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A Family and Community Focused Lifestyle Program Prevents Weight Regain in Pacific Islanders: A Pilot Randomized Controlled Trial

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Abstract

Preventing weight regain after the loss of excess weight is challenging for people, especially for ethnic minorities in the United States. A 6-month weight loss maintenance intervention designed for Pacific Islanders, called the PILI Lifestyle Program (PLP), was compared with a 6-month standard behavioral weight loss maintenance program (SBP) in a pilot randomized controlled trial using a community-based participatory research approach. Adult Pacific Islanders (N = 144) were randomly assigned to either PLP (n = 72) or SBP (n = 72) after completing a 3-month weight loss program. Successful weight maintenance was defined as participants' postintervention weight change remaining ≤3% of their preintervention mean weight. Both PLP and SBP participants achieved significant weight loss maintenance ($p \leq .05$). Among participants who completed at least half of the prescribed sessions, PLP participants were 5.1-fold (95% confidence interval = 1.06, 24; $p = .02$) more likely to have maintained their initial weight loss than SBP participants. The pilot PLP shows promise as a lifestyle intervention to address the obesity disparities of Pacific Islanders and thus warrants further investigation.

Keywords

weight loss maintenance, weight regain, Pacific Islanders, weight loss, ethnic minority health, obesity

The maintenance of weight loss, or preventing weight regain, is challenging for many people who lose excess weight. They often begin to regain weight within 6 to 12 months of making this effort (Perri & Corsica, 2002). Many regain one third of their weight within the first year and return to baseline by the second year (Curioni & Lourenco, 2005; Turk et al., 2009). There are many health benefits to losing excess weight and keeping it off for people who are overweight and obese, such as improving blood pressure, physical functioning, and diabetes management, if not its prevention (Knowler et al., 2009; Martin et al., 2001; Norris et al., 2005; Vidal, 2002).

Weight loss programs that focus on diet, exercise, and behavior modification can lead to a clinically meaningful weight loss of 5% to 10% (Knowler et al., 2002; Wing, 2004). Many of these weight loss programs typically include a maintenance phase, between 6 and 12 months after weight loss treatment, that involves monthly sessions that are follow-ups to the weight loss sessions (Perri & Corsica, 2002). Despite having maintenance sessions, many people still have difficulty maintaining their weight loss. Wing and colleagues suggest that weight loss maintenance sessions are not as efficacious as could be because they are mere extensions of the weight loss program (Wing, Tate, Gorin, Raynor, & Fava, 2006).

Researchers suggest that different strategies are needed to prevent weight regain from those used to achieve initial weight loss (Elfhag & Rossner, 2005; Perri & Corsica, 2002). Studies demonstrate the efficacy of interventions designed to prevent weight regain. Using a self-regulation approach, the Study to Prevent Regain (STOP Regain) found that an 18-month face-to-face program and Internet-based program

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were superior to a newsletter control group in 314 people who had already lost 10% of body weight using various weight loss means (Wing et al., 2006). Within 6 months, the researchers found significant differences in weight loss maintenance in which the face-to-face participants were less likely to regain weight (–0.02 ± 4.3 kg) than Internet-based (1.2 ± 4.2 kg) and control participants (1.5 ± 3.6 kg).

Wing and Jeffery (1999) examined the effects of recruiting participants alone or with friends/family members who were assigned to either standard behavior therapy or behavior therapy with social support training. At 6-month follow-up, they found participants who were recruited with family/friends and who also received social support training were better able to maintain their weight loss (66%) than those who were recruited alone and whose support person received the standard behavior therapy (24%). This demonstrates the benefits of recruiting participants with a support person into a weight loss maintenance program. It also demonstrates, along with the findings of the STOP Regain study, that the positive effects of an intervention focused on weight regain prevention, compared with a standard behavioral intervention, can be observed within 6 months following initial weight loss.

Although the studies reviewed here are promising, weight loss maintenance is challenging for many non-White ethnic populations. They tend to lose less weight and are more likely to regain their weight than Whites given the same obesity intervention, most likely due to socioeconomic/sociocultural factors affecting obesity treatment (Kumanyika, 2002). Many ethnic minorities in the United States are more likely to be economically disadvantaged, experience socioecological stressors, and live in obesiogenic environments that increase their risk for obesity and related disorders (Kumanyika, 2002; Mau et al., 2008). Among the factors associated with weight loss maintenance, family and socioenvironmental factors play a key role (Elfhag & Rossner, 2005; Tinker & Tucker, 1997), especially among economically challenged ethnic minority populations (E. M. Davis, Clark, Carrese, Gary, & Cooper, 2005). The maintenance of weight loss is complicated by many psychosocial (e.g., acculturation challenges), family (e.g., larger families to support and maintain), and work (e.g., lower paying jobs) stressors and by the types of living environments (e.g., poor access to healthier food options). Thus, culturally relevant interventions designed for weight loss maintenance in ethnically diverse populations are needed, especially those that focus on family and community supports.

To address this need for Pacific Islanders, such as Native Hawaiians, Samoans, Chuukese, and Filipinos, a community-based participatory research (CBPR) partnership was formed called the Partnership to Improve Lifestyle Interventions (PILI) ‘Ohana Project (POP). CBPR is a research approach that actively/equitably involves community and academic partners in addressing health disparities (Wallerstein & Duran, 2006). The POP is composed of five community organizations serving Pacific Islanders in Hawai‘i and scientists from the University of Hawai‘i. The POP’s CBPR partnership is described in more detail in Nacapoy et al. (2008). The need for culturally informed obesity interventions for Pacific Islanders in the United States is evident in their greater overweight/obesity (82%) and diabetes prevalence (22 %) compared with other ethnic populations and the larger U.S. population (Grandinetti et al., 2007; Mau, Sinclair, Saito, Baumhofer, & Kaholokula, 2009).

The POP’s partnership conducted a comprehensive obesity assessment of Pacific Islander communities in Hawai‘i, which included focus groups, informant interviews, and environmental evaluations. The methods and results of these assessments have been described by Nacapoy et al. (2008), Mau et al. (2008), and Mau et al. (2010). Overall, it was found that Pacific Islanders’ immediate social (family/friends) and physical (e.g., access to parks/gyms) environments were essential to their weight loss maintenance efforts by either encouraging or inhibiting their maintenance of positive behavior change. This information, with findings from the scientific literature, informed the design of a novel family and community focused weight loss maintenance program called the PILI Lifestyle Program (PLP). The behavioral strategies and foci of the PLP are consistent with empirically supported behavior change theories that emphasize the modeling/reinforcing effects of a person’s social and physical environment on individual behavior (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2003). It also is consistent with Pacific Islanders’ cultural beliefs/values where both immediate and extended families (‘ohana) are important to daily functioning and decision making (Kaholokula, Saito, Mau, Latimer, & Seto, 2008).

Using a CBPR approach, the POP’s partnership conducted a pilot randomized controlled trail (RCT) to test the effectiveness of the PLP as a community-based and community-led weight loss maintenance intervention for Pacific Islanders. We report here the result of this RCT that examined the effects of the PLP in achieving weight loss maintenance compared with a standard behavioral weight loss maintenance program (SBP) over a 6-month period. Study participants completed a 3-month intervention designed to initiate weight loss, which was an adaptation of the Diabetes Prevention Project’s Lifestyle Intervention (DPP-LI) by the POP community–academic partnership to the Pacific Islander population (Mau et al., 2010).

Method

Participants

Pacific Islander participants ($N = 144$) were those who completed a 3-month DPP-LI adapted weight loss program and willing to enroll in a 6-month weight loss maintenance program between 2007 and 2008. Only 15% ($n = 25$) of the

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participants who completed the DPP-LI opted not to continue on into this weight maintenance intervention study. Participants who declined to participant in the weight maintenance study did not differ statistically in terms of mean weights and body mass index (BMI) values from those who were randomized into the study ($p > .05$). Other preweight loss baseline characteristics and weight loss intervention outcomes for this cohort can be found in Mau et al. (2010). Participants entered the weight loss maintenance phase with a mean weight loss of 1.6 kg ($SD = 3.7$) and interquartile range of 4.5 kg.

The eligibility criterion for this study was completion of the 3-month DPP-LI to initiate weight loss. The criteria for participation in the 3-month DPP-LI were the following: (a) Pacific Islander (Native Hawaiian, Chuukese, Samoan, and Filipino), (b) ≥18 years or older, (c) overweight/obese defined as BMI ≥25 or ≥23 (for Filipinos only; Inoue & Zimmet, 2000), (d) willing/able to perform 150 minutes of brisk walking per week (or equivalent) and a dietary regimen to induce weight loss of 1 to 2 lbs/week, and (e) identify at least 1 family member or friend to provide support throughout the program. Participants with a medical condition that might affect their ability to safely complete the intervention or their ability to exercise had obtained written permission from a physician before beginning weight loss effort.

Pacific Islanders in the United States includes people with origins in the original inhabitants of the Polynesian, Micronesian, or Melanesian islands (Mau et al., 2009). The distribution of participants across the specific Pacific Islander groups represented in this sample was as follows: Native Hawaiians ($n = 75$), Samoans ($n = 16$), and Chuukese ($n = 38$). For the purpose of our study, Filipinos (often classified as "Asian") were included ($n = 9$) in this study given their similar risk profile as Pacific Islanders for obesity-related diseases in Hawai'i (Grandinetti et al., 2007). A small minority of participants included Pacific Islanders who did not report their specific ethnicity ($n = 2$) and non–Pacific Islanders ($n = 4$). All Native Hawaiian participants were native speakers of the English language. The English speaking fluency and comprehension of the other Pacific Islander participants varied but were at a level adequate for participation in the study based on observation by a community interviewer during the eligibility screening of each participant for entry into the 3-month DPP-LI-adapted intervention.

Study Design

Guiding the design of our pilot RCT was a CBPR approach in which the POP's community partners worked side by side with the academic partners in designing the PLP and in determining the study design as described in detail by Nacapoy et al. (2008) and by Mau et al. (2010). Briefly, we designed a pilot RCT to test the efficacy of the PLP delivered face to face compared with the SBP delivered over telephone as depicted in Figure 1. Because this was a pilot study to determine the feasibility and efficacy of a novel intervention (PLP), we purposefully limited the interventions' length to 6 months. The findings of past studies suggest that differences between two interventions in weight regain can be captured within 6 months following initial weight loss (Wing et al., 2006; Wing & Jeffery, 1999).

The participants were enrolled, given the interventions, and assessed across the five POP community organizations, all of which were completed within their respective community settings and by their own community recruiters, assessors, and peer educators. The five community organizations were Kokua Kalihi Valley Family Comprehensive Services (KKV), Kalihi-Pālama Health Center (KPHC; community health centers), Ke Ola Mamo Native Hawaiian Health Care System (KOM), Kula no Nā Po'e Hawai'i (KULA; a Hawaiian Homestead organization), and Hawai'i Maoli (HM) of the Association of Hawaiian Civic Clubs. For more details about these organizations, see Nacapoy et al. (2008).

Participants were randomly assigned in blocks of six (Efird et al., 2007), stratified by community organization, to one of two weight loss maintenance programs: (a) PLP ($n = 72$) or (b) SBP ($n = 72$). Information on weight (kg) was collected from participants at the beginning of the weight loss maintenance intervention (immediately following randomization; $N = 144$) and 6 months later for those who completed the interventions ($N = 100$). A $10 store gift card was given to participants for attending each assessment occasion.

This study was approved by the institutional review boards of the University of Hawai'i at Mānoa and the Native Hawaiian Health Care System. Informed consent was obtained from all participants. A data safety monitoring board (DSMB), which consisted of one cardiologist, two clinical health psychologists, and one nurse educator, was convened to ensure participants' safety and to monitor possible adverse events due to the intervention.

Interventions

The PLP was composed of six monthly sessions, lasting about 1½ hours in length each, delivered in groups (6-10 participants) by a trained community peer educator in the community setting. Table 1 summarizes the foci of each session and the order of their delivery. For Chuukese and Filipino participants at the KPHC site, the sessions were delivered in their native language by a bilingual community peer educator. For Chuukese and Samoan participants at the KKV site, the sessions were delivered both in English and concurrent translation into the Chuukese and Samoan language by a bilingual translator. Thus, each session at KKV took an average of 2 hours in length. To ensure the best approximation from English to these other languages, the bilingual translators were all health professional specially trained to translate health information, and they based their translations on the English version of the intervention materials.

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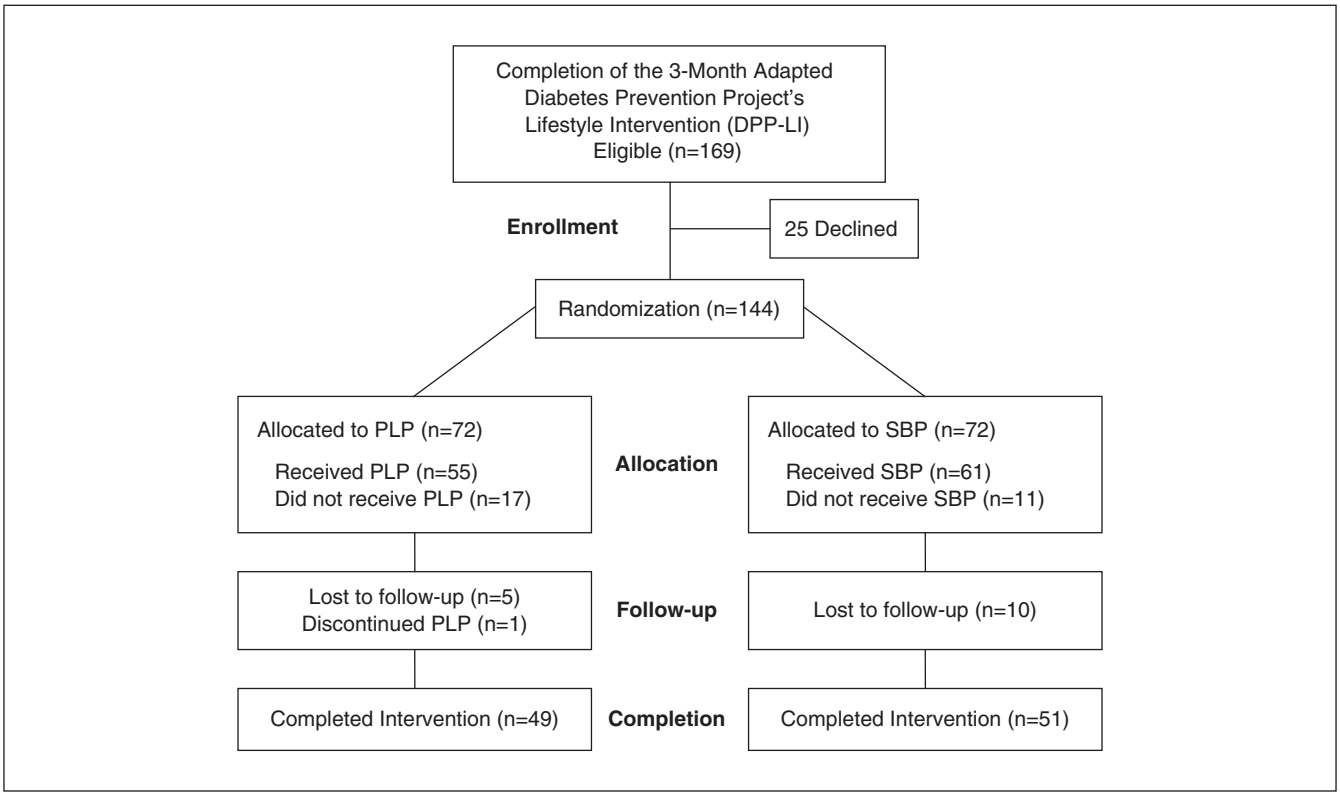

Figure 1. Consort diagram showing the flow of participants in the randomized trial

Table 1. Summary of the Sessions Delivered to the Participants by Intervention Group

Month	PILI Lifestyle Intervention (PLP)	Standard Behavioral Follow-up Program (SBP)
1	Identify healthy lifestyle values shared by all family members	Review of healthy eating and physical activity goals
	Family goal setting exercise	Review strategies to stay motivated
	Schedule family free time for activities	Assist in problem-solving/goal modification
2	Family eating history exercise	Review of healthy eating and physical activity goals
	Family meal planning exercise	Review strategies to stay motivated
	Identify community resources to support healthy lifestyle plan	Assist in problem-solving/goal modification
3	Identify physical/recreational activities for the family	Review of healthy eating and physical activity goals
	Family activity planning exercise	Review strategies to stay motivated
	Identify community resources to support family activities	Assist in problem-solving/goal modification
4	Identify ways the family can deal with difficult social events involving food	Review of healthy eating and physical activity goals
	Identify family's cultural beliefs that relate to healthy living	Review strategies to stay motivated
	Identify ways to increase social support in the home and in the community	Assist in problem-solving/goal modification
5	Managing negative thoughts/emotions exercise	Review of healthy eating and physical activity goals
	Increase family's understanding of how negative thoughts/emotions can affect healthy living goals	Review strategies to stay motivated
	Identify community resources to help manage negative thoughts/emotions	Assist in problem-solving/goal modification
6	Review of lessons, family action plans, and goals	Review of healthy eating and physical activity goals
	Plan next steps in maintaining a healthy lifestyle	Review strategies to stay motivated
		Assist in problem-solving/goal modification

Note. For the SBP participants, the individual review of their healthy eating and physical activity goals included identifying behavior change strategies that they found helpful and assisting in modification of their goals if needed.

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Each PLP session was accompanied with education materials, handouts, action plans, and homework assignments. The community peer educators were trained on the delivery of each session, and a PLP manual was used to ensure standardization of delivery and delivery fidelity. Participants were asked to identify and invite at least one family member or friend to attend each session with them but it was not mandatory for participation. The foci and strategies of the PLP were identified by community assessment and with input from the community investigators (Mau et al., 2010).

PLP was designed to build on the behavioral weight loss strategies, diet, exercise, and stress control strategies learned, and the individual action planning practiced, in the 3-month DPP-LI weight loss program (Mau et al., 2010). Family and community activities are also incorporated, designed to build and identify a supportive weight loss maintenance environment specific to each participant. The family activities were designed to encourage and elicit support from family/friends for the participants' identified healthy lifestyle goals. Activities included family meal and physical activity planning, identifying types of support needed (e.g., instrumental, emotional) from family and friends, how to effectively communicate one's healthy lifestyle goals, and how to deal with challenging family/social situations (e.g., social gatherings). Community support activities involved identifying naturally occurring resources (e.g., parks and healthy eating establishments) in their respective communities and sharing what they identified with other group members. The family and community exercises were to be completed between monthly sessions and designed to keep the participants active in their weight loss maintenance.

The SBP was composed of six monthly phone call follow-up sessions, lasting 15 to 30 minutes in length each, delivered individually by a trained community peer educator. Table 1 summarizes the foci of each follow-up session. For Chuukese, Filipino, and Samoan participants at the KPHC and KKV, these phone call sessions were delivered to them in their native language by a trained bilingual community educator in the same manner described earlier. Each phone call was scripted to ensure standardization of delivery. SBP was designed to follow-up on the behavioral weight loss strategies, diet, exercise, and stress control strategies learned and the individual action planning practiced in the 3-month DPP-LI weight loss program. The follow-up calls included a review of weight loss strategies and the DPP-LI educational materials and focused on assisting participants with maintaining or modifying their individualized healthy lifestyle plan. SBP participants also received mail-out reminders of diet, physical activity, and stress managements facts previously learned during the 3-month DPP-LI weight loss program.

The primary objective was for participants' postintervention weight change to be ≤3% of their preintervention mean weight (weight prior to initiating weight loss efforts) as recommended by Stevens, Truesdale, McClain, and Cai (2006). The primary outcome of weight (kg) was measured using an electronic scale (Tanita BWB800AS; Arlington Heights, IL) at baseline and 6-month follow-up. The weights were measured and collected by trained community assessors according to standardized data collection protocols. Two weight measurements were taken of each participant at each assessment point, and the average of the two were used in analysis.

Statistical Analysis

For this study, baseline was defined as the time point immediately following randomization of participants into the weight loss maintenance intervention. Differences in baseline characteristics of study participants by intervention group and by completion of prescribed sessions (i.e., those who completed at least half of all prescribed sessions vs. those who did not) were examined using Fisher's exact (categorical variables) and *t* (continuous variables) tests. Variables found to differ significantly between intervention groups were included as covariates in the logistic regression analysis. Blackwelder's (1982) method was used to test for equivalence of pre- and postintervention weights. Successful weight maintenance was defined as participants' 6-month postintervention weight change remaining ≤3% of their preintervention mean weight (Stevens et al., 2006). A relative indifference ratio (RIR) was computed as the odds ratio for weight maintenance (Cook, 2002; Senn, 1999). Logistic regression was used to compute RIR estimates adjusted for sex and community organization. A likelihood ratio test (LRT) was used to compute a *p* value for the null hypothesis that RIR equaled unity. In all analyses, dropouts were assumed to have regained 0.3 kg per month as used in similar studies (Wing et al., 2006). Statistical tests were two-sided and considered significant at $p \leq .05$.

Results

Baseline Characteristics

The pre–weight loss maintenance program characteristics of participants ($N = 144$) who were randomized are shown in Table 2. There were significant differences between the study groups in sex (more females in the SBP group) and distribution across community organization. Although PLP participants were heavier, there was no statistically significant difference in mean weight.

Retention and Adherence

The retention of participants between interventions was comparable with 68% in PLP and 71% in SBP (Figure 1). Approximately 47% of PLP versus 58% of SBP participants

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Table 2. Baseline Characteristics of the Study Participants by Intervention Group[a,b]

Characteristic	PLP ($N = 72$), *n* (%) or $M \pm SD$	SBP ($N = 72$), *n* (%) or $M \pm SD$
Ethnicity		
Chuukese	14 (19)	24 (33)
Filipino	5 (7)	4 (6)
Native Hawaiian	39 (54)	36 (50)
Samoan	10 (14)	6 (8)
Other Pacific Islander	2 (3)	0 (0)
Non–Pacific Islander	2 (3)	2 (3)
Community organization		
Kula no Nā Po'e Hawai'i[c,d]	21 (29)	9 (13)
Hawai'i Maoli[d]	8 (11)	12 (17)
Ke Ola Mamo	17 (24)	20 (28)
Kokuka Kalihi Valley	12 (17)	11 (15)
Kalihi-Pālama Health Cntr[c]	14 (19)	20 (28)
Age (years)[e]	50 ± 14	49 ± 15
Females[f]	56 (78)	66 (92)
Education level[e]		
Less than high school	16 (23)	18 (25)
High school diploma/GED	16 (23)	16 (22)
Some college/ tech.	20 (28)	21 (29)
College degree	19 (27)	17 (24)
Marital status		
Never married	16 (22)	21 (29)
Currently married	40 (56)	32 (44)
Disrupted marital status	16 (22)	19 (26)
Weight (kg)[g]	107 ± 32	99 ± 27
BMI	40 ± 9.6	39 ± 8.3

Note. PLP = PILI Lifestyle Program, SBP = Standard Behavioral Follow-up Program; BMI = body mass index.
a. Baseline = time point immediately following randomization into weight loss maintenance intervention.
b. At end of weight loss treatment program (prior to weight loss maintenance intervention).
c. Fisher's exact test, Kula versus Kalihi-Pālama, $p = .0257$.
d. Fisher's exact test, Kula versus Hawai'i Maoli, $p = .0451$.
e. Education level and age unknown for 1 participant.
f. Fisher's exact test, $p = .0353$.
g. The difference in baseline weights ($\mu_d = 7.0$, 95% confidence interval = −2.7, 17) did not differ statistically from zero ($p = .16$).

completed at least half of their prescribed sessions; however, the 95% confidence interval (CI) for the difference in proportions included zero. Of the baseline characteristics, community organization, $\chi^2(4, N = 144) = 25.55$, $p < .0001$, and age, $t(142) = -3.26$, $p = .0014$, were significantly associated with sessions completed across both intervention groups. Collectively, the two community health centers (KKV and KPHC) had the most number of participants (46%) who completed at least half of the sessions across the two intervention groups (mean age = 45.1; $SD = 15.3$). Older participants were more likely to complete at least half of the prescribed sessions (mean age = 53.7; $SD = 12.4$) compared with younger participants. There was no statistically significant difference between groups in mean baseline weights (kg) among the participants who dropped out or failed to complete at least half of the prescribed sessions (mean ± SD; PLP = 105 ± 27, SBP = 101 ± 31, $p = .54$).

Table 3. Mean Weight Gain at 6-Month Follow-up by Intervention Group

Intervention Group[a]	*M* (*SD*)	95% CI	Test for Equivalent Pre–Post Weight Maintenance[b]
PILI lifestyle program (PLP)	0.075 kg (4.7 kg)	−1.0, 1.2	Equivalent ($p \leq .05$)
Standard behavioral weight loss maintenance program (SBP)	0.581 kg (2.7 kg)	−0.06, 1.2	Equivalent ($p \leq .05$)

Note. *M* = mean; *SD* = standard deviation; CI = confidence interval.
a. Dropouts are assumed to have regained 0.3 kg per month.
b. Indifference region (3% mean baseline weight), $\Delta_{PLP} = -3.20$ to $+3.20$ kg, $\Delta_{SBP} = -2.98$ to $+2.98$ kg.

Weight Loss Maintenance

Both interventions achieved statistically significant weight loss maintenance ($p \leq .05$; Table 3). However, PLP participants were 2.5-fold (95% CI = 0.84, 7.2; LRT $p = .091$) more likely to have maintained their preintervention weight than SBP (i.e., weight change ≤3% of their preintervention mean weight; Table 4). Among the 76 (of the 144) participants who completed half or more (≥3) of their prescribed lessons, PLP participants were 5.1-fold (95% CI = 1.1, 24; LRT $p = .024$) more likely to have maintained their preintervention weight compared with SBP participants (Table 5).

Adverse Events

Potential medical adverse events were monitored throughout the trial and reviewed by the DSMB. No serious adverse events were determined to be due to the interventions.

Discussion

We found that both the PLP and SBP helped participants maintain their initial weight loss over a 6-month period.

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Table 4. Participants Who Maintained Baseline[a] Weight at 6-Month Follow-up by Intervention Group

Intervention Group[b]	PLP (n = 72)	SBP (n = 72)
Successful weight maintenance[c]	64 (52)	60 (48)
Unsuccessful weight maintenance[c]	8 (40)	12 (60)
Adjusted RIR = 2.5 (95% CI = 0.84, 7.2; LRT p = .0910)[d]		

Note. PLP = PILI Lifestyle Program, SBP = Standard Behavioral Follow-up Program; RIR = relative indifference ratio; CI = confidence interval; LRT = likelihood ratio test. Data shown as *n* (row %).
a. Baseline = time point immediately following randomization into weight loss maintenance intervention.
b. Dropouts are assumed to have regained 0.3 kg per month.
c. Weight change was computed as participants' weight at end of weight loss maintenance intervention (6-month follow-up) minus their weight at the beginning of weight loss maintenance intervention (baseline). Successful weight maintenance was defined as weight change remaining below the upper limit of the Δ indifference region (3% mean baseline weight), Δ_{PLP} = −3.20 to +3.20 kg, Δ_{SBP} = −2.98 to +2.98 kg.
d. Logistic regression model, RIR adjusted for sex and community organization.

Table 5. Participants With High Attendance[a] Who Maintained Baseline[b] Weight at 6-Month Follow-up by Intervention Group

Intervention Group	PLP (n = 34)	SBP (n = 42)
Successful weight maintenance[c]	31 (50)	31 (50)
Unsuccessful weight maintenance[c]	3 (21)	11 (79)
Adjusted RIR = 5.1 (95% CI = 1.06, 24; LRT p = .0239)[d]		

Note. PLP = PILI Lifestyle Program, SBP = Standard Behavioral Follow-up Program; RIR = relative indifference ratio; CI = confidence interval; LRT = likelihood ratio test. Data shown as *n* (row %).
a. High attendance = completed at least half (≥3) of their prescribed intervention sessions.
b. Baseline = time point immediately following randomization into weight loss maintenance intervention.
c. Weight change was computed as participants' weight at end of weight loss maintenance intervention (6-month follow-up) minus their weight at the beginning of weight loss maintenance intervention (baseline). Successful weight maintenance was defined as weight change remaining below the upper limit of the Δ indifference region (3% mean baseline weight), Δ_{PLP} = −3.20 to +3.20 kg, Δ_{SBP} = −2.98 to +2.98 kg.
d. Logistic regression model, RIR adjusted for sex and community organization.

However, between-intervention comparison revealed that more PLP participants were better able to maintain their initial weight loss compared with SBP participants within a 6-month pilot intervention period. This difference in weight loss maintenance was considerably larger among participants who completed half or more of the prescribed intervention sessions. The PLP appears to be effective for Pacific Islanders (i.e., Native Hawaiians, Samoans, Chuukese, and Filipinos) in preventing weight regain after intentional weight loss, with much stronger effects noted for those who attended at least half or more of the sessions.

Our findings are consistent with the 6-month results of Wing and Jeffery (1999) and Wing et al. (2006), in which their interventions, designed to prevent weight regain, performed better than either a standard behavior intervention or nonintervention control in a period of only 6 months following initial weight loss. Over a longer period of time (12-18 months) their interventions continued to perform better than comparison groups. This gives us confidence that our pilot PLP will perform as well when expanded over a longer time period and when continued to be delivered by community peer educators. Six months was sufficient to establish the preliminary effectiveness of the PLP for Pacific Islanders. Notwithstanding, a longer and more intense version of the PLP will likely yield better weight loss maintenance, since these factors have been shown to play an important role in controlling obesity (Perri & Corsica, 2002). Efforts are under way to expand the PLP into an 18-month weight loss maintenance intervention and to test its efficacy.

We employed a CBPR approach whereby community members served as coresearchers (with equal decision making) in all aspects of designing and testing the intervention, in delivering the interventions via community peer educators within their respective communities, and in having community researchers collect baseline and outcome data based on standardized protocols. This degree of involvement by community researchers is reflected in the list of authors who contributed to this report. What is also noteworthy is that the interventions were delivered by community peer educators who ranged in experience from first timers in delivering an intervention (from KULA and HM) to more experienced community health workers (from KOM, KKV, and KPHC). In a review of past studies that involved different group-led obesity interventions, no significant differences in weight loss outcomes could be identified between lay and professional group leaders (Anderson et al., 2009). Reviews of RCT studies with community health workers as interventionists find that they can improve health behavior outcomes because they are better able to relate to participants by making health education more culturally, ethnically, and geographically relevant (Gibbons & Tyus, 2007; Norris et al., 2006; Rowe, de Savigny, Lanata, & Victoria, 2005; Walters & Simoni, 2002).

In examining what baseline characteristics of our participants were associated with better participation in the prescribed sessions, we found that the community organization, from which they were recruited and received the interventions, and age were associated with the number of sessions they received. The two community health centers of our CBPR partnership (KKV and KPHC), collectively, had the most participants across the two interventions who completed at least half of all the sessions. We are unable, with the data from our study, to ascertain why adherence to the prescribed sessions were higher for the community health centers, but it might have something to do with the fact that they regularly provide clinical care and health education. The

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older adults (compared with younger adults) in our study were also more likely to participate in at least half of the sessions. Again, we are unable to ascertain why this may be so from the data we collected. Notwithstanding, these findings suggest that different strategies, based on type of organization delivering the intervention and age, might be needed to ensure that participants of a lifestyle intervention are able to adhere to its prescribed sessions, given that such adherence has been associated with better weight loss maintenance outcomes in this study and others (Perri & Corsica, 2002).

It is important to note that many of the Pacific Islanders in our study, across the two intervention groups, were morbidly obese (BMI ≥ 40) at baseline, despite having just completed a 3-month weight loss intervention. Mau et al. (2010) found a significant reduction in weight, albeit modest, between baseline measures and 3-month follow-up (−1.8 kg) in the cohort of participants from which the participants of this study were recruited. Despite the modest weight loss among participants who entered into our weight loss maintenance study, those who were randomized into the PLP were less likely to regain their weight compared with those who were randomized to SBP. This finding points to the benefits of the PLP in preventing not only weight regain in people who lost excessive weight but perhaps its potential for preventing excessive weight accumulation over time in people most at risk for overweight and obesity.

Given the pilot nature of our study, there are methodological limitations. Our "per protocol" results, analyzing only participants who completed at least half (≥3) of their lesson plans, must be interpreted cautiously. Departure from an intention-to-treat principle distorts the randomization process and may lead to unintended bias and counterintuitive results such as Simpson's paradox (i.e., the success observed in different groups can be reversed when the groups are combined; Wagner, 1982). It is possible that participants who dropped out or failed to complete at least half of their lesson plans were more resistant to intervention; however, there was no statistically significant difference in their mean baseline weights. Furthermore, our intention-to-treat analysis also produced a positive relative odds estimate, although the effect size was lower than the "per protocol" result (i.e., 2.5 vs. 5.1). Finally, males (only 15%) were underrepresented in our study, which limits its generalizability to the larger Pacific Islander male population.

It is also worth noting that the mean weight at baseline differed between PLP and SBP participants, with those in the PLP being heavier on average. However, this difference was not statistically significant ($p = .16$). Furthermore, because we assessed weight loss maintenance based on the proportion of individuals who did not exceed a 3% increase in their baseline weight (i.e., the range was −3.20 to +3.20 kg for PLP vs. −2.98 to +2.98 kg for SBP), the fact that the average mean weight between PLP and SBP participants were different at the start is not likely to have affected the observed outcomes. The successful weight loss maintenance measure we used (≤3% of initial weight) applied to both PLP and SBP participants.

Summary

Pacific Islanders are fast-growing population in the United States with continued immigration from Pacific Islands such as Western Samoa and the six U.S. Affiliated Pacific Basin Jurisdictions (e.g., American Samoa, Guam, and Federated States of Micronesia; Grieco, 2001). Also on the rise in these populations are obesity and obesity-related disorders (e.g., diabetes; J. Davis et al., 2004). Hence, culturally relevant obesity interventions are much needed for Pacific Islanders. The PLP shows promise as an intervention to prevent excessive weight regain in Pacific Islanders. Because the PLP focuses on family and community factors that affect a person's adoption and maintenance of healthy lifestyle changes, it also may show promise as an effective obesity intervention for other ethnic groups. Thus, the PLP warrants further examination in both Pacific Islanders and other ethnic populations. Finally, the use of a CBPR approach in designing, delivering, and testing the PLP and SBP interventions supports its strong applicability in both developing a culturally relevant community based and led intervention and testing its efficacy via a RCT as well as its effectiveness in a real-world setting.

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