Journal of Exercise Physiologyonline

June 2018
Volume 21 Number 3

Official Research Journal of the American Society of Exercise Physiologists

ISSN 1097-9751

JEPonline

The Acute and Chronic Physiological Responses to Exercise with the Total Gym® Row Trainer™ in Adults

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ABSTRACT

Padilla PA, Carrillo S, Montano EE, Buchanan CA, Dalleck LC. The Acute and Chronic Physiological Responses to Exercise with the Total Gym® Row Trainer™ in Adults. **JEPonline** 2018;21(3):133-145. This study determined the effectiveness of a 6-wk Total Gym® Row Trainer™ on improving fitness and cardiometabolic risk factors. Sixteen women and men (mean ± SD: age, 27.7 ± 8.8 yrs; weight, 73.3 ± 17.5 kg; percentage body fat, 24.6 ± 6.2%; and VO_2 max, 37.7 ± 5.8 mL·kg^{-1}·min^{-1}) completed both a maximal graded exercise test and a 30-min Total Gym® Row Trainer™ exercise session on non-consecutive days. Then, the subjects completed a 6-wk exercise training program (30-min sessions performed 5 times·wk^{-1}) on the Total Gym® Row Trainer™. Heart rate for the 30-min exercise session was 142.5 ± 11.3 beats·min^{-1}, which was 63.4 ± 13.9% of the subjects' heart rate reserve (HRR). Exercise intensity in METs was 5.8 ± 1.2, which equates to 48.8 ± 14.2% of oxygen uptake reserve (VO_2R). Total energy expenditure for an exercise session was 222.0 ± 74.3 kcal·session^{-1}. After 6 wk of training, there were significant ($P<0.05$) improvements in cardiometabolic risk factors, VO_2 max, and muscular fitness. The findings support the use of the Total Gym® Row Trainer™ as an alternative to traditional exercise modalities.

Key Words: Cardiometabolic Risk Factor, Energy Expenditure, Exercise Intensity, Resistance Exercise

INTRODUCTION

Regular physical activity confers various health benefits that include the prevention and management of hypertension, obesity, type 2 diabetes, dyslipidemia, and cardiovascular disease (CVD) (16). Physical activity may also contribute to improved cardiorespiratory fitness provided that exercise intensity is sufficient. Cardiorespiratory fitness, typically determined by maximal oxygen uptake (VO_2 max), refers to the highest rate at which oxygen can be taken up and consumed by the body during incremental exercise. Studies have consistently demonstrated an inverse relationship between VO_2 max values and risk of CVD and all-cause mortality (4,5). Given its relationship to positive health, the parameters of an exercise program that need to improve cardiorespiratory fitness have been studied extensively, and subsequently well-defined guidelines have been published (12). The American College of Sports Medicine (ACSM) currently recommends 20 to 60 min of aerobic exercise 3 to 5 $d \cdot wk^{-1}$ at an intensity of 64/70-94% of heart rate maximum (HR max), 40/50-85% of heart rate reserve (HRR) or oxygen uptake reserve (VO_2R), and 12 to 16 rating of perceived exertion (RPE). Additionally, ACSM has recommended a target energy expenditure of 150 to 400 net $kcal \cdot d^{-1}$. Traditional forms of aerobic exercise include walking, jogging, and cycling.

Indoor rowing is another common modality of aerobic exercise. Indoor rowing provides a moderate-to-vigorous workout, while sparing the joints the high-impact ground reaction forces associated with running and jogging. The Total Gym® Row Trainer™ is a newcomer to the indoor rowing community and differs substantially in function from the traditional rower. For example, according to manufacturer guidelines, the Total Gym® Row Trainer™:

- Features adjustable incline body resistance, integrating a strength component into a traditional cardio machine.
- Enables a smooth consistent load through the entire range of motion due to concentric and eccentric phases of the exercise while providing low impact compression on the joints, especially the lower spine.
- Is built for multi-planar movement including exercises such as the biceps curl and an alternating side to side row.

Nevertheless, because of its novelty, there is a lack of research on the Total Gym® Row Trainer™. Understanding the cardiovascular and metabolic responses to exercise is essential for designing safe and effective physical activity and rehabilitation programs. For example, it would be beneficial to understand the metabolic equivalent (MET) value associated with Total Gym® Row Trainer™. A MET value would allow the quantification of Total Gym® Row Trainer™ exercise intensity as low, moderate, or vigorous and, thus aid in establishing a safe and effective target workload.

The purpose of this study was to quantify the acute cardiovascular and metabolic responses to the Total Gym® Row Trainer™ and to determine the effectiveness of a 6-wk chronic exercise training program using the Total Gym® Row Trainer™ to improve cardiorespiratory and muscular fitness and to modify cardiometabolic risk factors. It was hypothesized that an acute bout of exercise on the Total Gym® Row Trainer™ would meet the recommended guidelines for moderate-to-vigorous intensity exercise as defined by the American Council on

Exercise (ACE) and ACSM, improve the subjects' cardiorespiratory and muscular fitness, and modify their cardiometabolic risk factors.

METHODS

Subjects

Sixteen healthy women (mean ± SD: age, 27.7 ± 8.8 yrs) were recruited from the student population of a local university and surrounding community via advertisement through the university website, local community newspaper, and word-of-mouth. The subjects were eligible for inclusion in the study if they were low to moderate risk and physically active as defined by ACSM (12). Exclusionary criteria included evidence of cardiovascular, pulmonary and/or metabolic disease. This study was approved by the Human Research Committee at Western State Colorado University. Prior to participation, each subject signed an informed consent form and underwent baseline testing.

Experimental Design

Acute Responses to Exercise with the Total Gym® Row Trainer™

To quantify the acute cardiovascular and metabolic responses to training with the Total Gym® Row Trainer™ an Oxycon Mobile portable calorimetric measurement system and Polar F1 heart rate monitor were worn by each subject throughout a single 30-min training session (Figure 1).

Figure 1. The Oxycon Mobile Metabolic System attached to a Subject during a Training Session with the Total Gym® Row Trainer™.

Chronic Responses to TRX Suspension Training

At baseline and post-program, the subjects performed a graded exercise test on a treadmill to determine maximal heart rate (HR max) and VO_2 max. Resting heart rate was also measured at baseline. Additionally, body composition, fasting blood lipids and blood glucose, waist circumference, weight, and muscular fitness were also assessed at baseline and post-program. These measures were obtained to determine the effectiveness of a 6-wk Total Gym® Row Trainer™ intervention in modifying the cardiometabolic risk factors. The experimental design for the chronic training responses to using the Total Gym® Row Trainer™ is presented in Figure 2.

Figure 2. Experimental Design for Chronic Training Responses to the Total Gym® Row Trainer™.

Protocols

Anthropometric Measurements

All anthropometric measurements were obtained using standard guidelines (12). Subjects were weighed to the nearest 0.1 kg on a medical grade scale and measured for height to the nearest 0.5 cm using a stadiometer. Percent body fat was determined via hydrostatic weighing. Waist circumference measurements were obtained using a cloth tape measure with a spring loaded-handle (Creative Health Products, Ann Arbor, MI). A horizontal measurement was taken at the narrowest point of the torso (below the xiphoid process and above the umbilicus). These measurements were taken until two were within 0.5 mm of each other.

Fasting Blood Lipid and Glucose Measurements

All fasting lipid and blood glucose measurements were collected and performed at room temperature. The subjects' hands were washed with soap and rinsed thoroughly with water, then cleaned with alcohol swabs and allowed to dry. Skin was punctured using lancets and a fingerstick sample was collected in heparin-coated 40 μl capillary tube. Blood was allowed to

flow freely from the fingerstick into the capillary tube without milking of the finger. Samples were then dispensed immediately onto commercially available test cassettes for analysis in a Cholestech LDX System (Alere Inc., Waltham, MA) according to strict standardized operating procedures. The LDX Cholestech measured total cholesterol, high density lipoprotein (HDL) cholesterol, low density lipoprotein (LDL) cholesterol, triglycerides, and blood glucose in fingerstick blood. A daily optics check was performed on the LDX Cholestech analyzer used for the study.

Maximal Exercise Test

On a power treadmill (Powerjog GX200, Maine), a modified Balke protocol was performed with subjects selecting a comfortable walking or jogging speed that could be maintained for the duration of the test. After a 2-min warm-up performed at a walking speed of 2 to 3 $mi \cdot hr^{-1}$, subjects were gradually brought to the selected walking or jogging speed for the first minute of the test, which was then maintained throughout the duration of the test. The warm-up portion and the first 1 min of the protocol were performed at 0% grade, there after each minute the treadmill grade was increased by 1% until volitional fatigue was attained. The final workload (speed and grade) achieved was recorded. Individual VO_2 max was subsequently estimated from the final workload using the ACSM metabolic equations for walking and running (12).

Muscular Fitness

Subjects performed 1-rep maximum (1-RM) testing for the bench press, leg press, and seated row exercises. The following protocol was used for 1-RM testing (12):

1. Ten reps of a weight the subject felt comfortable lifting (40 to 60% 1-RM) were performed to warm-up the muscles.
2. RPE was recorded followed by 1 min rest period.
3. Five reps of weight 60 to 80% 1-RM was performed as a further warm-up, then rating of perceived exertion (RPE) was recorded that was followed by a 2-min rest period.
4. First 1-RM attempt at a weight of 2.5 to 20 kg greater than the warm-up, the weight was dependent on the RPE of warm-up:
    a. If first 1-RM lift was deemed successful by the researcher (appropriate lifting form), the weight was increased until maximum weight the subject could lift was established with 3 min between each attempt.
    b. If first 1-RM lift deemed unsuccessful by the researcher, the weight was decreased until the subject successfully lifted the heaviest weight possible.

There was a 3-min rest between 1-RM attempts and a maximum of 5, 1-RM attempts. There was a 5-min of rest between the 1-RM testing of each resistance exercise.

Testing Session to Quantify Acute Cardiovascular and Metabolic Responses to the Total Gym® Row Trainer™

The subjects performed a 30-min Total Gym® Row Trainer™ exercise training session. The 30-min exercise session on the Total Gym® Row Trainer™ was divided into 6 x 5-min stages in which the following rowing motions were performed: (a) flat rowing; (b) incline rowing; (c) flat bicep curl rowing; (d) incline bicep curl rowing; (e) flat side-to-side rowing; and (f) incline side-to-side rowing. Prior to the start of the testing session, both the heart rate monitor and portable metabolic analyzer were attached to the subject. All subjects were familiarized with

the breathing apparatus and provided an explanation of testing instructions and precautions. Additionally, EMG activity was obtained from the following eight muscles of the lower extremities: tibialis anterior, medial gastrocnemius, vastus medialis, vastus lateralis, rectus femoris, biceps femoris, semitendinosis, and gluteus maximus. The data were collected for 30 sec at the conclusion of each rowing stage.

Table 1. The 6-wk Total Gym® Row Trainer™ Exercise Training Program.

Exercises	Week 1					Week 2					Week 3*					Week 4*					Week 5**					Week 6**				
	Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Fri	Mon	Tue	Wed	Thu	Fri
Under hand grip static row	■				■	■					■				■	■					■				■	■				
Single arm row (dynamic)					■	■									■	■					■				■	■				
Single arm row (static)	■					■				■	■					■				■	■					■				■
Single arm row single leg	■				■	■				■	■				■	■				■	■				■	■				■
single arm row with twist					■	■				■					■	■				■					■	■				■
Bicep curl dynamic	■					■				■	■					■				■	■					■				■
Bicep curl static	■				■					■	■				■					■	■				■					■
Bicep curl single leg	■				■					■	■				■					■	■				■					■
Core EX 1		■		■			■		■			■		■			■		■			■		■			■		■	
Core EX 2		■		■			■		■			■		■			■		■			■		■			■		■	
Core EX 3		■		■			■		■			■		■			■		■			■		■			■		■	
Over hand grip (low)		■		■			■		■			■		■			■		■			■		■			■		■	
Over hand grip (medium)		■		■			■		■			■		■			■		■			■		■			■		■	
Under hand grip low single leg		■		■			■		■			■		■			■		■			■		■			■		■	
Alternating row			■					■					■					■					■					■		
Over hand grip static EX1			■					■					■					■					■					■		
Over hand grip static EX2								■										■										■		
Front shoulder raise			■															■										■		
Front shoulder raise alternating								■					■					■					■					■		
Over hand grip high			■										■										■					■		
Over hand grip high single leg			■					■					■					■					■					■		
over hand grip upright row			■										■																	

* Addition of 1 resistance band (0-15lbs), ** Addtion of 2 resistance band (15-30lbs), Week 1 = Low resistance (17% of bodyweight) (level 1 incline), Week 2-6 = High Resistance

Training Program to Determine Chronic Responses to Exercise Training with the Total Gym® Row Trainer™

All the subjects completed a standard 6-wk Total Gym® Row Trainer™ training program (Table 1). The program consisted of 5 x 30-min Total Gym® Row Trainer™ exercise training sessions each week. Training sessions could be completed on all days of the week. However, the subjects were encouraged to train no more than 3 consecutive days without a rest day. All Total Gym® Row Trainer™ exercise training sessions were supervised by one member of the research team. Only the data from those subjects who completed ≥75% of the training sessions (i.e., 23 out of 30 sessions) were included in the final analysis.

Exercise Intensity and Metabolic Calculations

Individual heart rate reserve (HRR) was determined as the difference between resting and HR max values. Percent HRR was calculated by subtracting resting HR from the Total Gym® Row Trainer™ HR response, dividing by HRR, and then multiplying the quotient by 100. Likewise, individual oxygen uptake reserve (VO_2R) was quantified by taking the difference between resting VO_2 (a constant of 3.5 $mL \cdot kg^{-1} \cdot min^{-1}$ was used for all subjects) and maximum VO_2 values. Percent VO_2R was calculated by subtracting resting VO_2 from the Total Gym® Row Trainer™ VO_2 response, dividing by VO_2R, and then multiplying the quotient by 100. The metabolic equivalent (MET) for Total Gym® Row Trainer™ was determined by dividing the Total Gym® Row Trainer™ VO_2 by a standardized resting VO_2 value (i.e., 3.5 $mL \cdot kg^{-1} \cdot min^{-1}$). Energy expenditure ($kcal \cdot session^{-1}$) for the Total Gym® Row Trainer™ training session was calculated by multiplying the above-calculated MET equivalent

of the Total Gym® Row Trainer™ training session by individual body mass, dividing by 1000, multiplying by the caloric equivalent for the measured respiratory exchange ratio or RER (e.g., an RER of 0.83 equates to an energy cost of 4.838 kcal·L^{-1} of oxygen), and lastly multiplying by 30-min (duration of the Total Gym® Row Trainer™ training session).

Statistical Analyses

All analyses were performed using the SPSS Version 22.0 (Chicago, IL) and GraphPad Prism 6.0. (San Diego, CA). Measures of centrality and spread are presented as mean ± SD. Primary outcome measures for the acute cardiovascular and metabolic responses to the Total Gym® Row Trainer™ portion of the study were relative exercise intensity (%HRR and %VO_2R), metabolic equivalents (METs), and energy expenditure (kcal·min^{-1} and kcal·$session^{-1}$). Primary outcome measures for the chronic cardiovascular and metabolic responses to exercise training with Total Gym® Row Trainer™ were the change in cardiometabolic risk factors, including VO_2 max, weight, waist circumference, body composition, blood lipids, blood glucose, and muscular fitness. Paired *t*-tests were used to compare the mean primary outcome measures between baseline and post-program. The probability of making a Type I error was set at $P<0.05$ for all statistical analyses.

RESULTS

Acute Cardiovascular and Metabolic Responses to Training with the Total Gym® Row Trainer™

The acute cardiovascular and metabolic responses (mean ± SD) to a Total Gym® Row Trainer™ exercise training session for the 16 subjects (women = 9, men = 7) who completed the study are presented in Table 2. Overall heart rate for a 30-min exercise session was 142.5 ± 11.3 beats·min^{-1}, which corresponded to 63.4 ± 13.9% HRR. Exercise intensity in METs was 5.77 ± 1.2, which equated to 48.8 ± 14.2% VO_2R. Total energy expenditure for a Total Gym® Row Trainer™ exercise training session was 222.0 ± 74.3 kcal·$session^{-1}$. Figure 3 illustrates the exercise intensity in terms of HRR for a representative subject throughout the duration of a Total Gym® Row Trainer™ exercise training session. EMG values ranged from 23 to 81% of maximum voluntary contraction across lower body muscle groups.

Table 2. Acute Cardiovascular and Metabolic Responses.

Parameter	Mean ± SD
HR (beats·min^{-1})	142.5 ± 11.3
%HRR	63.4 ± 13.9
%VO_2R	48.8 ± 14.2
METs	5.77 ± 1.2
kcal·min^{-1}	7.4 ± 2.1
kcal·$session^{-1}$	222.0 ± 74.3

HR = Heart Rate, **%HRR** = Percentage Heart Rate Reserve, **kcal** = Kilocalories, **METs** = Metabolic Equivalents, **%VO_2R** = Percentage Oxygen Uptake Reserve

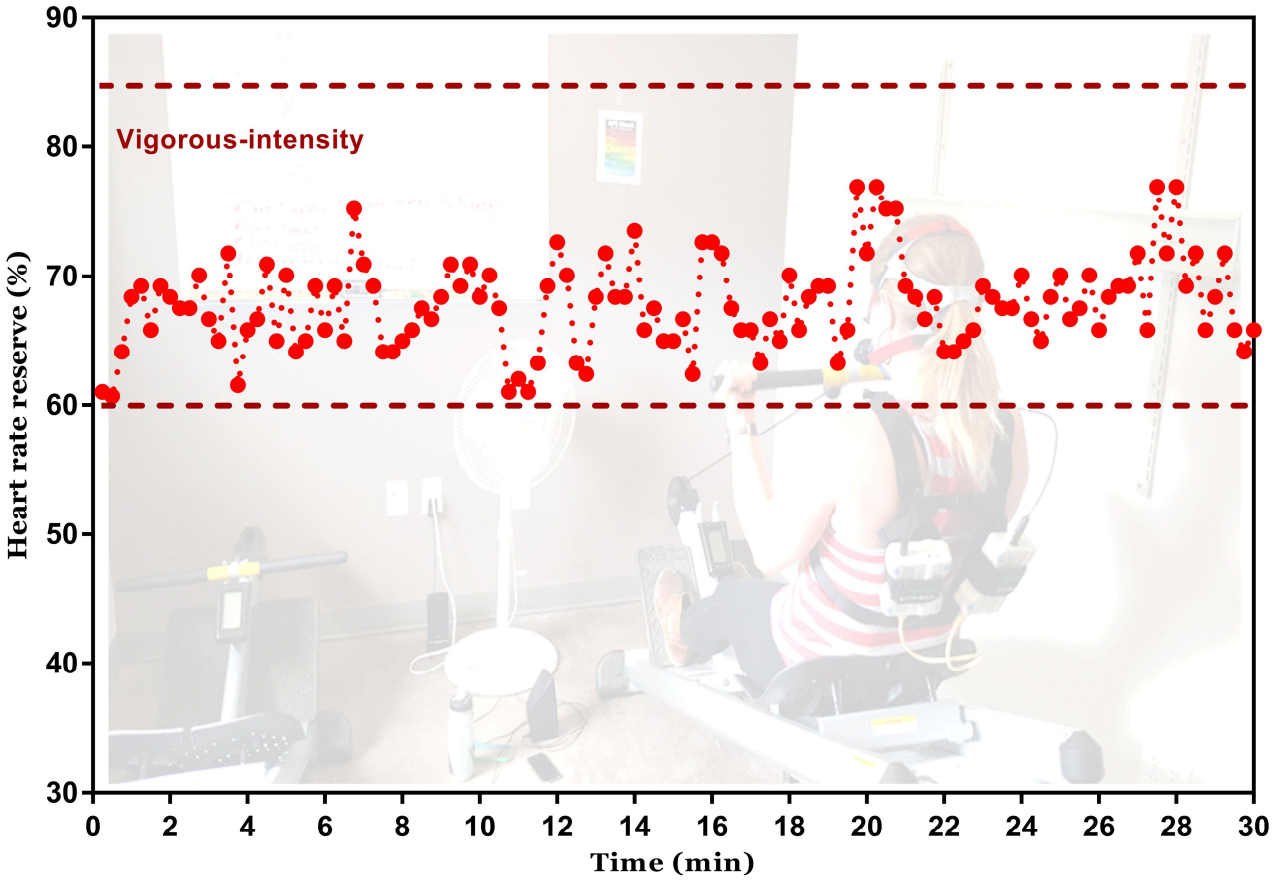

Figure 3. Exercise Intensity in Terms of Heart Rate Reserve (HRR) for a Representative Participant Throughout the Duration of a Total Gym® Row Trainer™ Exercise Session. The Dashed Lines (---------) Represent the Vigorous Exercise Intensity Classification.

Chronic Cardiovascular and Metabolic Responses to Training with the Total Gym® Row Trainer™

The chronic cardiovascular and metabolic responses to exercise training with the Total Gym® Row Trainer™ are presented in Table 3 for all subjects who completed the intervention (N = 16). At 6-wk, paired *t*-tests revealed favorable changes in weight (t (15) = 5.060, P<0.05), body fat % (t (15) = 6.252, P<0.05), HDL (t (15) = 4.150, P<0.05), triglycerides (t (15) = 3.232, P<0.05), blood glucose (t (15) = 3.976, P<0.05), and VO_2 max (t (15) = 10.241, P<0.05), which indicated a positive effect on body mass, body composition, and cardiovascular health. Paired *t*-tests revealed a significant increase in 1-RM leg press (t (15) = 4.719, P<0.05), 1-RM bench press (t (15) = 4.025, P<0.05), and 1-RM seated row (t (15) = 4.271, P<0.05), indicating a positive effect on muscular fitness.

Paired *t*-tests revealed no significant difference in baseline to post-program waist circumference (t (15) = 1.349, P>0.05), total cholesterol (t (15) = 0.547, P>0.05), and LDL (t (15) = 1.015, P>0.05).

Table 3. Baseline (Mean ± SD) and Mean Change (95% CI) at 6-wk in All Primary Outcomes after Training with the Total Gym® Row Trainer™.

Variable	Baseline Mean ± SD	Change at 6-wk Mean (95% CI)	P-value Difference to Baseline
Weight (kg)	73.3 ± 17.5	-0.98 (-1.40 to -0.57)	<0.001*
Waist Circumference (cm)	80.1 ± 12.6	-0.48 (-1.23 to 0.28)	0.197
Body Fat (%)	24.6 ± 6.2	-2.03 (-2.72-to 1.34)	<0.001*
TC ($mg \cdot dL^{-1}$)	181.3 ± 25.6	4.13 (11.94 to 20.20)	0.592
HDL ($mg \cdot dL^{-1}$)	52.9 ± 14.4	5.44 (2.65 to 8.23)	0.001*
LDL ($mg \cdot dL^{-1}$)	104.9 ± 32.4	-5.75 (-17.83 to -6.33)	0.326
TRIG ($mg \cdot dL^{-1}$)	126.6 ± 62.3	-16.75 (-27.80 to -5.70)	0.006*
GLU ($mg \cdot dL^{-1}$)	92.9 ± 7.5	-5.19 (-7.97 to -2.41)	0.001*
VO_2 max ($mL \cdot kg^{-1} \cdot min^{-1}$)	37.7 ± 5.8	3.38 (2.67 to 4.07)	<0.001*
1-RM Leg Press (lbs)	187.2 ± 78.9	17.50 (9.60 to 25.40)	<0.001*
1-RM Bench Press (lbs)	118.8 ± 55.6	11.25 (5.29 to 17.21)	0.001*
1-RM Seated Row (lbs)	58.9 ± 24.0	8.13 (4.07 to 12.18)	0.001*

CI = Confidence Interval, **TC** = Total Cholesterol, **HDL** = High Density Lipoprotein, **LDL** = Low Density Lipoprotein, **TRIG** = Triglycerides, **GLU** = Blood Glucose, **VO_2 max** = Maximal Oxygen Uptake, **1RM** = One Rep Max. *P<0.05

DISCUSSION

Physical inactivity is an important risk factor for the development and progression of CVD (11). Nevertheless, according to the 2013 data in adults who are ≥18 yrs of age, the age-adjusted proportion who reported engaging in moderate or vigorous physical activity that met the current physical activity guidelines for Americans was 50% (11). This is perhaps due in part to a lack of enjoyment experienced from participation in traditional forms of physical activity (such as walking, running, swimming, and cycling). Additionally, despite the long-existence of exercise-related health promotions, engagement in physical activities or exercise remains scarce, primarily reported to be due to lack of time (15). One possible way to increase the number of individuals involved in regular physical activity is to emphasize that the health benefits of traditional exercise can often be found in alternative forms of exercise in a time-efficient manner. Results from the present study provide two preliminary lines of evidence supporting the Total Gym® Row Trainer™ as an ideal alternative exercise modality:

1. The typical Total Gym® Row Trainer™ exercise session elicited cardiovascular and metabolic responses that fulfill exercise intensity guidelines for improving and maintaining cardiorespiratory fitness (7,12). Mean exercise intensity was 63.4% of HRR, 48.8% of VO_2R, and 5.8 METs. Overall energy expenditure for the Total Gym® Row Trainer™ exercise session was 222 $kcal \cdot session^{-1}$.
2. Participation in a 6-wk exercise training program with the Total Gym® Row Trainer™ positively modified numerous major CVD risk factors (e.g., lowered body fat, decreased blood glucose and triglycerides, and increased HDL cholesterol) and improved muscular

fitness. These findings suggest that the Total Gym® Row Trainer™ is an exercise modality that may simultaneously satisfy both aerobic and resistance training guidelines.

Acute Cardiovascular and Metabolic Responses

Exercise intensity is arguably the most critical component of the exercise prescription model. Failure to meet minimal threshold values may result in lack of a training effect, while an intensity that is too high may lead to over-training with a negative impact on adherence to an exercise program (9). Results from the present study indicate that exercise with a Total Gym® Row Trainer™ can be classified as "moderate-to-vigorous" according to various definitions of physical activity intensity (7,12). For example, moderate exercise intensity in relative terms has been defined as 40 to 59% of HRR/VO_2R while vigorous exercise intensity is defined as 60 to 84% of HRR/VO_2R (12). Subjects in the present study exercised at workloads that elicited HRR (63.4%) and VO_2R (48.8%) values that fall within the vigorous and moderate relative intensity categories, respectively.

In the 2008 U.S. physical activity guidelines report (8) and elsewhere (1), moderate-intensity physical activity in absolute metabolic terms has been classified as 3 to 6 METs. In the present study, the MET response to exercise with the Total Gym® Row Trainer™ averaged 5.8. Thus, subjects in the present investigation exercised at workloads during a typical Total Gym® Row Trainer™ exercise session that elicited metabolic responses within the accepted moderate-intensity range. This is an important finding given the fact that moderate-intensity exercise has been widely recommended for health benefits (7,8,12). Additionally, MET values described in the present study compare favorably to more traditional land-based aerobic exercise values and non-traditional exercise values. For instance, treadmill and over ground brisk walking at 4.0 mi·hr^{-1} is an equivalent moderate-intensity physical activity at 4.9 METs. Likewise, an 80-kg individual cycling between 50 and 100 Watts will elicit a MET value ranging from 4.0 to 6.0 METs (12). More recently, Smith and colleagues (14) reported that participation in a TRX Suspension Training class also elicited an absolute moderate-intensity metabolic response at 5.8 METs.

For the improvement and maintenance of cardiorespiratory fitness, ACSM recommends a target energy expenditure of 150 to 400 kcal·d^{-1}. From a practical perspective, results from the present study highlight that participation in a 30-min Total Gym® Row Trainer™ exercise training session yields a mean energy expenditure of 222 kcal that satisfies the ACSM recommendation for daily energy expenditure. This volume of energy expenditure is comparable to the other non-traditional alternative activities. For instance, Bausch et al. (3) reported that participation in a 1-hr session of Nintendo Wii Sports elicited a mean energy expenditure of ~250 kcal·session^{-1}. More recently, Weatherwax and colleagues (17) reported that participation in a 40-min Ultimate Frisbee match elicited a total energy expenditure of ~475 kcal·match^{-1}.

Chronic Cardiovascular and Metabolic Adaptations

The results of the current study demonstrate that regular exercise training with a Total Gym® Row Trainer™ confers similar health benefits when compared to those achieved from traditional aerobic training and resistance training. Indeed, training with a Total Gym® Row Trainer™ 5 d·wk^{-1} for 6 wk resulted in significant improvements in body weight (-1 kg), body fat (-2.03%), blood glucose (-5.19 mg·dL^{-1}), HDL cholesterol (+5.44 mg·dL^{-1}), blood triglycerides (-16.75 mg·dL^{-1}), and VO_2 max (+3.38 mL·kg^{-1}·min^{-1}). Moreover, various metrics

of muscular fitness (i.e., bench press, leg press, and seated row 1-RM) were also improved in the present study.

In the past few decades both low cardiorespiratory and muscular fitness have garnered considerable attention as independent and powerful predictors of CVD risk and premature mortality. For instance, it has been reported that increased muscular fitness is associated with a reduced risk of all-cause mortality (13). Likewise, Williams (18) showed in a meta-analysis that there was a marked decrease in relative risk for CVD when individuals moved out of the lowest quartile of cardiorespiratory fitness. More recently, Blair (6) estimated that low cardiorespiratory fitness accounted for more overall deaths when compared to deaths that could be attributed to traditional CVD risk factors, such as hypertension, obesity, high cholesterol, smoking, and diabetes. Accordingly, the changes in cardiorespiratory (i.e., increase in VO_2 max) and muscular fitness (i.e., increase in 1-RM bench press, leg press, and seated row scores) in the current study have novel clinical and public health relevance, as a large number of adults fall into clinically-defined low cardiorespiratory and muscular fitness categories and therefore demonstrate increased CVD risk (10). Overall, VO_2 max was improved on average by ~1.0 MET during the 6 wk of exercise training. These improvements likely have important long-term prevention implications as a recent study reported a 1 MET increase in VO_2 max was associated with an 18% reduction in deaths due to CVD (2).

Limitations of this Study

Possible limitations to the present study merit discussion. The present study investigated the acute and chronic cardiovascular and metabolic responses to a representative sample of healthy men and women participating in exercise training with a Total Gym® Row Trainer™ according to a standardized 30-min routine (see Table 1). The cardiovascular and metabolic responses would undoubtedly vary across different routines. Additionally, the chronic cardiovascular and metabolic responses may be more pronounced with a longer training period beyond the 6-wk duration of the present study. Future research might also examine other possible training adaptations including enhanced psychological health (e.g., reduced stress).

CONCLUSIONS

To our knowledge, this is the first study to investigate the acute and chronic cardiovascular and metabolic responses to exercise with the Total Gym® Row Trainer™. Findings from the present study support the activity as a feasible alternative to traditional exercise modalities for adults to elicit metabolic responses within the accepted moderate-to-vigorous intensity range. Moreover, regular exercise training with Total Gym® Row Trainer™ improves muscular fitness and positively modifies several major cardiovascular disease risk factors in a time efficient manner. Overall, these findings are important for exercise physiologists and others who design exercise programs and promote physical activity in the adult population.

ACKNOWLEDGMENTS

This investigation was supported financially by the American Council on Exercise (ACE). The American Council on Exercise (ACE) was not involved in development of the study design, data collection and analysis, or preparation of the manuscript. There are no other potential conflicts of interest related to this article.

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