

# Overview: Uli'eo Koa – Warrior Preparedness

Uli'eo Koa is an innovative, multidimensional pilot program developed to study how the lifestyle practices of our Native Hawaiian ancestors could facilitate optimal physical and spiritual fitness and effectively improve cardiovascular health. Uli'eo Koa program components include a traditional Hawaiian diet, rigorous physical exercise, traditional Hawaiian warrior fighting exercises, traditional Hawaiian massage (lomilomi), a culturally rich health education program and an assessment of spirituality.

The succeeding three papers describe different aspects of the Uli'eo Koa Program. Hughes provides an overview

of historical, philosophical and the health and wellness aspects of the program. The traditional Hawaiian diet component of the Uli'eo Koa Program is described by Leslie, who looks at the impact of the program on dietary practices and physiological changes. Mokuau's paper describes the application of a spirituality assessment, exploring the validity of this tool for a Native Hawaiian audience.

Collectively, these works give a first look at the Uli'eo Koa Program—linking ancient practices with the present for the purposes of health and wellness among Native Hawaiians.

## Uli'eo Koa – Warrior Preparedness

CLAIRE K. HUGHES\*

### Abstract

The Uli'eo Koa Program was developed to study physiological and spiritual changes that occurred in a group of active Native Hawaiian adults participating in a specially designed, culturally appropriate exercise and diet intervention that approximated the training for Native Hawaiian warriors. Program components were physical exercise (including traditional Hawaiian *lua* [fighting art]), a traditional Hawaiian diet (THD), *lomilomi* (Hawaiian massage), and a culturally rich health education program for active Native Hawaiian adults. Periodic assessments of muscle strength/fitness, flexibility, body composition, weight, body mass index, as well as other indicators, were compared to current standards of clinical medicine and science related to physical performance<sup>1</sup>. Differences

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observed from baseline to post-intervention suggested that the Uli'eo Koa Program may be effective in improving the health of Native Hawaiians. Limitations and clinical implications of the study are discussed.

### Introduction

#### Contemporary Native Hawaiian health

The poor health status of Hawai'i's indigenous people, *kānaka maoli*, has been well-documented and is associated with a nearly two-fold greater illness and death rate compared to other ethnic groups in Hawai'i<sup>2-4</sup>. During initial contact with Westerners in 1778, infected visitors introduced a number of communicable diseases previously unknown in Hawai'i, such as gonorrhea, syphilis, tuberculosis, measles, mumps, leprosy, diphtheria, cholera, typhoid, the plague, influenza, pneumonia, and small pox<sup>2,5</sup>. Epidemics swept through port cities and spread to surrounding communities. The result was massive *kānaka maoli* death and a dramatic 90% decline in the native population by 1893—115 years from the first contact<sup>2,5</sup>. Since 1910, those early scourges have been replaced with high rates of equally devastating non-communicable or chronic disease death<sup>2-3,5-7</sup>.

Today, *kānaka maoli* have the highest mortality rates in the State of Hawai'i for heart disease, cancer, stroke, accidents, and diabetes<sup>2-3,7</sup>, and they have the shortest life expectancy among Hawai'i's five major ethnic groups,

\*Administrator, Office of Health Equity, Hawai'i State Department of Health, 1250 Punchbowl Street, Honolulu, Hawai'i, 96813. Tel: (808) 586-4673. Fax: (808) 585-8252. Email: ckhughes@mail.health.state.hi.us.

which include Caucasians, Japanese, Chinese, Filipino, and Native Hawaiians<sup>2-3,7</sup>. In 1963, a study by the Department of Health (State of Hawai'i) reported a high mortality rate among Native Hawaiians from diabetes<sup>8</sup>. In 1967, baseline studies for the Honolulu Heart Study detected alarming signs of early heart attack, fatality on first heart attack, and a slightly lower average serum cholesterol level among Hawaiian men when compared to Japanese men who were being enrolled in the longitudinal cardiovascular disease study<sup>9-10</sup>. In addition, since the late 1980s, the Hawai'i State Department of Health's Behavioral Risk Factor Surveillance Surveys<sup>11-13</sup> have shown that, among Hawai'i's five major ethnic groups, Native Hawaiians have the highest rates in the State for obesity, cigarette smoking, acute and chronic alcohol drinking, and non-use of automobile seat belts<sup>3,11,13</sup>.

Although these health problems were identified, no interventions were developed to address the worsening health conditions of *kānaka maoli*<sup>3</sup> until the Ho'oke 'Ai—Moloka'i Diet Study (MDS) in 1987<sup>2-3</sup>. The Moloka'i Diet Study was the first and only scientifically conducted study on Native Hawaiians to determine the effects of an iso-caloric traditional Hawaiian diet (THD) on serum lipid levels<sup>14-15</sup>. A series of community-based THD intervention programs followed immediately on the islands of O'ahu, Kaua'i, Maui, and Hawai'i, and at three schools on O'ahu (i.e., Kaimukī Intermediate School, Kamehameha Schools—Athletics Program, and Kailua High School)<sup>16-20</sup>. The most prominent of the community-based interventions was the highly successful Wai'anae Diet Program that started on O'ahu in 1989<sup>3,14-15</sup>. The Wai'anae Diet Program targeted weight loss among severely overweight and morbidly obese *kānaka maoli* who were experiencing multiple health problems<sup>15</sup>. Currently, the Wai'anae Diet Program offers a diet that has been modified to include low-fat multi-ethnic dishes that are representative of Hawai'i's diverse population.

### Past Native Hawaiian health

The present status of the health of Native Hawaiians contrasts with that of historical accounts. Journal entries of early visitors provided evidence that between 1778 and 1839, *kānaka maoli* were physically superior in size and stature, as well as in musculature and strength<sup>21</sup>. The physical attributes of early *kānaka maoli* can be credited to the high expenditure of energy during daily hard physical work and a healthy diet (i.e., high-carbohydrate, low-fat traditional Hawaiian foods)<sup>2,5,21</sup>. The three written accounts to follow by the first European visitors describe the *kānaka maoli* in the late 18<sup>th</sup> and early 19<sup>th</sup> centuries:

"The Natives of these islands [Hawai'i] are, in general above the middle size, and well made; they walk very gracefully, run nimbly, and are capable of bearing great fatigue; though, upon the whole, the men are somewhat inferior, in point of strength and activity, to the Friendly islanders, and the women less delicately limbed than those of Otaheite ..." (Captain James King, March 1779)

"The natives are in general rather above the middle stature, well formed, with fine muscular limbs, open countenances, and features frequently resembling those of Europeans. Their gait is graceful, and sometimes stately. The chiefs in particular are tall and stout, and their personal appearance is so much superior to that of the common people, that some have imagined them a distinct race. This, however, is not the fact; the great care taken of them in childhood, and their better living have probably occasioned the difference." (Reverend Ellis, 1836)

"The nobles of the land are so strongly marked by their external appearance, as at all times to be easily distinguishable from the common people. They seem indeed in size and stature to be almost a distinct race." (Stewart, 1839)<sup>22</sup>

Historical accounts indicate that Native Hawaiians enjoyed a high level of physical and emotional health prior to the arrival of the first Westerners<sup>22-25</sup>. In addition, evidence abounds of the Native Hawaiians' ability to develop thriving, orderly, and productive communities driven by cultural values and practices that favored group orientation<sup>2,26-27</sup>, as well as a mutual respect for all things in the universe<sup>2</sup>. Native Hawaiians were skilled canoe builders, navigators, and brave sailors who sailed the entire Pacific Ocean for hundreds of years before Captain Cook arrived in 1778<sup>2,23,25</sup>. Native Hawaiian weaving, *tapa* making, and woodcarvings were finer than similar crafts found in other Pacific islands<sup>23-25</sup>. Native Hawaiians were careful environmentalists<sup>23,28</sup> and highly skilled in farming, fishing, and lifestyle practices that protected and improved the environment<sup>23-24</sup>.

Ancient Hawaiians understood health in its most holistic sense and practiced preventive medicine<sup>2,29</sup>. Their knowledge of human illnesses and healing was more advanced than that of the first Westerners to arrive in Hawai'i<sup>2,29</sup>. According to written accounts, many Hawaiian chiefs had achieved optimum physical growth and

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**Table 1. Uli'eo Koa program phases and schedule of measuring protocols**

Phase (duration)	When measures conducted	Assessment				
		Health status	Fasting blood panel	Physical activity	Dietary	Spirituality/religiosity
Phase I (3 weeks)	Program Start (baseline)	✓	✓	✓	✓	✓
	At 3 weeks (21 days)	✓	✓	✓		
Phase II (8 weeks)	At end of Phase II (11 weeks into program)	✓	✓	✓	✓	✓
Phase III* (9 months)	1 year from program start	✓	✓	✓	✓	✓

\* Phase III was not completed at the time this paper was submitted.

were considerably over six feet in height<sup>15,21,30</sup> and exhibited fine muscle development and physical agility<sup>21,22,25,30</sup>.

## Improving Native Hawaiian health

Over the past 200 years, there has been a continuous decline in the health status of *kānaka maoli*—an aftermath of the population decline, cultural insult, and disenfranchisement of a nation. However, pivotal events and achievements have occurred, such as the 20<sup>th</sup> century open-ocean voyages of the Polynesian voyaging canoe *Hōkūle'a*, the struggle to reclaim and heal the island of Kaho'olawe, and a reawakening and restoring of the cultural fiber and skills that contributed to a once-thriving and healthy people.

Within this progressive context, a focus on changing behaviors and lifestyle practices among Native Hawaiians to improve health indicators is crucial. Restoring health to the Native Hawaiian population requires special attention to developing culturally appropriate and aggressive methods to change the risk factors that presently exist. The challenge of a lifestyle change is difficult to achieve and even more difficult to maintain; however, a renaissance in *kānaka maoli* health is a logical next step.

The present study explores the efficacy of a culturally appropriate program geared toward improving the health of Native Hawaiians.

## Uli'eo Koa

The Uli'eo Koa Program was designed to modify and improve physiological, behavioral, and psychological-spiritual aspects of participants' health. The approach utilized a combination of physical activity and a low-fat nutritious diet which Western medicine has long recognized as the most effective approach to weight control. In addition, this approach reduces the risks for cardiovascular disease as well as other chronic health conditions (e.g., diabetes, renal failure, hypertension, cancer, other degenerative diseases).

The initial planning and developing of the Uli'eo Koa's physical activity program included incorporating traditional *lua* (Hawaiian fighting art) exercises as well as traditional *lomilomi* (Hawaiian massage). A team of Native Hawaiian health professionals collaboratively designed appropriate clinical and medical measures to assess progress in this unique intervention program drawing on specialties of Western medicine, physical fitness, *lua*, chiropractics, physical therapy, social work, food, and nutrition.

The specific elements of the traditional lifestyle practices of our ancestors central to the Uli'eo Koa Program included: (a) continuous high physical output of energy in work, travel, and recreation; (b) traditional Hawaiian diet (low-fat, high-complex-carbohydrate diet and fresh water to drink); (c) physical training and *lomilomi* (Hawaiian massage); (d) traditional spiritual practices; and (e) cultural education.

Anticipated changes were: (a) measurable increases and improvements in muscle strength/fitness, flexibility, and body composition; (b) decreases in weight and body mass index (BMI); (c) decreases in serum levels of glucose, lipids, triglycerides, and cholesterol (see Leslie's article in this issue); (d) improvements in dietary practices (see Leslie's article in this issue); and (e) improvements in orientation towards a traditional cultural and spiritual belief system (see also Mokuau *et al.*'s article in this issue).

In their totality, these changes reflect the optimal health and fitness practices of our ancestors. Lifestyle modifications, if sustained, would demonstrate a potential for improvement of health status among present-day *kānaka maoli*.

## Method

### Participants

There were a total of 16 Uli'eo Koa *kānaka maoli* participants (12 men, 4 women). These individuals were members of a traditional Hawaiian fighting art organization. The participants had previously maintained a mod-

Table 2. Uli'eo Koa Program

Phase (duration)	Physical exercise	<i>Lomilomi</i>	Traditional Hawaiian diet
Phase I (3 weeks)	Morning Exercise 1.5 – 2.0 hrs. long 5 times/week	2 times/day for 5 days/week following morning exercise and evening exercise	Prepared breakfast 5 days/week
	Evening Exercise 1.5 – 2.0 hrs. long 5 times/week		Prepared lunch, snacks and dinner 5 days/week
			Education sessions followed evening meals
Phase II (8 weeks)	Evening Exercise 1.5 – 2.0 hrs. long 3 times/week	3 times/week following evening exercise	Prepared dinner 2 days/week
			Education sessions followed evening meals
Phase III (9 months)	Self-directed exercise	Self-directed <i>lomilomi</i>	Self-directed dietary practices

erate level (1-2 hours, once a week) of physical activity in their daily lives. Their ages ranged from 23 to 64 years with a mean of 45+ years. At baseline, their mean height was  $171.81 \pm 8.19$  centimeters and their initial blood pressure ranged from normal to moderate hypertension (systolic 128-164 mm Hg, diastolic 60-112 mm Hg).

## Measures

Table 1 provides a summary of the assessments of the Uli'eo Koa Program by the three phases.

A standard health history questionnaire was administered, which included a fasting blood panel and physical activity assessment. The following outcomes were measured: (a) muscle strength/fitness = bench press (one-repetition maximum weight), bicep curl (one-repetition maximum weight), shoulder press (one-repetition maximum weight), push-ups (number per minute), and sit-ups (number per minute); (b) flexibility = cervical range of motion and leg deficiency correction; (c) body composition = percent body fat; (d) weight (balanced-beam scale); (e) height (stadiometer attached to balanced-beam scale); (f) BMI; and (g) cultural spirituality = modified Brief Multidimensional Measure of Religiousness/Spirituality (BMMRS)<sup>31</sup>.

Muscle strength and flexibility were assessed using the Hoggan MicroFET and Dular Inclinator (following guidelines set forth by the American Medical Association)<sup>32</sup>.

Given that all participants of the Uli'eo Koa Program were associated with an organization dedicated to the Native Hawaiian fighting art of spiritual guardians, spirituality and religiousness were central concepts. The spirituality-religiosity instrument (i.e., modified BMMRS) was selected and administered by a Native Hawaiian clinical

social worker who had conducted a preliminary study to assess the conceptualization of spirituality among *kānaka maoli* in contemporary life (i.e., focus group methodology was used to explore the beliefs and experiences of 28 Native Hawaiians<sup>33</sup>; see also Mokuau *et al.* in this issue).

No assessment was designed for the educational sessions; however, the information was offered to complement the exercise, cultural, and health components.

A final assessment of all parameters will be conducted at the end of one year from baseline (Phase III) and will measure each participant's ability to sustain individual lifestyle changes over the preceding nine-month period. This self-sustaining phase of the program is currently underway.

## Procedures

Table 2 summarizes the components and procedures of the Uli'eo Koa Program for the three phases.

The Uli'eo Koa Program entailed a baseline followed by three phases.

**Exercise.** In Phase I (April to mid-July, 2000), two daily (Monday through Friday) workout sessions began on the first day and continued for three weeks. The morning session occurred between 5:30 and 7:00 AM after which a buffet breakfast was served. The activities combined aerobic exercises, stomach exercises for upper, lower, and oblique abdominal muscles, and whole-body stretching exercises. The evening workout was held between 6:00 and 7:30 PM, followed by dinner and an educational session (see below). Evening workout sessions incorporated exercises of aerobics, agility (to develop muscle

strength and endurance), and flexibility-stretching. Flexibility and *lua* exercises (performed non-stop for 20-25 minutes) were incorporated into both the morning and evening sessions upon completion of walking, and muscle strength and endurance exercises. On Saturdays, participants assembled at various locations throughout the island to perform work and activities, such as hiking and community projects. Sunday was a day of rest.

**Diet.** The THD was first used by Na Pu'uwai in the Moloka'i Diet Study<sup>14</sup> to study physiological changes among study participants and to determine the impact on diseases that are current threats to the *kānaka maoli* population<sup>2,3,14-15</sup>.

The Uli'eo Koa THD was developed based on the requirement of excellent sources of nutrients to sustain the high level of athletic performance planned for the study, as well as to achieve the major physiological and anthropometric changes associated with positive health. Acknowledging that reorientation to cultural food practices was essential for a successful achievement of the targeted lifestyle changes, Uli'eo Koa THD utilized the expertise of *kānaka maoli* food and nutrition professionals to plan and execute daily meals and snacks that approximated traditional meals of the culture.

The nutrient composition of the THD is 78-80% carbohydrate, 12% protein, and 10% fat<sup>32-33</sup>. The sources of carbohydrate are essentially all high-fiber, complex carbohydrates that promote prevention and control of chronic health illnesses prevalent among *kānaka maoli* today. Fish, shellfish, and fowl are the primary protein foods in the THD. The fat content of the THD is approximately 8-10% of the total calories, which is far lower than the daily amount ingested by most Americans (33%) and significantly lower than the 40% of the usual diet of modern-day *kānaka maoli*<sup>34-35</sup>. The beverages approved were water and Hawaiian *māmaki*, *ko'oko'olau*, and other herbal teas. Drinking large amounts of water was required (i.e., at least eight servings of eight-ounce glasses a day). Coffee, black tea, soda, soda water, canned juices, and alcoholic beverages were not allowed.

During Phase I, a nutritionist/registered dietitian monitored the meal program and preparation, and provided participants with information on nutrients consumed on a daily basis. The program protocols paid particular attention to safety issues for adults.

**Lomilomi.** *Lomilomi* (Hawaiian massage, body manipulation) healing was developed by the 'olohe *lua* (ancient masters of *lua*) to correct joint injury and body misalignment, as well as to reduce the stress and pain of muscle spasms that resulted from the strenuous physical training used to train warriors in old Hawai'i. In traditional fighting schools, *lomilomi* was incorporated into the cooling down period after strenuous physical exercise.

The Uli'eo Koa *nā 'olohe lua* (masters of *lua*) selected four *lomilomi* techniques that are basic massage methods used in *lua*. These stimulating massage methods were used on the shoulder, back, and hip areas. *Lomilomi* of the spine and upper and lower extremities was provided twice daily, five days a week during Phase I, and three times weekly at the end of the hour-and-a-half exercise period during Phase II. This traditional healing method was used in Uli'eo Koa to relax the muscles, increase circulation, realign the spine (and increase the spinal range of motion), foster balance, prepare participants for the heavy daily workout sessions, and establish a spiritual connection among the treatment participants.

**Traditional spiritual practices.** The program intent was to promote good health

within a cultural context that focused on knowledge, skills, and beliefs characteristic of the Native Hawaiian culture<sup>33</sup>. The promotion of health for *kānaka maoli* requires a holistic approach—an understanding of people that encourages attention to several dimensions of functioning, including biological-physical, psychological-emotional, cognitive, behavioral, cultural-social, and spiritual.

Spirituality is an intrinsic part of humanity that inspires devotion and guides experience. There are multiple definitions of spirituality; however, the following interpretations capture some common elements:

- Spirituality is the relationship of the human person to something or someone which/who transcends self.
- Spirituality is the process in which integration occurs within the self, between the self and others and the natural world, and beyond limits of selfhood in connection with the transcendent.
- Spirituality is a search for meaning, purpose and morality in life and a striving for fulfilling relationships<sup>33</sup>.

For *kānaka maoli*, spirituality has historically been a sacred dimension of life evident in creation chants<sup>33</sup> and described in written accounts of ancient Hawaiian civilization<sup>33</sup>. Spirituality emphasizes connections as the energy source that imbues all of life, and as the affinity of

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self, others, nature, and a transcendent realm in a balanced (*pono*) manner.

However, spirituality also extends into contemporary life, including having prayer (*pule*) before meals and special events, singing or chanting (*oli*), dancing (*hula*), and sharing of compassion and love with others (*aloha*). Spirituality in contemporary life is influenced by traditional Hawaiian cosmography, as well as by doctrines of Christian religion, introduced with the arrival of the missionaries in the 1820s. In contemporary society, *kānaka maoli* may share dominant religious thinking and behavior with the general population of the United States, and thus, subscribe to Catholic and Protestant denominations as well as a variety of new sects that have developed over time<sup>33</sup>.

**Education.** As in other THD programs<sup>14</sup>, Uli'eo Koa provided cultural and health experts who presented information on health, physical fitness, nutrition, interpretation of laboratory tests, *lua*, body alignment, *kinolau* (spiritual counterparts) of food, farming, fishing, preparation of fish and foods, psychology of communication, family behaviors supporting health, Hawaiian language, and cardiopulmonary resuscitation (CPR). Uli'eo Koa also sponsored several excursions to reorient participants to the pleasures of outdoor activities (e.g., hikes, visits to Hawaiian cultural programs such as traditional fishing and farming practices) and to enjoy nature (e.g., scenic mountains, cultural-spiritual sites).

**Physician approval.** All participants were required to have signed approval from their primary care physician prior to beginning the program and participants continued contact with primary care physicians throughout the entire project. Prior to entering the program, participants on medication were advised to have their primary care physician review their medications and provide instructions on dosages in anticipation of a change in activity levels.

## Data analyses

The outcome measures were analyzed to determine the appropriate means and percents for the baseline, post-Phase I, and post-Phase II. Comparisons between baseline and post-Phase II were made using the software programs of StatView SE+Graphics and StatView II.

## Results

No participant withdrew due to adverse effects from the dietary modification or exercise interventions resulting in a sample size of 16 adults.

### Muscle strength/fitness, flexibility, and body composition

**Muscle strength and fitness.** The average muscle strengths of the left and right extremities increased 5.9% and 5.3%, respectively. Muscle strength performance for the bench press, bicep curl, and shoulder press increased during Phase I. During Phase II, however, both bench press and bicep curl muscle strength measures regressed to pre-program levels. The mean muscular strength measured by shoulder press (one-repetition maximum weight) was  $40.01 \pm 16.05$  kg at baseline,  $43.09 \pm 17.36$  kg after Phase I, and  $45.05 \pm 16.57$  kg after Phase II. The mean muscle endurance measured by push-ups (number per minute) was  $31.71 \pm 13.70$  at baseline,  $38.14 \pm 11.76$  following Phase I, and  $38.21 \pm 11.76$  after Phase II. Mean muscle endurance measured by sit-ups (number per minute) was  $34.71 \pm 16.12$  at baseline,  $38.29 \pm 12.97$  after Phase I, and  $41.36 \pm 14.45$  after Phase II.

**Flexibility.** Flexibility improvement was indicated by a 4% pre-post increase in the average cervical range of motion. The median leg deficiency among all participants averaged 3/8 of an inch at the baseline examination. After *lomilomi* treatment for three months, the leg deficiencies were balanced, indicating a correction of the spinal imbalances and increased spiral range of motion.

**Body composition.** Percent body fat composition decreased throughout the entire program: Baseline = 24.64% ( $\pm 7.46\%$ ), post-Phase I = 23.11% ( $\pm 6.13\%$ ), and post-Phase II = 22.21% ( $\pm 4.88\%$ ).

### Weight and body mass index (BMI)

Weight loss occurred over the 11-week period, with a greater decrease occurring during Phase II—the phase that offered fewer group exercise periods. The mean weights (in kg) were as follows: Baseline =  $81.65 (\pm 15.63)$ , post-Phase I =  $80.38 (\pm 15.75)$ , and post-Phase II =  $77.95 (\pm 15.10)$ . BMI also decreased across the duration of the program: Baseline =  $27.69 (\pm 3.52)$ , post-Phase I =  $27.05 (\pm 3.53)$ , and post-Phase II =  $26.27 (\pm 3.50)$ .

**In contemporary society, *kānaka maoli* may share dominant religious thinking and behavior with the general population of the United States, and thus, subscribe to Catholic and Protestant denominations as well as a variety of new sects that have developed over time.**

## Traditional cultural and spiritual belief system

The Hawaiian spiritual assessment of the modified BMMRS was administered to determine whether Uli'eo Koa may have influenced spiritual-religious beliefs and practices. Overall, the pre- and post-test assessments showed minimal differences. However, descriptive trends showed that the participants were very moderately "spiritual," but only "slightly religious." Aspects of spirituality that were emphasized included Native Hawaiian concepts such as "God/Akua as watchful, forgiving and a source of strength," and "ancestral spirits," and practices that emphasized the importance of seeking and receiving help from one's family. Finally, *kinolau* forms were generally perceived to be associated with food, and spirituality was viewed by all participants at both pre- and post-test as "always" being central to *lua* and contributing to the identity of Native Hawaiians.

## Discussion

The general results, in combination with that of Leslie (this issue) and Mokuau *et al.* (this issue), suggested that the Uli'eo Koa Program was successful in increasing the overall health of the participants (i.e., muscle strength/fitness, flexibility, weight, BMI, and other physiological indicators). The improvement in muscle strength suggested that the shoulder-resistant exercises of the agility circuit exercises may have contributed to the improved shoulder press performance. The regression to pre-program levels of the both bench press and bicep curl muscle strength at the end of Phase II may have been due to the increased concentration on cardiovascular, endurance, aerobic, and lower-body exercises to improve overall health. The general lack of pre-post differences on spirituality may have been due to a ceiling effect whereby participants measured very high at baseline.

## Limitations

There are several limitations to the present study. (1) The sample size was relatively small ( $n = 16$ ) decreasing the statistical power. (2) The participants in the Uli'eo Koa Program (i.e., only adults; a 3-to-1 ratio of males to females; members of a traditional Hawaiian fighting art organization) were not representative of all *kānaka maoli*. The results of the present investigation are therefore generalizable to only the population that the sample represents. (3) The statistical analyses were limited to simple methods designed for professional specialties. (4) The absence of a control group (e.g., cohort sample that is exposed to non-culturally sensitive diet and exercise program) precludes more definitive conclusions about the

efficacy of individual components of the Uli'eo Koa Program. (5) Further long-term maintenance data are needed to determine the longevity of the health improvements that were obtained up to the end of Phase II.

## Implications

Despite the limitations noted above, tentative implications can be put forth. The overall improvement in health status seen within the 11-week program may suggest the efficacy of the combined intervention of diet and physical exercise. In addition, incorporating a traditional Hawaiian approach may have increased the appeal of the program for the participants.

The finding of greater weight loss in Phase II among this relatively fit adult group runs counter to results of previous THD programs that were conducted for very overweight and morbidly obese participant. For these latter programs, greater weight loss was obtained in the initiation period. The findings of the Uli'eo Koa Program

may suggest greater maintenance of health improvements.

The positive changes reflected in the present study suggest that modern-day fit *kānaka maoli* can achieve a holistic-spiritual orientation and maintain physical fitness by undertaking and sustaining a daily regimen of appropriate diet and exercise similar to that provided by the Uli'eo Koa Program. Further research is needed using a larger and more representative sample of *kānaka maoli* employing a longitudinal design with a comparison control group. This would allow for more definitive conclusions about the efficacy of the Uli'eo Koa Program.

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