An Outcome-Based Action Study on Changes in Fitness, Blood Lipids, and Exercise Adherence, Using the Disconnected Values (Intervention) Model

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The authors' purpose in this action study was to examine the effect of a 10-week intervention, using the Disconnected Values Model (DVM), on changes in selected measures of fitness, blood lipids, and exercise adherence among 51 university faculty (10 men and 41 women) from a school in the southeastern United States. The DVM is an intervention model that is intended to provide incentive to replace unhealthy with healthy behavioral patterns. Multivariate Mixed Model analyses indicated significantly improved fitness (e.g., cardiovascular, strength, percent body fat) and lipid profile (e.g., blood cholesterol, triglycerides) scores between pre- and postintervention on all measures (ps < .05) with the exception of blood pressure and high-density lipoprotein cholesterol (ps > .05). Adherence for cardiovascular activity averaged 22 out of 30 sessions (73%), and strength-training adherence averaged 13 out of 20 sessions (65%). The results of this outcome-based study suggest that the DVM provides an effective cognitive-behavioral approach to promoting regular exercise.

Index Terms: adherence, disconnected values model, exercise, exercise intervention, lipids, physical activity

Researchers have known the physiological and psychological benefits of exercise for many years, yet the rate of exercise participation and adherence in the normal population remains low. Despite dire warnings from the medical community about the negative consequences related to poor health and quality of life, several factors have contributed to a person's conscious decision to avoid starting or quitting an exercise program. In their review of literature, Dunn, Andersen, and Jakicic concluded that 50% of new exercisers drop out of exercise programs within 3 to 6 months. The primary reasons for dropping out were overambitious unmet goals, the perceived lack of desired results, no exercise prescription or instruction, exercise-related injury, lack of social support, and, most of all, perceived lack of time. Along these lines, about 50% to 65% of individuals who join fitness clubs drop out within 6 months or do not renew their membership because of similar reasons.2

Attempts at improving healthy behaviors, in general, and exercise habits, in particular, have been extensive in recent years. Studies have typically consisted of researchers examining the efficacy of a model or theory that attempts to influence the individual's attitudes about the targeted outcome, ostensibly leading to a change in behavior. Yet, despite the apparent popularity of these theories and models...
DISCONNECTED VALUES MODEL.

for explaining actions or inactions related to health behaviors, the data for establishing permanent changes in health behavior have been less than promising.

One limitation of existing intervention research on improving exercise habits has been the assumption that the person desires a change in behavior. The researcher typically imposes goals for behavior change on the individual rather than having goals and motives self-generated and self-determined. According to Buckworth and Dishman, an individual's desire for behavior change is assumed sufficient for initiating and changing both attitude and behavior, particularly over a prolonged time period. Researchers using this approach have ignored addressing the deeper meaning a person must attach to the behavior change—that is, to acknowledge the costs and long-term consequences of an unhealthy lifestyle and to include the person's value system as the foundation to commit to behavior change.

Before addressing the intervention model that incorporates these factors that we tested in this study, a brief overview of the factors that influence and prevent exercise behavior is needed to justify components of our proposed model.

Existing theories and models that help explain exercise behavior rely on a strong relation between people's beliefs about the requirements for maintaining good health and their health-promoting actions. According to Hausenblas, Carron, and Mack, "individuals have the greatest commitment to exercise when they hold favorable beliefs about exercise and believe that they can successfully perform the behavior." There is a paradox between a person's favorable beliefs about exercise and the absence of a regular exercise habit. To Buckworth and Dishman, a person may believe in the health benefits of exercise, yet conclude that there is a lack of time in the day to exercise regularly. In addition, the results of several studies have shown that intention to exercise does not account for all exercise behavior. Other common barriers to exercise have been well established in previous literature, (eg, physical discomfort, lack of a convenient exercise facility, intimidation of observers), each of which is accompanied by the person's very positive attitudes toward engaging in regular exercise.

Linking a person's beliefs with their subsequent actions, particularly in reference to exercise, forms another limitation of existing models. According to McAuley and Milhalko, even if people possess positive beliefs about their ability to exercise, the decision to embark on an exercise program is fraught with challenges especially when individuals are sedentary, older, or recovering from a life-threatening disease. For example, it may be too unpleasant for individuals to engage in physical activity at the correct level of intensity, duration, and frequency to obtain sufficient health and medical benefits. As a result, the benefits of not setting aside time to exercise (eg, having more time to do other things, not experiencing the discomfort associated with vigorous exercise) are greater than the costs of leading a sedentary lifestyle (eg, weight gain, poorer health, reduced lifespan).

Haan, Aerts, and Cooper contend that individuals are more likely to adhere to a particular belief, such as regular exercise, if it is ingrained early and often in life.

Intervention research has been only moderately successful in changing exercise behavior permanently. The amount of outcome variance explained in studies testing the efficacy of exercise interventions has rarely been higher than 30%. Increased physical activity or fitness associated with the interventions typically diminished with time after the end of the intervention. These results persisted as a function of age, gender, and race. In their meta-analysis of 127 studies and 14 dissertations to determine the effectiveness of interventions to enhance exercise adherence in a healthy population, Dishman and Buckworth reported that only about 20% of the studies included a follow-up to the intervention. Effects were better under conditions of low to moderate intensity compared with strength or aerobic training.

Numerous authors have described selected limitations of the extant exercise intervention literature. For example, Buckworth and Dishman lament the absence of a theoretical framework or model or only selected components of a model. The authors correctly concluded, "without a theoretical framework, the choice of variables cannot be well justified and the ability to interpret results is limited". Thus, the generalizability of findings from these studies to the community would not be feasible. Another reason that might explain the paucity of exercise intervention effectiveness is that strategies and programs often have been imposed on the individual: Researchers have not controlled for the exerciser's motives, rationale, and personal commitment to begin and maintain an exercise program. A similar problem exists for allowing exercisers to select their own exercise regimen, venue, and schedule. The lack of personal involvement in voluntarily choosing (ie, a strategy called perceived choice) and committing to the type and schedule of exercise involvement forms another limitation of existing exercise adherence research. As Glasgow et al concluded from their review of the extant health behavior research, "it is well documented that the results of most behavioral and health promotion studies have not been translated into practice." One such likely mechanism that would enhance the application of research results is what Oldridge refers to as regimen factors to improve adherence. He contends that "strategies for improving adherence with long-term..."
interventions are seldom very effective on their own.”\textsuperscript{15(p132)} However, if the strategies are implemented as an integral part of one’s daily routine, adherence is far more likely. In particular, he suggests “keeping the regimen straightforward, providing clear instructions and periodic checks, promoting good communication with the patient, and reinforcing their accomplishments.”\textsuperscript{15(p132)} As Ockene\textsuperscript{16} concludes, “[C]hange is a process, not a one-time event, and we can’t expect people to make changes at a level for which they’re not ready. Our interventions need to be directed to where the individual is.”\textsuperscript{p(15)}

**Action research**

Action research is any systematic inquiry to gather information about the operation and effectiveness of particular programs.\textsuperscript{17} Investigators’ primary goal when implementing action research is to gain insight into cognitive and behavioral processes, to develop improved methods for making positive change, and to enhance performance outcomes. In the present context, we intended action research to identify the mechanisms by which individuals identified the unhealthy behaviors (ie, exercise, nutrition, hydration, and other acknowledged unhealthy habits) they wanted to change, and to develop new behavioral routines that would promote energy and quality of life. In this way, action research concerns using interventions to help others adapt to desirable behaviors and, therefore, does not include a control group. Thus, according to Herr and Anderson,\textsuperscript{18} “action research is done by or with insiders to an organization or community, but never to or on them.”\textsuperscript{p(15)}

Mills\textsuperscript{17} identifies 4 steps of action research: identifying an area of focus, collecting data, analyzing and interpreting data, and developing an action plan. Herr and Anderson\textsuperscript{18} extend this process by beginning with developing a plan of action, then acting to implement the plan, observing the effects of action in the context in which it occurs, and reflecting on these effects as a basis for further planning and subsequent action. In our study, this included identifying unhealthy (negative) habits, obtaining and interpreting deficiencies in preintervention data related to fitness and lipids, and developing an action plan. The action plan formed the basis for a 10-week intervention in which we assigned clients to a performance coach whom they continued to work with in carrying out the plan.

The Disconnected Values Model (DVM): An intervention

As indicated earlier, the process of behavior change is challenging because habits and routines (eg, a sedentary lifestyle) are firmly entrenched.\textsuperscript{16} Attempting to increase exercise behavior is particularly difficult because it is accompanied by an array of long-held feelings and attitudes that could reflect an array of barriers, negatively held perceptions, and unpleasant past experiences. Examples include the physical education teacher or coach who used exercise as a form of discipline, a former athlete’s burnout from exercise caused by too much physical training during years of competition, injury from previous exercise attempts, or a person’s history of starting, then quitting, exercise programs. Exercise at an intensity to yield health benefits requires effort, and, for many individuals, contending with physical discomfort is too challenging and undesirable.\textsuperscript{6}

The DVM is predicated on 2 postulates that have strong implications toward promoting exercise behavior, both of which are missing from the extant exercise psychology literature. The first postulate is that self-motivated behavior reflects a person’s deepest values and beliefs about his or her passion, referred to by Loehr and Schwartz\textsuperscript{9} as purpose. Purpose prompts the desire to become fully engaged in activities that “really matter” in meeting personal goals and future aspirations.

The second postulate is that the primary motivators of normal human behavior consist of 3 stages: to identify a deeply held set of values, to live a life consistent with those values, and to consistently hold ourselves accountable to them. For example, an individual with values such as health, family, or performance excellence should be self-motivated to exercise because engaging in regular physical activity is consistent with these values. A deeper sense of purpose consists of shifting one’s attention from fulfilling one’s own needs and desires to serving and meeting the needs of others.\textsuperscript{19} The self-motivated drive to develop an exercise habit rests, at least in part, on recognizing the inconsistency between people’s negative habits (ie, lack of regular exercise) and their values, and then to institute a new, positive habit of exercise that is strongly connected to values. As Loehr and Schwartz\textsuperscript{9} conclude, “deeply held values fuel the energy on which purpose is built.”\textsuperscript{p(140)} The important component of this model is that individuals are usually motivated to act in a manner that is consistent with their values.

The DVM includes a component virtually ignored by researchers—providing intervention content that includes a sense of purpose: “the energy derived from connecting to deeply held values and a purpose beyond one’s self-interest.”\textsuperscript{11(p131)} Loehr and Schwartz\textsuperscript{9} explain self-destructive behaviors and negative habits (eg, poor nutrition, lack of exercise, high stress) as reflecting a “lack of ... firm beliefs and compelling values [that are] easily buffeted by the prevailing winds. If we lack a strong sense of pur-
Negative habits

Negative habits are thoughts, emotions, or tasks experienced regularly that are acknowledged by the person as not healthy or in the person’s best interests yet remain under the person’s control. The model begins with the person’s acknowledgement of negative habits. In this example, not exercising and poor nutrition form negative habits that need changing. The result is low energy, premature mental fatigue, and reduced quality of life.

The primary reason individuals maintain negative habits—continuing to perform certain actions they know are unhealthy or wrong—is because the perceived benefits of maintaining the habit outweigh its costs and long-term consequences. A habit likely will not exist without benefits. For example, the negative habit of exhibiting anger because of frustration has perceived benefits of prompting action, maintaining situational control, and emotional release of unpleasant feelings, such as frustration. As discussed later, the benefits of not exercising include more time to do other things, less discomfort from physical exertion, and fewer expenses for fitness clothing. Negative habits persist when the benefits are more important or gratifying than the habit’s costs. One function of the model, then, is to help the clients detect their negative habits and how these habits lead to undesirable outcomes.

Performance barriers

Performance barriers are persistent thoughts, emotions, or actions that compromise and create obstacles to high quality performance. Whether these barriers are actual (eg, injury, anger) or perceived (eg, time restraints, discomfort, anxiety), they are almost always controllable and, thus, changeable. For instance, the emotional barrier of anxiety (eg, worry about one’s physical appearance in a fitness facility) can be controlled by addressing the source(s) of concern and developing adaptation strategies that overcome these thoughts. People who are uncomfortable and self-conscious about exercising in public, for instance, can focus on their exercise regimen or interact with an exercise partner while ignoring others in the room. A person who has time restraints can develop time-management strategies and social support from significant others to allow time for exercise. After negative habits have been associated with performance limitations, an individual will examine the benefits of maintaining these negative habits—in this case, lack of exercise.

Perceived benefits of negative habits

One approach to motivating individuals to change unhealthy behaviors is to help them to identify the benefits and costs of these habits. In their Drugs in Sport Deterrence Model (DSDM), for example, Streiler and Boeckmann help athletes recognize the benefits and costs of drug-taking behaviors that are inherently undesirable, illegal, or immoral. The cost-benefit tradeoffs are salient and mediated by situational factors. The DSDM, however, is a conceptual model that describes the factors that underlie drug-taking behavior: It is not an intervention model. Still, similar factors from the DSDM can be used to describe exercise behavior in which a person determines the benefits and costs of exercising and maintaining an active lifestyle, as opposed to not exercising and remaining sedentary. Despite the so-called benefits of not exercising, central to the DVM is the person’s acknowledgement of the costs and long-term consequences of a sedentary lifestyle.

Costs and long-term consequences of negative habits

The costs of not exercising include reduced fitness, weight gain, and higher stress and anxiety. The long-term consequences of these costs include poorer physical and mental health, reduced quality of life, and, in some cases, shortened lifespan. Individuals who possess a long-term time perspective (eg, become aware of long-term consequences of unhealthy behaviors) are more likely to engage in actions with health protective properties.

In a study supporting the influence of long-term consequences on behavior change, Hall and Fong found that a time perspective intervention—that is, teaching individuals about the long-term benefits of healthy behavioral patterns—has strong motivational properties toward health-promoting behavior. In our model, if the person perceives these costs as acceptable, then the negative habit of not exercising and maintaining a sedentary lifestyle likely will continue. In the parlance of Hall and Fong, these individuals are not likely to possess a long-term time perspective. If, however, the costs are perceived as greater than the benefits and the person concludes that these costs and long-term consequences are unacceptable, then a change in behavior is far more likely.
Examples of the cost-benefit tradeoff component of the model are as follows: Benefits for the negative habit of not exercising include more time for other tasks, less effort and physical discomfort, and no expenses for exercise clothing, shoes, equipment, and a fitness club membership. The costs of not exercising, however, include less energy, weight gain, reduced mental capacity, poorer sleep, and a more negative mood state. The long-term consequences of not exercising include poorer health, higher rate of disease, more rapid aging, reduced quality of life, and shorter lifespan. Benefits of a poor diet include rapid gratification, save time (ie, fast foods), low cost, good taste (caused by high fat), and convenience. The costs of a poor diet include increased "bad" cholesterol (low-density lipoprotein, or LDL), increased weight, reduced concentration, and lower energy. Long-term consequences are higher likelihood of gastrointestinal disease, cancer, and diabetes, more rapid aging, and reduced quality of life.

Determining values and beliefs

Perhaps the most widespread area neglected by researchers in attempting to change health behavior is addressing people's values and beliefs about what they consider important in life. Values are core beliefs that guide behavior, provide impetus for motivating behavior, and provide standards against which we assess behavior. Values are highly relevant to establishing a person's individuality and help understanding of behavior. For example, as Rokeach contends, people who behave consistently with their values of health will more likely have daily rituals and long-term habits that enhance health and general well being. According to Hogan and Mookherjee, "values may be one of the most distinguishing characteristics motivating human beings and the likely effects of values on human behavior, beliefs, and attitudes are indisputable." Crace and Hardy contend that a person's values guide behavior and that sharing values with others has a strong effect on the commitment to sacrifice personal, self-serving needs for the benefit of others.

Values have a stronger role in behavior change than do interests, attitudes, and needs. For example, interests, attitudes, and needs are more situational and derived from a core set of values. Therefore, a plethora of interests and attitudes are derived from a relatively reduced number of values. In addition, interests, attitudes, and needs are transitory, once satiated, and may not influence behavior. Values, however, are almost always firmly entrenched and stable and thus transcend situations and guide behavior over a long period of time.

Researchers have studied the underlying factors that help explain the role of values as a source of motivation to change behavior. For example, Verplanken and Holland examined the value-behavior relationship over 6 studies among undergraduate students in the Netherlands. The researchers contend that values motivate behavior when they become integrated as "part of the self." They ascertained the degree to which values are integrated into one's self-concept and the effect of behaving contrary to one's values and beliefs on subsequent actions. They assumed that the individual is motivated "to restore or compensate for the experienced failure (of living up to one's values) if an opportunity to do so arises." Similar to one of our model's goals—participants examining disconnects between the values and habits they acknowledged were negative (unhealthy)—Verplanken and Holland hypothesized that "self-focus would activate values that are central to the self." In 3 studies of university student couples, Bardi and Schwartz found that normative pressures to perform certain behaviors mediate the strength of value-behavior relations. Therefore, if individuals view engaging in regular exercise or proper eating habits as part of a normal and acceptable lifestyle (ie, as part of cultural norms), then they are more likely to adopt these behaviors as part of their value system and maintain these actions. People's motivations to behave in a manner that is consistent with their values is thus a function of 2 things: (1) the extent of perceived importance of the value and (2) the value's compatibility with cultural norms.

Although research on values and exercise behavior is lacking, the results of the Verplanken and Holland and Bardi and Schwartz studies, among others, suggest that values predict exercise behavior. Thus, individuals are more likely to engage in exercise if health is one of their values. If family is an important value, then, predictably, that individual will devote more time and effort toward enhancing family relationships and well being. However, if health forms part of a person's value system and the individual behaves in a manner that is inconsistent with this value (eg, not exercising, poor nutrition, lack of sleep), the link between value and behavior is referred to as a disconnect. This disconnect forms an important motive for behavior change.
Establishing a disconnect

Counseling psychologists might ask clients who do not exercise personal questions, such as "To what extent are your values consistent with your actions? If you value your health, do you have habits that are not good for you and are therefore inconsistent with your values? What about your family? Do you value your spouse, children, or parents? If you lead a sedentary lifestyle and are not involved in a program of exercise, yet one of your deepest values is to maintain good health, to what extent is your value inconsistent with your behavior? Do you detect a 'disconnect' between your beliefs about good health and your unhealthy behavioral patterns?"

The misalignment between one's behaviors and one's values is best represented in Festinger's cognitive dissonance theory. The theory posits a tendency for individuals to seek consistency among their cognitions (i.e., beliefs, personal views, emotions, values). An inconsistency between attitudes or behaviors (dissonance) results in an individual's drive to change the attitude to accommodate the behavior. The most important factors that influence this drive for change are the number of dissonant beliefs and the importance a person attaches to each belief. For example, beliefs about or the importance of family could be dissonant from ignoring family members, not taking the time to mentor children, or not developing positive relationships. Dissonance may be reduced or eliminated by reducing the importance of the conflicting beliefs, acquiring new beliefs that change the balance, or removing the conflicting attitude or behavior.

Although cognitive dissonance theory provides a valid theoretical foundation for our model, the DVM goes beyond the recognition of dissonance by asking individuals to acknowledge the costs and long-term consequences of their negative habits and to develop a self-regulation action plan that carries out cognitive-behavior strategies to replace the negative habit with new, positive rituals. Values, then, form the foundation of our model.

Acceptability of the disconnect

If people acknowledge that the negative habit of not engaging in exercise is inconsistent with their deepest values and beliefs, a follow-up question is needed to ascertain if the disconnect between the person's negative habit (e.g., lack of exercise) and the person's values is acceptable. If the disconnect is acceptable—many individuals believe that changing the negative habit is either undesirable or beyond their control—then no change in behavior will likely occur. It is necessary for the mental health professional or researcher, therefore, to identify another unacceptable disconnect between the person's negative habit and values. Only when the disconnect is unacceptable to the individual is the person prepared to commit to behavior change by developing and carrying out an action plan.

Developing a self-regulation action plan

A person's decision to initiate an exercise program, ostensibly because the disconnect between the negative habits of nonexercise and the person's deepest values and beliefs is unacceptable, is followed by developing a self-regulation detailed action plan. As Figure 1 depicts, action plans include 4 primary components: quantitative data from testing to establish a baseline of fitness and other health
indicators, personal coaching for fitness prescription and instruction, scheduled routines (ie, when and where exercise will occur), and remembering one's values. The results of past studies indicate that specificity of timing and precision of behavior dramatically increases the probability of carrying out a self-controlled action plan successfully. For example, one inherent feature of Prochaska and DiClemente's transtheoretical model to promote health behavior change, a process replicated for exercise behavior, is to target specific behaviors within a specified time frame. In addition, Maddox contends that developing an exercise routine by planning the time and location of most exercise sessions will facilitate exercise adherence.

Our process-outcome study consisted of us testing the efficacy of the DVM on changes in selected fitness measures (ie, strength, cardiovascular fitness, blood pressure, percent body fat), lipid profile (eg, cholesterol, triglycerides), and short-term exercise adherence. We hypothesized that the DVM intervention would result in significant improvements in fitness and lipid profile scores. We also predicted exercise adherence to be at or above the national average of 66% during the 10-week intervention.

**METHODS**

**Participants**

The study included 51 full-time faculty and staff members (10 men and 41 women) from a university in the southeastern United States who volunteered to participate in the study. We recruited them via campuswide e-mails sent to all university faculty members. Participants ranged in age from 27 to 64 years ($M = 44.8, SD = 2.56$). All participants received written consent from their personal physicians to participate in aerobic and resistance training exercise. Prior to the study, they had not engaged in regular exercise and, therefore, were categorized as unfit. Table 1 shows descriptive statistics confirming the low level of fitness prior to the intervention. The university's institutional review board approved this study.

**Equipment and Measures**

We conducted 4 fitness tests and a blood test within 72 hours of the program's formal beginning (consisting of a 3-hour seminar that is described later) and again at the conclusion of the intervention 10 weeks later.

**Fitness Tests**

**Body composition**

We measured body composition with a Lange skinfold caliper (Beta Technology Inc, Santa Cruz, CA). Trained technicians performed a 7-site assessment to assure accuracy and consistency. We calculated body fat percentage from estimates of body density using the Siri equation.

**Blood pressure**

We assessed blood pressure with a WelchAllyn automatic blood pressure machine, Model CE0050, 420 series (Welch Allyn Inc, Skaneateles Falls, NY). A skilled technician assessed blood pressure with a large manual blood pressure cuff if the participant's arm circumference was too large for the automatic blood pressure machine. We measured all participants in the seated position using the right arm.

**Cardiovascular fitness**

We assessed estimated $\text{VO}_{2\text{max}}$ (the maximum amount of oxygen, in milliliters, one can use in 1 min/kg of body weight) with the Single-Stage Treadmill Test. This test, endorsed by the American College of Sports Medicine for low-risk participants, consists of walking on a treadmill at 2–4.5 mph for 4 minutes to elicit a heart rate between

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**TABLE 1. Descriptive Statistics for Pre- and Post-Physical Fitness Measures ($N = 49$)**

<table>
<thead>
<tr>
<th>Physical fitness</th>
<th>Pretest $M$</th>
<th>Pretest $SD$</th>
<th>Posttest $M$</th>
<th>Posttest $SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic blood pressure</td>
<td>124.53</td>
<td>15.25</td>
<td>125.53</td>
<td>14.98</td>
</tr>
<tr>
<td>Diastolic blood pressure</td>
<td>77.90</td>
<td>10.37</td>
<td>77.18</td>
<td>8.83</td>
</tr>
<tr>
<td>% body fat</td>
<td>31.79</td>
<td>7.62</td>
<td>30.01</td>
<td>7.38</td>
</tr>
<tr>
<td>Cardiovascular fitness</td>
<td>32.76</td>
<td>8.06</td>
<td>34.30</td>
<td>8.15</td>
</tr>
<tr>
<td>Bench press estimated 1-RM</td>
<td>92.04</td>
<td>53.50</td>
<td>107.13</td>
<td>61.16</td>
</tr>
<tr>
<td>Leg press estimated 1-RM</td>
<td>391.80</td>
<td>137.88</td>
<td>433.22</td>
<td>140.03</td>
</tr>
</tbody>
</table>

Note. 1-RM = 1-repetition maximum.
50% and 70% of age-adjusted maximal heart rate to obtain a measure of cardiovascular fitness. Each participant performed the test on a Quinton Treadmill, Model number Q55 (Cardiac Science Corp, Bothell, WA) using standard protocol. We asked participants not to hold the handrails during the test unless absolutely necessary. Heart rate was manually palpated for 10 seconds during the final minute of the test for use in the prediction equation.

Muscular strength (estimated 1-RM testing)

We estimated upper and lower body strength with the Estimated 1-RM Test, using a Universal Weight Machine (Model No. SS1500, Universal Gym Equipment Co, West Point, MS). We briefly instructed each participant as to proper form and breathing techniques before performing each test. A bench press was used for upper body, and a leg press was used for lower body testing. To estimate the appropriate weight load for the test, we asked participants about their involvement in weight training. We then told participants to perform as many repetitions at the selected weight until fatigue (up to 15 repetitions). We used prediction conversions with weight lifted and repetitions performed to determine estimated 1-repetition maximum (1-RM).

Procedure and Intervention

Outcome evaluation, also called process-outcome studies, encompasses program assessment and outcomes; in-session behaviors are linked to treatment outcome. Specific methods include performance planning and reporting and performance indicators that are commensurate with program goals. We conducted our outcome-based study in accordance with Schalock's recommendations: (a) establishing baseline data, (b) determining desired outcomes, and (c) aligning program services with desired outcomes. Kaplan contends that "it seems important to ensure that evidence-based behavioral medicine criteria include features that will enhance relevance and external validity, and help to close the gap between research and practice." We obtained fitness and lipid baseline data, indicating the outcome of initiating and adhering to an exercise program that would improve fitness markedly. Although we did not measure the participants' eating habits, it is plausible that instruction on developing proper nutritional habits would contribute to improved lipid profile data. We enacted an action plan and personal coaching to help participants meet their goals.

The intervention began with a 3-hour seminar for all participants in which we presented material related to the model through the use of a workbook, DVD, group member interaction, and lecture. Seminar objectives included asking participants to list their negative habits (eg, lack of exercise, improper nutrition), to identify their top 5 values from a 40-item values checklist (eg, health, humility, integrity, kindness, responsibility, faith), to detect disconnects between their habits and values, and to develop an action plan on the basis of their conclusion that the disconnect between selected negative habits and values was unacceptable. We ignored any disconnect that a participant deemed "acceptable" because it would not lead to health behavior change. Within 1 week of the seminar, participants: (a) were assigned a performance coach with whom they would work during the 10-week intervention, (b) scheduled and completed fitness tests and a blood test to obtain their lipid profile, and (c) scheduled instructional and prescription sessions for resistance training in the university's weight room.

During the 10-week intervention, performance coaches met with participants (a) to review the action plan, (b) to receive information, in oral and written form, about proper ways to exercise and selected changes in eating habits from educational materials and DVDs, (c) to receive instruction on resistance training techniques, (d) to discuss the participant's values, (e) to review actual and potential impediments to fulfilling the action plan, (f) to develop strategies to overcome these impediments, and (g) to provide positive feedback on desirable behavior and constructive feedback on continuing undesirable behavior. Coaches obtained exercise adherence data directly from their respective participants at the end of each week from personal or phone interviews.

An additional component of the coaching intervention was to communicate proper dietary and nutritional habits for improving the participant's lipid profile. Clients watched a 30-minute DVD on proper eating habits to maintain body weight and improve energy. The Human Performance Institute (Orlando, FL) produced the DVD, and we used it with their permission. Although it did not propose any specific dietary regimen, general nutritional recommendations included eating breakfast, consuming light, frequent meals (about every 3 hours) during the day, avoiding heavy meals within 2 hours of bedtime, separating "need" foods (80% of daily intake) from "want" foods (20% of daily intake), eating snacks to maintain proper blood sugar levels throughout the day, drinking approximately 64 oz. of water daily, minimizing caffeine intake during the day (preferably no caffeine after midday), and, above all, avoiding excessive food consumption at one sitting (ie, overeating). We obtained all eating guidelines from Groppel and Anshel, Reeves, and Roth.
their health, happiness, or quality of life. They then determined the benefits, costs, and long-term consequences of these negative habits. Participants then identified, on a checklist, 5 of their most deeply held values, and we asked them to examine evidence of a disconnect (ie, incompatibility) between their negative habits (eg, lack of exercise) and their values (eg, health, family). They then determined whether any disconnect between their negative habits and deeply held values was unacceptable, given the costs and long-term consequences. A disconnect that was not acceptable provided the basis for developing an action plan that focused on replacing the negative habit—lack of exercise—with positive routines, in this case, initiating and maintaining an exercise program and selected changes in nutritional habits over 10 weeks.

We trained research assistants (graduate students) as performance coaches to supervise the action plans and to carry out and supervise intervention content in exercise and nutrition. The research assistant generated an action plan consisting of a time-management schedule that provided a structure for performing a minimum of 3 exercise (cardiovascular and resistance training) sessions per week, desirable eating habits, and other routines (eg, presleep rituals, recovery breaks during the day) that were intended to overcome the participant’s negative habits. We gave each participant 4 fitness tests and a blood test (lipids profile) immediately prior to and following the intervention. The tests identified the fitness level of subjects, who were then given an individualized exercise program to improve muscular strength and cardiovascular fitness.

In summary, the intervention consisted of the following content and sequence:

Weeks 1 and 2: share testing data (fitness, blood), share program goals, begin fitness program on the basis of prescription. Be sure all testing is completed, including the online test.

Week 3: Review DVD (fitness or nutrition), review values and disconnects, review One-Time Action Steps. (This consisted of identifying single events that participants could easily complete that would improve their health, happiness, or wellness. Examples include purchasing a fitness club membership, taking midday walks with a partner, replacing unhealthy snacks with fruit, or attending religious services.) Help participant develop a mission statement.

Week 4: Review DVD (fitness or nutrition), monitor fitness. Review ways to expand physical capacity (exercise, nutrition, sleep, hydration)

Week 5: Review strategies to change other negative habits, perhaps taken from printout of FEI or from workbook. Consider inviting the participant’s spouse/partner to engage in the session. Ways to expand mental, emotional, and spiritual capacity.

Week 6: Build new rituals while reviewing problems with old rituals. Did participant quit or stop using former new rituals? If this happened, why, and what can you do to restarting the ritual?

Think of developing new habits and addressing ways to overcome failure to develop new, positive habits.

Week 7: Recovery strategies: What can participant do to engage in 90-minute recovery during the day? Calling someone special? Taking a walk? Exercise? Smoking or donuts do not count.

Week 8: Support systems: Who can participant recruit to help in the continuation of the journey in developing and maintaining new routines? Observe and discuss another DVD?

Week 9: Review additional DVD? Review long-term plans to maintain these new habits. Remind participant that this change is about living a life that is consistent with personal values and leaving a legacy. What is it the participant want to leave behind? What does participant want family and colleagues to remember?

Week 10: Review action plan, celebrate successes, develop a support plan so that the participant has someone to rely on to maintain these new routines, and to offer praise for commitment to being true to personal values. Review vision and mission statements.

RESULTS

We computed 2 Multivariate Mixed Model (MMM) analyses to examine the effect of the DVM intervention on a participant’s physical fitness and lipids profile. The MMM analysis addressed the presence of multiple dependent measures for changes in both physical fitness and lipids with repeated measures on the time (ie, pre- and postintervention) factor. The MMM analysis controlled for the Type 1 error that could be inflated with separate analysis for each dependent measure.42–43 If the overall multivariate statistics were significant, we analyzed the follow-up univariate test to determine which dependent measures contributed to the significant overall test. The MMM analysis meets the assumption of sphericity, that is, difference scores of the variance in a repeated measures factor are equal for all levels.42,43 When there are only 2 levels of a within-subjects factor (eg, pre- and postintervention comparisons), the sphericity assumption can be ignored, as we did, because there is only 1 difference score of variance.

Physical Fitness Measures

We deleted fitness scores from 2 participants because of missing values (ie, listwise deletion); we therefore ana-
DISCONNECTED VALUES MODEL

analyzed 49 participants' data. The overall result of the MMM analysis indicated a significant time (pre- and postintervention) effect on the physical fitness measures (Wilks’s \( \Lambda = .299 \), \( p < .001 \)). This implies that engaging in an exercise program resulted in improved physical fitness. The MMM analysis showed a high magnitude of \( \eta^2 = .701 \), which demonstrated a meaningful significant effect for time. The follow-up univariate tests indicated significant differences between pre- and postintervention on percent body fat, \( F(1,48) = 29.10 \), \( p < .001 \); cardiovascular fitness, \( F(1,48) = 10.38 \), \( p = .002 \); bench press estimated 1-RM, \( F(1,48) = 49.64 \), \( p < .001 \); and leg press estimated 1-RM, \( F(1,48) = 27.69 \), \( p < .001 \). Table 1 shows descriptive statistics of all fitness tests. Table 2 shows the MMM analysis for physical fitness measures.

Lipid Profile

We deleted data from 1 participant because of missing values, so we therefore analyzed data from 50 participants. The overall result of the MMM analysis for the lipids profile indicated a significant time (pre- and post-intervention) effect on the blood profile (Wilks’s \( \Lambda = .749 \), \( p = .039 \)). This implied that increased exercise habits and changed nutritional habits resulted in an improved blood profile. The MMM analysis showed a moderate magnitude of \( \eta^2 = .25 \), which demonstrated that 25% of variance was accounted for changes in lipids. The follow-up univariate tests on the lipid change measures indicated significant differences between pre- and postintervention for cholesterol (total), \( F(1,49) = 8.46 \), \( p = .005 \); LDL cholesterol, \( F(1,49) = 5.75 \), \( p = .020 \); very-low-density lipoprotein (VLDL) cholesterol, \( F(1,49) = 6.45 \), \( p = .014 \); Risk (defined as combined factors that identify the probability of a cardiac event, reflecting the patient's LDL and triglycerides data), \( F(1,49) = 9.31 \), \( p = .004 \); and triglycerides, \( F(1,49) = 6.55 \), \( p = .014 \). HDL, however, did not reach statistical significance, \( F(1,49) = .030 \), \( p = .874 \). Table 3 lists the descriptive statistics for the pre- and postintervention lipids profile data. Table 4 shows the MMM analysis for lipids profile measures.

### TABLE 2. Multivariate Mixed Model Analysis for Physical Fitness Measures (N = 49)

<table>
<thead>
<tr>
<th>Variate</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>( p )</th>
<th>( \eta^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multivariate</td>
<td>6</td>
<td>(( \Lambda = .299 ))</td>
<td>16.78</td>
<td>.000</td>
<td>.701</td>
</tr>
<tr>
<td>Univariate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic blood pressure</td>
<td>1</td>
<td>24.50</td>
<td>.31</td>
<td>.578</td>
<td>.006</td>
</tr>
<tr>
<td>Diastolic blood pressure</td>
<td>1</td>
<td>12.50</td>
<td>.46</td>
<td>.501</td>
<td>.009</td>
</tr>
<tr>
<td>Percent body fat</td>
<td>1</td>
<td>77.05</td>
<td>29.10</td>
<td>.000</td>
<td>.377</td>
</tr>
<tr>
<td>Cardiovascular fitness</td>
<td>1</td>
<td>57.79</td>
<td>10.38</td>
<td>.002</td>
<td>.178</td>
</tr>
<tr>
<td>Bench press estimated 1-RM</td>
<td>1</td>
<td>5580.81</td>
<td>49.64</td>
<td>.000</td>
<td>.508</td>
</tr>
<tr>
<td>Leg press estimated 1-RM</td>
<td>1</td>
<td>42040.89</td>
<td>27.69</td>
<td>.000</td>
<td>.366</td>
</tr>
</tbody>
</table>

Note. MS = mean square; \( \eta^2 \) = effect size; 1-RM = 1-repetition maximum.

### TABLE 3. Descriptive Statistics for Pre- and Post-Lipids Profile Measures (N = 50)

<table>
<thead>
<tr>
<th>Blood profile</th>
<th>Pretest M</th>
<th>Pretest SD</th>
<th>Posttest M</th>
<th>Posttest SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol</td>
<td>205.72</td>
<td>37.47</td>
<td>194.22</td>
<td>35.47</td>
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<tr>
<td>HDL cholesterol</td>
<td>56.32</td>
<td>13.43</td>
<td>56.18</td>
<td>13.03</td>
</tr>
<tr>
<td>LDL cholesterol</td>
<td>125.00</td>
<td>33.43</td>
<td>115.94</td>
<td>30.02</td>
</tr>
<tr>
<td>VLDL cholesterol</td>
<td>25.08</td>
<td>13.66</td>
<td>22.46</td>
<td>11.29</td>
</tr>
<tr>
<td>Risk</td>
<td>3.82</td>
<td>1.04</td>
<td>3.62</td>
<td>1.01</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>125.56</td>
<td>68.30</td>
<td>112.28</td>
<td>56.81</td>
</tr>
</tbody>
</table>

Note. HDL = high-density lipoprotein; LDL = low-density lipoprotein; VLDL = very low-density lipoprotein; Risk = probability of a cardiac event.
Exercise Adherence

We ascertained adherence rates for 2 exercise regimens, cardiovascular and resistance training. We defined adherence for cardiovascular exercise as following the exercise prescription of engaging in cardiovascular exercise a minimum of 3 times a week. We defined adherence for resistance training as engaging in weight training a minimum of twice a week. Full (100%) adherence for aerobic exercise (3 times/wk for 10 wks) and strength training (2 times/wk for 10 wks) was 30 sessions and 20 sessions, respectively. We obtained adherence rates from phone interviews and direct observations with the participants' performance coach. (Coaches exercised with participants once a week.) Adherence for cardiovascular activity averaged 22 out of 30 sessions (73%), and strength-training adherence averaged 13 out of 20 sessions (65%).

COMMENT

We conducted this study to determine the effect of a 10-week behavioral intervention (the DVM) on changes in exercise behavior and nutritional habits that would result in concomitant improvements on selected fitness measures and the lipids profile. Results of the MMM analyses for fitness and lipids indicated significantly improved scores from pre to post-intervention. These results supported the hypotheses of significant improvements on selected measures of fitness and the lipids profile on the basis of the DVM. It was apparent that participants, consisting of unfit middle-aged (M age = 44.8 yrs, SD = 2.56) male and female university faculty members, were capable of changing exercise and eating habits that affected their general health.

Significant improvements in all fitness and lipids profile measures were corroborated by the relatively high exercise adherence rates for both cardiovascular and strength training. Typical exercise adherence rates are approximately 50% during an intervention or within the first 3 months of beginning a formal program. Therefore, the current adherence rate of 73% and 65% for cardiovascular and resistance training, respectively, is a marked improvement from previous attempts at promoting exercise habits. One additional likely explanation of superior post-intervention outcomes was that, in addition to a change in exercise habits, participants also incorporated lifestyle changes. As Ockene contends, there are 3 factors that affect adherence: the individual (ie, what is brought to the treatment), the interpersonal (ie, others involved with that individual), and the environment (ie, the context in which the individual lives, works, and participates).

Adherence to improving healthy habits—in this study, changes in exercise and eating habits—must incorporate lifestyle changes that are meaningful and have long-term benefits. Loehr and Schwartz on the basis of their extensive clinical experience, extol the virtues of developing rituals that are planned, specific, detailed, and executed accordingly. The goal, they contend, is to create a structure that will help the individual overcome the bombardment of competing options, choices, and infinite demands. As Hall and Fong found that "long-term thinkers are more likely than short-term thinkers to engage in health-protective behaviors and less likely to engage in health-damaging behaviors." (p 65)

To determine other possible underlying reasons that could explain improved adherence, we conducted follow-up structured, personal interviews with a subsample of 25 of the 51 participants (50%). These were meant to determine: (a) their attitude toward the program, (b) the influence of identifying

**TABLE 4. Multivariate Mixed Model Analysis for Lipids Profile Measures (N = 50)**

<table>
<thead>
<tr>
<th>Variate</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>( \eta^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multivariate</td>
<td>6</td>
<td>(( \Lambda = .749 ))</td>
<td>2.46</td>
<td>.039</td>
<td>.251</td>
</tr>
<tr>
<td>Univariate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cholesterol</td>
<td>1</td>
<td>3,306.25</td>
<td>8.46</td>
<td>.005</td>
<td>.147</td>
</tr>
<tr>
<td>HDL cholesterol</td>
<td>1</td>
<td>0.49</td>
<td>0.03</td>
<td>.874</td>
<td>.001</td>
</tr>
<tr>
<td>LDL cholesterol</td>
<td>1</td>
<td>2,052.09</td>
<td>5.75</td>
<td>.020</td>
<td>.001</td>
</tr>
<tr>
<td>VLDL cholesterol</td>
<td>1</td>
<td>171.61</td>
<td>6.45</td>
<td>.014</td>
<td>.016</td>
</tr>
<tr>
<td>Risk</td>
<td>1</td>
<td>1.06</td>
<td>9.31</td>
<td>.004</td>
<td>.001</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>1</td>
<td>4,408.96</td>
<td>6.55</td>
<td>.014</td>
<td>.118</td>
</tr>
</tbody>
</table>

*Note. MS = mean square; \( \eta^2 \) = effect size; HDL = high-density lipoprotein; LDL = low-density lipoprotein; VLDL = very low-density lipoprotein; Risk = probability of a cardiac event.
their values on changes in their behaviors, (c) feelings about
their performance coach and the coaching process, and
(d) permanent changes they had adopted in their exercise
and eating habits during the intervention. With respect to
attitude, 88% of participants (n = 22) rated the program as
"highly favorable." Specific reasons for the positive attitude
included fitness instruction, personal coaching, educational
materials (including the DVDs on nutrition and fitness), and
testing (fitness and lipids) data that identified specific needs
for improving health.

Participants indicated 100% agreement that identifying
their values was self-motivating when committing to an
exercise program. Health was the most common listed value
(n = 22; 86%), followed by family (n = 19; 76%). Further,
24 of the 25 respondents (96%) indicated that the acknowl-
edged disconnect between the participants' values and their
unhealthy behavior patterns was an incentive to make life-
style changes. One additional factor that likely reinforced
behavior change was the widespread (100%) favorable atti-
tude toward their respective performance coach. A major-
ity of participants (n = 22; 88%) indicated their intention
to maintain long-term involvement (ie, making a lifestyle
change) with some form of regular exercise after the study.

Finally, we obtained various forms of validity, which
included theoretical, evaluative, outcome, process, and
catalytic validation.\(^7\) We obtained theoretical validity (ie,
ability of the study to explain the phenomenon under exami-
nation) by providing participants with insights into their undesirable behavioral patterns, acknowledging their values and the disconnect between their values and their negative habits, and providing added incentive to carry out
an action plan for establishing new rituals. Evaluative valid-
ity (ie, that data were objective and obtained in an unbiased
manner) reflected the quantitative (fitness and blood lipids)
data we obtained. Outcome validity (ie, that the action
emerging from the study leads to the successful resolution
of the research problem) reflected significant improvements
from pretest to posttest on specific quantitative outcomes,
indicating strong adherence to program concepts. Process
validity (ie, that the study has been conducted in a depend-
able and competent manner) was a function of the trained,
professional seminar leader who provided initial informa-
tion and developed participant motivation to engage in this
program, as indicated by favorable participant assessments
of the seminar and of the coaches who provided leadership,
education, and monitoring of participant progress.

Implications

The favorable results support recommendations of research-
ers and scholars for future research in the area of promoting a
healthy lifestyle. For example, with respect to increasing
exercise behavior and in support of the cost/benefit/long-
term consequences component of the DVM, Dunn and
Blair\(^4\) suggest "providing individuals with education or
consciousness-raising about the benefits of physical activ-
ity and the risks of inactivity ... to move them to a shift
in the decisional balance to become physically active."\(^5\)\(^6\)\(^7\)
Berger et al\(^8\) warn, however, that "simply emphasizing the
relationship between disease reduction and regular exercise
is not sufficient to keep most people physically active
over time."\(^9\)\(^10\)\(^11\)\(^12\)\(^13\)\(^14\)\(^15\) The authors emphasize the importance of
helping exercisers develop positive inner experiences (ie,
intrinsic motivation) to promote exercise adherence rather
than overemphasizing the positive outcomes from exercise
(eg, lost weight, improved appearance, reduced stress). The
DVM strengthens this perspective by using a person's self-
identified values as a motivator for starting and maintain-
ing an exercise habit.

One possible reason for the equivocal results of previ-
ous exercise adherence research is the virtual absence of
time for building relationships with researchers or per-
sonal trainers/exercise leaders that foster trust and loyalty,
provide information, and create social support toward a
commitment to initiate and maintain habitual exercise.\(^16\)
Hays\(^17\) recognized the importance of developing a trusting
and respectful relationship between the exercise leader (or
researcher) and the person who is undertaking an exercise
program, an experience many individuals consider novel,
physically stressful, and threatening. In the present study,
we designed the interaction between the seminar leader (the
first author), the performance coaches, and each participant
to build positive relationships, to maintain trust, and to
express a genuine desire to help individuals achieve their
goals of living a life consistent with their values by improv-
ing health and quality of life. The result was heightened
self-motivation to replace negative habits (in this study,
related to lack of exercise and proper nutrition) with new,
positive routines.

Loehr and Schwartz,\(^18\) who consulted thousands of cli-
ents primarily in the corporate sector, contend that promot-
ing any health-enhancing behavior requires the develop-
ment of scheduled routines or habits that are linked to
the person's deepest values. It is important, therefore, to
ritualize exercise habits entrenched in time and linked to the
exerciser's values, strategies not usually taken into account
in most interventions but inherent in the DVM. In addi-
tion, previous investigators have not devoted adequate time
to building researcher/participant relationships that would
nurture trust, commitment, loyalty, and effort toward the
exercise program.
This study included limitations that should be considered in future studies of the DVM. We did not include a control group and randomization procedures. Although these are inherent limitations of action research, such as changes caused by history or maturation effects, determining cause and effect conclusively is not possible because of the exclusive use of this intervention. In addition, the absence of quantitative data related to eating habits, an important component of changes in lipids, would have helped us assessing the DVM’s efficacy beyond exercise. Changes in dietary habits were self-reported to the participant’s respective performance coach, however. We recommend that future researchers include a dietician or nutritionist to provide education, coaching, and data collection on eating habits.

Glasgow et al. conclude about the future of health behavior change research, “If we are serious about evidence-based behavioral medicine and about closing the gap between research findings and application of these findings in applied settings, we cannot continue ‘business as usual.’” Along these lines, Oldridge suggests that investigators in future adherence-enhancing research should focus on “keeping the regimen straightforward, providing clear instructions and periodic checks, promoting good communication with the patient, and reinforcing their accomplishments.” Thus, although large sample sizes may be needed to establish statistical power, the opportunity to build relationships with participants that, in turn, would likely improve adherence rates is often compromised.

New, creative approaches to changing health behavior, including exercise, are needed. Haynes contends that current intervention strategies often omit theoretical underpinnings. In comparison to the paucity of long-term intervention effectiveness in promoting exercise behavior, the DVM offers a potential vehicle with which to engage the individual cognitively and emotionally to encourage health behavior change. Future research on using the DVM on health-behavior change, particularly exercise and changes in eating habits, is warranted.

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NOTE

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REFERENCES

DISCONNECTED VALUES MODEL


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