

Development of a Videoconference-Adapted Version of the Community Diabetes Prevention Program, and Comparison of Weight Loss With In-Person Program Delivery

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ABSTRACT Introduction: Effective, standardized, and easily accessible weight management programs are urgently needed for military beneficiaries. Videoconference interventions have the potential for widespread scaling, and can provide both real time interaction and flexibility in delivery times regardless of location, but there is little information on their effectiveness and acceptability. Materials and Methods: This study as part of a larger weight loss trial describes the videoconference adaption of Group Lifestyle Balance (GLB) program, a community group-based Diabetes Prevention Program intervention, and provides a comparison of weight loss and meeting attendance between in-person and videoconference delivery modes over 12 weeks in adult family members of military service members. Forty-three participants were enrolled from two military installations and received either the videoconference-adapted or an in-person GLB program in a non-randomized trial design. Differences in program attendance and percent weight lost at 12 weeks were compared by independent samples *t*-tests and nonparametric methods. Group differences in the percentage of weight lost over the 12-week period were analyzed using a linear mixed model. Results: All GLB intervention components were successfully delivered by videoconference with minor adaptations for the different delivery mechanism. Participant retention was 70% and 96% in the in-person and videoconference groups, respectively ($p = 0.04$). Completing participants in both groups lost a significant percent body weight over the 12 week intervention ($p < 0.001$) and there was no difference in percent body weight after 12 weeks of intervention ($6.2 \pm 3.2\%$ and $5.3 \pm 3.4\%$ for in-person and videoconference at 12 weeks, respectively; $p = 0.60$). Conclusion: This study describes the first videoconference adaption of the GLB program for use in military families. Attrition was lower in the videoconference group, and there were a similar levels of weight loss in both groups regardless of delivery modality. Videoconference weight loss interventions are effective and feasible for scaling to support healthy weight management in military as well as civilian populations.

INTRODUCTION

The prevalence of overweight and obesity in US military service members and their families is similar to that in the civilian population.^{1,2} These high rates of obesity in military families increase

health care costs across the US military services.³ Although there are some established guidelines⁴ and service specific weight loss programs available to military families,^{5,6} program attendance, adherence, and effectiveness have not been systematically investigated. None of the services offer weight loss program with systematic evaluation for program content, duration, or modality for long-term weight sustainment needs. These observations indicate an urgent need for effective solutions to address obesity and overweight in military service members and their families.

Developing programs that are able to effectively support healthy weight management in military family members with overweight and obesity requires consideration of the unique challenges faced by this population. In particular, frequent family relocation and deployments for service members disrupt traditional behavioral approaches to weight loss, by separating participants and their counselors. Videoconference delivery of behavioral weight management programs could potentially provide behavioral support to military families without the loss of continuity during relocations, by eliminating the need for counselors to be in the same geographic area as the participants. Such approaches have been tested in civilian populations, and preliminary studies indicate weight loss is similar in magnitude to in-person interventions.^{7,8} However, to our knowledge, there has been no evaluation of the effectiveness of

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videoconference approaches to address overweight and obesity in families with active duty military service members.

Group Lifestyle Balance (GLB)^{9,10} is the official community-adapted version of the Diabetes Prevention Program^{11,12} and is in widespread use. The few videoconference implementations of GLB reported suggest it can be effective in civilian populations,^{8,13–15} and retired service members¹⁶ but no videoconference adaptation has been described in sufficient detail to allow replication. Furthermore, no adaptation has been reported for military families, and the studies published to date in other populations lack control groups or comparative in-person implementation groups, which limits evaluation of program integrity and effectiveness of the videoconference delivery format.

This report describes an adaptation of the GLB program and the collection of preliminary data to compare weight loss and attrition between videoconference and in-person intervention program delivery among adult family members of active duty military personnel over 12 weeks. We hypothesized there would be no significant difference in weight loss or participant drop-out between the two program delivery methods.

METHODS

This study was part of the ongoing Healthy Families Healthy Forces (HF2) randomized controlled trial (trial # NCT02348853). Briefly, the HF2 study compares GLB with a different behavioral weight loss intervention⁸ for changes in body weight and cardiometabolic risk factors in adult family members of active duty military personnel or retired military personnel. Participants in the subgroup reported herein were randomized to the GLB arm of the larger trial, and were assigned to either in-person or videoconference groups depending on their date of enrollment and location. The different program implementations occurred as part of an expansion of the trial beyond the immediate locality of the research center, which prompted videoconference rather than in-person intervention delivery. The study evaluated participants during 12 weeks of weight loss. Sample sizes for this analysis were based on enrollment in the initial two in-person groups, which were matched to the subsequent two videoconference groups and enrollment took place between May 2015 and March 2016. The study was approved by the Institutional Review Boards at Tufts University and the US Army Medical Research and Materiel Command (USAMRMC), as well as the USAMRMC Human Research Protection Office. All participants provided written informed consent.

Videoconference Adaptation of GLB

The goal of the GLB videoconference adaptation was to retain as many components of the program as possible, including programmatic goals, specific education content, provided materials, and accountability factors. The adapted version differed only in specific implementation features necessary to work effectively in the videoconference format. Table I summarizes the program features in the videoconference delivery and the in-person versions of the intervention. Principal

differences in the videoconference version included: delivery of all materials that could not easily be emailed (e.g., pedometer, book of calorie and fat values) in a single package at the start of the intervention; providing a remote Wi-Fi scale the counselor could access to collect data on body weight independent of participant reporting; emailing session handouts prior to sessions rather than distribution during meetings; and counselor review of accountability and goal exercises (e.g., food logs and goals for physical activity in the coming week) by email during the week. In addition, among the optional interactive program activities provided in the GLB materials,¹⁷ those selected were the ones considered feasible for videoconference use.

Participants

A total of 43 individuals were included in this analysis. Inclusion criteria for study enrollment including being an adult (>18 years of age) family member of an active duty or retired military personnel, with a body mass index (BMI) ≥ 25.0 kg/m² at screening and were enrolled in the GLB arm of the study. In addition, participants needed to be willing to complete online or paper surveys and participate in study interventions and outcome measures to be eligible. Exclusion criteria included prior gastric bypass surgery, current pregnancy, recent weight loss, or any medical complication impacting food absorption or prevent participation in a weight loss intervention involving consumption of a healthy diet.

Intervention Delivery

Implementation of both the in-person and videoconference interventions was conducted by a single experienced weight loss counselor trained in GLB content and delivery (AT) and 5% of videoconference recordings were reviewed for quality assurance. The in-person intervention was implemented as recommended in the curriculum,¹⁷ with the exception of three changes designed to provide parity between the two different interventions being tested in the larger trial, and to support programmatic adherence. These changes included: (1) the addition of weekly emails as a mid-week contact between the counselor and participants; (2) optional booster sessions (which allowed mixing between groups); and (3) optional make-up sessions by phone or for videoconference any missed session. The videoconference intervention was delivered as summarized in Table I, with the addition of the same three components described above for the in-person delivery mode.

MEASUREMENTS

Body Mass Index and Percent Weight Change

As part of the larger study, fasting weight was measured in duplicate at baseline using a digital calibrated scale weighing to ± 0.1 kg (Escali BFBW200 Digital, Minneapolis, MN) and height was assessed in duplicate using an upright stadiometer measuring to ± 0.1 cm (Model 213, Seca). Weight change from session 1 to session 12 was assessed by non-fasting

TABLE I. Components of GLB in the Original In-Person Format and as Modified for Videoconference Delivery

	In-Person	Videoconference
Core goals		
Food intake	Calorie and fat goals prescribed according to starting weight	Same as in-person.
Physical activity	150 minutes of moderate intense physical activity per week	Same as in-person.
Body weight	7% body weight loss	Same as in-person.
Materials		
Participant notebook	Given at 1st session	Given at start of program in package. Opened at 1st session.
Fat and calorie counter	Given at 2nd session	Given at start of program in package. Not discussed until 2nd session.
Keeping Track booklet	Printed copy provided at each session.	Two options were given: a) Printed copy in Participant Notebook with electronic version for subsequent sessions; b) Online food and activity tracker shared with counselor.
Specific session handouts	Printed copies given out at relevant session.	Electronic copies emailed 3–5 days prior to session and shared by videoconference during sessions.
Scales	None given.	Remote scale weight shared weight with counselor.
Pedometers	Given at session 10.	Given at start of program in package. Pedometers not discussed until session 10.
Session delivery		
Timing	Asked to arrive 5 minutes early to allow time for obtainment of session weight and to turn off phones.	Asked to be on time, turn their videos on and be in a quiet place where they can communicate freely (headphones to limit background noise if applicable)
Weights	Weighed at session.	Remote scale data used from session ± 1 day.
Educational component	Discussion based delivery of session material focused on nutrition, physical activity or behavior.	Same as in-person. Additional visuals (e.g., choosemyplate.gov) were also presented in the videoconference format.
Activities	Worksheets, role-play, demonstrations.	Same as In-Person, except for Session 8 Activity 1 (breakout groups using visual prompts to create healthy restaurant meals), which is modified so participants bring restaurant menus to identify healthy choices as a whole group.
Participation	Encouraged, and all participants are expected to engage in some form of participation	Same as in-person.
Wrap-up	Summarize session material and reinforce take-home messages	Same as in-person.
Home assignment	Assigned at the end of session to apply at least one of the principles discussed	Same as in-person.
Pre and post session mingling	Participants who want to engage with other participants are invited to come early or stay after sessions.	Same as in-person, via the videoconferencing platform.
Accountability and communication		
Home weight, goals for diet and physical activity	Recorded in Keeping Track booklet and handed to Counselor at sessions.	Weight obtained from remote scales that sync with Counselor. Two options were provided for goal setting. (1) Recorded in electronic Keeping Track booklet and emailed to Counselor. (2) Recorded in online food and activity tracker synced with Counselor.
Feedback	Weekly feedback provided. Written on Keeping Track booklet and returned in person at following session.	Weekly feedback Emailed to participant based on previous week's electronic Keeping Track booklet or online food and activity tracker plus remote scale data. Feedback not limited to timing of meetings, can be more rapid than in-person GLB.

weight measurements obtained during the in-person counseling meetings for the in-person group, or from remote weight measurements using a provided Wi-Fi scale for the videoconference group (In-person scales: Tanita BF-679W, Maneocho Itabashi-ku: Japan; Remote Wi-Fi scales: Withings WS-30, Paris, France). For the Wi-Fi scales, counselors were provided access to the online data for each participant in the videoconference group. The first weight recorded was used as the measurement. Data were considered missing for

participants who did not attend a session or provide their weight within five days of a meeting.

Session Attendance and Drop Out

Attendance at the in-person meetings and the videoconference meetings was recorded by the counselor. Drop-outs were defined as participants who informed the investigators they were dropping out, did not attend the last four sessions,

or missed the 6-month outcome measurements in the larger trial.

Statistical Analyses

Participants who dropped out of the study and participants who completed the study were compared. Baseline characteristics for the videoconference and in-person participants who completed the 12 week intervention were also assessed. Continuous variables were compared using an independent samples *t*-test (if the variable was normally distributed) or the non-parametric Wilcoxon–Mann–Whitney test (if the variable was not normally distributed). The Fisher’s Exact test was used to compare categorical variables. Differences in percent weight loss over 12 weeks between the in-person and videoconference groups were evaluated using a linear mixed model with adjustment for age, level of education, and baseline weight. A *p*-value <0.05 was considered statistically significant. All analyses were conducted using Stata statistical software version 15 (StataCorp, College Station, TX).

RESULTS

Of the 43 enrollees, seven dropped out before the end of the 12-week study period. There were no significant differences between completers and dropouts in age (*p* = 0.60), baseline BMI (*p* = 0.52), sex (*p* = 0.30), and reported family income (*p* = 0.106). Participants who did not complete the intervention tended to have a lower level of education (*p* = 0.052). The retention rate was greater in the videoconference group compared to the in-person group (70% and 96% for in-person and videoconference, respectively; *p* = 0.04).

Baseline characteristics for participants who completed the in-person and videoconference groups are compared in

Table II. There were no differences between in-person and videoconference groups in participant age, sex, baseline BMI classification, education, or household income.

Figure 1 displays attendance and the trajectory of weight loss for each group over the 12 week intervention period. In a direct comparison of the two groups, there was no significant difference in 12 week percent weight loss ($6.2 \pm 3.2\%$ and $5.3 \pm 3.4\%$ for in-person and videoconference, respectively; *p* = 0.60) or session attendance ($90 \pm 15\%$ and $90 \pm 12\%$ for in-person and videoconference, respectively; *p* = 0.52). In a linear mixed model, both the in-person and videoconference groups experienced significant weight loss over the 12 week intervention (*p* < 0.001), although there was no significant difference in weight loss was observed between the two groups over time (*p* = 0.14). Similar results were observed after adjustment for baseline age, level of education, and baseline weight.

DISCUSSION

This study describes an adaptation of the widely recognized GLB weight management intervention for delivery by videoconference to adult family members of active duty military personnel and retired service members, and provides a preliminary evaluation of the effectiveness of the new format. All aspects of the traditional GLB intervention could be delivered by videoconference with small modifications to presentation style, such as providing physical materials in a single package and modifying class exercises to be conducted as a group with visuals presented by videoconference. This GLB adaptation showed clinically significant mean weight loss for both in-person and videoconference groups. There were no significant differences in weight loss between enrollees in the videoconference intervention and those in the

TABLE II. Baseline Demographic Information on Completers for the In-Person and Videoconference GLB Interventions

	In-Person (N = 14)	Videoconference (N = 22)	<i>p</i> -value
Sex, N(%)			
Female	13 (93)	22 (100)	0.389
Male	1 (7)	0 (0)	
Age, years (mean±SD ^a)	36.27 ± 5.8	42.0 ± 9.76	0.051
BMI, kg/m ² (mean±SD)	33.7 ± 9.1	35.1 ± 6.6	0.307
Education, N(%)			0.065
High school, some college, or associates degree	4 (29)	8 (36)	
College degree	4 (29)	12 (55)	
Graduate degree	6 (43)	2 (9)	
Family income, N(%)			0.846
\$20,000–\$39,999	2 (14)	3 (14)	
\$40,000–\$59,999	2 (14)	3 (14)	
\$60,000–\$79,999	3 (21)	3 (14)	
\$80,000–\$99,999	5 (36)	6 (27)	
>\$100,000	2 (14)	7 (32)	

^aSD = standard deviation.

*Significant findings; *p* < 0.05.

Differences between in-person and videoconference groups were assessed using independent *t*-tests for normally distributed continuous variables, Wilcoxon–Mann–Whitney test for non-normally distributed continuous variables, and Fischer’s exact test for categorical variables.

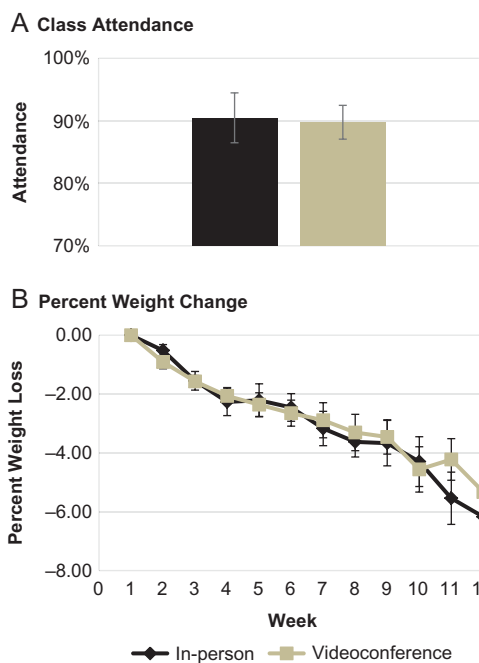


FIGURE 1. Attendance and percent weight change over 12 weeks.

standard in-person program over 12 weeks (5.3% and 6.2% for the videoconference and in-person, respectively), nor was there a difference between the groups in the trajectory of weight change over time. The average session attendance was high and similar between groups (90% versus 90%). However, participant retention was higher in the videoconference group compared to the in-person groups (70% and 96% for in-person and videoconference, respectively). Combined, these results indicate that the videoconference GLB, which is convenient for participants and allows for relocations without intervention disruption, is at least as effective for use in military families as the traditional in-person intervention.

Typical GLB interventions usually yield weight loss of 2–4.5% in the general population, including by videoconference delivery,^{7,9,18} which is lower than the 5% threshold recommended for clinically impactful benefits.¹⁹ These values are lower than the 7% mean weight loss achieved in the original Diabetes Prevention Program research trial,¹² which was an intense research-focused intervention that provided greater counselor–participant interactions and provided food than is feasible in a community-based intervention. It is therefore notable that both groups in this study achieved weight loss >5%. Although reasons for the high program effectiveness described are not fully understood, it may be relevant that the program was delivered by a masters-level registered dietitian with counseling experience and formal training in the GLB program. We also modified the traditional GLB intervention to include the addition of mid-week email contacts between counselors and participants, booster sessions for participants to meet individuals from other groups, and make-up sessions for missed attendance. Additionally, our

results are consistent with a previous study using videoconference methodology in military veterans,²⁰ suggesting that videoconference delivery may be particularly effective in military families and retirees.

The retention rate of 96% in the videoconference group is higher than previously reported weight loss studies²¹ and was significantly greater than the in-person group. Lower dropouts in the videoconference group could be due to the convenience and versatility of the videoconference platform. Participants were able to join meetings from any location with a cell phone service or internet connection using various devices. Similarly, lower attrition rates in videoconference vs in-person weight loss classes were demonstrated in a study using another behavioral based weight loss program.⁸

This study was the first to demonstrate successful videoconference adaptation of the GLB program in military families. It was conducted to understand the impact of a protocol change prompted by recruitment constraints and utilized the initial subset of data from a larger ongoing randomized trial, whose purpose is to compare the effectiveness of different weight management interventions independent of intervention delivery method. As this study was not powered to detect a difference, a larger study examining in-person versus videoconference intervention delivery for weight management is therefore required to confirm the promising results observed here. In addition, this intervention was delivered by a single, highly qualified counselor, and the effect of implementing GLB using counselors who lack a dietetic degree is unknown. Additional studies evaluating the potential effect of the counselor qualifications are therefore needed.

In conclusion, this study showed that videoconference delivery of the widely-recognized GLB weight loss intervention achieved comparable weight loss to the traditional in-person program delivery and lower participant drop-out. This result is consistent with our previous study demonstrating comparable weight loss and program attrition between in-person and videoconference delivery in a non-traditional behavioral intervention.⁸ As GLB has publicly available resources¹⁷ and a formal counselor training program,⁹ the adaptations to create a videoconference intervention are practical and support the widespread use of this intervention.

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PREVIOUS PRESENTATION

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