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# Effect of a short-duration culturally tailored community-based diabetes self-management intervention for Korean immigrants: A Pilot Study

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## Abstract

**Purpose—**The purpose of this pilot study is to assess the effectiveness, feasibility, and acceptability of a short-duration culturally tailored community-based diabetes self-management program (CTCDSP) for Korean immigrants with type 2 diabetes delivered at a non-clinic affiliated community center.

**Methods—**Forty-one Korean adults with type 2 diabetes participated in a 2-session CTCDSP delivered by a bilingual nurse practitioner at a Korean community center. Outcome measures included biological, behavioral, general health well-being, diabetes knowledge, and self-efficacy assessed at baseline, post-education, and 3 months follow-up. Repeated-measures ANOVAs were used to explore mean differences in outcomes across the three assessment points.

**Results—**From baseline to 3-month follow-up assessment, participants exhibited significant improvement on several physiological and behavioral measures. Mean levels of hemoglobin A1C and waist circumference decreased, while high-density lipoprotein levels increased. Additionally, participants reported an increase in weekly feet checks, and there was a trend increase in participants' reported frequency of exercise activities. The feasibility of the CTCDSP was established and participant satisfaction with the program was high.

**Conclusions—**A short-duration CTCDSP may be an effective, feasible, and favorably-received approach to improving diabetes outcomes in Korean and potentially other underserved ethnic minority immigrants who have limited access to mainstream clinic-based diabetes self-management programs.

### Keywords

diabetes self-management; education intervention; Korean immigrants

The prevalence of type 2 diabetes is rising among Korean Americans and is thought to be at least twice that of the white population.[1] According to a health survey in a west coast state where a large number of Asian Americans live,[2] the highest rate of increase in diabetes prevalence between 2003-2005 was observed among Koreans (4.4% to 7.5%), compared to Filipinos (8.3% to 8.7%) and Vietnamese (6.7% to 7.0%), while the prevalence in Chinese went down (4.8% to 4.4%).[3] Despite rising prevalence of type 2 diabetes and studies

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reporting suboptimal management of glucose and cardiovascular risk factors in this group,[4] information about diabetes self-management and education in Korean immigrants is scanty.

Although hospitals and clinics offer diabetes self-management programs, such programs remain difficult for ethnic minorities, especially immigrant groups, to access, largely due to language barriers and financial constraints.[5] In addition, traditional American diabetes management strategies are often perceived by ethnic minorities to be culturally insensitive and have thus been largely ineffective.[6] These reports are highly relevant to Korean immigrants because approximately two-thirds of Korean immigrants are first generation[7] and about 90% of first generation Korean immigrant adults are reported to have language barriers.[8] In addition, Korean adults are the most likely to be uninsured among Asian subgroups and the most likely to be without a usual place for health care,[2,9] further limiting this group's ability to access mainstream health information and education necessary for optimal diabetes self-management.

Culturally sensitive community-based diabetes self-management interventions have shown benefits for Latino, Chinese, and Korean adults.[8,10-11] However, most of these programs require several weeks of participation and some are quite resource intensive (e.g., home glucose monitoring with tele-transmission, one year intensive series),[8,11] limiting the programs' utility and feasibility for implementation at a community site with no clinic affiliation and no external support for personnel and technology. The purpose of this pilot study is to assess the effectiveness, feasibility, and acceptability of a short-duration (a two-session) two-session culturally-tailored community-based diabetes self-management program delivered at a non-clinic affiliated community center.

## Methods

### Study design, setting, and participants

A single group pretest and posttest design was used to address study aims. A sample of 58 Korean immigrant adults was recruited from a Korean community on the West Coast using flyers, center newsletters, and Korean newspapers. Three individuals were deemed ineligible upon arrival to the first session, as they had not actually been diagnosed but only thought that they had type 2 diabetes. Two individuals did not show up to the first session. Therefore, 53 eligible participants enrolled in the study.

Based on previous published pilot studies with similar nature, it was estimated that a total of 28 participants provided 80% power for detecting medium pre-post effect size on changes in hemoglobin A1C. Oversampling by almost double helped to account for potential attrition, although the retention in our study was excellent, at 96% through the completion of the education intervention. Inclusion criteria included the following: 1) 21-80 years of age and 2) diagnosed with type 2 diabetes for at least a year. The study procedures were approved by a university institutional review board, and all participants provided written informed consent.

### Description of the culturally tailored Intervention

The intervention consisted of two sessions of diabetes self-management education which were led by an experienced bilingual family nurse practitioner. The first session lasted 1.5 hours and the second session, which occurred 2 weeks later, lasted 2.5 hours. Both sessions were held in a classroom at the community center. A third follow-up session was conducted 3 months post-intervention solely to assess long-term outcomes following the education intervention and thus no education was provided at this visit.

The education was based on content considered essential by the American Diabetes Association (ADA) and the National Diabetes Education Program[12-13] and included pathophysiology of diabetes, complications, treatment modalities, medication, diet, exercise, and self-management strategies. Self-monitoring of blood glucose and how to interpret results were also included. Cultural tailoring was operationally defined in the intervention as employing the native language, integrating cultural dietary preferences, encouraging family participation and support, and holding open discussions of cultural beliefs and treatment practices for diabetes (e.g., home remedies, oriental medicine). Particular attention was paid to diet management with traditional Korean foods, calorie and carbohydrate information on common foods by portion sizes, and hands-on nutrition label reading and carbohydrate counts. Other features of the intervention included provision of counsel for dietary change by modification of ethnic foods and recipes, demonstration of healthy food choices and cooking tips, provision of counsel for activity change using cultural activities, assistance in developing individualized plans for preventing/treating diabetic complications, and visual counsel for foot and skin care.

## Measures

Intervention effectiveness was assessed using several measures (described below) that were available in both English and Korean. Translation of instruments was conducted using a back-translation process.[14] Any discrepancies were resolved by consensus of three bilingual Korean immigrants; two health care professionals and a volunteer translator at a medical center near the Korean community. The instrument was pilot tested with three patients with diabetes in the same Korean community.

Demographic variables assessed include age, sex, education, income, insurance, years of residence in the United States, and source of care. Clinical questions included medications, frequency of doctor's visits, and frequency of at-home glucose checks.

Self-management behaviors were measured with the Summary of Diabetes Self-Care Activities revised scale (SDSCA).[15] The SDSCA assesses the level of performing self-care activities specific to diabetes management. This study used items assessing the following areas relevant to diabetes management: diet (both general and specific), exercise, blood sugar testing, foot care, and medication. Response choices range from 0 to 7, and higher scores indicate higher frequency of performing self-management activities. This scale has been widely used in diabetes self-management studies and has been found to be valid and reliable.[15] In the current sample, internal consistency for the most of the subscales was acceptable (alphas ranged from .74 to .99) with the exception of the specific diet subscale (alpha = .39). The low alpha for the specific diet subscale may be related to cultural inappropriateness of one of the items (which asks about consumption of full-fat dairy products). This possibility was pointed out in a validation study of the Spanish version of the SDSCA.[16] Cronbach's alpha for the complete 12 item scale was .71, similar to the value of . 68 obtained in the aforementioned study.

Diabetes knowledge was measured using the 14 item general diabetes test subscale from the Diabetes Knowledge Test (developed by the Michigan Diabetes Research Training Center (MDRTC).[17] The Korean version of this scale has demonstrated adequate reliability (≥.70) in previous studies.[8]

Self-efficacy was measured using a diabetes self-efficacy scale adapted from a self-efficacy scale for cardiac patients coping with myocardial infarction.[18] This scale assesses participants' confidence in doing what is needed to manage their diabetes including diet and exercise. Higher scores reflect greater self-efficacy. The scale has been used in diabetes

research with ethnic minority populations. In the current sample, internal consistency was high (alpha = .91).

Mood was measured by the Patient Health Questionnaire (PHQ-9).[19] This 9-item scale measures depressive symptoms over the previous 2 weeks. Each item can be scored with a minimum of 0 and a maximum of 3 points. The cut-off score for depression in this study was set at ≥10 points, as proposed by Kroenke et al. Internal consistency in the current sample was high (alpha = .87).

Health status was assessed using SF-12, an abbreviated version of the Medical Outcomes Study SF-36 health survey.[20] Physical component summary (PCS-12) and mental component summary (MCS-12) scores were generated by converting participant responses to standardized values and summing the standardized values. Higher scores represented better health. In prior research, the PCS-12 and MCS-12 summary measures have demonstrated high internal consistency in Korean samples (alphas > .81).[21]

Biological measures included A1C, blood pressure, lipids, body mass index (BMI), waist circumference (WC), and waist-to-hip ratio (WHR). A1C was measured using a finger-stick blood sample by the Metrika A1c Now InView point of service monitor, which is certified by the National Glycohemoglobin Standardization Program.[22] Blood pressure was determined using the mean of two measures taken with an electronic blood pressure monitor (A&D Medical Model UA-767). Using the same finger-stick sample of whole blood, a lipid panel was analyzed using the Cholestech LDX system, which has showed reproducibility comparable to laboratory analysis.[23] Height and weight were measured to assess BMI and waist and hip circumference to assess WHR according to national practice guidelines using a Gulick II tension tape. BMI and WHR were calculated according to standardized formula.

Feasibility was determined by the ability to recruit and retain participants. Acceptability was assessed by participants' satisfaction with the culturally tailored intervention using three questions.[10]

## Procedures

The study consisted of three sessions: a baseline session, a post-intervention session two weeks after baseline, and a follow-up session at 3-months after the baseline session. Each session lasted from one to three hours. After consent was obtained at the baseline session, participants filled out questionnaires and received a finger stick blood test for A1C and lipids as well as blood pressure and anthropometric measures. The first 1.5- hour education session began immediately following the baseline data collection. The second 2.5-hour session occurred 2 weeks later. Participants received education and then completed post-intervention questionnaires. Blood pressure measures were the only physiological measures taken at this visit. The 3-month follow up visit was composed only of data collection (no education was provided); participants filled out questionnaires and underwent the same set of biological measures as they had at baseline. At all three sessions participants were encouraged to ask questions about the education content and their self-management issues. At the end of each session participants received $20 cash for their participation in the study. Throughout the three months of the study, a research staff member facilitated retention by conducting reminder calls about the next session.

## Statistical Analysis

To address the study's aim of examining pre- to post-intervention changes in health markers, *t*-tests and analyses of variance were used to assess changes in mean levels of biological markers, diabetes management behaviors, and general health and well-being variables across the three clinical assessments (baseline, post-intervention, and 3-month follow up).

Dependent variables that were assessed at only two time points were analyzed with paired *t*-tests and dependent variables that were assessed at all three time points were analyzed via repeated measures ANOVAs. When sphericity assumptions were violated, degrees of freedom were adjusted using the Greenhouse-Geisser correction. All analyses were conducted using SPSS Version 18. *P*-values less than .05 are reported as significant and *p*-values less than .10 are reported as trends.

Feasibility and acceptability of the intervention were examined via descriptive statistics on retention rates, average per-person cost, and self-report items regarding participants' perceptions of the intervention experience.

## Results

### Intervention effectiveness

Forty-one of the 53 originally enrolled participants completed assessments at all 3 time points. Thus, analyses are based on data from these 41 participants. A series of t-tests and chi-squared analyses examined possible differences in demographics and baseline measures of outcome variables between participants who did and did not complete all three assessments. Participants with complete data did not significantly differ from participants who dropped out with respect to age, gender, years in the US, or English proficiency. Regarding the outcome variables, participants who dropped out of the study had significantly lower levels of baseline high-density lipoprotein (HDL) [$t(46) = -3.104$, $p < .01$] and significantly higher baseline triglyceride levels [$t(46) = 2.146$, $p < .05$] than participants with complete data. The two groups did not differ with respect to any other baseline outcome measures.

### Baseline results

Table 1 displays demographic characteristics for the 41 participants who completed all three assessments. Participants were about 70 years of age on average (range: 30-87 years) and 53.7% were female. English proficiency was low despite an average of 27 years in the US. More than three quarters had income less than $20,000 and only about 24% received any type of diabetes education. More than 70% of participants used ethnic health care clinics and hospitals. About 10% did not have a usual source of care. Although 83% of the participants responded that they had health insurance, this is most likely due to the age of the sample as 78 % of participants were over age 65 and thus qualified for Medicare. Hypertension and high cholesterol were reported in about half the participants. In terms of meeting ADA recommendations for glucose and heart disease risk factor management, the sample was sub-optimal, with a vast majority of respondents classified as overweight or obese and less than half meeting the guidelines for A1C levels, systolic blood pressure, HDL, and triglycerides.

### Post-education and 3 month follow-up results

Table 2 presents results of paired t-tests and repeated measures ANOVAs assessing mean differences in the outcome variables across the study assessments. Outcome variables were divided into three categories: physiological markers, diabetes management behaviors, and health and well-being scales. Results revealed that levels of A1C significantly decreased from baseline to 3-month follow-up: 7.3 to 6.8% [$t(39) = 5.13$, $p < .001$], while HDL levels significantly increased from baseline to 3-month follow-up: 44.1 to 47.8mg/dL [$t(36) = -3.52$, $p < .01$]. Average WC also decreased from baseline to 3-month follow up: 38.5 to 37.3 inches [$t(40) = 4.89$, $p < .001$]. In terms of diabetes management behaviors, number of reported feet checks per week increased significantly across the three assessments 1.7 to 2.8 to 3.1 times [$F(2, 80) = 12.70$, $p < .001$], and there was a trend-level increase in participants

scores on the exercise subscale of the SDSCA [$F(1.71, 68.37) = 2.88$, $p < .10$]. The health and well-being variables showed no significant change across the three assessments.

### Retention, Feasibility, and Acceptability of the Intervention

Retention rate from baseline (week 1; $n = 53$) to the second visit (week 3; $n = 51$) was 96%. One patient did not show and the other patient had a family emergency. Ten participants were lost to 3-months follow up from the second visit (retention rate was 80%); two did not show, three were unreachable by phone, four were not able to come due to distance, and one subject was out of town long-term. The overall retention rate from the beginning of the study to the end was 77%.

Total cost of the intervention was estimated based on the following items: educational materials, nurse practitioner and two assistants (for each of the two education sessions), and food (see Table 3, for breakdown of costs). Glucose monitors and strips for demonstration were brought in by patients as well as by the nurse practitioner. A free community-based intervention site was available after contacting community leaders who expressed interest in diabetes education programs to improve health of Korean immigrants. The total cost per participant for the intervention program was quite low at $15.64.

Most participants reported being satisfied or very satisfied with the culturally tailored diabetes education (88.7%) program. Almost all participants (96.2%) indicated that they would recommend the program to a friend. Seven participants came from locations farther than 100 miles from the education site, and even after the study was completed several participants called the study team to inquire about the time of next education program.

## Discussion

Successful diabetes management requires that patients effectively engage in day to day self-management, and diabetes education is essential to ensure that patients have the knowledge and skills to do so. Although practice guidelines emphasize the importance of patient education, accessing traditional clinic-based diabetes education is a challenge for many ethnic minority immigrants due to socio-economic and cultural barriers. Ethnic minorities, including Korean immigrants, often lack the opportunities available to the mainstream diabetic population to acquire skills and information necessary to adequately self-manage diabetes. To address these disparities in diabetes care, in the current study, a short-duration, culturally tailored, non-clinic based community diabetes self-management program was tested for its effectiveness and feasibility among Korean immigrants with type 2 diabetes.

Consistent with previous studies, the community-based culturally tailored education intervention was effective in that participants exhibited improved physiological outcomes and self-care behaviors. The clinical significance as well as statistical significance was demonstrated by change in means and effect sizes for important biological markers and behavioral measures. The 0.52% drop in A1C, 3.78 mg/dL improvement in HDL, and 1.16 inch reduction in WC over 3 months, as well as the almost double increase in the frequency of feet checks per week indicated clinical significance compared with previous studies with similar duration.[24] Although the drop in A1C levels over 3 months was lower than that reported in a study with Chinese Americans (0.99% decrease), it was higher than that reported in a study with Mexican Americans (.46% decrease) and the effect size for the A1C drop (.36) was larger than that of the Mexican American study (.22).[24] Furthermore, in our study, effect sizes for HDL and WC were medium, indicating significant improvement in these important risk factors for coronary heart disease (CHD).

Another community-based culturally-tailored intervention for Korean Americans, which employed 2-hour weekly education sessions for 6 weeks, home glucose monitoring with tele-transmission, and monthly telephone counseling by a nurse, reported an A1C reduction of 1.19% at 18 weeks.[8] Although A1C reduction was less in the current study, the shorter duration education intervention still resulted in significant reduction in A1C levels, even at 14 weeks. Additionally, participants in the current study with a shorter duration education program demonstrated significant improvement in CHD risk factors such as HDL and WC, an equally important goal in diabetes care given that people with diabetes are at a 2-4-fold increased risk for CHD.[25]

Additionally, although the two diet subscales and the glucose checks subscales of the SDSCA did not exhibit significant mean change across assessments, the means were in the predicted direction. Participants reported following dietary recommendations and checking their glucose more frequently across the three assessments, although effect sizes were small. The relatively small sample size probably limited power to detect these small but potentially important effects. Thus, future studies with a larger sample size are needed to further examine changes in diabetes management behaviors across the intervention.

The retention rate observed in the current study was high (96%) through the completion of education portion of intervention, although the overall attrition rate of 23% across the three assessments was slightly higher than has been reported in intervention studies with Latino and Chinese populations (10 – 20%).[10-11] A potential reason for this may be that because the 3-months follow up did not include an education session, participants had less motivation to attend the visit. In fact, several participants asked whether they would receive education at the last visit. Lower attendance at the last session may suggest that participants' primary interest for study participation was the opportunity to obtain diabetes education and information, rather than compensation or free tests.

Despite the positive results, a few limitations of the study deserve mentioning. First, the study did not include a control group. Because the intervention was conducted in a rather small ethnic enclave, including a control group would have been difficult, as the control group may have been contaminated through interaction with participants from the experimental group. However, because no control group was included, it cannot be concluded with certainty that the intervention actually caused the changes observed in the outcome variables. Future research utilizing a control group is needed to address causal effects of the intervention. Second, although trends in the expected direction were observed, some of the outcome variables did not evidence significant change across the assessments. This may have been due to the relatively small sample size and the short duration of follow up assessments because of budgetary constraints. Future studies should consider addressing these limitations and examine a similar intervention with a larger sample size and a longer duration. Third, generalizability may be limited to first generation Korean immigrants living in ethnic enclaves, as well as older adult populations with limited English skills. Future research should also address the efficacy of a similar intervention with different Korean immigrant populations (e.g., those living in mainstream geographic locations, second generation) and different Asian ethnic subgroups.

## Implications

Patients with language barriers often seek care from private ethnic providers in ethnic enclaves, whose clinics often do not have adequate resources to provide evidence-based diabetes education in a culturally sensitive manner. Given these barriers, community settings may be a more amenable environment for diabetes education that Korean immigrants can access regardless of clinic affiliation or referral requirements. The present study demonstrated that a purely community-based (non-clinic affiliated) culturally tailored

education program providing practical information about diabetes management in a less resource intensive format is feasible and may be an effective approach to improve self-management and health outcomes in this population. Such a program can also serve as a model to increase access to up-to-date mainstream diabetes education and information for Korean immigrants and other underserved Asian ethnic minority immigrants, especially those that are uninsured and have language barriers. Findings from this study can be applied to the practice of diabetes educators as well as health care providers working with Korean immigrant older adults with diabetes and contribute to the growing body of evidence that culturally tailored diabetes education program targeting ethnic minorities may be effective in improving outcomes.

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## Table 1

Participant demographics and percentage meeting ADA standards of care (N=41)

| **Continuous Variables** | **Mean (SD)** |
|---|---|
| Age | 70.3 (8.4) |
| Years in the US | 27.0 (9.5) |
| English Proficiency* | 2.0 (0.8) |
| Duration of DM | 8.9 (8.6) |
| Frequency of Care† | 6.4 (4.2) |
| Glucose Checks per Week | 6.2 (9.8) |
| **Categorical Variables** | **Percentage** |
| Male | 46.3 |
| Education | 54.7 |
| < High School | 19.5 |
| High School | 34.1 |
| 2-year College | 9.8 |
| 4-year College | 31.7 |
| Graduate School | 4.9 |
| Income | |
| < $20,000 | 75.6 |
| $20,000 - $39,000 | 17.1 |
| $40,000 - $59,000 | 4.9 |
| $60,000 - $79,000 | 0.0 |
| ≥ $80,000 | 2.4 |
| Married | 75.6 |
| Received Diabetes Education | 24.4 |
| Source of Care | |
| None | 9.7 |
| Korea Town Private Practice | 65.9 |
| Korea Town Hospital | 4.9 |
| Mainstream Private Practice | 12.2 |
| Mainstream Hospital | 7.3 |
| Health Insured | 82.9 |
| Diabetes Medication | |
| Insulin Alone | 4.9 |
| Insulin + Oral Medication | 7.3 |
| Oral Medication Alone | 80.5 |
| No Medication | 7.3 |
| **ADA Standard of Care Guidelines‡** | **% Meeting Criteria§** |
| Hemoglobin A1C < 7% | 45.0 |
| Systolic Blood Pressure < 130 mm Hg | 48.8 |
| Diastolic Blood Pressure < 80 mm Hg | 65.0 |

| **Continuous Variables** | **Mean (SD)** |
|---|---|
| Total Cholesterol < 200 mg/dL | 73.0 |
| Triglycerides < 150 mg/dL | 43.2 |
| Low-Density Lipoprotein < 100 mg/dL | 57.1 |
| High-Density Lipoprotein, mg/dL (> 40 men, > 50 women) | 35.1 |
| Body Mass Index < 23 kg/m$^2$ [/] | 14.6 |
| Waist circumference (≤ 90 cm men, ≤ 80 cm women) | 7.3 |
| Waist to hip ratio (≤ 0.9 men, ≤ 0.85 women) | 9.8 |

[*] Scale Range 1-5 (Higher = more proficient).

[†] Times per year that participant visits doctor.

[‡] Adapted from: American Diabetes Association, Clinical Practice Recommendations. *Diabetes Care.* 2011; 34(suppl 1): S11-61.

[§] Ns vary slightly across variables (35-41).

[/] World Health Organization recommendation for Asians, 2002.

## Table 2

Mean values (SD) and significance tests for dependent measures across assessments (N=41)

| Variable | Baseline | Post-Program | Follow-up | *F/t* * | *P* | Df | E.S.† |
|---|---|---|---|---|---|---|---|
| **Biological Markers** | | | | | | | |
| Hemoglobin A1c | 7.31 (1.45) | | 6.79 (1.40) | 5.13 | .000 | 39 | 0.36 |
| Systolic BP | 124.17 (26.40) | 129.97 (19.05) | 129.15 (18.65) | 1.10 | .339 | 2 | 0.03 |
| Diastolic BP | 74.60 (11.82) | 75.03 (12.64) | 74.12 (10.95) | 0.27 | .767 | 2 | 0.01 |
| Total Cholesterol | 171.78 (38.79) | | 174.93 (42.65) | 0.11 | .917 | 36 | −0.02 |
| LDL | 92.26 (33.26) | | 94.21 (50.57) | −0.16 | .875 | 33 | −0.02 |
| HDL | 44.05 (11.74) | | 47.83 (12.15) | −3.52 | .001 | 36 | −0.39 |
| Triglyceride | 174.81 (78.06) | | 199.20 (108.12) | −.921 | .363 | 36 | −0.15 |
| Body Mass Index | 27.16 (3.62) | | 26.91 (3.49) | 1.57 | .125 | 40 | 0.07 |
| Waist Circumference | 38.47 (3.24) | | 37.31 (3.74) | 4.89 | .000 | 40 | 0.34 |
| Waist/Hip Ratio | 0.91 (0.04) | | 0.92 (0.05) | −1.46 | .152 | 40 | −0.22 |
| **Diabetes Management** | | | | | | | |
| Diet: General | 3.47 (1.82) | 3.71 (1.50) | 4.02 (1.67) | 2.07 | .133 | 2 | 0.05 |
| Diet: Specific | 3.95 (1.14) | 4.00 (1.00) | 4.24 (1.11) | 1.29 | .281 | 2 | 0.03 |
| Exercise | 3.12 (1.91) | 3.58 (1.94) | 3.73 (1.97) | 2.88 | .071 | 2 | 0.07 |
| Glucose Checks | 3.50 (2.70) | 3.89 (2.50) | 4.07 (2.36) | 1.65 | .203 | 2 | 0.04 |
| Feet Checks | 1.66 (1.93) | 2.71 (2.14) | 3.06 (2.12) | 12.70 | .000 | 2 | 0.24 |
| Medication Adherence | 6.37 (1.88) | 6.37 (1.92) | 6.61 (1.54) | 1.24 | .290 | 2 | 0.03 |
| **Health & Well Being** | | | | | | | |
| Diabetes Knowledge | 58.01 (16.69) | 59.58 (18.25) | 61.32 (15.81) | 0.96 | .387 | 2 | 0.02 |
| Diabetes Self-Efficacy | 2.32 (0.59) | 2.49 (0.53) | 2.41 (0.53) | 2.49 | .098 | 2 | 0.11 |
| Mood (PHQ-9 Score) | 8.78 (5.64) | | 8.80 (6.31) | −0.03 | .976 | 40 | 0.00 |
| SF-12 Physical Health | 39.14 (9.69) | | 41.16 (10.09) | −1.39 | .174 | 40 | −0.20 |
| SF-12 Mental Health | 44.07 (9.38) | | 45.55 (9.28) | −1.18 | .246 | 40 | −0.16 |

LDL = low density lipoprotein HDL=high density lipoprotein

* F-values are reported for dependent variables measured at all 3 assessments, t-values are presented for dependent variables measured at only 2 assessments.

† $\eta^2$ is reported for F-tests, Cohen's d is reported for t-tests.

**Table 3**

Cost of diabetes education intervention (N=53)

| Item | Total Cost | Per-participant Cost |
|---|---|---|
| Education Materials | $159.00 | $3.00 |
| Nurse Practitioner | $400.00 | $7.55 |
| Two Assistants | $200.00 | $3.77 |
| Food | $70.00 | $1.32 |
| **Total** | **$829.00** | **$15.64** |