Review

Evaluation of physical activity reporting in community Diabetes Prevention Program lifestyle intervention efforts: A systematic review

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ABSTRACT

Introduction. The Diabetes Prevention Program (DPP) lifestyle intervention has been translated to community settings using the DPP goals of 7% weight loss and 150 min of moderate physical activity (PA) per week. Given that PA is a primary lifestyle goal and has been linked to improvements in metabolic health in the DPP, it is important to understand the role that PA plays in translation effort success. The purpose of this review is to thoroughly evaluate the reporting of PA methodology and results in DPP-based translations in order to guide future prevention efforts.

Methods. PubMed and Ovid databases were searched to identify peer-reviewed original research articles on DPP-based translations for adults at-risk for developing diabetes or cardiovascular disease, limited to English language publications from January 2002–March 2015.

Results. 72 original research articles describing 57 translation studies met eligibility criteria. All 57 study interventions included a PA goal, 47 studies (82%) collected participant PA information, and 34 (60%) provided PA results.

Conclusions. Despite PA being a primary intervention goal, PA methodology and results are under-reported in published DPP translation studies. This absence and inconsistency in reporting PA needs addressed in order to fully understand translation efforts' impact on participant health.

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Introduction

The Diabetes Prevention Program (DPP) was one of the first randomized clinical trials to demonstrate that a chronic disease could be prevented by adopting lifestyle changes. The DPP enrolled 3234 overweight adults with impaired glucose tolerance from across 27 diverse U.S. sites (Diabetes Prevention Program Research Group, 1999). Participants were randomized to an intensive lifestyle intervention with a weight loss goal of 7% and a physical activity (PA) goal of 150 min per week of moderate intensity PA or to receive Metformin or placebo. The lifestyle arm had a 58% lower incidence of diabetes and 41% lower incidence of the metabolic syndrome (NCEP-ATP III criteria) after 3 years compared to the placebo arm (Knowler et al., 2002; Orchard et al., 2005).

As one of the two key DPP intervention goals, physical activity did significantly increase due to the intervention. Specifically, the DPP lifestyle intervention participants significantly increased PA by 6 metabolic equivalent (MET)-hours per week at the end of the trial, an equivalent in duration and intensity to approximately 1.5 h of brisk walking (MET-equivalent 4.0), assessed by questionnaire (Knowler et al., 2002; Hamman et al., 2006). In terms of meeting the PA goal, 74% and 67% of participants met the PA goal at the end of the 16-session core and at the final intervention visit, respectively (Wing et al., 2004). PA was shown to be a strong predictor of both weight loss and maintenance of weight loss among DPP lifestyle participants. In post-hoc analysis, incident diabetes was 44% lower among participants in the lifestyle intervention that met the PA goal compared to those not meeting either weight loss or PA goals (Hamman et al., 2006). It is clear that PA played a significant role in the success of the DPP at achieving long-term weight loss and directly or indirectly reducing diabetes incidence.

After the conclusion of the randomized portion of the DPP, the lifestyle intervention was modified for implementation in the community setting. In efforts to translate the DPP intervention to diverse community settings, there has been a variety of approaches used, resulting in different program structure and delivery methods (summarized in Jackson, 2009; Johnson et al., 2013; Ackermann, 2013; Whittemore, 2011). The effectiveness of translation efforts for achieving substantial weight loss, reported between 3–7%, and modification of diabetes and cardiovascular disease (CVD) risk factors have been evaluated (Ali et al., 2012; Cardona-Morrell et al., 2010; Whittemore, 2011). What is much less clear is the success of these community translation programs in achieving the PA goals and the impact of any PA change on various metabolic risk factors.

In translation, as with clinical research, PA information can be collected objectively (such as with activity monitors) or subjectively (logs, diaries, and questionnaires) with each assessment method varying in the components of PA that they can measure accurately (Bassett et al., 2000; Bassett, 2009; van Poppel et al., 2010). Since different PA assessment methods capture different aspects of PA, the results of translation efforts may not be directly comparable (Pettee et al., 2009; Kriska and Caspersen, 1997). Further, different characteristics of physical activity (intensity, duration, frequency) may impact different aspects of health, so understanding PA in the context of these characteristics is important for evaluation. These differences can be addressed when reporting PA methodology and results by providing an appropriate explanation of the measurement tool used, including administration of the instrument, so that the results can be interpreted in the context of the measurement instrument.

Given that PA is one of two primary goals of the DPP lifestyle intervention and subsequent translation efforts, and that PA has been linked to both weight loss and improvements in metabolic health in the DPP, it is important to understand the role that PA plays in the success of translation efforts. Since the translation of DPP-based lifestyle interventions to community settings and weight loss achieved in these programs have been evaluated, the focus of this review will be on the PA components of these programs. The purpose of this review is to thoroughly evaluate the reporting of PA methodology and results in DPP-based community translation studies in order to guide future prevention efforts and program evaluations.

Methods

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 27-item checklist was used to guide evidence acquisition and synthesis (Moher et al., 2009).

Data sources

An article search was performed in PubMed and Ovid (MEDLINE and PsycINFO) databases on March 2, 2015 to identify publications detailing lifestyle interventions for the prevention of type 2 diabetes. The search was limited to abstracts and full-text articles published in English language, with human subjects, and a date range of January 2002–March 2015. The date range was selected to include articles published after the original publication of the Diabetes Prevention Program results (Knowler et al., 2002). Keywords used include *diabetes*, *pre-diabetes*, *metabolic syndrome*, *translation*, *lifestyle*, *intervention*, *prevention*, *adults*, and *diabetes prevention program*, searched in article text and titles. Reference lists of published reviews and meta-analyses of DPP translation literature were searched for additional publications not identified in the online database search.

Article eligibility criteria

After the keyword search, each title and abstract was screened by the primary author for potential inclusion in the review. Inclusion criteria comprised peer-reviewed articles of original research in adult populations at high-risk for type 2 diabetes and/or cardiovascular disease (CVD) (i.e., having pre-diabetes, the metabolic syndrome, or risk factors for type 2 diabetes such as age and overweight/obesity) (American Diabetes Association, 2014) and that used an intervention design with a minimum of six sessions based on the DPP lifestyle intervention theory or curriculum.

Abstracts that indicated the content was a systematic review, method and/or implementation article (and thus would not include intervention outcomes), or author commentary were excluded. Interventions listed in published study protocols and methods articles were searched to determine if results from these studies had been published as a separate manuscript. Lifestyle interventions that enrolled primarily diabetic participants or those with CVD were excluded. In addition, studies that investigated the utility of lifestyle intervention for alternative outcomes, such as gestational diabetes or chronic kidney disease, were excluded.

Data extraction

The primary author extracted data from each publication to include the design of the study, participant demographics (age, sex, race/ethnicity), the location of the program (city/state or country), the setting in which the intervention was delivered, the intervention delivery format, length of intervention and follow-up, PA goal, inclusion of PA sessions as part of intervention, PA measurement, and PA results. The secondary author (BRW) reviewed this information for correctness and completeness. Discrepancies were discussed with and resolved by the remaining authors. The extracted information was used to