

Institution: BRUNEL UNIVERSITY (H0113)
Unit of Assessment: 26 – Sport and Exercise Sciences, Leisure and Tourism
Title of case study: A Musical Marathon for the Masses: Run to the Beat
<p>1. Summary of the impact (indicative maximum 100 words)</p> <p>Drawing on his research in the area of music and physical activity, Dr Costas Karageorghis was invited to serve as a scientific advisor for a groundbreaking series of musically-accompanied running events held annually in London. Run to the Beat™ is a unique concept in that the half-marathon course was lined with music stations delivering output based on the scientific research led by Dr Karageorghis at Brunel over the last two decades. Ultimately, Run to the Beat garnered considerable economic benefits in the health, entertainment, charitable, and technology sectors, and represented a knowledge transfer that reached tens of millions across the world through internet, television, radio, and print-media channels.</p>
<p>2. Underpinning research (indicative maximum 500 words)</p> <p>The principle behind the music selection for the Run to the Beat events reflects every aspect of the Music in Sport and Exercise Research Group's work but especially a lineage of papers investigating preference for music tempo at different exercise intensities. These studies were carried out in the academic sessions (October-May) of 2004/5, 2006/7, and 2008/9 and published in 2006, 2008, and 2011 respectively. The first study established the essential purpose of the series; to assess preference for varying music tempi across a range of exercise intensities. Participants reported a preference for both medium and fast tempo music at low and moderate exercise intensities, and for fast tempo music at high intensity. The second study in the series was focussed on the effects of differing music tempi on psychological responses (i.e. intrinsic motivation and flow state) in addition to music-tempo preference. Participants undertook endurance exercise on a treadmill whilst listening to either medium (115-120 bpm), fast (140-145 bpm), or mixed (alternating medium and fast) tempi music programmes. The outcomes were that a medium-tempi music programme yielded the best motivational outcomes and was the most likely to be preferred. The third study was the most ambitious and sought to comprehensively map the relationship between tempo-preference and exercise heart-rate by employing a broad range of tempi (slow, medium, fast, and very fast) and exercise intensities (40%-90% of maximal heart rate reserve). The findings confirmed that faster music is preferred at higher exercise intensities but the relationship is more complex than the simplistic linear one proposed by theorist Makoto Iwanaga in the mid-nineties. In essence, the relationship is non-linear exhibiting a series of dips and plateaux (see Section 3: Karageorghis et al., 2011). A key finding that informed subsequent work with exercise populations was that exercisers prefer a much narrower band of tempi (125-140 bpm) than previously thought (90-160 bpm). The findings from this series of studies informed the music selection for the Run to the Beat events.</p> <p>The positions held by the authors at Brunel were as follows: Dr Karageorghis led each study as a Senior Lecturer in 2004/5 and as a Reader thereafter. Leighton Jones, who was second author on each of the papers, was an undergraduate student from 2001-04, a master's student from 2004-06, and a doctoral student (on a Sport Sciences bursary) from 2010-13. Daniel Low, a co-author for the first paper, was an undergraduate student at the time the data were collected and subsequently completed a doctorate at Exeter University (2010). Daniel Stuart, co-author for the second paper, was an undergraduate student during the period 2003-06. The final paper was co-authored by Dr David-Lee Priest who read for a doctorate in Sport Sciences from 1998-2003 (funded by David Lloyd Leisure Ltd.) and has since undertaken part-time duties as a Research Assistant and Lecturer, Daniel Bishop who has served as a Lecturer since 2007, and Harry Lim, who was a doctoral student in the group from 2008-12 (on a Sport Sciences bursary). Four undergraduate students are also listed as co-authors; they assisted in the execution of this large-scale study and used the data within their final-year special projects (Rose Akers, Adam Clarke, Jane Perry and Benjamin Reddick).</p> <p>The music selection for Run to the Beat also hinged on two other strands of the group's work: the development of a series of conceptual models predicting psychological and behavioural responses to music during exercise and the validation of a questionnaire designed for the purpose of rating</p>

the motivational qualities of music in physical activity contexts: The Brunel Music Rating Inventory.

3. References to the research (indicative maximum of six references)

Each of the following outputs is available to the Panel through online databases (SPORTDiscus, MEDLINE, PsycInfo) and the HEI. URLs and DOIs are also included.

1. Karageorghis, C. I., Jones, L., & Low, D. C. (2006). Relationship between exercise heart rate and music tempo preference. *Research Quarterly for Exercise and Sport*, 26, 240-250. [Impact Factor: 1.108; 24 Scopus citations; 53 Google Scholar citations]. URL: <http://www.ingentaconnect.com/content/aahperd/rqes/2006/00000077/00000002/art00009>
2. Karageorghis, C. I., Jones, L., Priest, D. L., Akers, R. I., Clarke, A., Perry, J. M., Reddick, B. T., Bishop, D. T., & Lim, H. B. T. (2011). Revisiting the relationship between exercise heart rate and music tempo preference. *Research Quarterly for Exercise and Sport*, 82, 274-284. [Impact Factor: 1.108; 3 Scopus citations; 1 Google Scholar citation]. URL: <http://www.ingentaconnect.com/content/aahperd/rqes/2011/00000082/00000002/art00014>
3. Karageorghis, C. I., Jones, L., & Stuart, D. (2008). Psychological effects of music tempi during exercise. *International Journal of Sports Medicine*, 29, 613-619. [Impact Factor: 2.268; 19 Scopus citations; 40 Google Scholar citations]. URL: <http://dx.doi.org/10.1055/s-2007-989266>
4. Karageorghis, C. I., Mouzourides, D. A., Priest, D. L., Sasso, T., Morrish, D., & Walley, C. (2009). Psychophysical and ergogenic effects of synchronous music during treadmill walking. *Journal of Sport & Exercise Psychology*, 31, 18-36. [Impact Factor: 2.452; 33 Scopus citations; 70 Google Scholar citations]. URL: <http://journals.humankinetics.com/jsep-back-issues/JSEPVOLUME31ISSUE1FEBRUARY/PsychophysicalandErgogenicEffectsofSynchronousMusicDuringTreadmillWalking> [Top-ranked item on Brunel University Research Archive 2011-present: <http://bura.brunel.ac.uk/statistics/buraStats/ItemViewed.html>]
5. Karageorghis, C. I., Priest, D. L., Terry, P. C., Chatzisarantis, N. L. D., & Lane, A. M. (2006). Redesign and initial validation of an instrument to assess the motivational qualities of music in exercise: The Brunel Music Rating Inventory-2. *Journal of Sports Sciences*, 24, 899-909. [Impact Factor: 2.082; 31 Scopus citations; 59 Google Scholar citations]. DOI: <http://dx.doi.org/10.1080/02640410500298107>
6. 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 sport and exercise: the Brunel Music Rating Inventory. *Journal of Sports Sciences*, 17, 713-724. [Impact Factor: 2.082; 50 Scopus citations; 96 Google Scholar citations]. DOI: <http://dx.doi.org/10.1080/026404199365579>

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Output 2 was supported by a WestFocus Executive Grant awarded to Costas Karageorghis; Project title: Music in Rehab Project: Phase II; Dates: Sept 2008-Aug 2009; Value: £11,000.

Output 3 was supported by a WestFocus Consortium Grant for Costas Karageorghis; Project title: Music in Rehab Project; Dates: Sept 2006-Aug 2008; Value: £20,000.

Output 4 was supported by a WestFocus Executive Grant awarded to Costas Karageorghis; Project title: Music in Rehab Project: Phase II; Dates: Sept 2008-Aug 2009; Value: £11,000.

Output 5 was supported by a research grant from David Lloyd Leisure Ltd awarded to Costas Karageorghis; Project title: Development of a Nationwide Music Policy for David Lloyd Leisure Ltd.; Dates: Sept 2000-Aug 2003; Value: £13,000.

Output 6 was supported by a research grant from the Brunel Non-Formulaic Fund (NFF) awarded to Peter Terry (co-applicant: Costas Karageorghis); Project title: The Motivation and Emotion Project; Dates: Sept 1996-Aug 1999; Value: £140,000.

Note: Outputs 2 and 4 were also supported by consultancy and CD royalty fees derived from the Run to the Beat project which were fed back into the research programme (Value: £32,200).

Impact case study (REF3b)**4. Details of the impact** (indicative maximum 750 words)

The focal point of this case study is Run to the Beat, a groundbreaking series of mass-participation events that fuse half-marathon running with scientifically-selected music performed by live acts and DJs along the route. As the leader of the Music in Sport and Exercise Research Group, Dr Karageorghis was approached by the International Management Group (IMG) to provide scientific consultancy and to serve as a figurehead for the event; opportunities that gave him a platform to communicate the findings of his group's research to a wider public.

On Sunday 5 October 2008, the inaugural event featured 8,000 runners who pounded the streets of Greenwich to the sounds of 30 live bands. A successful renewal on Sunday 27 September 2009 demonstrated the maturity of the concept; indeed, a 50% growth in participant numbers was realised (12,000+). In 2010, the London event had 15,000 participants, and in 2011, 17,000. The Run to the Beat concept was rolled out across mainland Europe, with the 2010 launch in Basel (Switzerland) being the first (2,500+) and replicated in 2011 and 2012 with similar numbers. The event series exerts considerable charitable and economic impact which has been alloyed by global music sales (e.g. Run to the Beat CD and download albums in association with Ministry of Sound and City Showcase) and the launch of cutting-edge music players and mobile phones.

Dr Karageorghis served as a spokesperson and scientific consultant for the launch of the Sony W-series of wearable MP3 players as well as two Sony Ericsson mobile phones (W760i and W995 Walkman Phones). His involvement continued until after the third renewal on 26 September 2010, by which time the event was firmly established on the running calendar and represented a prominent brand that was adopted by Nike Inc. for the period 2011-14. Sustained impact has occurred under the stewardship of Nike Inc. with 18,500 participants competing at the 2012 event.

The research underpinned the impact by giving the event a strong scientific premise which was fore-grounded in public relations initiatives. Indeed, the science underpinning the event was eponymous in that the title referenced the human predisposition to entrain to a musical rhythm. The work of the research group linking exercise heart-rate with music tempo was the main focus of the media activity associated with the event. Coverage presented the research in a favourable light describing it as "novel" and "cutting edge" and using the concept of Run to the Beat to address the wider question of how music can play a motivational and assistive role in physical activity. The way in which runners' exercise heart-rates were used to "contour" the tempo of the musical selections was a principle incorporated prominently in all marketing materials and album releases.

Media-related activities engaged in by Dr Karageorghis included press conferences, workshops for journalists, a pop-science section on the event website explaining the principles underlying the music selection and several product launches. The breadth and reach of Run to the Beat's social impact was aided by worldwide media exposure culminating in dedicated broadcasts on Channel 4, slots in primetime documentaries, magazine shows throughout Europe and South America (e.g. UK, France, Sweden, Brazil), and numerous spreads in broadsheet newspapers (e.g. *The Times* and *The New York Times*). The primary beneficiaries were event participants who were given a window on the research, offered support to incorporate the findings into their event preparation, and were able to experience it in action on the day. Carefully-selected music has been shown to reduce perceptions of exertion by 8-12% while enhancing affect by 10-15%. Similarly, it may improve movement efficiency by up to 7% and extend voluntary endurance by as much as 15%. For these reasons, the music programmes provided were integral to the popularity of the events.

Through the considerable media activity associated with Run to the Beat, a wider pool of several million readers, listeners and viewers were offered insights to support their own use of music in exercise. Economic benefit from Run to the Beat was felt by the media, equipment manufacturers (e.g. Sony and Sony Ericsson), sports promoters (IMG), the running community who were provided with an additional and novel event in London, and charitable institutions who gained a fulcrum for their fundraising endeavours. London-based artists also benefitted from the event as they were given a platform (online and on stage) to perform their work and develop their public profiles. For example, the relatively unknown south London rapper, Tinie Tempah, was booked for the 2010 event and his single *Written In The Stars* went to #1 in the Vodafone Big Top 40 chart on the evening of the event following his performance on the main stage (26 September 2010; <http://www.bigtop40.com/chart/archive/2010/39/>).

Impact case study (REF3b)

A distinctive characteristic of the social impact and capital generated by Run to the Beat has been the uniting of those in the sporting, mercantile, entertainment and creative industries. Alliances have developed between the various beneficiaries: national charities, musical collectives such as the Panjabi Hit Squad and the Royal Artillery Band, blue chip companies such as Sony Ericsson, and local government. As the group's research is synonymous with the event, every form of publicity and outreach directly amplifies the impact of this work. Impact was also created along civic lines through the provision of social events that generated community interest and an influx of visitors into the local authority area (Greenwich). The Run to the Beat brand cemented the association of Brunel with the use of music in exercise and furthered the profile of Karageorghis as its foremost practitioner. Subsequent to his involvement, Dr Karageorghis has been asked to fulfil numerous knowledge transfer projects and consultancy work that has generated considerable impact. These projects include appearing as a witness to support claims of musical rights agencies to obtain proper rights for their content when reproduced in gymnasias, the compilation of a BASES Expert Statement, which is the most viewed of all 11 statements (4,695 unique page views; source BASES), the invitation to produce an encyclopaedia entry on the topic for Sage, and more recently, his appointment by the American College of Sports Medicine as Chair of *MusicMoves: A Global Health Initiative*. Run to the Beat has spawned further innovative projects that found their focus in the 2012 London Olympiad. In an initiative sponsored by Red Bull, Karageorghis teamed up with Urban music producer Redlight and Team GB Athletics captain, Dai Green, to devise a new piece of music to help the athlete prepare for his 400-metre hurdles bid; this work proved to be very much the 'heir apparent' to the case study described herein

(http://www.redbull.co.uk/cs/Satellite/en_UK/Video/Red-Bull-Performance-Track-021243219217531).

In summary, Run to the Beat generated wide- and far-reaching impact which was felt across an array of sectors (industry, charity, art, media and civic) and by event participants in the UK and Europe, media users across the globe (e.g. via prominent coverage in the USA and Brazil), and the local communities that hosted the races. Run to the Beat has brought the subject of exercise to music into the public consciousness in a way that has not occurred since the surge in popularity associated with aerobic dance exercise in the early 1980s. The output of the Music in Sport and Exercise Research Group has percolated society at an increasing rate, informing both the knowledge base and practice of sport and exercise over the last decade. As an index of the reach of the impact, the Brunel-based music research is cited >100,000 times on Google.

5. Sources to corroborate the impact (indicative maximum of 10 references)

- Article in *The Times* on 22 October, 2009 <http://www.thetimes.co.uk/tto/health/diet-fitness/article1757023.ece>
- Article in *The New York Times* on 10 January, 2008 www.nytimes.com/2008/01/10/fashion/10fitness.html
- Article in *The Guardian* on 22 April, 2012 <http://www.guardian.co.uk/lifeandstyle/2012/apr/22/does-music-help-you-run-faster>
- Article in *The Sun* on 23 July, 2009 <http://www.thesun.co.uk/sol/homepage/sport/2549833/SunSport-get-ready-to-Run-to-the-Beat.html>
- Feature on Channel 4 on 19 August, 2009 <http://www.channel4.com/programmes/mccain-track-field-show/episode-guide/series-1/episode-2>
- Website for the Basel, Switzerland Run to the Beat <http://www.iwbbaselmarathon.ch/>
- Website of Run to the Beat partners City Showcase <http://cityshowcase.co.uk/page/the-science-behind-run-to-the-beat?symfony=1cb5be03241a1364e7aeb0a64f593c0c>
- The BBC Raise Your Game website http://www.bbc.co.uk/wales/raiseyourgame/sites/motivation/psychedup/pages/costas_karageorghis.shtml

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