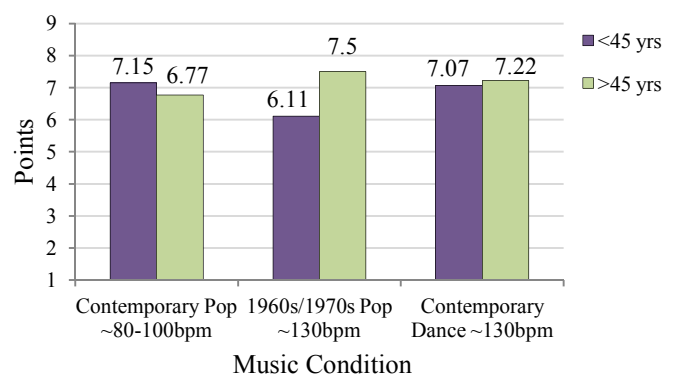


Figure 6. Post-exercise energy by condition and age

The performance of contemporary pop in the younger group may be attributable to a higher baseline score for the condition:

the baseline scores are shown in table 1 below, and indicate consistency between conditions for the older group, but less so for the younger group:

**Table 1. Baseline energy scores**

Music condition	Age	
	<45	>45
Contemporary Pop ~80-100bpm	6.00	5.59
1960s/1970s Pop ~130bpm	5.26	5.55
Contemporary Dance ~130bpm	5.03	5.50

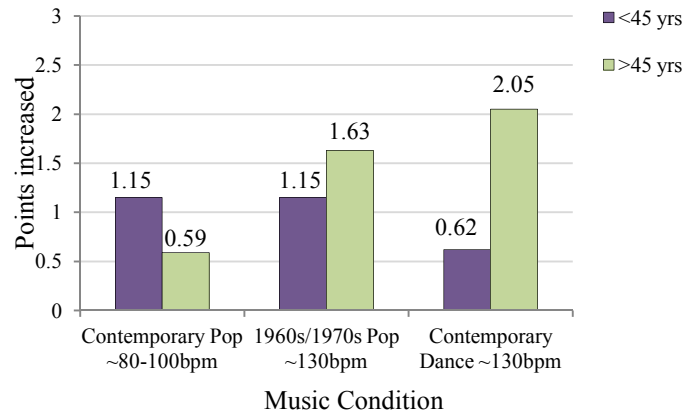
While the older group’s baseline scores ranged from 5.50 to 5.59, displaying consistency, the younger group’s baseline scores were 5.03 for dance, 5.26 for 1960s/1970s pop and 6.00 for contemporary pop, creating a possible confounding effect. For post-exercise energy, there was a large interaction effect between age and music condition that was statistically significant:  $F_{(2,44)}=3.753$ ,  $p=.031$ ,  $\eta_p^2=.146$ . Subsequent analysis found this was attributable to the interaction between the contemporary pop and 1960s/1970s pop conditions for both age groups.

4) *Affect*. Increase in positive affect and post-exercise was analyzed. The baseline scores were varied across both groups (see table 2), despite randomization, and the inconsistency suggests the results for affect should be treated with caution.

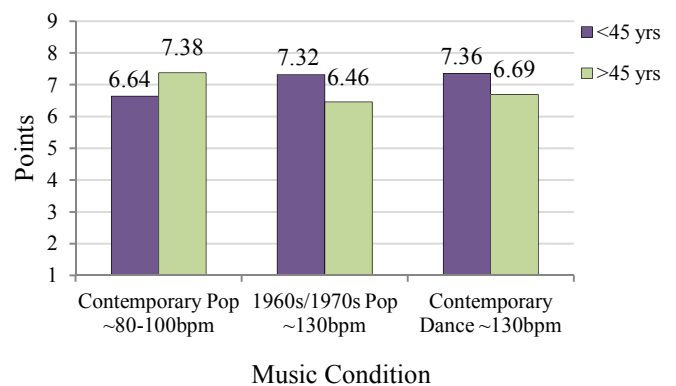
**Table 2. Baseline affect scores**

Music condition	Age	
	<45	>45
Contemporary Pop ~80-100bpm	6.23	6.05
1960s/1970s Pop ~130bpm	5.30	5.68
Contemporary Dance ~130bpm	6.08	5.32

Increase in positive affect (figure 7) suggested that the contemporary dance condition was the most effective at increasing positive affect for the older group, but the least effective for the younger group. However, there was no statistically main effect or interaction effect. The post-exercise affect scores (figure 8) also showed no statistically significant main effects or interactions. The results indicate the 1960s/1970s pop condition having a more positive effect on the younger group than on the older group; for the older group, the post-exercise affect scores were lowest for the 1960s/1970s condition and highest for contemporary pop, but the high baseline score for contemporary pop may have impacted here.



**Figure 7. Affect increase by condition and age**



**Figure 8. Post-exercise affect by condition and age**

### C. Discussion

Study 2 involved 24 gym members participating in a treadmill-based test in a within-participants design, with results analyzed by two age groups: over 45 years and under 45 years. Measurements were taken of distance travelled, liking for the music in each condition and energy and affect before and after the test. The key finding was that although there was a statistically significant interaction between age and music taste with regard to preference, this had little impact on performance. Energy and affect levels reflected age-related preference to a small degree, but insufficiently to be statistically significant.

There was support for the literature in that older participants liked the older music more than the younger participants did, but the suggestion of mixing music from different eras in gym environments (Priest and Karageorghis, 2008) was not supported because of the negative effect older music had on the younger group. Furthermore, the suggestion that “idiom, date of release and artist of the music in question must be allied to the age and sociocultural background of the exercise participants” (Karageorghis et al, 2006: 907, italics added) was not endorsed since dance music produced favourable outcomes for both age groups and was widely liked. Effects were found in the anticipated directions, but these were generally small.

The results may have been affected by the varied ages and backgrounds of the participants, the practical difficulties of



preventing other members chatting to exercise participants and the difficulty in creating contrasting playlists with a substantial element of control (matching for key or similar lyrical content, for example). The affect grid may have been responsible for discrepancies in results for energy and affect, and some participants struggled with the principles behind the grid, requiring assistance completing it. Simple, individual scales seem a more practical solution for self-rating exercises.

Nevertheless, when taken in conjunction with the findings of Study 1, the results show interesting patterns of preference and outcomes that address the previous dearth of knowledge regarding the use of music for exercise by gym members.

#### IV. GENERAL DISCUSSION

The studies here present useful findings regarding gym exercisers' response to music in exercise across the lifespan, representing a much broader age range than typically in the research, in an ecologically valid setting. The mixed methods approach offered a useful means of exploring the topic area qualitatively in Study 1 to provide an informed quantitative design for Study 2.

When the results of the two studies are taken in conjunction with each other, the most noteworthy finding is that contemporary dance styles are liked across a wide age range. Counter to Priest and Karageorghis' suggestion to play music from different eras to reflect the age range of gym users (2008), the evidence here suggests that gym users aged over 45 generally like contemporary popular styles, while exercisers aged under 45 dislike music from their junior school years or earlier. It appears that retirees engage differently with music to those in employment and have a lower tolerance of high volume, high energy music (Study 1); rather than preferring older music, there is evidence to suggest that music is treated with ambivalence by this group. Although they form a small percentage of gym users, health benefits for older exercisers are considerable in order to preserve health and independence through strength and cardiovascular fitness, and it important not to alienate this group.

The liking for contemporary music among those aged 50 to 60 was unexpected prior to the study and worthy of consideration. Why was dance music, in particular, so popular? For the exerciser in their mid-fifties, contemporary dance styles emerged at a time when they were aged around 30, by which time preferences are thought to be well-established. However, the style is frequently played in gym environments and exercise classes, perhaps resulting in it being perceived as suited to exercise and experience built in that context. It is also noteworthy that this age group discussed their use of MP3 players, and their engagement with new technology and changes in the way music is disseminated may have resulted in dynamic preference patterns.

Several of the participants expressed surprise that the 1960s/1970s condition was of the same beats per minute as the contemporary dance condition. This suggests that other intrinsic elements may be at play; for example, tempo of the music may be interacting with the rhythm to give the impression of being more upbeat. This has implications for the system used in the BMRI-2 (Karageorghis et al., 2006) where tempo and rhythm are considered in isolation. In practice, the

impact of intrinsic music factors on motivation may be more complex.

Debriefing discussions with participants in Study 2 raised various issues, and provided further qualitative data for consideration in future research design. Although attempts were made to control for consistency of behavior prior to each research session, events ranging from a tough day at the office to a previous day's drinking appeared to impact on results. Randomisation would have mitigated to some extent, but the inconsistencies in baseline measurements for affect and energy in Study 2 indicate the difficulties of ensuring consistency. Personal associations with the music were also difficult to control for: one exerciser in the older group had one of the 1970s tracks on her gym MP3 player, so was used to exercising to it, while a participant in his twenties had happy memories of a themed 70s weekend at Butlins which appeared to stimulate a heightened ergogenic response to that condition although he stated he had not particular liking for that style of music. A third participant described dealing with disliked music by 'switching off' and this may have had a different effect from remaining focused on it despite disliking it. These individual experiences demonstrate the importance of debriefing in terms of gaining additional useful information and also gaining an understanding of how methods might be improved in future studies. It is, in effect, an informal addition to the data collected in Study 1.

The studies here were limited by their size and scope, but provide a useful exploratory basis on which to explore the topic in the future. The categories of exerciser are worth further investigation, particularly the third possible category of the 'grouper', which uses music as a shared reference; there was some evidence of this in the gym and may be more in exercise classes.

Existing studies in iPod and MP3 use have looked at travel, urban environments and use in the workplace but there has been little focus so far on their use in exercise. Study 1 indicates a sophisticated use of different music styles among exercisers, which may be a fairly recent development. New technologies offer flexible, compact methods of storing large quantities of music often with the facility to build and edit playlists. The scope of choice this affords the exerciser was simply possible with a cassette player or portable CD player. MP3 players also offer sound quality that is not affected by vigorous movement, unlike many earlier technologies.

The socialiser group identified in Study 1 was generally retired and aged over 60, but it is not clear whether age or life stage is the main factor regarding behaviours and ambivalence towards music in the gym. The observation that a long-term sick participant seemed to reflect the criteria for this group indicates that life stage may be more important than age. However, it must also be noted that the over 60s have not grown up with portable music technology. Carrying out similar studies in ten or twenty years could result in far more use of portable music players by retired participants.

Ultimately, the aims of the research are to find out how to enhance the gym experience and promote adherence. It is desirable that studies should be carried out to compare adherers' and non-adherers' music use in the gym, and to explore the benefits of music to motivate exercisers to prepare to exercise, playing music as a pre-gym motivating ritual, rather than only playing music during exercise sessions.



## V. CONCLUSION

The key findings of these studies are firstly the identification of distinct socialiser and worker groups in the gym and secondly indications of a broad liking for contemporary dance music among exercisers aged from their teens to their late fifties. The practical implications are that contemporary dance music is the most suitable soundtrack for the gym. It is less likely to alienate members that other styles, has broad appeal and produces positive outcomes with regard to affect and output. Nevertheless, any music policy selected will have some detractors, and awareness is needed of socialisers' dislike of loud volumes. These issues need to be taken into account both by leisure centre managers and by researchers designing exercise adherence interventions utilizing music.

Future research needs to consider the impact of age and life stage on the socialiser/worker distinction and the third, grouper category of exerciser. Research into iPod/MP3 use in gyms is timely; there is little available at present, and research now would help give a snapshot against which future developments in technology and media use could be compared.

This study presents several significant contributions to the literature. It not only identifies different styles of engagement with media during exercise, but shows that recent technological developments in music dissemination are operating in gyms alongside a shift in the link between music preference and age. These discoveries offer huge opportunities to take advantage of new technology to develop music interventions which enhance the exercise experience and help individuals adhere to and enjoy their exercise programmes.

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