

<http://www.clemburkedrummingproject.com/Research.html#european>

Clem Burke Drumming Project

Research

[The energy cost of rock drumming: a case study](#)

[Physiological demands of rock drumming: a case study](#)

European College of Sport Science (ECSS) 13th annual Congress, July 2008, Estoril, Portugal

The energy cost of rock drumming: a case study

Authors: [Marcus Smith](#), [Clem Burke](#): University of Chichester, School of Sport Exercise & Health Sciences, College Lane, Chichester, West Sussex, P019 6PE, UK. Email: m.smith@chi.ac.uk, [Steve Draper](#) and [Chris Potter](#): University of Gloucestershire, Faculty of Sport, Health and Social Care, Oxstalls Campus, Oxstalls Lane, Longlevens, Gloucester, GL2 9HW, UK.

Introduction

The energy cost of various forms of physical activity has received considerable attention (Ainsworth et al., 1993). However, despite being a physically demanding activity that could offer an alternative to more conventional forms of physical exercise prescription: drumming has received little attention (Smith, 2001).

Aim

The aim of the study was to to investigate the energy cost of rock drumming during concert performance in a high profile rock drummer.

Methods

Subject: [Clem Burke](#) (drummer with the band Blondie): 52yr, 1.80m and 83.6kg) volunteered to take part in the study. Ethical approval was gained from the University of Chichester Ethics Committee.

Incremental drumming test:

- Performed 6 hours prior to the concert.
- Consisted of four 4-min stages, followed by fifth stage to volitional exhaustion.
- Work rate at each stage controlled via a click-track that was audible to the subject through headphones (Sony, Japan).
- Starting work rate was 110 b.min⁻¹, increasing 20 b.min⁻¹ for each subsequent stage.
- Oxygen uptake (VO₂) and respiratory exchange ratio (R) were measured throughout using a portable analyser (K42b, Cosmed, Italy).
- Heart rate (HR) was measured throughout the incremental drumming test and concert performance using short range telemetry (S810i, Polar, Finland).
- Energy expenditure was calculated using indirect calorimetry from the respiratory data (using the final 60 s of each sub-maximal stage).
- This was used to calculate the relationship with HR using linear regression
- This relationship was used to estimate energy expenditure from the concert HR data.
- Resting metabolic rate was calculated from the 2-min period prior to the incremental test, VO₂peak was defined as the highest 15 s moving average VO₂ during the test.

Figure 1 and 2 showing the subject playing drums during the incremental test to volitional exhaustion and concert performance.

Results

Incremental test:

- Peak heart rate: 191 b.min⁻¹.
- VO₂peak: 2.02 L.min⁻¹ (24.2 ml.kg⁻¹.min⁻¹).

Concert performance:

- Concert duration: 82 min 27 s.
- Average heart rate: 145 b.min⁻¹ (range 110-179 b.min⁻¹).
- Estimated total energy expenditure based on HR: 564 kcal.
- Equated to 2.7 times greater than resting metabolic rate.
- Average energy expenditure: 412 kcal.hr⁻¹ or 0.082 kcal.kg⁻¹.min⁻¹.

Conclusions

Data showed that rock drumming is an intense and physically demanding activity with peak HR well in excess of age predicted maximum.

Estimated energy expenditure from the concert revealed a rate of energy expenditure higher than those previously published for seated drumming.

We conclude that rock drumming demands a high level of energy expenditure and warrants further investigation as an area of physical activity.

Ainsworth, B.E. et al. (1993) Compendium of Physical Activities: classification of energy costs of human physical activities. *Med Sci Sports Ex.* 25(1): 70-80.

Bannister, E.W. and Brown, S.R. (1968) The Relative Energy Requirement of Physical activity. In *Exercise Physiology* (Falls, H.B. (ed)).
Smith, M.S. (2001) Physiological Analysis of Clem Burke during Blondie's 1999 'No Exit' World Tour. In *Blondie, From Punk to the Present: A Pictorial History* (Metz, A. (ed)).

British Association of Sport and Exercise Sciences (BASES) Annual Conference, September 2008, Brunel University, West London

Physiological demands of rock drumming: a case study

Authors: [Marcus Smith](#), [Clem Burke](#): University of Chichester, School of Sport Exercise & Health Sciences, College Lane, Chichester, West Sussex, P019 6PE, UK. Email: m.smith@chi.ac.uk, [Steve Draper](#) and [Chris Potter](#): University of Gloucestershire, Faculty of Sport, Health and Social Care, Oxstalls Campus, Oxstalls Lane, Longlevens, Gloucester, GL2 9HW, UK.

Introduction

The physiological demands of different types of sport (Smith, 2006, *Journal of Sports Science and Medicine*, 5, 74-89) and physical activity (Abdelhamid & Everett, 1999, *Journal of Construction Engineering and Management*, 125, 47-52) have been documented.

However, despite its worldwide popularity, rock drumming has received limited scientific enquiry.

This is somewhat surprising given the intensity, duration and number of concerts played by professional rock drummers during National or International Tours (Smith, 2002, In Blondie, From Punk to the Present, edited by A. Metz, Musical Legacy Publications).

Aim

The aim of this study was to investigate the physiological demands of rock drumming through a longitudinal study of a professional rock drummer.

Methods

With institutional ethical approval a longitudinal case study (1997 to 2007) was undertaken on [Clem Burke, drummer from the rock group Blondie](#).

Physical characteristics during the data acquisition period were: (Age range: 42 to 52 yrs, Mass range: 79.5 to 84.3 kg).

Drumming performance was undertaken using a Premier drum kit (Premier, Leicester, England) recorded at 2 outdoor and 10 indoor venues in England.

The duration of each concert varied between 60 to 93 minutes.

Throughout each performance heart rate was measured at 5 second intervals using short-range telemetry (Polar S810i, Kempele, Finland, see Figure 1 below).



Blood lactate was measured 3-minutes post performance from a finger-prick sample (Lactate pro analyser, Arkray, Japan).

Results

Heart rate:

- Typical 'live' performance heart rate trace shown below in Figure 2 (Brighton Centre, 2004, selected songs in boxes). Also see [research video recordings](#)



- Example data set (Manchester Apollo, 2007):
- Concert duration: 82 min 7 sec
- Number of songs played: 19
- Longest song: 'Rapture': 10 min 7 sec
- Shortest song: 'Please Please Me': 1 min 50 sec
- Highest peak heart rate: 'Union City Blue'
- (range 144- 179 b.min⁻¹, mean 155 b.min⁻¹).
- Lowest peak heart rate: 'Screamin Skin'
- (range 129-144 b.min⁻¹, mean 135 b.min⁻¹).
- Concert mean heart rate: 145±13 b.min⁻¹.
- Peak blood lactate value: 3.6 mmol.l

Conclusions

It is evident that rock drumming may be classified as an intermittent activity.

'Live' rock drumming performance relies heavily upon the interplay between aerobic and anaerobic energy systems, supporting the work of Smith et al. (2008, *European College of Sports Sciences, Stormily, Portugal*).

Future research should focus on the physiological demands of energy supply to the leg versus arm muscles for different song tempos.