

## International Journal of Research in Exercise Physiology

Original Research Article

# The Energy Expenditure and Relative Exercise Intensity of Pound®

Abigail Ryskey<sup>1</sup>, John P. Porcari<sup>1</sup>, Kimberley Radtke<sup>1</sup>, Susan Bramwell<sup>1</sup>, Teresa E. Lee<sup>2</sup>, Carl Foster<sup>1</sup>

<sup>1</sup>Department of Exercise and Sport Science, University of Wisconsin-La Crosse, La Crosse, WI, USA

<sup>2</sup> Winona State University, Winona, MN, USA

### **Abstract**

**Introduction:** Recently, drumming-based workouts have become increasingly popular. These workouts combine traditional drumming movements with a variety of other exercises to create a total body workout. To date, there is limited research evaluating the exercise intensity of these types of programs.

**Purpose:** To determine the relative exercise intensity and energy expenditure of Pound®, a commercially available drumming-based exercise program. **Methods:** Six male (age 22.8±1.72 years) and 16 female (age 20.8±2.17 years) subjects performed a graded exercise test on a treadmill. After habituation, subjects also performed a 38-minute Pound® cardio-jam session. Heart rate and VO<sub>2</sub> were monitored every minute throughout the workout and perceived exertion was recorded approximately every 4 minutes throughout the session using the Borg 6-20 RPE scale. **Results:** It was found that subjects exercised at an average of 72±6.6% of HR<sub>max</sub>, 41±6.2% of VO<sub>2max</sub>, and an RPE of 12.7±1.9 during the Pound workout. Average energy expenditure was 238±44.4 kcal/session (males = 281±41.4; females = 222±34.4). **Conclusion:** Overall the Pound® cardio-jam session resulted in a moderate-intensity workout that can provide a feasible option for individuals looking for alternatives to traditional aerobic training programs.

**Key Words:** Cardio-jam, Drumming, Exercise Intensity

## INTRODUCTION

Over the years there has been considerable interest in the physiological demands of drumming. In 2008, researchers at the University of Gloucestershire and the University of Chichester in England studied the energy cost of rock drumming on Clem Burke, a high-profile drummer<sup>1</sup>. Researchers recorded his energy expenditure (EE) and heart rate (HR) during a concert and found that he expended 412 kcal/hour, had an average HR of 145 bpm, and reached a peak HR of 190 bpm. Brown<sup>2</sup> assessed the EE and HR of heavy metal drummers and found that during a 40-minute drumming session they expended approximately 387 kcals and had an average HR of 150 bpm. Average oxygen consumption (VO<sub>2</sub>) ranged from 42-45% of VO<sub>2</sub>max. Romero<sup>3</sup> also studied the EE and HR of heavy metal drummers and found they burned an average of 518 kcals/hour and had an average HR of 143 bpm. Heart rate responses have also been studied in young novice drummers and middle-aged drummers during a 40-minute African drumming session<sup>4</sup>. It was found that the young novice drummers spent the majority of the session at heart rates between 40-55% of predicted maximal HR, while the middle-aged drummers were between 60%-65% of predicted maximal HR. A recent study by Da La Rue et al.<sup>5</sup> measured HR and *estimated* EE during a 40-minute concert in 14 semi-professional and professional male drummers. It was found that the drummers had an estimated EE of 623 kcals/hour and

an average HR of 166 bpm, leading them to conclude that drumming can be characterized as hard/vigorous activity.

Recently, drumming has become a popular form of group exercise. Drums Alive<sup>®</sup> is considered to be the first fitness program that combined traditional aerobic movements and drumming<sup>6</sup>. During the program, individuals drum on a large exercise ball instead of a regular drum while performing squats, lunges, and familiar dance moves. It has been stated that during a 60-minute fast-paced workout of Drums Alive<sup>®</sup> an individual can burn up to 400 calories<sup>7</sup>.

A new fitness program that is becoming popular is "Pound<sup>®</sup>." Pound<sup>®</sup> is a 45-60 minute full-body fitness program that incorporates Pilates and total body movements with drumming<sup>7</sup>. The only equipment used in Pound<sup>®</sup> are Ripstix. Ripstix are a set of drumsticks that weigh a quarter of a pound each and are used to "pound" to the beat of the music. Pound<sup>®</sup> has stated on their website that a 60-minute Pound<sup>®</sup> workout can burn over 900 calories<sup>8</sup>. However, there is no evidence to support their claims. The purpose of this study was to quantify the relative exercise intensity and energy expenditure of a Pound<sup>®</sup> exercise session.

## METHODS

### Participants

Twenty-two apparently healthy male (n=6) and female (n=16) volunteers between 18-25 years of age were recruited from the University of Wisconsin La-Crosse. All subjects were recreationally active (exercising at least 3 times weekly for the past 6 months), but were not competitive athletes. The PAR-Q was completed by each subject to screen for known cardiovascular and orthopedic contraindications to exercise. Eligible subjects provided written informed consent. The study was approved by the University of Wisconsin- La Crosse Institutional Review Board for the Protection of Human Subjects.

### Procedures

Each subject completed a maximal exercise test on the treadmill and a cardio-jam session of Pound®. The treadmill test used an incremental protocol where subjects started at a self-selected pace and 0% grade. Treadmill speed remained the same throughout the test and grade was increased 2.5% every 2 minutes until volitional exhaustion. During the test, VO<sub>2</sub> was measured continuously using a metabolic cart (Moxus Modular Metabolic System, AEI Technologies, Naperville, IL) and HR was recorded each minute via radiotelemetry (Polar Electro, Kempele, Finland). At the end of each stage and at maximal exertion subjects rated their perceived exertion (RPE) using the 6-20 Borg Scale<sup>8</sup>.

All subjects completed three practice sessions of Pound® prior to data collection. Each subject then completed a 38-minute cardio-jam session of Pound®. Subjects followed along to a pre-recorded, DVD-based Pound® workout, which was obtained from the official Pound® website<sup>7</sup>. The session included a 5-minute dynamic warm-up, 28 minutes of Pound® movements, and a 5-minute cool-down. Throughout the workout HR and VO<sub>2</sub> were measured continuously and RPE was assessed after the warm-up, approximately every 4 minutes during the workout, and after the cool-down. Energy expenditure was calculated from the VO<sub>2</sub> data assuming a 5 kcal per liter of O<sub>2</sub> consumed<sup>9</sup>.

### Statistical analyses

Standard descriptive statistics were used to summarize the data. Comparisons between males and females were made using independent t-tests. Alpha was set at .05 to achieve statistical significance.

## RESULTS

The descriptive characteristics of the subjects who participated in the study are presented in Table 1. The responses to the Pound® cardio-jam session DVD are represented in Table 2 and Figures 1-5, respectively. It was found that average HR, %HRmax, %VO<sub>2</sub>max, and RPE were similar between males and females, while average VO<sub>2</sub>, METs, kcal/min, and total Kcals/session were significantly different between gender.

**Table 1.** Descriptive characteristics of the subjects.

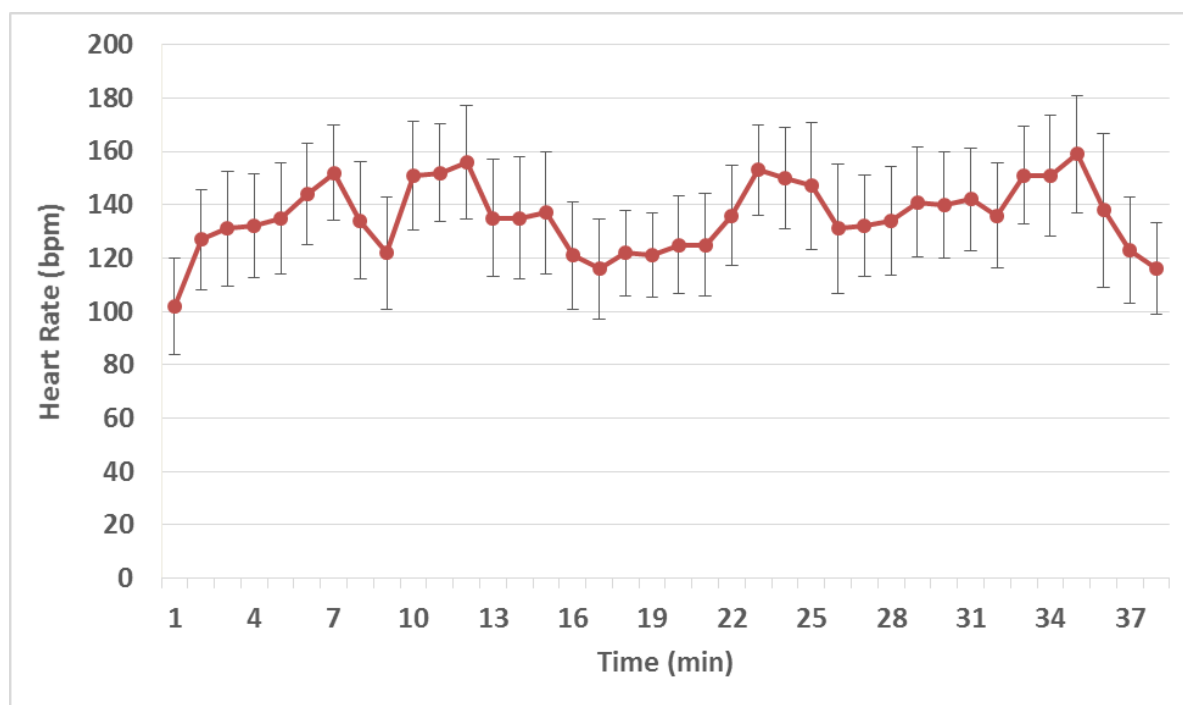
Parameter	Males (n=6)	Females (n=16)
Age (yr)	22.8 ± 1.72	20.8 ± 2.17
Height (cm)	178 ± 5.99	167 ± 6.98
Weight (kg)	75.1 ± 8.98	67.9 ± 7.26
HRmax (bpm)	190 ± 13.9	190 ± 10.8
VO <sub>2</sub> max (ml/kg/min)	56.7 ± 3.46	42.4 ± 7.86

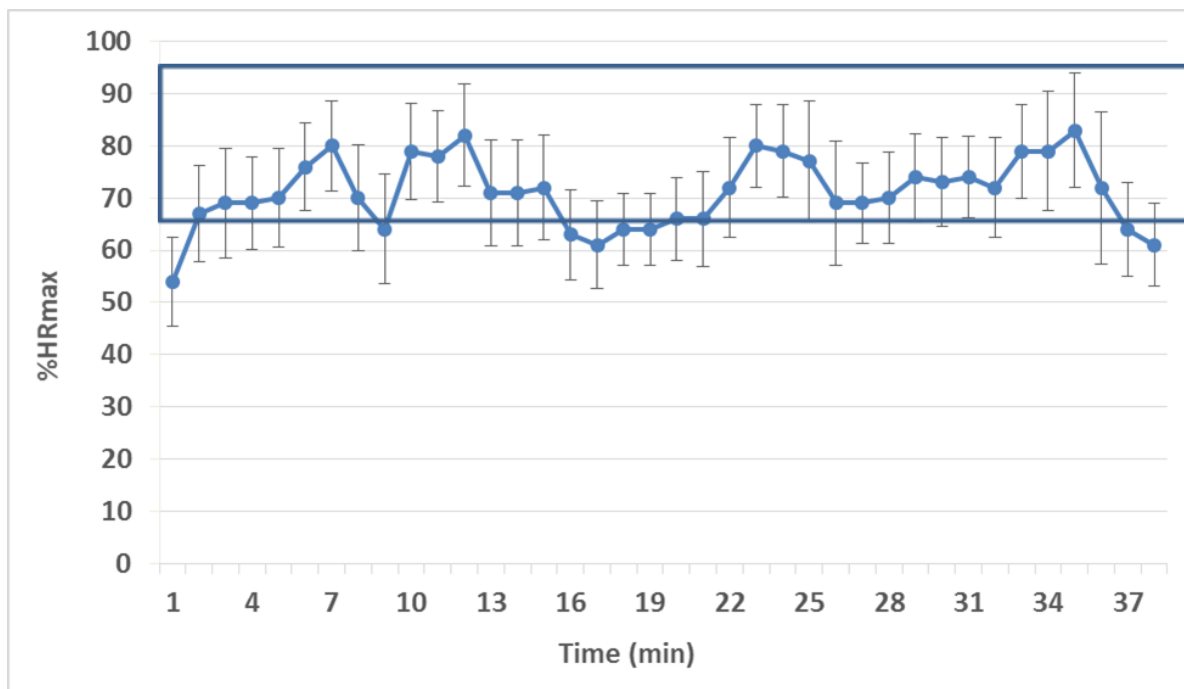
Values represent mean ± standard deviation.

**Table 2** Physiological responses during the Pound® cardio-jam session.

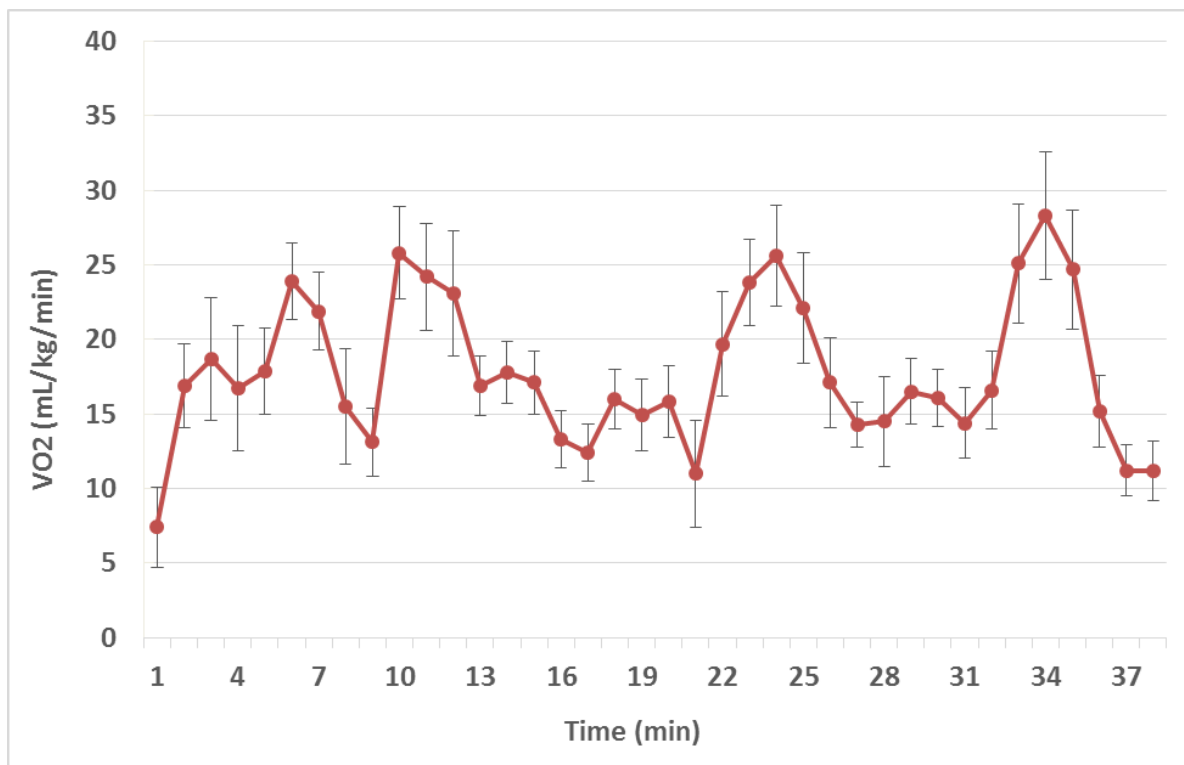
Parameter	Males (n=6)	Females (n=16)	Overall (N=22)
Average HR (bpm)	130 ± 15.3(110-159)	141 ± 15.1(115-159)	137 ± 15.5(110-159)
Average %HRmax	68 ± 5.2(60-75)	73 ± 6.8(62-82)	72 ± 6.6(60-82)
Average VO <sub>2</sub> (mL/kg/min)	19.7 ± 1.71(18.3-21.9)*	17.1 ± 1.54(14.6-19.6)	17.8 ± 1.93(14.6-21.9)
Average % VO <sub>2</sub> max	39 ± 4.5(34-44)	42 ± 6.6(27-51)	41 ± 6.2(27-51)
METs	5.6 ± .5(5.2-6.3)*	4.9 ± .4(4.2-5.6)	5.1 ± .6(4.2-6.3)
kcal/min	7.4 ± 1.1(6.1-8.9)*	5.8 ± .9(4.2-7.8)	6.8 ± 1.2(4.2-8.9)
Total kcal/session	281 ± 41.4(232-339)*	222 ± 34.4(161-296)	238 ± 44.4(161-339)
Average RPE	12.8 ± 2.7(8.8-16)	12.7 ± 1.7(9.5-15)	12.7 ± 1.9(8.8-16)

Values represent mean ± standard deviation (range). \*Significantly different from females (p<.05).

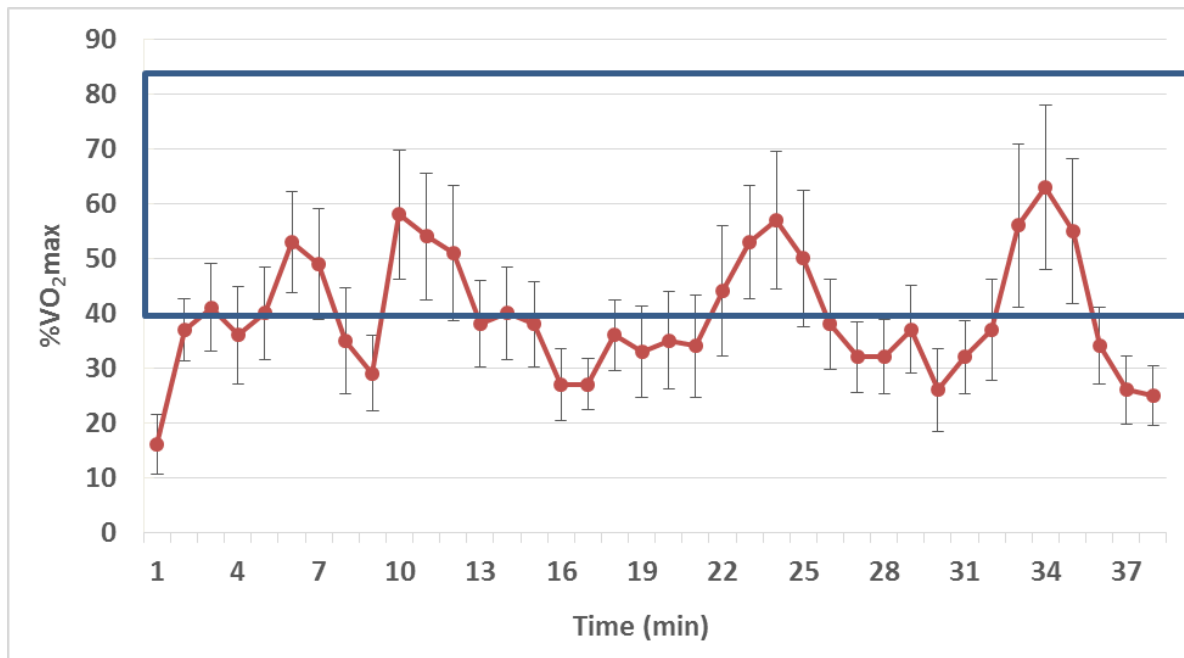
**Figure 1.** Heart rate responses during the Pound® cardio-jam session.



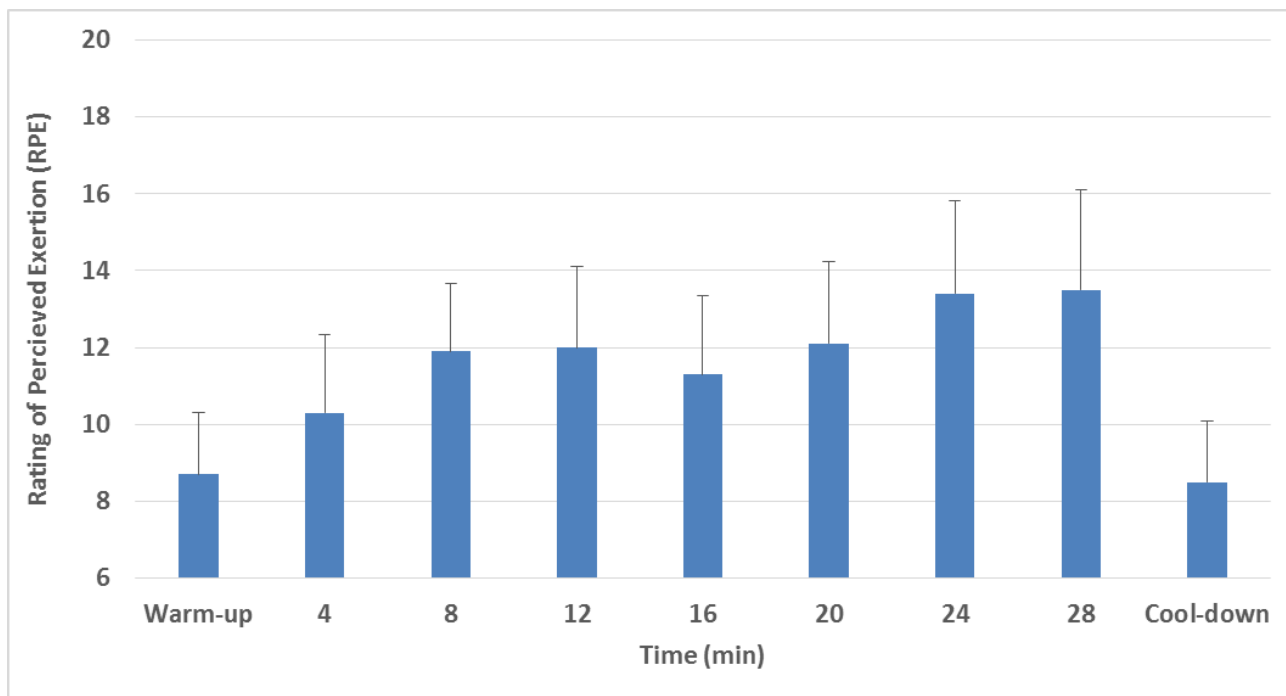
**Figure 2.** Relative HR responses (% HRmax) during the Pound® cardio-jam session. The boxed region indicates the American College of Sports Medicine (ACSM) guidelines for improving cardiorespiratory fitness (64%-94% of HRmax)<sup>10</sup>.



**Figure 3.** Relative oxygen consumption (VO<sub>2</sub>) responses during the Pound® cardio-jam session.



**Figure 4.** Relative oxygen consumption responses (%VO<sub>2</sub>max) during the Pound® cardio-jam session. The boxed region indicates the ACSM guidelines for improving cardiorespiratory fitness (40%-85% of VO<sub>2</sub>max)<sup>11</sup>.



**Figure 5.** Rating of perceived exertion (RPE) response during the Pound® cardio-jam session.

## DISCUSSION

The purpose of this study was to determine the relative exercise intensity and energy expenditure of a Pound® cardio-jam session. Guidelines presented by the American College of Sports Medicine recommend that an individual should exercise between 64-94% of HRmax<sup>10</sup> and 40-85% of VO<sub>2</sub>max<sup>11</sup> in order to obtain a cardiorespiratory benefit. The current study found that subjects were exercising at an average of 72% of HRmax and 41% of VO<sub>2</sub>max, which fall into the moderate-intensity range. This is consistent with the findings of Smith et al.<sup>1</sup> and Brown<sup>2</sup> who found that heavy metal drummers were exercising between 55-70% of HRmax and 42-45% of VO<sub>2</sub>max, respectively. One thing to notice was the undulating nature of the HR (Figure 1) and VO<sub>2</sub> responses (Figure 3). This was due to the fact that some segments of the workout were done standing, and incorporated exaggerated movements of the arms and legs, while other segments were done sitting on the ground. Subjects felt that the sitting segments were relatively “easy” compared to the standing segments. When the intensity of the overall workout was summated, these easy segments decreased the overall intensity of the workout.

Prior to data collection, pilot testing was completed on two subjects to determine if the HR-VO<sub>2</sub> relationship for Pound® was similar to the HR-VO<sub>2</sub> relationship during treadmill exercise. It was found that at any given level of VO<sub>2</sub>, HR was 10-20 bpm

higher for Pound® compared to treadmill exercise. This could have been due to a couple of factors. During Pound®, subjects are required to grip the Ripstix fairly tightly, and are also in an isometric squat position for a large segment of the workout. Previous research on the pressor response suggests that these types of movements can increase HR and blood pressure disproportionately relative to the metabolic needs of the muscle<sup>12</sup>. More importantly, what this indicates is that HR may not be an appropriate method to assess exercise intensity during Pound®.

Because individuals have different VO<sub>2</sub>max values, which affects the calculated relative exercise intensity, intensity is often classified based on absolute metabolic units (METs)<sup>13</sup>. Light-intensity physical activity is defined as being 2.0-2.9 METs, moderate-intensity ranges from 3.0-5.9 METs, and activities requiring  $\geq 6.0$  METs are considered vigorous. In the present study, the average MET requirement for Pound was 5.1 METs (range = 4.2-6.3), which falls into the moderate-intensity range. Other activities that are of similar intensity include walking at 4.0 mph on level ground (5.0 METs)<sup>14</sup>, hula-hooping (5.9 METs)<sup>15</sup>, TRX Suspension Training (5.8 METs)<sup>16</sup>, and stand-up paddleboarding at an easy pace (6.3 METs)<sup>17</sup>.

Exercise intensity can also be prescribed using the 6-20 Borg RPE scale<sup>8</sup>, with values of 12-14 correlating to moderate-intensity exercise<sup>10</sup>. Excluding the warm-up and cool-down, the average RPE of the Pound®

workout was  $12.7 \pm 1.9$ , which correlates to a “somewhat hard” workout based on the verbal anchor points of the Borg scale. This would classify Pound as a moderate-intensity activity. In the heavy metal drumming study conducted by Brown<sup>3</sup>, subjects RPE during a 40-minute drumming session was 13.3.

The current study found that participants burned an average of 238 kcals (6.3 kcal/min) during the 38-minute Pound<sup>®</sup> workout. Brown<sup>2</sup> found that directly measured EE during a 40-minute drumming session averaged 387 kcals (9.7 kcal/min). Romero<sup>3</sup> found that heavy metal drummers expended an average of 518 kcals/hour (8.6 kcal/min) and Smith et al.<sup>4</sup> found that African drumming expended an average of 412 kcals/hour (6.9 kcal/min). De La Rue et al.<sup>5</sup> used HR to *estimate* EE during a drumming session. They found that the average EE of drumming was 623 kcals/hour (10.4 kcal/min), which is significantly higher than other studies. However, based upon the aforementioned pilot testing completed as part of this study, one must be cautious when using HR to predict EE during drumming.

The EE values recorded in the current study are lower than what is claimed on the Pound<sup>®</sup> website<sup>8</sup>. According to Pound<sup>®</sup>, an individual can burn 900+ calories during a 60-minute session. By extrapolation using the data from this study, females would burn an average of 384 kcal and males 444 kcal during a 60-minute session of Pound<sup>®</sup>.

The highest individual result observed in our data was 339 kcals over the 38-minute workout, or 535 kcal/hour, which is still far short of 900+ kcal. These results are reminders that commercial claims often site extreme individual responses and are unlikely to represent meaningful average responses. Our results are more in line with the data for drummer Clem Burke, who burned an average of 412 kcal/hour<sup>1</sup> during a concert. This is also comparable to what is presented on the Drums Alive<sup>®</sup> website, where it is stated that participants’ burn up to 400 kcals/hour<sup>6</sup>.

To our knowledge, this is the first research project to be conducted on Pound<sup>®</sup>. Future research may want to evaluate potential improvements in balance, speed, agility, and coordination that this program claims to develop<sup>7</sup>. Additionally, exercise enjoyability is a key component when looking at exercise adherence. Participant enjoyment during Pound<sup>®</sup> should be compared to other, non-traditional modes of exercise.

Possible limitations of the current study include the fact that subjects had only practiced the Pound<sup>®</sup> workout three times prior to being tested. It is possible that with more practice, or by using subjects who participated regularly in drumming-based workouts, higher physiological responses could have been attained. Another limitation was that aerobic capacity of subjects in the current study were all “good” to “excellent” based upon published



norms<sup>13</sup>. In less fit subjects, it is likely that the relative intensity of the Pound® workout would have been higher.

## CONCLUSIONS

In summary, we found that the intensity of a Pound® cardio-jam session fell into the moderate-intensity range. It should be noted, however, that using HR to estimate exercise intensity may be problematic, since HR's may be artificially elevated in relation to VO<sub>2</sub>. Directly measured EE for both males and females was also within the range recommended for weight management or weight loss, but is substantially lower than advertised on the Pound® website<sup>18</sup>. Collectively, the findings of this study suggest that Pound® is a viable option for individuals seeking an alternative to traditional aerobic exercise programs and modalities.

## Disclosures

This study was funded by the American Council on Exercise (ACE). However, ACE was not involved in the design of this study, collection or analysis of the data, or the preparation of this manuscript.

## References

- Smith M, Draper S, Potter C. (2008). Physiological demands of rock drumming: A case study. *J Sports Sci Med*, 5, 74-89.
- Brown JT. (2016). The energy expenditure of heavy metal drummers *Masters' Thesis & Specialists Projects*. <http://digitalcommons.wku.edu/theses/1647>
- Romero B. (2014). The metabolic demands of heavy metal drumming. *ProQuest Dissertations & Theses Global*. Retrieved from <http://gradworks.umi.com/15/26/1526244.htm>
- Smith C, Vilijoen J, McGeachie L. (2014). African drumming. *J Cardiovasc Med*, 15, 441-446.
- Da La Rue SE, Draper SB, Potter CR, Smith MS. (2013). Energy expenditure in rock/pop drumming. *Int J Sports Med*, 34, 868-72.
- Hill L. (2012, Jan 2). Drumming out fat in the new year. *CNN*. Retrieved from <http://www.cnn.com/2012/01/02/health/drums-alive-fitness-exercise>
- Pound®. (2013, September, 10.) Retrieved from <https://poundfit.com/>
- Borg G. (1982). Psychophysical bases of perceived exertion. *Med Sci Sports Exerc*, 14(5). 377-381.
- Porcari J, Bryant C, Comana F (Ed). (2015). *Exercise Physiology*. Philadelphia, PA: F.A. Davis.
- Pescatello LS (Ed). (2014). *ACSM's Guidelines for Exercise Testing and Prescription* (9<sup>th</sup> ed). Baltimore, MD: Lippincott Williams & Wilkins.
- Kenney LW (Ed). (1995). *ACSM'S Guidelines for Exercise Testing and Prescription* (5<sup>th</sup> ed). Baltimore, MD: Williams & Wilkins.
- Porcari J, Curtis J. (1996). Can you work strength & aerobics at the same time?. *Fit Mgmt*, 26-29.
- Riebe D (Ed). (2017). *ACSM's Guidelines for Exercise Testing and Prescription* (10<sup>th</sup> ed). Philadelphia, PA: Wolters Kluwer.
- Ainsworth BE, Haskell WL, Herrmann SD, Meckes N, Bassett JR DR, Tudor-Locke C, Greer JL, Venzina J, Whitt-Glover MC, Leon AS. (2011). 2011 Compendium of physical activities: A second update of codes and MET values. *Med Sci Sports Exerc*, 42(8), 1575-1581.
- Holthusen J, Porcari J, Foster C, Doberstein S. (2010). Hooping: Effective workout or child's play? *ACE Certified News*, 1-3.
- Smith LE, Snow J, Fargo J, Buchanan CA, Dalleck LC. (2016). The acute and chronic health benefits of TRX suspension training® in healthy adults. *Int J Res Ex Phys*, 11(2), 1-15.
- Andres J, Porcari JP, Cress ML, Camic C, Radtke K, Foster C. (2017). Physiologic responses to standup paddleboarding. *GMJ*, 10, 26-28.
- Donnelly JE, Blair SN, Jakicic JM, Manore MM, Rankin JW, Smith BK. (2009). American College of Sports Medicine Position Stand: Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults. *Med Sci Sports Exerc*, 41, 459-471.