Published in final edited form as:

Diabetes Educ. 2016 April ; 42(2): 153–165. doi:10.1177/0145721716630386.

Effectiveness of Program Modification Strategies of The Diabetes Prevention Program: A Systematic Review

Hind H. Nemah, MD, MPH¹, Anne K. Sebert Kuhlmann, PhD, MPH², and Rachel G. Tabak, PhD, RD³

¹Brown School, Washington University in St. Louis, St. Louis, MO 63130; tel: 314-203-5454; hind.neamah@wustl.edu

²Brown School, Washington University in St. Louis, St. Louis, MO 63130

³Prevention Research Center in St. Louis, Brown School, Washington University in St. Louis, One Brookings Drive, Campus Box 1196, St. Louis, MO 63130; tel. 314-935-0153; fax 314-935-0150; rtabak@wustl.edu

Abstract

Purpose—The purpose of this study is to review the effectiveness of commonly used program modifications classified under cultural adaptation and program translational strategies for the Diabetes Prevention Program (DPP) in terms of risk reduction for type 2 diabetes.

Methods—Authors extracted data about weight, body mass index (BMI), and five areas of program modification strategies from 28 interventions and analyzed them in SPSS software. Bivariate analyses examined the odds of achieving a significant reduction in outcomes by each modification of the DPP and by presence of a maintenance component as well as the mean reduction of weight and BMI by more versus fewer modifications and by the presence of a maintenance component.

Results—There were no statistically significant differences in achieving a significant reduction in weight or BMI by any type of modification or by the presence of a maintenance component. Programs with fewer modifications reported significantly greater reduction in mean weight at 12

Address Correspondence to: Anne K. Sebert Kuhlmann, Behavioral Sciences & Health Education, College for Public Health & Social Justice, Saint Louis University, 3545 Lafayette Ave., Salus Center #309, St. Louis, MO 63104; tel: 314-977-4029; fax: 314-977-8150; sebertkuhlmann@slu.edu.

[current] Behavioral Sciences & Health Education, College for Public Health & Social Justice, Saint Louis University, 3545 Lafayette Ave., Salus Center #309, St. Louis, MO 63104; tel: 314-977-4029; fax: 314-977-8150

Contributors' Statement

Hind Neamah: Ms. Neamah contributed to the conceptualization and design of the study, data extraction, statistical analysis and interpretation, drafting the manuscript, and critical revision of the manuscript for intellectual content. She agrees to be accountable for all aspects of the work in terms of accuracy and integrity and has approved the final version of the manuscript as submitted.

Anne K. Sebert Kuhlmann: Dr. Sebert Kuhlmann conceptualized and designed the study, contributed to data extraction, statistical analysis and interpretation, drafting the manuscript, reviewing and revising the article for intellectual content and study supervision. She agrees to be accountable for all aspects of the work in terms of accuracy and integrity and has approved the final version of the manuscript as submitted.

Rachel G. Tabak: Dr. Tabak contributed to the study design, data extraction, drafting the manuscript, and reviewing the article for intellectual content. She agrees to be accountable for all aspects of the work in terms of accuracy and integrity and has approved the final version of the manuscript as submitted.

Financial Disclosure: All authors have no financial relationships relevant to this article to disclose.

Conflict of Interest: All authors have no conflicts of interest to disclose.

months post-intervention and at furthest time point extracted. Programs with a maintenance component achieved significantly greater reduction in mean weight measured at furthest time point extracted.

Conclusions—The DPP appears to be programmatically robust to a wide variety of cultural adaptation and translational strategies. Potentially cost-saving modifications do not seem to reduce effectiveness, which should encourage implementation on a broader scale. Program planners should, however, make efforts to include maintenance components because they appear to significantly reduce risk for acquiring type 2 diabetes.

Keywords

DPP; cultural adaptation; diabetes; program adaptation; modifications

Background

In a randomized trial, the Diabetes Prevention Program (DPP), a lifestyle intervention, reduced the incidence of type 2 diabetes, with an effect superior even to the medication metformin.¹ The original DPP intervention had two major goals, a minimum of 7% weight loss/weight maintenance and at least 150 minutes of physical activity per week.¹ As part of the DPP intervention, participants received: 1) individual case managers or “lifestyle coaches”; 2) frequent contact with intervention staff; 3) a structured, 16-session core-curriculum including behavioral self-management strategies for weight loss and physical activity; 4) supervised physical activity; 5) a maintenance intervention; 6) a “toolbox” of adherence strategies; 7) individual tailoring of materials and strategies to address ethnic diversity; and 8) an extensive network of training, feedback, and clinical support to reach these goals.¹ The DPP has now been translated into a variety of settings and populations in an effort to extend this benefit to the population-level.^{2,3} Systematic reviews by the Community Preventive Services Task Force have concluded that DPP-like interventions are effective at decreasing diabetes incidence and improving cardio-metabolic risk factors, and are also cost effective.^{4,5} However, modifications are required in order to enhance the feasibility of program delivery and participant engagement in real-world settings.⁶

Interventions are often determined to be ‘evidence-based’ using studies conducted in controlled settings. Then, they are expected to be implemented with fidelity to the original intervention, as developed and tested without deviation.⁷ Challenges arise, however, in translating interventions successful under the controlled environments of randomized trials into routine practice, especially for lifestyle interventions because human lifestyles are heavily influenced by complex social and cultural factors. Cost-related issues also arise with translating interventions like the DPP as randomized clinical trials often have significantly more resources to implement interventions compared to researchers and public health practitioners attempting “real world” translations. Consequently, as interventions are rolled out into real-world implementation, they often experience a ‘voltage drop’ or a decrease in benefit.⁸

Additional benefit reductions may result from ‘program drift’, which occurs when programs are modified to better fit the local context and begin to deviate from the manualized

protocol.⁶ Evidence-based interventions (EBI) are modified in a variety of ways and for numerous reasons,⁸ many of which may actually lead to improved program sustainability.⁸ Program adaptation is a broad term that is often used to describe modifications to the original program. However, for the purpose of this review, modifications to a program can be categorized into modifications designed for program translation (translational strategies) and modifications designed for cultural sensitivity (cultural adaptations). In this context, translational strategies refer to the systematic processes, activities, and resources that are used to integrate interventions into different settings,⁹ while cultural adaptations refer to the systematic modification of an EBI to consider language, culture, and context to be compatible with the participant's cultural patterns, meanings and values.¹⁰ Additionally, it is important to recognize that modifications actually exist along a spectrum¹¹ and have an inverse relationship with program fidelity, such that fidelity to the original intervention decreases as more modifications are made.¹² Thus, careful description of program modifications are necessary as is assessment of the impact of various modifications on program benefits.

Although there are several reviews that assessed published literature regarding DPP modifications, most of these reviews were purely descriptive or have not assessed outcomes in relation to specific areas of cultural adaptations and program translational strategies. For example, Johnson et al. assessed quality of the studies, the most commonly reported outcomes, and described results from these studies,¹³ while Whittmore et al. assessed reach, efficacy, adoption, and implementation¹⁴ but neither compared the outcomes across studies. Sanders et al. described the most commonly reported cultural adaptations and identified that the lack of comparisons to evidence-based interventions (no control or reliance on usual care controls) made it difficult to ascertain superior cultural adaptations.¹⁵ Although Dunkley et al. address this problem through synthesizing data for their meta-analysis by describing interventions in terms of IMAGE and NICE criteria, which are specific models of care put out by an independent group of researchers and the NIH, respectively, achieving outcomes was examined in relation to deviations from the guidelines and not by cultural adaptations.¹⁶

The current review adds to the literature in two important ways. First, it addresses the challenge identified in the literature regarding comparing weight loss across studies due to varying follow-up times.^{13,14} Second, it presents a unique method of synthesizing across different study designs to analyze outcomes by the type of modification made to the DPP. Because cultural adaptations and translational strategies of the DPP occur in a variety of settings and with diverse populations,¹⁷⁻²⁰ it is necessary to describe the outcomes of the adapted and translated DPP interventions. This paper aims to answer the following questions: Do context-modified DPP interventions still report significant reductions in diabetes risk(s), and does the magnitude of these reductions differ significantly based on the most commonly reported cultural adaptations and program translational strategies?

Research Design

Methodology

This systematic literature review draws data from a previous systematic literature review of the DPP by Tabak et al.²¹ The previous work sought to describe DPP cultural adaptations, translational strategies, and implementation.²¹ Detailed description of the review methodology is published elsewhere²¹ but is summarized here briefly. English-language articles published in peer-reviewed scientific journals on the subject of DPP translation in Academic Search Complete and Google Scholar from January 2004 to December 2013 were reviewed.²¹ Authors extracted information from 44 articles in three domains; only “translational strategies and/or cultural adaptations” is relevant to the current paper.²¹ To evaluate what modifications had been made, authors used the eight categories of the Ecological Validity Model (EVM) framework: language, persons, metaphors, content, concepts, goals, methods, and context.¹⁰ To assess how the modification was made, authors extracted descriptions of the process of modification. To operationalize this, a comprehensive review identified articles reporting cultural adaptation of the DPP; that is, studies that explicitly accounted for clients’ culture, ethnicity or race.²¹

Authors then developed a checklist for coding each aspect of the two possible program modifications (translational strategies and cultural adaptations) through an iterative process. For example, translational strategies were coded on 9 variables in relation to the original DPP and included: (using visuals reflecting study population, changing materials’ language level to be literacy sensitive, changing inclusion criteria, changing incentives or using variations of the “tool-kit”, adding activities to the intervention, changing the frequency and dose of the DPP classes, changing DPP class format from individual to group format, and changing the implementation staff from healthcare professionals to lay health workers or mixed staff).²¹ In line with the definition of cultural adaptations, this concept was coded on 8 variables including: (using a language other than English, implementing bilingual staff or involving community/tribe workers, changing metaphors used in materials or classes to be culturally applicable, changing content of the material to be culturally sensitive, changing concepts, changes to goals of the intervention to be culturally relevant, and using culturally sensitive methods such as talking circles in Native American communities, and changes to framework so as to use community-based participatory research).²¹ Two reviewers coded a sample of 10% of the articles and upon achieving substantial agreement (>90%); one reviewer coded each of the remaining articles.²¹ For this review, we graded study quality using the ADA evidence-grading system for clinical practice recommendations.²²

Data Extraction

Because the current review aims to examine reported effectiveness of cultural adaptations and program translations, it includes only those articles that reported outcomes, excluding ten articles from the initial review that were merely intervention descriptions.²³⁻³² Researchers extracted information from 34 articles³³⁻⁶⁶ imported the data into IBM SPSS V 22 software, and examined outcomes reported.

Study Measures

Program outcome measures—The most commonly reported program outcome measures included body mass index (BMI) and/or weight. For both weight and BMI outcomes, authors examined two variables – a continuous variable of mean change from baseline to different time(s) of measurement(s) and a dichotomous variable of statistically significant results in mean change of weight and/or BMI. For the mean change from baseline, although all studies reported baseline measurements for outcome variables and evaluated them at least twice, the frequency and timing of outcome measurements varied widely. The most common time points were immediately post-intervention, six- and/or 12-months post-intervention. Therefore, authors extracted information at these four reported time points and difference from baseline for each of these time points was calculated in kilogram (Kg) for weight and in Kg/M² for BMI. For the dichotomous variable of statistically significant result, since studies used a variety of statistical tests and group comparisons, a study was considered to report a significant reduction in BMI/weight if there was a statistically significant difference found in at least one statistical comparison to a previous measurement or to another study arm regardless of study designs.

All but 8 of the 34 articles reported body mass index (BMI) and/or weight as an outcome. The authors excluded these 8 articles³³⁻⁴⁰ in order to examine the relationship between modifications and the most commonly reported outcomes of BMI and weight. Two studies^{48, 51} reported outcomes from two different intervention arms or phases of the study. Since each intervention arm/phase modified the DPP differently, authors included each arm/phase as a separate intervention. This resulted in 28 DPP program modifications analyzed here (see Figure 1).

Program modification measures (cultural adaptations and translational strategies)—Authors chose the most commonly reported program modifications among the many translational strategies and cultural adaptations identified by Tabak and colleagues.²¹ The most commonly reported translational strategies included: 1) frequency and timeline of DPP classes, defined as a modification to the timeline of original DPP classes from 16 core sessions delivered over 16 weeks to any different schedule that either reduces the number of sessions or the timeline for session delivery 2) class format, defined as a modification made to the format of delivery of classes from the individual-based format of the DPP to any other format such as group sessions, a combination of group and individual sessions, or internet-based sessions, and 3) implementing staff, defined as a modification made to the criteria of selecting the implementing staff from that of the DPP which constituted healthcare professionals, dietitians, and lifestyle coaches in the DPP to include lay community workers, or a combination of lay workers and clinicians. The most common cultural adaptation reported by Tabak et al.²¹ was content. Modifying content in this context was defined as modifications made to the program that demonstrate cultural knowledge in planning the intervention including values, costumes and traditions, and understanding the uniqueness of each group (social, economic, historical, political). A modification to “content” was considered to be made if a study described culturally appropriate/traditional recipes and physical activities, talked about cultural ideas related to diabetes risk, or if there was a general description that the program was adapted to the

cultural needs of the community. Changes to the content in this setting do not constitute adding new activities to the program that were not included in the original DPP. Since the original DPP was delivered in a clinical setting, authors also included implementation setting defined as the context/place/facility where the program was administered (e.g., churches, community facilities, worksites, etc.) as a program modification.

Based on Tabak et al.'s work, authors coded these five major areas of adaptation and translation dichotomously as similar to or different from the DPP. Authors considered that a specific area of the program was modified only if there was evidence of this modification in the description of the program. Thus assuming that descriptions of program modifications in studies published in a peer-reviewed journal are a complete report of the methodology and content of the study, if a study did not report specifically on a modification, the authors coded it as similar to the DPP. Authors then tallied the total number of areas modified. In order to compare the relative number of modification made, the sample was divided at the mid-point, comparing those that made 2 or fewer modifications from the original DPP with those that made 3 or more modifications.

Maintenance Measure

While the original DPP included a maintenance component combining group and individual approaches, motivational campaigns, and "restarts";¹ the interventions reviewed here reported a wide variety of maintenance activities. Therefore, authors extracted information about having any form of maintenance component and categorized interventions dichotomously as having any form of maintenance component (similar to the DPP) versus none (different from the DPP) regardless of the maintenance type and/or duration

Analyses

Authors used Fisher's Exact test to assess the association between statistically significant change in weight and/or BMI from baseline to each of the three measured time-points by each of the five modification strategies and by whether the intervention had a maintenance component or not. Mann-Whitney U tests assessed the association between fewer modifications versus more modifications and mean change in weight and BMI at each time-point. Because of the wide variety of time-points evaluated, the value of the furthest time-point measurement extracted was used to assess mean difference in weight and BMI from baseline. The data examined here met the assumptions for both Fisher's Exact and Mann Whitney U tests.

Results

Table 1 provides a detailed description of the studies included in this review, their modification strategies, and the outcomes reported other than BMI and weight. Based on the ADA system, 5 studies were graded A, 6 studies were graded B, and 15 studies were graded C – one study graded B had 2 separate interventions phases and one graded C had 2 intervention phases.^{48, 51}

Of the 28 interventions examined, only one implemented individual sessions as in the original DPP trial, while all others modified the format by either implementing group

sessions (n=24), self-study (n=1), or a mixture of group and individual sessions (n=2). Almost half of the interventions (n=13) condensed the timeline of the program or reduced the number of the sessions from that of the original DPP trial. Implementation staff was mostly similar to the original DPP trial, comprising healthcare professionals (n=21), while some interventions employed community lay workers (n=5) or mixed teams of healthcare professionals and lay community workers (n=2). The majority of the interventions (n=16) did not indicate any cultural adaption of program content. Like the original DPP trial, 9 interventions delivered their programs in a clinical setting, while others delivered theirs in community settings (n=11), churches (n=4), worksites (n=3), or via the Internet (n=1). The frequency for each modification and its attributes can be found in Table 2.

There was no statistically significant difference in modifying any of the five major areas of cultural adaptations or program translation strategies from the DPP or in having a maintenance component and reporting a significant reduction in weight or BMI (Table 3). Programs with fewer modifications (2 strategies) reported greater BMI and weight reductions at all time-points except for BMI measured at 6-months post-intervention, but this difference reached statistical significance only for weight at 12-months post-intervention (U=34.00, $p<0.01$) and at furthest time point reported (U=147.00, $p=0.02$) (see Table 4).

Moreover, programs with some form of maintenance component reported a higher magnitude of BMI and weight reduction at 6- and 12-months post-intervention, but this trend was statistically significant only for weight measured at the furthest time-point reported (U= 46.00, $p=0.02$) (Table 4).

Discussion

The 28 interventions reviewed here evaluated some modified version of the DPP, suggesting that programmatic modification is relatively common and often necessary to make an evidence-based program like the DPP appropriate for specific segments of the population or particular contexts. Although the DPP has been developed to accommodate diverse population in terms of race/ethnicity and health literacy,¹ further modifications have been introduced to reach a broader base. Other systematic reviews have agreed with this finding.^{14, 15} Importantly, the DPP appears to be effective – at least in significantly reducing BMI and weight among participants, which are important risk factors for diabetes and other chronic diseases – even when substantially modified from the original DPP model. Achieving statistical significance does not, however, necessarily equate to clinically significant changes. The most commonly reported outcome in this review was weight. Previous literature has also documented that this finding.^{13, 14} The most commonly reported modifications identified here were consistent with previous literature on setting,¹⁵ program timeline or dose,¹³ format of program delivery,¹³ and modifying the content to be culturally relevant.¹⁵ Previous literature highlighted that varying follow-up points in time had complicated comparing weight across different studies,^{13,14} this review successfully addresses the issue through comparing results across similar time-points together and across the furthest time-points examined.

No single area of program cultural adaptation or translational strategy assessed in this review appeared to diminish the likelihood of achieving significant reductions in weight and BMI; however, those that modified fewer areas total, regardless of which areas they modified, tended to report slightly better outcomes. This suggests that program fidelity does matter to a certain extent and is consistent with previous research on program fidelity.¹⁷ To authors' knowledge, this paper is the first to examine this association within DPP-like interventions.

From a program planning perspective, it is notable that even when interventions implement potentially resource-saving/cost-reduction modifications such as condensing the timeline, reducing the number of sessions offered, delivering the program in a group setting, or utilizing non-clinical professionals as program facilitators, they still consistently report significant reductions in participants' BMI and weight. These findings agree with previous literature suggesting that organizations and program planners with limited resources who are interested in implementing the DPP may still be able to do so successfully in a format that is better suited for their needs.^{16, 13} Such modifications may also increase the feasibility of implementation and the likelihood of program sustainability over time – both important elements for addressing the current diabetes epidemic in the US.

The one area which organizations and program planners concerned with cost should consider carefully is planning and budgeting for a maintenance component. Those interventions that included a maintenance component (irrespective of exactly what that component entailed) reported more substantial reductions in weight and BMI among participants. This finding is consistent with existing literature on weight-loss that points to the importance of maintenance intervention components to help participants reach and maintain weight reductions.^{67, 68}

Interestingly, only 4 of the 28 interventions reviewed here reported 150 minutes of physical activity per week as an outcome despite this being one of the major goals of the DPP. It is unclear whether this was just not reported or because it was not tracked as an outcome. However, since physical activity provides health benefits independent of weight or BMI reduction,^{69, 70} programs should look to assess physical activity as an outcome. The advent of technological devices such as smart-phone apps and fitness bands may help participants self-monitor and track physical activity with reduced respondent burden and social desirability bias.

Limitations

As with any review of the published literature, authors are limited by what has been published and what information about programmatic modifications may be included in the papers reviewed. Additional challenges arose trying to synthesize across studies as many different outcomes were reported at various time-points. Despite the original DPP having two main outcomes, a minimum 7% weight loss and at least 150 minutes of physical activity per week, only a small number of studies reported these outcomes. Therefore, authors analyzed the most commonly reported outcomes, reductions in weight and BMI. While the differences may have reached statistical significance, they may not have been clinically significant reductions. In an effort to look comprehensively at culturally adapted DPP interventions, authors included studies with a range of designs and statistical tests, which

constrained the ability to synthesize across studies. Finally, the relatively small number of studies included in the review and the fact that only one study reported no significant reductions in weight among participants limit the power of analyses. While the published literature tends to be biased towards significant results⁷¹ and many organizations implementing modifications of the DPP may have neither the personnel nor the time to publish their outcomes, other reviews have also found the DPP to be a robust evidence-based intervention.^{14, 72}

Conclusions

The DPP appears to be “programmatically robust” to a wide variety of intervention cultural adaptations and translation strategies. All of the interventions reviewed here modified at least one of five major areas from the DPP yet still reported statistically significant reductions in weight and/or BMI among participants. While further research is necessary to determine exactly how much the DPP can be modified without reducing effectiveness, our results indicate that adapting the DPP to specific contexts can be conducted without compromising effectiveness. Importantly, potentially cost-saving modifications do not seem to reduce effectiveness, which should encourage implementation on a broader scale. Authors recommend that those implementing the DPP-based interventions consider how they can track and report the main outcomes of a minimum 7% weight loss and at least 150 minutes of physical activity per week at 3 time-points (immediately post-intervention, 6- and 12-months post-intervention) in addition to measuring weight and/or BMI reductions. Reporting of the same outcomes at consistent time-points would greatly facilitate an understanding for whom the DPP works and under what circumstances.

Implications for Diabetes Educators

These findings suggest that diabetes educators can still support patients to achieve significant reductions in weight and BMI even when modifying the DPP to different settings and to diverse populations. This includes modifications for resource-limited settings, with changes such as reductions in the number of sessions and delivery by lay health workers. Diabetes educators are encouraged, however, to include a maintenance component in their weight-reduction programs and to implement cultural adaptations and program translation strategies only as necessary since programs with fewer modifications tend to achieve a higher magnitude of weight and BMI reduction. Programs modifying the DPP aiming at reducing the risk of type 2 diabetes should also emphasize achieving 150 minutes of physical activity per week and a minimum 7% weight loss, because these measures are linked to improved outcomes and were the major goals of the DPP.

Acknowledgments

This study was supported in part by The NIDDK Center for Diabetes Translation Research (P30DK092950). The content is solely the responsibility of the authors and does not necessarily represent the official view of the NIH.

References

1. Diabetes Prevention Program (DPP) Research Group. The Diabetes Prevention Program (DPP): description of lifestyle intervention. *Diabetes Care*. Dec; 2002 25(12):2165–2171. [PubMed: 12453955]
2. Schulze MB, Hu FB. Primary prevention of diabetes: what can be done and how much can be prevented? *Annu Rev Public Health*. 2005; 26:445–467. [PubMed: 15760297]
3. Tuomilehto J. Primary prevention of type 2 diabetes: lifestyle intervention works and saves money, but what should be done with smokers? *Ann Intern Med*. Mar 1; 2005 142(5):381–383. [PubMed: 15738457]
4. Li R, Qu S, Zhang P, et al. Economic evaluation of combined diet and physical activity promotion programs to prevent type 2 diabetes among persons at increased risk: A systematic review for the community preventive Services task force. *Ann Intern Med*. Sep 15; 2015 163(6):452–60. DOI: 10.7326/M15-0469 [PubMed: 26167962]
5. Balk EM, Earley A, Raman G, Avendano EA, Pittas AG, Remington PL. Combined diet and physical activity promotion programs to prevent type 2 diabetes among persons at increased risk: A systematic review for the community preventive services task force. *Ann Intern Med*. 2015; 163:437–451. DOI: 10.7326/M15-0452 [PubMed: 26167912]
6. Durlak JA, DuPre EP. Implementation matters: a review of research on the influence of implementation on program outcomes and the factors affecting implementation. *Am J Community Psychol*. Jun; 2008 41(3-4):327–350. DOI: 10.1007/s10464-008-9165-0 [PubMed: 18322790]
7. Prochaska JO, Evers KE, Prochaska JM, et al. Efficacy and effectiveness trials: examples from smoking cessation and bullying prevention. *J Health Psychol*. 2007; 112(1):170–178. [PubMed: 17158850]
8. Chambers DA, Glasgow RE, Stange KC. The dynamic sustainability framework: addressing the paradox of sustainment amid ongoing change. *Implement Sci*. 2013; 8:117.doi: 10.1186/1748-5908-8-117 [PubMed: 24088228]
9. National Institutes of Health. Dissemination, implementation, and operational research for HIV prevention interventions (R01). Vol. PAR-08-166. Bethesda, MD: National Institutes of Health; 2009. p. 24
10. Bernal G, Bonilla J, Bellido C. Ecological validity and cultural sensitivity for outcome research: issues for the cultural adaptation and development of psychosocial treatments with Hispanics. *J Abnorm Child Psychol*. Feb; 1995 23(1):67–82. [PubMed: 7759675]
11. Lara M, Bryant-Stephens T, Damitz M, et al. Balancing “fidelity” and community context in the adaptation of asthma evidence-based interventions in the “real world”. *Health Promot Pract*. 2011; 12(6 suppl 1):63S–72S. DOI: 10.1177/1524839911414888 [PubMed: 22068362]
12. Carvalho L, Honeycutt S, Escoffery C, Glanz K, Sabbs D, Kegler M. Balancing fidelity and adaptation-implementing evidence-based chronic disease prevention programs. *J Public Health Manag Pract*. Jul-Aug;2013 19(4):348–356. DOI: 10.1097/PHH.0b013e31826d80eb [PubMed: 23462111]
13. Johnson M, Jones R, Freeman C, et al. Can diabetes prevention programmes be translated effectively into real-world settings and still deliver improved outcomes? A synthesis of evidence. *Diabet Med*. Apr; 2013 30(1):1464–5491. DOI: 10.1111/dme.12018
14. Whittemore R. A systematic review of the translational research on the Diabetes Prevention Program. *Transl Behav Med*. Sep; 2011 1(3):480–491. DOI: 10.1007/s13142-011-0062-y [PubMed: 24073067]
15. Sanders Thompson VL, Johnson-Jennings M, Baumann AA, Proctor E. Use of culturally focused theoretical frameworks for adapting diabetes prevention programs: A qualitative review. *Prev Chronic Dis*. 2015; 12:140421. DOI: <http://dx.doi.org/10.5888/pcd12.140421>.
16. Dunkley AJ, Bodicoat DH, Greaves CJ, et al. Diabetes prevention in the real world: Effectiveness of pragmatic lifestyle interventions for the prevention of type 2 diabetes and of the impact of adherence to guideline recommendations: A systematic review and meta-analysis. *Diabetes Care*. 2014; 37:922–933. DOI: 10.2337/dc13-2195 [PubMed: 24652723]

17. Garfield SA, Malozowski S, Chin MH, et al. Considerations for diabetes translational research in real-world settings. *Diabetes Care*. Sep; 2003 26(9):2670–2674. [PubMed: 12941736]
18. Glasgow RE, Fisher EB, Anderson BJ, et al. Behavioral science in diabetes. Contributions and opportunities. *Diabetes Care*. 1999; 22(5):832–843. [PubMed: 10332691]
19. Glasgow RE, Goldstein MG, Ockene JK, Pronk NP. Translating what we have learned into practice. Principles and hypotheses for interventions addressing multiple behaviors in primary care. *Am J Prev Med*. Aug; 2004 27(2 Suppl):88–101. [PubMed: 15275677]
20. Kriska A, Delahanty L, Pettee K. Lifestyle intervention for the prevention of type 2 diabetes: translation and future recommendations. *Curr Diab Rep*. 2004; 4:113–118. [PubMed: 15035971]
21. Tabak R, Sinclair KA, Baumann AA, et al. A review of Diabetes Prevention Program translations: use of cultural adaptation and implementation research. *Transl Behav Med*. First online: 16 September 2015.
22. American Diabetes Association. American Diabetes Association evidence-grading system for clinical practice recommendations. *Diabetes Educ*. Jan; 2008 31(1):s1–s2.
23. Yank V, Stafford RS, Rosas LG, Ma J. Baseline reach and adoption characteristics in a randomized controlled trial of two weight loss interventions translated into primary care: a structured report of real-world applicability. *Contemp Clin Trials*. Jan; 2013 34(1):126–135. DOI: 10.1016/j.cct.2012.10.007 [PubMed: 23124047]
24. Perez Siwik V, Kutob RM, Ritenbaugh C, Aickin M, Gordon JS. Families United/Familias Unidas: Development and implementation of a family-based group office visit model for the primary prevention of type 2 diabetes. *Diabetes Educ*. Nov-Dec;2012 38(6):811–821. DOI: 10.1177/0145721712461533 [PubMed: 23019237]
25. Krukowski RA, Pope RA, Love S, et al. Examination of costs for a lay health educator-delivered translation of the Diabetes Prevention Program in senior centers. *Prev Med*. Oct; 2013 57(4):400–402. DOI: 10.1016/j.cct.2009.09.002 [PubMed: 23831492]
26. Katula JA, Vitolins MZ, Rosenberger EL, et al. Healthy Living Partnerships to Prevent Diabetes (HELP PD): design and methods. *Contemp Clin Trials*. Jan; 2010 31(1):71–81. [PubMed: 19758580]
27. Brown BD, Harris KJ, Harris JL, Parker M, Ricci C, Noonan C. Translating the diabetes prevention program for northern plains indian youth through community-based participatory research methods. *Diabetes Educ*. 2010; 36(6):924–935. DOI: 10.1177/0145721710382582 [PubMed: 20944056]
28. Williams LB, Sattin RW, Dias J, et al. Design of a cluster-randomized controlled trial of a diabetes prevention program within African American churches: The Fit Body and Soul study. *Contemp Clin Trials*. Mar; 2013 34(2):336–347. DOI: 10.1016/j.cct.2013.01.002 [PubMed: 23354313]
29. Simkin-Silverman LR, Conroy MB, Bhargava T, McTigue KM. Development of an online diabetes prevention lifestyle intervention coaching protocol for use in primary care practice. *Diabetes Educ*. Mar-Apr;2011 37(2):263–268. [PubMed: 21421991]
30. Lawlor MS, Blackwell CS, Isom SP, et al. Cost of a group translation of the Diabetes Prevention Program: Healthy Living Partnerships to Prevent Diabetes. *Am J Prev Med*. Apr; 2013 44(4 Suppl 4):S381–389. [PubMed: 23498303]
31. Dodani S, Kramer MK, Williams L, Crawford S, Kriska A. Fit body and soul: a church-based behavioral lifestyle program for diabetes prevention in African Americans. *Ethn Dis*. Spring;2009 19(2):135–141. [PubMed: 19537223]
32. Ackermann RT, Marrero DG. Adapting the diabetes prevention program lifestyle intervention for delivery in the community: The YMCA model. *Diabetes Educ*. 2007; 33(1):69–78. [PubMed: 17272794]
33. Harwell TS, Vanderwood KK, Hall TO, Butcher MK, Helgeson SD. Factors associated with achieving a weight loss goal among participants in an adapted Diabetes Prevention Program. *Prim Care Diabetes*. Jul; 2011 5(2):125–129. DOI: 10.1016/j.pcd.2010.12.001 [PubMed: 21233033]
34. New York State Health Foundation. New York State YMCA Diabetes Prevention Program: Outcomes and Implications. New York State Health Foundation; Oct. 2012

35. Dodani S, Fields JZ. Implementation of the fit body and soul, a church-based life style program for diabetes prevention in high-risk African Americans: a feasibility study. *Diabetes Educ.* May-Jun; 2010 36(3):465–472. DOI: 10.1177/0145721710366756 [PubMed: 20508263]
36. Pagoto SL, Kantor L, Bodenlos JS, Gitkind M, Ma Y. Translating the diabetes prevention program into a hospital-based weight loss program. *Health Psychol.* Jan; 2008 27(1 Suppl):S91–98. DOI: 10.1037/0278-6133.27.1.S91 [PubMed: 18248110]
37. Piatt GA, Seidel MC, Chen HY, Powell RO, Zgibor JC. Two-year results of translating the diabetes prevention program into an urban underserved community. *Diabetes Educ.* Nov-Dec;2012 38(6): 798–804. DOI: 10.1177/0145721712458834 [PubMed: 22968220]
38. Seidel MC, Powell RO, Zgibor JC, Siminerio LM, Piatt GA. Translating the diabetes prevention program into an urban medically underserved community: A nonrandomized prospective intervention study. *Diabetes Care.* 2008; 31(4):684–689. DOI: 10.2337/dc07-1869 [PubMed: 18252904]
39. Schneider KLP, Sullican JCP, Pagoto SLP. Translation of the diabetes prevention program into a community mental. *Transl Behav Med.* Sep; 2011 1(3):453–460. DOI: 10.1007/s13142-011-0053-z [PubMed: 24073066]
40. Smith-Ray RL, Almeida FA, Bajaj J, et al. Translating efficacious behavioral principles for diabetes prevention into practice. *Health Promot Pract.* Jan; 2009 10(1):58–66. [PubMed: 17494949]
41. Yeary KH, Cornell CE, Turner J, et al. Feasibility of an evidence-based weight loss intervention for a faith-based, rural, African American population. *Prev Chronic Dis.* Nov.2011 8(6)
42. Dallam GM, Foust CP. A comparative approach to using the diabetes prevention program to reduce diabetes risk in a worksite setting. *Health Promot Pract.* 2013; 14(2):199–204. DOI: 10.1177/1524839912437786 [PubMed: 22763893]
43. Davis-Smith YM, Davis-Smith M, Boltri JM, et al. Implementing a diabetes prevention program in a rural African-American church. *J Natl Med Assoc.* Apr; 2007 99(4):440–446. [PubMed: 17444435]
44. DeJoy DM, Padilla HM, Wilson MG, Vandenberg RJ, Davis MA. Worksite translation of the diabetes prevention program: Formative research and pilot study results From FUEL your life. *Health Promot Pract.* 2013; 14(4):506–513. DOI: 10.1177/1524839912461014 [PubMed: 23091301]
45. Guyse LA, McHugh BR, Meszaros JF, et al. Collaborative approach to implementing an adapted diabetes prevention program lifestyle intervention. *Diabetes Spectr.* 2011; 24(3):138–143. DOI: 10.1186/s13012-014-0135-7
46. Jiang L, Manson SM, Beals J, et al. Translating the Diabetes Prevention Program into American Indian and Alaska Native communities: results from the Special Diabetes Program for Indians Diabetes Prevention demonstration project. *Diabetes Care.* Jul; 2013 36(7):2027–2034. DOI: 10.2337/dc12-1250 [PubMed: 23275375]
47. Katula JA, Vitolins MZ, Rosenberger EL, et al. One-year results of a community-based translation of the Diabetes Prevention Program: Healthy-Living Partnerships to Prevent Diabetes (HELP PD)Project. *Diabetes Care.* Jul; 2011 34(7):1451–1457. DOI: 10.2337/dc10-2115 [PubMed: 21593290]
48. Kramer MK, Kriska AM, Venditti EM, et al. Translating the Diabetes Prevention Program: a comprehensive model for prevention training and program delivery. *Am J Prev Med.* Dec; 2009 37(6):505–511. DOI: 10.1016/j.amepre.2009.07.020 [PubMed: 19944916]
49. Kramer MK, McWilliams JR, Chen HY, Siminerio LM. A community-based diabetes prevention program: evaluation of the group lifestyle balance program delivered by diabetes educators. *Diabetes Educ.* Sep-Oct;2011 37(5):659–668. DOI: 10.1177/0145721711411930 [PubMed: 21918204]
50. Kramer MK, Cepak YP, Venditti EM, Semler LN, Kriska AM. Evaluation of the Group Lifestyle Balance programme for diabetes prevention in a Hispanic Women, Infants and Children (WIC) Programme population in the USA. *Divers Equal Health Care.* 2013; 10(2):73–82.

51. Ma J, Yank V, Xiao L, et al. Translating the Diabetes Prevention Program lifestyle intervention for weight loss into primary care: a randomized trial. *JAMA Intern Med.* Jan 28; 2013 173(2):113–121. DOI: 10.1001/2013.jamainternmed.987 [PubMed: 23229846]
52. Matvienko OA, Hoehns JD. A lifestyle intervention study in patients with diabetes or impaired glucose tolerance: translation of a research intervention into practice. *J Am Board Fam Med.* Sep-Oct;2009 22(5):535–543. DOI: 10.3122/jabfm.2009.05.090012 [PubMed: 19734400]
53. Mau MK, Keawe'aimoku Kaholokula J, West MR, et al. Translating diabetes prevention into native Hawaiian and Pacific Islander communities: the PILI 'Ohana Pilot project. *Prog Community Health Partnersh.* Spring;2010 4(1):7–16. DOI: 10.1353/cpr.0.0111 [PubMed: 20364073]
54. McBride PE, Einerson JA, Grant H, et al. Putting the Diabetes Prevention Program into practice: a program for weight loss and cardiovascular risk reduction for patients with metabolic syndrome or type 2 diabetes mellitus. *J Nutr Health Aging.* Dec; 2008 12(10):745s–749s. [PubMed: 19043651]
55. McTigue KM, Conroy MB, Bigi L, Murphy C, McNeil M. Weight loss through living well: translating an effective lifestyle intervention into clinical practice. *Diabetes Educ.* Mar-Apr;2009 35(2):199–204, 208. DOI: 10.1177/0145721709332815 [PubMed: 19321806]
56. McTigue KM, Conroy MB, Hess R, et al. Using the internet to translate an evidence-based lifestyle intervention into practice. *Telemed J E Health.* Nov; 2009 15(9):851–858. DOI: 10.1089/tmj.2009.0036 [PubMed: 19919191]
57. Ockene IS, Tellez TL, Rosal MC, et al. Outcomes of a Latino community-based intervention for the prevention of diabetes: The Lawrence Latino Diabetes Prevention Project. *Am J Public Health Res Feb.* 2012; 102(2):336–342. DOI: 10.2105/AJPH.2011.300357
58. Rosal MC, Lemon SC, Nguyen OH, Driscoll NE, Ditaranto L. Translation of the diabetes prevention program lifestyle intervention for promoting postpartum weight loss among low-income women. *Transl Behav Med.* 2011; 1(4):530–538. DOI: 10.1007/s13142-011-0069-4 [PubMed: 24073075]
59. Ruggiero L, Oros S, Choi YK. Community-based translation of the diabetes prevention program's lifestyle intervention in an underserved Latino population. *Diabetes Educ.* Jul-Aug;2011 37(4):564–572. DOI: 10.1177/0145721711411107 [PubMed: 21690435]
60. West DS, Bursac Z, Cornell CE, et al. Lay health educators translate a weight-loss intervention in senior centers: a randomized controlled trial. *Am J Prev Med.* Oct; 2011 41(4):385–391. DOI: 10.1016/j.amepre.2011.06.041 [PubMed: 21961465]
61. Amundson HA, Butcher MK, Gohdes D, et al. Translating the Diabetes Prevention Program Into Practice in the general community: Findings from the Montana cardiovascular disease and diabetes prevention program. *Diabetes Educ.* 2009; 35(2):209–223. DOI: 10.1177/0145721709333269 [PubMed: 19321807]
62. Boltri JM, Davis-Smith YM, Seale JP, Shellenberger S, Okosun IS, Cornelius ME. Diabetes prevention in a faith-based setting: results of translational research. *J Public Health Manag Pract.* Jan-Feb;2008 14(1):29–32. [PubMed: 18091037]
63. Boltri JM, Davis-Smith M, Okosun IS, Seale JP, Foster B. Translation of the National Institutes of Health Diabetes Prevention Program in African American churches. *J Natl Med Assoc.* Mar; 2011 103(3):194–202. [PubMed: 21671523]
64. Vadheim LM, Brewer KA, Kassner DR, et al. Effectiveness of a lifestyle intervention program among persons at high risk for cardiovascular disease and diabetes in a rural community. *J Rural Health.* Summer;2010 26(3):266–272. DOI: 10.1111/j.1748-0361.2010.00288.x [PubMed: 20633095]
65. Aldana SG, Barlow M, Smith R, et al. The diabetes prevention program: a worksite experience. *AAOHN J.* Nov; 2005 53(11):499–505. quiz 506-497. [PubMed: 16309012]
66. Whittemore R, Melkus G, Wagner J, et al. Translating the diabetes prevention program to primary care: a pilot study. *Nurs Res.* Jan-Feb;2009 58(1):2–12. [PubMed: 19092550]
67. Tussing-Humphreys LM, Fitzgibbon ML, Kong A, Odoms-Young A. Weight Loss Maintenance in African American Women: A systematic review of the behavioral lifestyle intervention literature. *J Obes.* 2013; 2013:437369.doi: 10.1155/2013/437369 [PubMed: 23691286]

68. Perri M, McAllister D, Gange J, Jordan R, McAdoo W, Nezu A. Effects of four maintenance programs on the long-term management of obesity. *J Consul Clin Psychol.* Aug; 1988 56(4):529–534. serial online.
69. Arem H, Moore SC, Patel A, et al. Leisure time physical activity and mortality: A detailed pooled analysis of the dose-response relationship. *JAMA Intern Med.* Apr; 2015 175(6):959–967. DOI: 10.1001/jamainternmed [PubMed: 25844730]
70. Ekelund U, Heather AW, Teresa N, et al. Physical activity and all-cause mortality across levels of overall and abdominal adiposity in European men and women-the European Prospective Investigation into Cancer and Nutrition Study (EPIC). *Am J Clin Nutr.* Jan.2014 doi: 10.3945/ajcn.114.100065
71. Dwan K, Gamble C, Williamson PR, Kirkham JJ. Systematic review of the empirical evidence of study publication bias and outcome reporting bias — An updated review. *PLOS One.* Jul.2013 8(7)doi: 10.1371/journal.pone.0066844
72. Johnson M, Jones R, Freeman C, et al. Can diabetes prevention programmes be translated effectively into real world settings and still deliver improved outcomes? A synthesis of evidence *Diabetic Med.* 2013; 30(1):3–15. DOI: 10.1111/dme.1201 [PubMed: 22998334]

Figure 1.

Flow chart of article inclusion process

*Twenty-six articles were included in this review from which authors extracted 28 interventions.

Table 1

Categories of modifications and other outcomes reported by intervention

Study	ADA [§] evidence-grading ²²	Contents	Sessio Format	Implementing staff	Setting of delivery	Program timeline or dosage	Cumulative changes	Other Outcomes Reported
Aldana, et al. ⁶⁵	C	0 [*]	1 ^{**}	0	1	0	2	OGT [¶] (mg/dl). FI [¶] (UIU/ml). A1C%. CRP [¶] (mg/L). TG [¶] (mg/dl). HDL [¶] (mg/dl). LDL [¶] (mg/dl). vLDL [¶] (mg/dl). Combined hyperlipidemia (CHL/HDL) ratio. TG [¶] (mg/dl). Aerobic Fitness (ml/kg/min).
Amundson et al. ⁶¹	B	1	0	0	0	0	1	No other outcomes reported.
Boltri et al. ⁶²	C	1	1	0	1	0	3	sBP [¶] (mmHg). dBP [¶] (mmHg). FG [¶] (mg/dl).
Boltri et al. ⁶³	B	0	1	0	1	1	3	FG [¶] . BP [¶] .
Dallam et al. ⁴²	B	0	0	0	1	1	2	MAP [¶] . Physical activity levels (Pascoe). Diabetes Risk Score.
Davis-Smith et al. ⁴³	C	0	0	0	1	1	2	Finger-prick glucose (mg/dl).

Study	ADA § evidence-grading ²²	Contents	Sessio Format	Implementing staff	Setting of delivery	Program timeline or dosage	Cumulative changes	Other Outcomes Reported
								sBP. dBP
DeJoy et al. ⁴⁴	C	1	1	1	1	0	4	Stage of change: diet & physical activity (% action/maintenance). Self-efficacy score for diet & physical activity.
Guyse et al. ⁴⁵	C	0	1	0	1	1	3	sBP. dBP. LDL. HDL. FG.
Jiang et al. ⁴⁶	C	0	1	1	0	0	2	WC [¶] Glucose. Insulin. % Weight loss. Homeostasis model assessment of insulin resistance
Katula et al. ⁴⁷	A	0	1	0	1	0	2	WC. Cholesterol. HDL [¶] Non HDLc. Glucose. sBP. dBP
Kramer et al. ⁴⁸ phase 1	B	0	1	0	0	1	2	WC Cholesterol LDL HDL

Study	ADA § evidence-grading ²²	Contents	Sessio Format	Implementing staff	Setting of delivery	Program timeline or dosage	Cumulative changes	Other Outcomes Reported
Kramer et al. ⁴⁸	B	0	0	0	0	1	1	TG Fasting plasma glucose sBP dBP
phase2								WC. Cholesterol. LDL. HDL. TG. Fasting plasma glucose. sBP. dBP.
Kramer et al. ⁴⁹	C	0	1	0	0	1	2	Cholesterol. LDL. HDL. TG. Fasting plasma glucose. sBP. dBP.
Kramer et al. ⁵⁰	C	1	1	0	0	1	3	Barriers to maintain weight loss and physical activity level survey questionnaire.
Ma et al. ^{* 51} (<i>Coach-led</i>)	A	1	1	0	0	1	3	% Weight change.
Ma et al. ⁵¹ (<i>Self-directed</i>)	A	1	0	1	1	1	4	% Weight change.
Matvienko et al. ⁵²	C	0	1	0	1	0	2	WC. HC [¶] . sBP.

Study	ADA § evidence-grading ²²	Contents	Session Format	Implementing staff	Setting of delivery	Program timeline or dosage	Cumulative changes	Other Outcomes Reported
Mau et al. ⁵³	C	0	1	1	1	1	4	dBP. sBP. dBP. 6-minutes walk test. Dietary fat intake score. Physical activity level.
McBride et al. ⁵⁴	C	0	1	0	0	1	2	sBP. dBP. WC. % Body fat. Metabolic equivalent of task score (METs). Daily calories. Total daily fat (grams). Total daily saturated fat (grams). Daily servings of fruits and vegetables.
McTigue et al. ⁵⁵	B	0	1	0	0	1	2	No other outcome reported.
McTigue et al. ⁵⁶	C	1	1	1	1	0	4	sBp.
Ockene et al. ⁵⁷	A	1	1	1	1	0	4	A1C. WC.
Rosal et al. ⁵⁸	C	1	0	1	1	0	3	No other outcomes reported.
Ruggiero et al. ⁵⁹	C	1	0	0	1	1	3	No other outcomes reported.
Vadheim et al. ⁶⁴	C	1	0	0	1	1	3	No other outcomes reported.
West et al. ⁶⁰	A	0	0	1	1	0	2	No other outcomes reported.

Study	ADA § evidence-grading ²²	Contents	Sessio Format	Implementing staff	Setting of delivery	Program timeline or dosage	Cumulative changes	Other Outcomes Reported
Whittemore et al. ⁶⁶	B	0	1	0	0	0	1	No other outcomes reported.
Yeary et al. ⁴¹	C	1	0	1	1	1	4	No other outcomes reported.

* 0=Similar to the DPP

** 1=Different from the DPP

§ American Diabetes Association evidence grading system for clinical practice recommendation (A = randomized controlled trial with adequate sample size, B = non-randomized quasi-experimental design OR pilot RCT with small sample size, C = single-group pre/post or observational design)

¶ OGTT=fasting oral glucose test; FI= fasting insulin, CRP= high-sensitivity C-reactive protein, TC= total cholesterol, HDL= high density lipoprotein , LDL= Low density lipoproteins, vLDL= very low density lipoproteins, TG= triglycerides, BP= blood pressure, sBP= systolic blood pression, dBP=diastolic blood pressure, FG= fasting blood glucose, WC= waist circumference, HC= hip circumference, MAP= mean arterial pressure, HDLc= high density lipoprotein cholesterol

Table 2

Descriptive summary of interventions reviewed by category of modifications, n=28

Program modification strategies	Attributes	n	%
Format	Individual sessions (Similar to DPP)	1	3.6%
	Group sessions	24	85.7%
	Self-study	1	3.6%
	Group and individual sessions	2	7.1
Program's timeline or dosage	16 sessions over 4 months (Similar to DPP)	15	53.6%
	Reduction in timeline or number of sessions	13	46.4%
Implementation staff	Healthcare professionals (Similar to DPP)	21	75.0%
	Lay community workers	5	17.9%
	Mixed team of lay workers and healthcare professionals	2	7.1%
Contents of the program	No change (Similar to DPP)	16	57.1%
	Cultural Adaptations	12	42.9%
Setting of implementation	Clinic (Similar to DPP)	9	32.1%
	Community	11	39.3%
	Church	4	14.3%
	Worksite	3	10.7%
	Internet	1	3.6%

Table 3
Significant Reductions in BMI and Weight by Categories of Modifications, Fisher's Exact Test

Modifications	A statistically significant difference found in Outcomes*					
	BMI n= 24			Weight n= 28		
	No	Yes	p	No	Yes	p
Contents						
Similar to DPP	1 (4.02%)	12 (50.0%)	0.40	1 (3.60%)	15 (53.6%)	0.57
Different from DPP	0 (0.0%)	11 (45.8%)		0 (0.0%)	12 (42.9%)	
Format of the sessions						
Similar to DPP	0 (0.0%)	09 (37.5%)	1.00	0 (0.00%)	10 (35.7%)	0.64
Different from DPP	1 (4.2%)	14 (58.3%)		1 (3.06%)	17 (60.7%)	
Setting of delivery						
Similar to DPP	1 (4.1%)	07 (29.2%)	0.33	1 (3.60%)	09 (32.1%)	0.36
Different from DPP	0 (0.0%)	16 (66.7%)		0 (0.00%)	18 (64.3%)	
Implementing staff						
Similar to DPP	1 (4.0%)	17 (68.0%)	1.00	1 (3.6%)	18 (64.3%)	0.68
Different from DPP	0 (0.0%)	07 (28.0%)		0 (0.0%)	09 (32.1%)	
Program timeline						
Similar to DPP	1 (4.2%)	08 (33.3%)	0.38	1 (3.6%)	11 (39.3%)	0.43
Different from DPP	0 (0.0%)	15 (62.5%)		0 (0.0%)	16 (57.1%)	
Maintenance						
Similar to DPP	1 (4.0%)	12 (50.0%)	0.54	1 (3.6%)	13 (46.4%)	0.50
Different from DPP	0 (0.0%)	11 (45.8%)		0 (0.0%)	14 (50.0%)	

* Significant results reported across any comparison and at any time point.

For some categories, denominators are less than 28 due to missing data.

Table 4

Reduction in mean BMI/weight by degree of program modification and by presence of a maintenance component, Mann Whitney U test

Mean difference from baseline	Modified 2 or fewer Strategies (<i>median</i>) [□]	Modified 3 or more strategies (<i>median</i>)	Exact Sig	Maintenance		Exact Sig
				Yes (<i>median</i>)	No (<i>median</i>)	
BMI (Kg/M²)						
Post- intervention (<i>n</i> =16) [■]	-1.70	-1.10	0.71	--	--	--
Six months (<i>n</i> =11)	-0.80	-0.91	0.93	-1.10	-0.61	0.07
Twelve months (<i>n</i> =13)	-1.78	-0.50	0.30	-1.63	-0.40	0.93
Furthest time point (<i>n</i> =24)	-1.65	-0.80	0.17	-1.65	-0.80	0.08
Weight (Kg)						
Post-intervention (<i>n</i> =20)	-9.60	-4.50	0.09	--	--	--
Six months (<i>n</i> =11)	-6.5	-4.56	0.25	-6.30	-3.90	0.23
Twelve months (<i>n</i> =16)	-10.24	-3.50	0.002 [*]	-6.20	-2.50	0.34
Furthest time point (<i>n</i> =28)	-10.58	-4.50	0.02 [*]	-6.25	-3.72	0.02 [*]

^{*} Significant value at p<0.05

[□] Authors reported median for mean differences in outcomes instead of mean-ranks to better demonstrate comparisons.

[■] For some categories, denominators are less than 28 due to missing data.