

Does the ACE Integrated Fitness Training® Model Really Work?

→ What You Need to Know:

This is the first report on an ongoing three-year study examining the effectiveness of exercise programming based on the ACE Integrated Fitness Training® Model. The results of this study provide additional support to the findings of previous ACE-supported research on the Model—namely, that the personalized approach optimizes training responsiveness and positively impacts both cardiorespiratory fitness and cardiometabolic health.

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Since first introducing the ACE Integrated Fitness Training® (ACE IFT®) Model more than a decade ago, ACE has been supporting research to investigate its effectiveness in real-world settings.

Previous research on the ACE IFT Model has shown the following:

- ▶ An individualized exercise program based on the ACE IFT Model elicited significantly greater improvements in VO₂max, muscular fitness and key cardiometabolic risk factors. In addition, an individualized exercise program increased training responsiveness when compared to a standardized exercise training program.
- ▶ Exercise programming based on the ACE IFT Model is effective in a community setting in terms of reducing cardiovascular risk in adults, demonstrating that the results of the study mentioned above also can be seen when the Model is used on a larger scale. Also, these findings support the implementation of the Model as a means of community-wide primary prevention initiatives.
- ▶ Older individuals adapt to personalized cardiorespiratory and muscular training and improve health-related

components of physical fitness to the same relative extent as younger individuals when adhering to a personalized exercise program based on the ACE IFT Model.

- ▶ The ACE Mover Method™—the cornerstone of the ACE IFT Model's client-centered approach—is a successful strategy for facilitating behavior and lifestyle changes.

This current study represents the next step in this growing body of research. Like the studies cited above, this research was conducted by Lance Dalleck, PhD, and his team of researchers in the High Altitude Exercise Physiology Program at Western Colorado University. This is the first report on an ongoing randomized, controlled trial that will last three years. At the conclusion of this project, researchers will have conducted a multi-year, multi-site study that provides a robust body of data from more than 100 participants.

The purpose of the study is to examine the effectiveness of personalized exercise programming using the ACE IFT Model at eliciting favorable comprehensive training responsiveness (i.e., cardiorespiratory fitness + muscular fitness + cardiometabolic health). The findings presented here are from year 1 of this research.

The Study

Fifty-one nonsmoking men and women ranging in age from 42 to 80 years old were recruited to participate in a 13-week study. All were physically inactive, which is defined as not having participated in at least 30 minutes of moderate-intensity physical activity on at least three days of the week for at least three months, and all were asked to continue their current dietary habits and to not perform additional exercise beyond that required for the research. None of the participants had evidence of cardiovascular, pulmonary and/or metabolic disease, as determined by the completion of a medical history questionnaire.

The participants underwent two days of baseline measurements prior to the beginning of the study. The following variables were measured:

- ▶ Resting heart rate
- ▶ Resting blood pressure
- ▶ Anthropometric measurements: height, weight, percent body fat, and waist and hip circumferences
- ▶ Fasting blood lipids
- ▶ Fasting blood glucose
- ▶ Muscular fitness testing: five-repetition maximum (5-RM) for the bench press and leg press exercise
- ▶ Maximal exercise testing: maximal oxygen consumption ($\dot{V}O_2$ max) and maximal heart rate [note that heart-rate reserve (HRR) was calculated for each participant by subtracting resting heart rate from maximal heart rate]
- ▶ First and second ventilatory thresholds (VT1 and VT2)

After completing the baseline assessments, the participants were randomized into three groups:

- ▶ ACE IFT Model group
- ▶ Standardized training group
- ▶ Control group

The Exercise Programs

The cardiorespiratory exercise was performed on various modalities: arm, cycle and rowing ergometers; elliptical crosstrainers; and treadmills. The standardized training group worked at an intensity based on a percentage of their HRR, while those in the ACE IFT Model group received programming based on their ventilatory thresholds. For both groups, a target heart rate was determined to coincide with either the HRR or ventilatory thresholds to establish a specific exercise intensity for each exercise session.

The cardiorespiratory training programs progressed for both groups over the course of the 13 weeks. Frequency remained consistent for both exercise groups, at three workouts per week throughout the study.

For the standardized training group, cardiorespiratory exercise began in week 1 at 40 to 45% of HRR for 25 minutes per day. The duration of each training session was extended by 5 minutes each week until weeks 5 and 6, when intensity increased to 50 to 55% HRR for 45 minutes per day. Then, in weeks 7 and 8, duration increased to 50 minutes per day. For the final five weeks of the study, this group exercised at 60 to 65% HRR for 50 minutes per day.

For the ACE IFT Model group, cardiorespiratory exercise began at a heart rate below VT1 for 25 minutes per day. As with the standardized training group, the duration of training sessions was extended by 5 minutes per week until weeks 5 and 6, when intensity increased to a heart rate greater than or equal to VT1 but below VT2. Then, in weeks 7 and 8, duration increased to 50 minutes per day. For the final five weeks of the study, this group exercised at an intensity greater than or equal to VT2 for 50 minutes per day.

Muscular Training

Muscular training was introduced during week 4 and continued to be performed three days per week through week 13.

For the standardized training group, the program consisted of the following single- and multijoint exercises performed on machines:

- ▶ Bench press
- ▶ Shoulder press
- ▶ Lat pull-down
- ▶ Seated row
- ▶ Biceps curl
- ▶ Triceps push-down
- ▶ Seated leg press
- ▶ Seated leg extension
- ▶ Prone leg curl
- ▶ Seated back extension/flexion

Two sets of 12 repetitions were completed for each exercise. Resistance was progressed every two weeks by approximately 3 to 5% of the total weight lifted for the upper body and approximately 6 to 10% for lower-body exercises. A session rating of perceived exertion (RPE) of 5 to 6 on the 0-to-10 scale was maintained across the training program.

For the ACE IFT Model group, muscular training consisted of multijoint/multiplanar exercises using both free weights and machines. The machines allowed for free motion during the exercises, meaning that range of motion was not limited to a specific arc. The following exercises were performed:

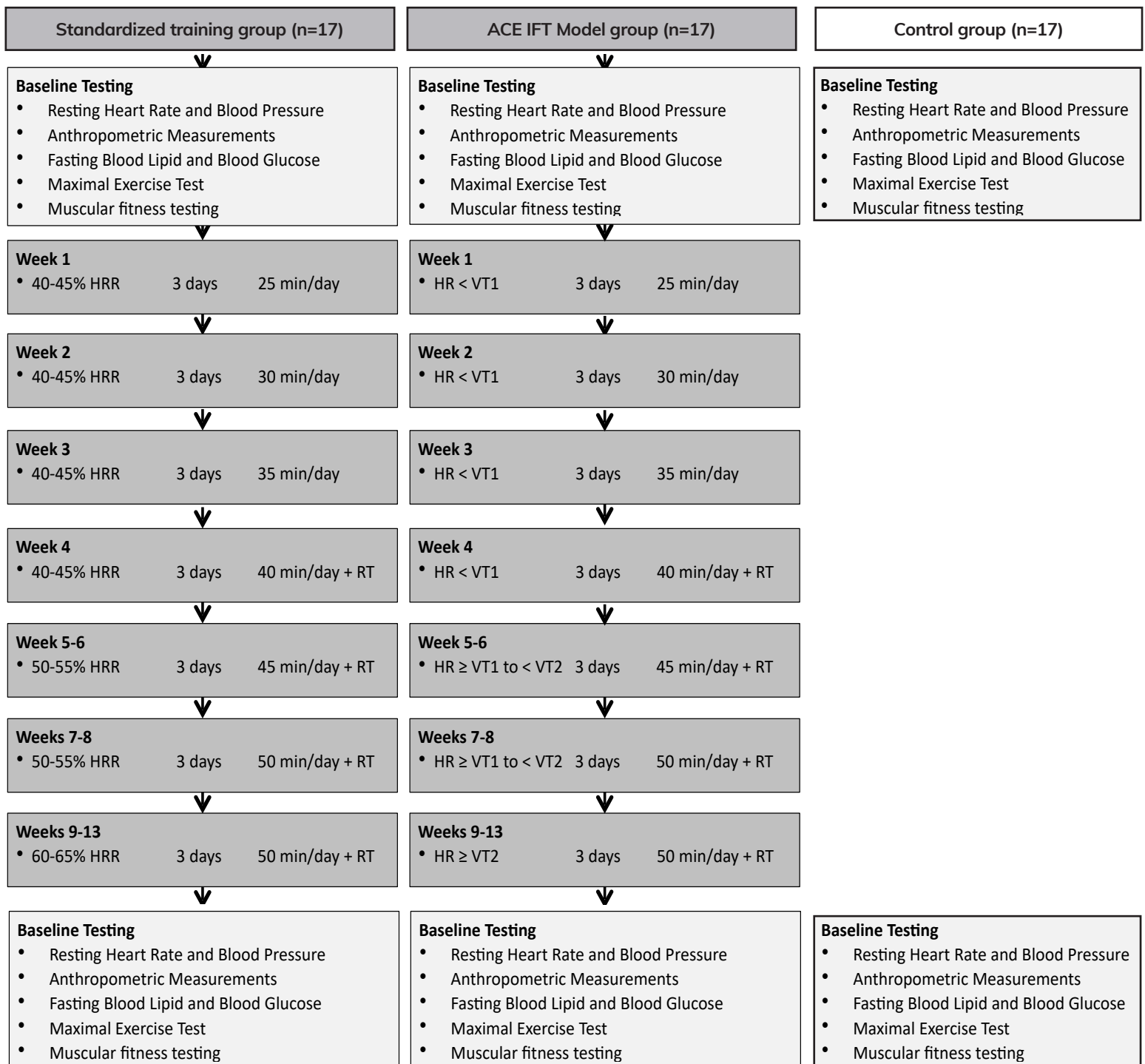
- ▶ Stability ball circuit (glute bridges, crunches, russian twists, planks)
- ▶ Lunge matrix

- ▶ Kneeling/standing wood chops
- ▶ Kneeling/standing hay balers
- ▶ Dumbbell squat to 90-degree knee bend
- ▶ Standing one-arm cable row
- ▶ Step-ups with dumbbell onto a 6-inch (15-cm) step
- ▶ Modified (assisted) pull-ups
- ▶ Dumbbell bench press

Two sets of 12 repetitions were completed for each exercise. The intensity of weighted exercises started at 50% of 5-RM and was progressed by 5% 5-RM increments every two weeks. For exercises that did not include a weighted resistance (e.g., stability ball circuit), the number of repetitions was increased by approximately 5 to 10% to maintain an RPE rating of 5 to 6 on the 0-to-10 scale.

Figure 1 provides a flow chart of the experimental procedures and exercise programs for all three groups.

Figure 1
Flow chart of experimental procedures and exercise programming for each of the two exercise training groups



Note: HR = Heart rate; HRR = Heart-rate reserve; RT = Resistance training; VT1 = First ventilatory threshold; VT2 = Second ventilatory threshold

Table 1

Physical and Physiological Characteristics at Baseline and 13 Weeks for the Control, Standardized Training, and ACE IFT Model Groups (Values are mean ± SD).

Parameter	Control group (n=17; women = 8, men = 9)		Standardized group (n=16; women = 8, men = 8)		ACE IFT group (n=18; women = 9, men = 9)	
	Baseline	13wk	Baseline	13wk	Baseline	13wk
Age (years)	55.8 ± 7.1	_____	65.9 ± 8.8	_____	61.8 ± 10.9	_____
Height (cm)	167.8 ± 8.8	_____	166.1 ± 8.1	_____	168.3 ± 9.8	_____
Body mass (kg)	72.2 ± 9.2	72.4 ± 8.9	82.5 ± 15.9	82.0 ± 16.4	83.3 ± 19.8	82.7 ± 18.7
Waist circumference (cm)	81.8 ± 8.6	82.1 ± 8.8	92.1 ± 19.6	93.1 ± 13.8	95.2 ± 15.8	91.5 ± 12.2*
Body fat (%)	27.6 ± 3.1	28.9 ± 3.5*	35.9 ± 6.2	32.1 ± 3.7*†	34.8 ± 6.3	29.6 ± 5.4*†
Resting HR (bpm)	66.6 ± 13.6	65.4 ± 9.1	75.4 ± 4.2	75.3 ± 6.5	71.2 ± 9.8	68.9 ± 13.4
$\dot{V}O_2$ max (mL/kg/min)	27.0 ± 6.0	26.7 ± 6.1	23.6 ± 10.9	25.3 ± 10.6*†	25.9 ± 6.6	30.2 ± 7.0*†
Systolic BP (mmHg)	117.1 ± 9.3	120.6 ± 9.3*	121.4 ± 11.6	120.1 ± 12.2	124.0 ± 7.0	118.4 ± 4.5*†
Diastolic BP (mmHg)	77.5 ± 8.2	81.4 ± 5.3*	77.9 ± 7.7	78.3 ± 7.8	78.1 ± 6.0	74.6 ± 6.3*†
Total cholesterol (mg/dL)	200.4 ± 35.1	202.8 ± 29.3	192.0 ± 45.0	214.5 ± 58.4	207.3 ± 46.5	207.2 ± 48.3
HDL cholesterol (mg/dL)	46.7 ± 23.7	45.9 ± 20.3	54.1 ± 17.5	56.4 ± 16.5*†	54.8 ± 21.6	59.9 ± 19.9*†
LDL cholesterol (mg/dL)	119.7 ± 33.0	120.5 ± 28.8	119.1 ± 32.4	124.7 ± 26.9	118.9 ± 33.0	115.3 ± 29.6*
Triglycerides (mg/dL)	132.7 ± 37.6	137.2 ± 39.5	118.3 ± 58.2	111.4 ± 54.9*†	115.8 ± 39.0	102.8 ± 39.3*†
Blood Glucose (mg/dL)	89.7 ± 6.1	90.1 ± 7.2	92.9 ± 7.9	91.6 ± 9.8	96.1 ± 8.6	91.9 ± 6.4*†
Bench press 5-RM (kg)	22.2 ± 11.7	23.2 ± 12.1	23.8 ± 16.5	27.4 ± 19.6*†	25.2 ± 14.8	28.9 ± 15.2*
Leg press 5-RM (kg)	55.1 ± 30.1	58.7 ± 35.2	47.8 ± 27.2	65.0 ± 39.7*	77.6 ± 42.8	107.3 ± 46.0*†

* Within-group change is significantly different from baseline, p<0.05

† Change from baseline is significantly different than control group, p<0.05

‡ Change from baseline is significantly different than control and Standardized groups, p<0.05.

Note: HR = Heart rate; bpm = Beats per minute; $\dot{V}O_2$ max = Maximal oxygen consumption; BP = Blood pressure; HDL = High-density lipoprotein; LDL = Low-density lipoprotein; 5-RM = Five-repetition maximum

The Results

At the end of the 13-week program, participants from all three groups repeated the measurements taken at the outset. It is important to note that the three groups did not differ in physical or physiological characteristics prior to the study.

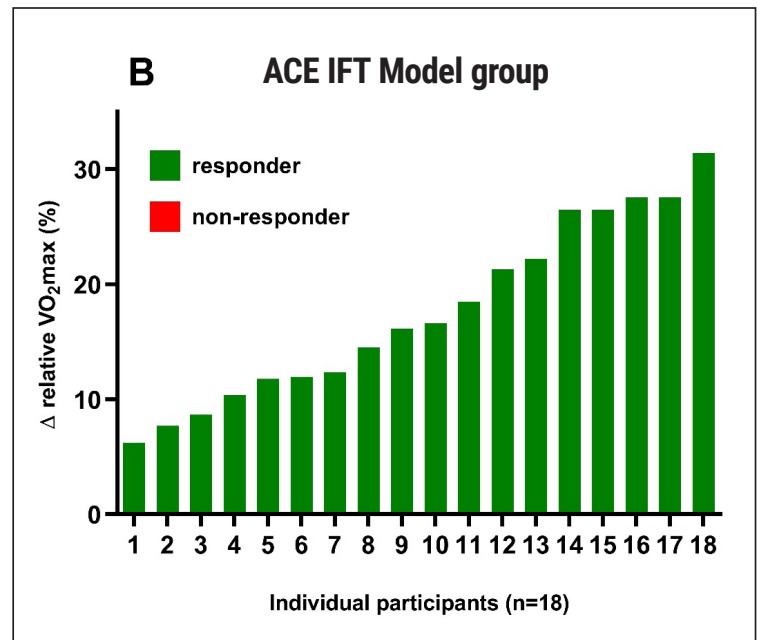
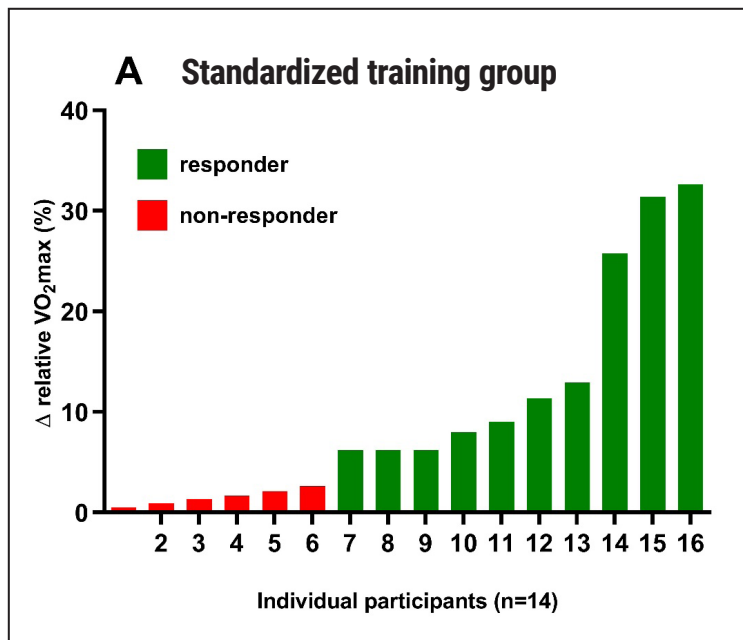
Here are the key findings, as presented in Table 1:

- ▶ Changes in $\dot{V}O_2$ max were significantly more favorable in the ACE IFT Model group when compared to the standardized training group and control group.
- ▶ Changes in body mass, waist circumference, resting heart rate and total cholesterol were not significantly different in either the standardized training or ACE IFT Model groups.
- ▶ Changes in body-fat percentage, systolic and diastolic blood pressure, HDL cholesterol, triglycerides, blood glucose, and leg press 5-RM were significantly more desirable in the ACE IFT Model group relative to the control group.

- ▶ Changes in $\dot{V}O_2$ max, body-fat percentage, high-density lipoprotein (HDL) cholesterol, triglycerides, and bench press 5-RM were significantly more desirable in the standardized training group when compared with the control group.

Another element of the findings of this research centers on the incidence of $\dot{V}O_2$ max non-responders and responders, which you can learn more about in this ACE-supported 2017 study on the ACE IFT Model. As you can see in Figure 2A, 62.5% of those in the standardized training group experienced a favorable change in $\dot{V}O_2$ max, which categorized them as responders. This leaves 37.5%, or six of the 16 individuals in this group, experiencing an undesirable change in $\dot{V}O_2$ max. Meanwhile, in the ACE IFT Model group (Figure 2B), 100% of participants saw a positive improvement in $\dot{V}O_2$ max. Importantly, there were no significant differences between these two groups in several potential influencing factors on responders/non-responders, including age, baseline $\dot{V}O_2$ max, exercise adherence and sex.

Figure 2
Individual variability in relative $\dot{V}O_{2\max}$ response (% change) to exercise training in the standardized training (A) and ACE IFT Model (B) groups



The Bottom Line

The results of this study provide additional support to the findings of previous ACE-supported research on the ACE IFT Model—namely, that the personalized approach made possible by the Model optimizes training responsiveness. As explained by Dr. Dalleck, “Participants in the group that followed the ACE IFT Model programming all had significant improvements in both cardiorespiratory fitness and cardiometabolic health.”

In addition, Dr. Dalleck says, “This study confirmed what previous research found, that by personalizing programming through the ACE IFT Model, you’re getting a lot more uniformity in terms of the response to training. You’re not having the incidence of non-responders that you have with standardized, generic training.”

As this ongoing study continues over the course of the next two years, examining the effectiveness of personalized exercise programming using the ACE IFT Model at eliciting favorable comprehensive training responsiveness (i.e., cardiorespiratory fitness + muscle fitness + cardiometabolic health), ACE will continue to report on its findings.

So, what does this research mean to you, the ACE Certified Professional?

Given that the primary mission of the American Council on Exercise is to get people moving, it is paramount that health and exercise professionals have evidence-based

programming options available to implement at the individual and community levels. These preliminary findings are encouraging. At the conclusion of this three-year project, it is anticipated that this study and its findings will provide robust evidence for the efficacy of personalized exercise programming using the ACE IFT Model. Furthermore, it is

our vision that these findings could also underpin future iterations of exercise guidelines at the national and international level. ▲

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Daniel J. Green is ACE’s Senior Project Manager and Editor for Publications and Content Development. In addition to his work with organizations including the International Association of Fire Fighters and Agriculture Future of America, Daniel writes an ongoing blog series

covering lifestyle change for NBCbetter.com. He has also written feature articles for local publications in Western North Carolina (WNC), including WNC Parent and WNC Magazine.

This study, which was commissioned by the American Council on Exercise, was first published in the peer-reviewed *International Journal of Research in Exercise Physiology*.