# ACE-SUPPORTED RESEARCH: Investigating the Effectiveness of the ACE Mover Method™ with Vulnerable Populations

## A Person-centered Approach:

**When using the ACE IFT Model to develop programs for clients, the intensity of cardiorespiratory exercise is based on the individual's ventilatory thresholds—as determined through use of the talk test—as opposed to estimates of a target heart rate, as is done with most common programming tools. Meanwhile, muscular training begins with functional training that establishes (or reestablishes) postural stability and kinetic chain mobility before later adding external resistance and more dynamic movements. This person-centered approach essentially eliminates the phenomenon of non-responders and provides a safe and effective strategy that holds up over the long haul and can be modified as the client's goals and fitness level change.**

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Over the past several years, ACE has sponsored numerous studies that have established the efficacy of personalized exercise programming and progression based on the ACE Integrated Fitness Training® (ACE IFT®) Model.

A key element of the ACE IFT Model—and one that makes the Model truly unique in the fitness industry—is the ACE Mover Method™, which empowers clients to make behavioral changes to improve their health, fitness and overall quality of life. Previous research into using the ACE Mover Method as part of programming based on the ACE IFT Model has demonstrated its success in driving meaningful behavior change and improving cardiometabolic health.

The next step in the evolution of the ACE-sponsored research in this area focuses on underserved, understudied and vulnerable populations, including various racial and ethnic groups and older adults, as well as college students (who are at high risk for mental health crises).

This article highlights two studies, both of which were led by Lance Dalleck, PhD, of the High Altitude Exercise Physiology Program at Western Colorado University.

The studies followed similar protocols, though they measured different outcomes. The exercise programming in both studies adhered to the principles of the ACE IFT Model and were comparable to the program used in previous ACE-sponsored research.

The studies also featured 10-minute ACE Mover Method interventions that utilized the ACE ABC Approach™, were embedded within the exercise sessions and were unique to each participant's specific goals and needs. Every participant–researcher interaction was a collaboration aimed at positive lifestyle change (e.g., reduced sedentary time, healthy eating or stress reduction).

## Study 1

### Racial and Ethnic Groups and Older Adults

This study examined the effectiveness of the ACE Mover Method at modifying healthy lifestyle behaviors among participants from various racial and ethnic groups—Hispanic/Latino, Black and Asian/Pacific Islander—as well as older adults.

Sixty-four people participated in this study, 24 of whom were older adults over the age of 65 and 40 of whom were from the aforementioned racial and ethnic groups. All participants completed a 10-week personalized exercise program based on the ACE IFT Model, while half also took part in weekly, client-centered educational sessions using the ACE Mover Method and ACE ABC Approach.

Participants in both groups completed the following baseline and post-program testing:

- Anthropometric measures
- Cardiometabolic risk factors
- Maximal oxygen uptake ($VO^2max$)

They also completed the following assessments for lifestyle behaviors and psychological outcomes:

- International Physical Activity Questionnaire
- Sedentary Behavior Questionnaire
- Simple Lifestyle Indicator Questionnaire

Unfortunately, there was considerable dropout, with only 36 of 64 participants completing the 10-week program. The Delta and Omicron surges of the COVID-19 pandemic likely played a significant role in this attrition, though exact reasons for dropout were not obtained and recorded to respect participant medical privacy.

The physical and physiological characteristics of the participants at the beginning of the study (baseline) and after the 10-week program are found in Table 1. As you can see, cardiometabolic health and cardiorespiratory fitness improved in both the control (i.e., exercise only) and ACE Mover Method groups. The changes were similar for both groups, except for waist circumference and low-density lipoprotein cholesterol, where the ACE Mover Method group saw statistically significant improvements.

**Table 1. Physical and Physiological Characteristics at Baseline and 10 Weeks for the Control and ACE Mover Method Groups (values are mean ± SD)**

| | Control Group (N=17) | | ACE Mover Method Group (N=19) | |
|---|---|---|---|---|
| Outcome Variable | Baseline | 10 Weeks | Baseline | 10 Weeks |
| Age (years) | 53.5 ± 16.6 | ------- | 52.4 ± 17.8 | ------- |
| Body mass (kg) | 77.9 ± 20.7 | 77.4 ± 20.5* | 84.7 ± 17.1 | 83.9 ± 16.8* |
| Waist circumference (cm) | 85.0 ± 15.5 | 85.2 ± 14.9 | 87.9 ± 10.3 | 85.6 ± 9.1*† |
| Systolic BP (mmHg) | 125.4 ± 12.9 | 119.9 ± 13.0* | 126.1 ± 15.6 | 120.6 ± 15.0* |
| Diastolic BP (mmHg) | 83.9 ± 5.5 | 80.4 ± 5.8* | 81.1 ± 9.5 | 78.0 ± 8.0* |
| Total cholesterol (mg/dL) | 174.8 ± 46.7 | 182.9 ± 49.7 | 201.1 ± 35.3 | 199.4 ± 28.1 |
| HDL cholesterol (mg/dL) | 55.3 ± 22.7 | 59.8 ± 20.7* | 53.9 ± 13.3 | 58.4 ± 10.7* |
| LDL cholesterol (mg/dL) | 99.8 ± 29.8 | 99.4 ± 32.8 | 123.0 ± 33.7 | 114.3 ± 26.1*† |
| Triglycerides (mg/dL) | 102.6 ± 39.4 | 93.6 ± 29.2 | 92.4 ± 28.8 | 91.6 ± 20.8 |
| Blood glucose (mg/dL) | 90.1 ± 10.9 | 87.8 ± 9.3 | 90.8 ± 6.1 | 88.1 ± 3.9* |
| VO2max (mL/kg/min) | 30.0 ± 6.7 | 33.9 ± 6.9* | 29.2 ± 7.1 | 33.2 ± 7.7* |
| MetS z-score | –2.20 ± 3.05 | –2.53 ± 2.49 | –2.19 ± 1.32 | –3.23 ± 1.12* |

*Note:* BP = Blood pressure; HDL = High-density lipoprotein; LDL = Low-density lipoprotein; MetS = Metabolic syndrome

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

† Change from baseline is significantly different from control group; $p < 0.05$

The healthy behavior and lifestyle change scores at the start of the study and after the 10-week program are presented in Table 2. In the control group, there were no significant changes over the course of the study, while those in the ACE Mover Method group saw improvements in all categories, meaning that they spent less time performing sedentary behaviors, reported less stress and ate more vegetables, fruits and fiber after only 10 weeks of collaboratively using the ACE Mover Method.

If you plan to use these types of questionnaires, which are fairly standardized and provide a great way to track progress that clients might not otherwise recognize or acknowledge, Dr. Dalleck suggests you first familiarize yourself with the questionnaires and what they are tracking. Then, give clients an opportunity to ask questions and become comfortable with the process. Also, encourage clients to answer honestly, as that is the only way to gain insight into their behavior.

# Study 2

## College Students

While attending an institution of higher education, students often experience unfamiliar hardships, such as heavy academic load, increased responsibilities, financial burdens and the stress of navigating a work-life balance. These hardships place additional strain on the overall health and wellness of the students, which likely contributes to the continued prevalence of health-risk behaviors seen in this population. For this reason, this study focused on assessing mental health outcomes when college students participate in an exercise program based on the ACE IFT Model that includes intentional ACE Mover Method sessions.

Fifty-five students participated in this study, 48 of whom completed the program. All participants took part in an eight-week exercise program using the ACE IFT Model, as well as the ACE Mover Method sessions. Unfortunately, the duration of this study, which was intended to last 10 weeks, was also impacted by the COVID-19 pandemic, as in-person learning was delayed at the outset of the semester.

Comparable anthropometric measures, cardiometabolic risk factors and cardiorespiratory fitness tests were conducted as in Study 1. Those data, at the beginning and mid-point of the program and at eight weeks, are presented in Table 3. Statistically significant changes were seen in the participants' first ventilatory threshold, as well as self-reported physical fitness scores and exercise scores, both of which highlight participants' feelings of increased fitness. While statistically significant improvements were seen specifically when it comes to low-intensity exercise, the researchers speculate that those improvements might also be seen at moderate and vigorous intensities in a longer-term study.

To interpret lifestyle change, the researchers measured weekday sedentary behavior, weekend sedentary behavior, nutrition (vegetable, fruit and fiber consumption) and alcohol consumption (Table 4). While there were no statistically significant findings in this area, trends were in a positive direction. The researchers point out that both average weekday and weekend sedentary behavior decreased by approximately two hours, which should be considered practically significant, if not statistically significant.

**Table 2. Healthy Behavior and Lifestyle Change Scores at Baseline and 10 Weeks for the Control and ACE Mover Method groups (values are mean ± SD)**

| | Control Group (N=17) | | ACE Mover Method Group (N=19) | |
|---|---|---|---|---|
| Outcome Variable | Baseline | 10 Weeks | Baseline | 10 Weeks |
| Sedentary behavior weekday (min) | 504.7 ± 186.4 | 500.0 ± 173.1 | 507.9 ± 124.2 | 476.3 ± 121.7*† |
| Sedentary behavior weekend (min) | 570.0 ± 186.0 | 566.2 ± 182.5 | 562.4 ± 143.2 | 527.1 ± 143.9*† |
| Life stress | 3.59 ± 1.28 | 3.71 ± 1.05 | 3.47 ± 0.96 | 4.37 ± 1.34*† |
| Nutrition #1 (vegetables) | 3.35 ± 1.17 | 3.29 ± 0.92 | 3.53 ± 1.02 | 4.11 ± 0.74*† |
| Nutrition #2 (fruits) | 3.06 ± 1.03 | 3.18 ± 0.81 | 2.79 ± 0.71 | 3.89 ± 0.74*† |
| Nutrition #3 (fiber) | 3.41 ± 0.71 | 3.59 ± 0.71 | 3.42 ± 1.02 | 4.11 ± 0.66*† |

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

† Change from baseline is significantly different from control group; $p < 0.05$

**Table 3. Physical and Physiological Characteristics at Baseline, 4 Weeks and 8 Weeks for All Participants (values are mean ± SD)**

| | Baseline | Mid-program | Post-program |
|---|---|---|---|
| Age | 22.2 ± 2.8 | ----- | 22.2 ± 2.8 |
| Body mass (kg) | 71.0 ± 15.9 | ----- | 71.1 ± 15.1 |
| Waist circumference (cm) | 79.8 ± 11.4 | ----- | 79.9 ± 10.1 |
| Resting heart rate | 78.6 ± 15.1 | ----- | 75.3 ± 11.6 |
| Systolic BP | 113.5 ± 11.3 | ----- | 113.6 ± 9.7 |
| Diastolic BP | 73.6 ± 7.8 | ----- | 71.9 ± 9.5 |
| MetS z-score | –0.6 ± 0.7 | ----- | –0.6 ± 0.8 |
| MetS criteria | 1.2 ± 1.0 | ----- | 0.9 ± 1.0 |
| HDL cholesterol (mg/dL) | 48.1 ± 19.5 | ----- | 50.5 ±18.3 |
| LDL cholesterol (mg/dL) | 107.0 ± 31.0 | ----- | 95.6 ± 28.6 |
| Total cholesterol (mg/dL) | 165.9 ±34.5 | ----- | 165.9 ± 31.1 |
| Triglycerides (mg/dL) | 89.1 ± 39.5 | ----- | 97.5 ± 52.1 |
| Blood glucose (mg/dL) | 88.7 ± 7.0 | ----- | 89.4 ± 4.7 |
| VT1 (bpm) | 134.0 ± 12.4 | ----- | 129.8 ± 11.2* |
| VT2 (bpm) | 159.3 ± 13.9 | ----- | 157.4 ± 13.6 |
| Self-reported physical fitness score | 15.0 ± 2.5 | 16.2 ± 2.8† | 16.2 ± 3.5* |
| Exercise score (total) | 12.1 ± 5.3 | 14.0 ± 4.3† | 14.1 ± 4.7* |
| Exercise score (light intensity) | 3.2 ± 1.6 | 3.4 ± 1.7 | 4.0 ± 1.4* |
| Exercise score (moderate intensity) | 4.1 ± 1.5 | 4.6 ± 1.7 | 4.4 ± 2.0 |
| Exercise score (vigorous intensity) | 5.1 ± 3.4 | 6.0 ±2.9 | 5.7 ± 2.9 |

*Note:* HDL = High-density lipoprotein; LDL = Low-density lipoprotein; MetS = Metabolic syndrome; VT1 = First ventilatory threshold; VT2 = Second ventilatory threshold

* Significant difference between baseline and post-program; $p < 0.05$

† Significant difference between baseline and mid-program; $p < 0.05$

### MetS z-score and Responders Versus Non-responders

In Tables 1 and 3, you may have noticed the term MetS z-score, which may be unfamiliar to many readers. Traditionally, researchers looking into training responsiveness have used VO2max to quantify improvements in cardiorespiratory fitness, which provides a very narrow view. In contrast, the MetS z-score combines a number of values into a single score, including blood pressure, circumference measures, blood glucose, high-density lipoprotein and triglycerides. The primary benefits for inclusion of a continuous MetS z-score are twofold: (1) it acknowledges that there is a continuum to cardiometabolic risk within each individual and (2) it provides a more sensitive tool for assessing individualized training responsiveness following an exercise intervention.

According to Dr. Dalleck, "By broadening the definition of training responsiveness, researchers are better able to capture the true benefits of an exercise program." Think about it this way: If you were working with a client on a long-term exercise program, would you be better served by monitoring progress using a single value like body weight or a combination of several different measures of cardiorespiratory fitness, muscular fitness and even quality of life?

Finally, to interpret changes in mental health outcomes, self-reported mental health and life stress were measured (Table 5). Self-reported mental health statistically significantly improved over the course of the eight weeks. While life stress did not change in a statistically significant way, the slowly increasing score reveals a positive trend, as lower scores on the Simple Lifestyle Questionnaire indicate higher risk, so the move from 2.8 to 3.0 is a positive outcome and actually moves the students out of the most at-risk category, which is a score below 3.0. Importantly, the positive trend in life stress may indicate an improved ability to manage stress (which is a goal of using of the ACE Mover Method), rather than a decrease in actual stressors.

When working with college-aged clients, it's important to emphasize mental health as a benefit of physical activity. In fact, physical activity can be seen as a form of primary prevention against future mental health crises, later in their college experience or even later in life. Some young clients may be reluctant to discuss mental health with you, but mentioning this benefit of physical activity may open up the conversation or, at the very least, give the client another reason to adhere to their physical-activity or behavior-change program.

**Table 4. Lifestyle Outcome Measures at Baseline, Mid-program and Post-program**

| | Baseline | Mid-program | Post-program |
|---|---|---|---|
| Sedentary behavior weekday (min) | 593.7 ± 350.9 | 562.4 ± 375.0 | 493.9 ± 254.4 |
| Sedentary behavior weekend (min) | 711.6 ± 390.1 | 627.0 ± 244.0 | 575.7 ±235.9 |
| Diet score (vegetables) | 2.3 ± 1.2 | 2.1 ± 1.1 | 2.4 ± 1.1 |
| Diet score (fruit) | 2.5 ± 1.3 | 2.4 ± 1.2 | 2.4 ± 1.3 |
| Diet score (fiber) | 1.9 ±1.7 | 1.9 ± 1.3 | 1.9 ±1.4 |
| Alcohol consumption (drinks/week) | 3.0 ± 3.9 | 2.6 ± 3.9 | 3.0 ± 3.7 |

**Table 5. Mental Health Outcomes at Baseline, Mid-program and Post-program**

| | Baseline | Mid-program | Post-program |
|---|---|---|---|
| Self-reported mental health | 45.6 ± 6.7 | 47.0 ± 6.8 | 49.4 ± 6.66*† |
| Life stress | 2.8 ± 1.0 | 2.9 ± 1.0 | 3.0 ± 1.0 |

* Significant difference between baseline and post-program; $p < 0.05$

† Significant difference between mid-program and post-program; $p < 0.05$

## The Bottom Line

Given the prevalence of chronic disease, there is an urgent need to identify successful collaborative strategies focused on positive healthy lifestyle changes. These two studies add to the growing body of evidence to support the efficacy of using the ACE IFT Model, the ACE Mover Method and the ACE ABC Approach.

The mission of the American Council on Exercise is to get people moving, so it is paramount that health coaches and exercise professionals have evidence-based programming options available to implement on the individual and community levels. The findings of these two studies provide critical evidence demonstrating that personalized exercise programming based upon the ACE IFT Model, including the ACE Mover Method, can be successfully implemented within vulnerable groups of clients to improve cardiometabolic health and facilitate healthy lifestyle changes.

It is also important to highlight that the benefits of proper implementation of these resources and strategies extend beyond the physiological to the behavioral and psychological. Not only do we now have evidence that the ACE Mover Method can help your clients achieve improvements in cardiorespiratory and muscular fitness, but also evidence that it can help them eat more healthfully, better manage their stress and improve their mental health.

> **"By broadening the definition of *training responsiveness*, researchers are better able to capture the *true benefits* of an *exercise* program."**

Dr. Dalleck points out that these findings, coupled with ACE's commitment to providing evidence-based content, allow ACE Certified Professionals to be confident when they are implementing these tools that there is evidence to support their efficacy. If a client asks you how you know something will work, or the extent of the benefits they might see, you can point them to evidence to support the work you do.

"That's really critical," says Dr. Dalleck, as it establishes you as a professional and a trusted resource as clients experience their behavior-change journeys.

The studies presented here were first published in the peer-reviewed *International Journal of Research in Exercise Physiology.* You can find those published reports here and here.