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Original Article

One-Year Weight Loss with a Telephone-Based Lifestyle Program

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Key Words
Obesity · Weight loss · Lifestyle intervention · Telephone-based intervention

Abstract
Objective: Telephone-based weight loss programs are offered as an alternative to face-to-face obesity treatments, but data on the effectiveness regarding weight loss are limited. Therefore, we evaluated a telephone-based lifestyle program in a real-world setting. ***Methods:*** The telephone-based intervention consists of regular phone calls providing individualized lifestyle recommendations, and delivery of printed materials. Anthropometric and metabolic data are collected by general practitioners or are self-reported. ***Results:*** Baseline data were available from 398 participants (61% men; weight 103.12 ± 14.21 kg; BMI 33.38 ± 2.83 kg/m^2) and 1-year data from 258 (65%) participants. In the completers, mean weight change was –4.25 ± 5.18 kg ($p < 0.001$) which corresponds to a mean percentage body weight change of –4.10 ± 4.88%. 87 participants (34%) lost more than 5% of their initial body weight, with 29 (11%) losing more than 10% of their initial body weight. 40 participants (16%) gained weight over this period. A reduction of abdominal girth of –0.59 cm (95% CI 0.34, 0.85 cm; $p < 0.001$) and total cholesterol of –1.55 mg/dl (95% CI 0.04, 3.05 mg/dl; $p = 0.044$) per kilogram weight loss was observed. ***Conclusions:*** The telephone-based lifestyle program results in a moderate weight loss after 12 months, which may be comparable to face-to-face interventions. Telephone-based weight loss support is independent of time and location and represents a tool which is also accepted by men.

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Introduction

Overweight and obesity are a serious health problem worldwide. The results of the German Health Interview and Examination Survey for Adults (DEGS1) conducted from 2008 to 2011 indicated that 67% of men and 53% of women are overweight, and almost a quarter is obese [1]. In the last two decades, the prevalence of obesity has especially increased in the group of men and young adults [1] which is similar to the trend in many other countries including the USA [2–4].

Weight loss interventions are traditionally delivered face-to-face in individual counselling sessions or in group meetings. However, due to the high prevalence of overweight and obesity and due to the limited availability of obesity clinics, there is a great need to develop alternative tools to deliver weight loss interventions that reach an ever growing target population. Apart from new information and communication technologies, mainly based on smartphones, studies have only investigated the efficacy of telephone-based weight loss programs in research settings. In a randomized controlled study with lifestyle intervention, 415 participants were allocated to three different intervention groups. After 24 months, participants in the intervention group supported through telephone, webpage, and email had a mean weight change of –4.6 kg compared to –0.8 kg in the control group and –5.1 kg in the in-person support group. The control group differed significantly from the intervention groups, but there was no statistically significant difference in weight change between the two intervention groups [5]. In another study, participants in the control group had a mean weight change of –2.0 kg after 2 years, whereas in the telephone-based intervention group and in the in-person intervention group a weight change of –6.2 kg and –7.4 kg was achieved, respectively, with a statistically significant intervention effect compared to the control group [6].

While these prospective trials demonstrated the general efficacy of this approach for weight management, very little is known whether or not telephone-based interventions are also efficient and safe in a real-world setting. Therefore, the aim of this study was to evaluate the impact on weight loss of a telephone-based lifestyle program called ‘Leichter Leben’ (Living Lighter) which is offered by the largest private German health insurance company. Since there is now increasing awareness and willingness among health care providers to tackle obesity, it is important to assess how such telephone-based intervention programs can contribute to weight management in the overweight and obese population.

Participants and Methods

Participants

Members of the German private health insurance DKV (Deutsche Krankenversicherung) are selected for the program via a standardized procedure based on several criteria (e.g., full service rate, indication for weight management, no serious psychological disorder, no participation in another health program of the DKV). From November 27, 2008 until May 31, 2012, 2,749 members (1,810 men, 939 women) have been invited by letter to participate.

Intervention

The ongoing lifestyle program ‘Leichter Leben’ is conducted by almeda GmbH (Munich, Germany), a health care provider specialized on telephone-based services. The program was initially developed as a telephone-based lifestyle intervention for weight management and establishing a healthy lifestyle. It consists of six specific modules (an ‘orientation phase’ of approximately 3 months after registration, and the maxi,

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intensive, standard, basis and mini modules which only differ in intensity of support). The intervention mainly includes the orientation phase, the maxi, the intensive, and the standard module. The basis and the mini modules are a type of follow-up assistance.

The intervention is planned to run for a total of 27 months. For this analysis, 12-month data were considered.

The lifestyle counselling is provided via phone calls, written information material (newsletter, health information, dietary protocols for personal use), and regular short message services (SMS) with frequencies dependent on the module. The written information material focusses on self-help information about nutrition, physical activity, and behavior. The quality of information is checked by an independent expert. The SMS service had a reminder and motivational function based on the defined aims (e.g., more fruits and vegetables, more physical activity).

The participants have personal coaches (via telephone) during the whole program. The coaches are health care or nutritional experts who have been trained by the health care provider. The phone calls are based on motivational interviewing. For specific nutrition-related questions external experts are available.

During the intervention, the participants are called monthly in the orientation and intensive phase, biweekly in the maxi module and quarterly in the standard module. In the basis module one single call takes place. The first call is about 45 min, and the following calls are limited to around 30 min.

Participants are allocated to the different modules according to their risk profile (mainly defined by BMI, waist circumference, blood pressure, lipid profile, glucose tolerance, physical activity, and lifestyle) or their personal preference. Every risk item has three risk categories: low, middle, high. For example, if a person achieves a high risk for three or more items, the maxi module, which represents the most intensive intervention, is recommended.

Consequently, the lifestyle intervention based on nutrition, physical activity, and behavior recommendations is personalized and can be modified according to the actual willingness and health status of the participant, thereby allowing individual delivery of the program. This is also reflected by the fact that participants are allowed to change the module when convenient to them.

Data Collection and Measurements

Data are collected by two different means: via standardized questionnaires during the telephone interview (self-reported) and via the medical documentation sheet completed by the participant's general practitioner. Participants are asked to have a baseline assessment by their general practitioners after registration and follow-up assessment during the program. This documentation sheet includes co-morbidities, current medications, anthropometric data, physical activity data, blood pressure as well as blood parameters like lipids, glucose, albumin, creatinine, and uric acid. For self-measurement of anthropometric data, written instructions are given to the participants. Values of blood pressure and blood parameters are forwarded by general practitioners to the service center, and general practitioners are paid for this service. Other data including self-reported weight are documented at each phone call by the respective coach. Data are collected in a pragmatic approach; in addition to the two data sources the data are collected in a specific time range, and not at a specific time point.

Statistical Analysis

The primary purpose of this evaluation was to investigate the efficiency of a telephone-based lifestyle intervention on weight loss. However, the number of weight measurements available and the time points of these measurements varied greatly between participants. For this reason, two methodological approaches were chosen for data analysis. For the first approach, the data were harmonized to give weight data at baseline and approximately 3, 6, and 12 months after starting the program. The first documented weight value per participant was considered to be the baseline weight. A weight value in the time range 90 ± 45 days after start was defined as 3-month weight. If more than one weight value was available in this time period the value closest to 90 days was used. The mean weight change from baseline to 12 months was calculated for the participants for whom 12-month data were available, with change over time analyzed using a paired t-test. However, since participants who remained in the program may have different weight trajectories compared to those who dropped out, an additional analysis was performed for all participants who partici-

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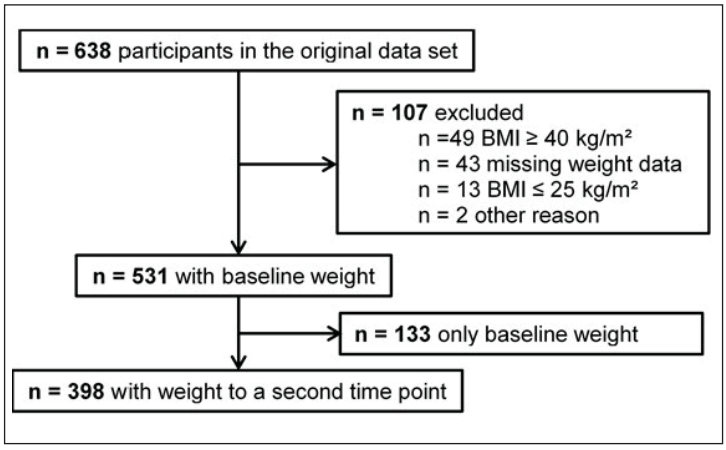

Fig. 1. Data flow.

pated in the study using the weight values at all time points in the harmonized dataset. This analysis produced valid estimates under the assumption that data were missing at random (MAR). Therefore, a mixed model for repeated measures was fitted to the weight values with time included categorically as an independent variable. An unstructured covariance matrix between measurements on the same participant was assumed. From this model, the mean change from baseline to each time point could be estimated.

The pragmatic approach to the analysis using the harmonized dataset allowed weight change over specified time ranges to be estimated in a clear manner. However, this approach discarded some of the available data and did not use the precise time of measurement. Due to this, an additional analysis of the weight data was performed using all recorded weight data. To this data, a linear random coefficient model was fitted, which assumed that change within a participant was linear over time, but took into account that baseline weight and rate of change differed between participants.

For abdominal girth, blood pressure and metabolic parameters (cholesterol, triglyceride and glucose), two values were available for analysis (defined as recorded before and after 225 days). To assess how the change in these variables is associated with change in weight, linear regression models were fitted with change in weight and number of days between the two measurements as independent variables. To calculate change in weight for this analysis, weight values recorded within 30 days of the measurements were used.

Further, for the study completers, the association between the total number and duration of telephone calls with 12-month weight change was estimated using Pearson's correlation.

Results

Baseline Characteristics of Participants

By May 2012, a total of 638 participants had registered to the program. For several reasonsthat are listed in figure 1, 107 participants were excluded, and only participants with weight data available at least at two time points (n = 398) were included in the analysis.

The baseline characteristics for all study participants (n = 398) and for the participants with 12-month data (n = 258) are shown in table 1. More men (61%) than women (39%) participated. The mean age was 50.84 ± 9.98 years, and the mean baseline weight was 103.12 ± 14.21 kg, representing a BMI of 33.38 ± 2.83 kg/m^2, with minimum of 27.40 kg/m^2 and maximum of 39.96 kg/m^2. Other baseline characteristics of the participants such as abdominal girth, blood pressure, and blood parameters are shown in table 1. The baseline characteristics of the participants providing 12-month data (completers) were comparable to those for the whole study group (table 1).

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Table 1. Baseline characteristics for all participants and participants with 12-month data[a]

Parameter	All participants (n = 398)	Participants with 12-month data (n = 258)
Men/women, n	242 (61%) / 156 (39%)	155 (60%) / 103 (40%)
Age, year	50.84 ± 9.98	50.72 ± 10.06
Height, m	1.76 ± 0.10	1.75 ± 0.09
Weight, kg	103.12 ± 14.21	103.16 ± 14.29
BMI, kg/m^2	33.38 ± 2.83	33.53 ± 2.80
Abdominal girth, cm	111.39 ± 11.17 (n = 279)	111.12 ± 11.15 (n = 207)
Systolic blood pressure, mm Hg	130.87 ± 13.86 (n = 249)	129.93 ± 13.45 (n = 174)
Diastolic blood pressure, mm Hg	82.32 ± 8.41 (n = 249)	81.74 ± 8.40 (n = 174)
Total cholesterol, mg/dl	211.96 ± 40.06 (n = 246)	213.01 ± 39.73 (n = 174)
HDL-cholesterol, mg/dl	51.46 ± 16.62 (n = 232)	51.53 ± 16.78 (n = 165)
LDL-cholesterol, mg/dl	133.13 ± 33.03 (n = 229)	133.90 ± 33.39 (n = 164)
Triglycerides, mg/dl	164.45 ± 120.96 (n = 234)	169.87 ± 137.54 (n = 164)
Glucose, mg/dl	94.06 ± 20.86 (n = 223)	94.11 ± 21.95 (n = 163)

HDL = High-density lipoprotein, LDL = low-density lipoprotein.
[a]Results are shown as mean ± SD if not indicated otherwise.

Table 2. Results of analyzing the harmonized dataset for weight change after 3, 6, 9, and 12 months compared to baseline weight data[a]

Time since baseline	n	Mean weight change ± SD in kg since baseline for completers	Estimates of weight change (95% CI) in kg since baseline for all participants
3 months	365	–1.25 ± 3.56	–1.17 (–1.52, –0.81)
6 months	339	–2.29 ± 4.52	–2.26 (–2.75, –1.77)
9 months	294	–3.34 ± 5.09	–3.18 (–3.75, –2.61)
12 months	258	–4.25 ± 5.18	–3.88 (–4.48, –3.29)

[a]Results are shown as mean ± SD if not indicated otherwise.

Weight Change after 12 Months

For the 258 study participants with weight data at 12 months (completers), the mean weight change was –4.25 ± 5.18 kg (table 2) ($p < 0.001$) which corresponds to a mean percentage body weight change of –4.10 ± 4.88%. 87 participants (34%) lost more than 5% of their initial body weight, with 29 (11%) losing more than 10% of their initial body weight. 40 participants (16%) gained weight over this period. The results at 3, 6, and 9 months are given in table 2.

The repeated measures model, fitted to the harmonized data for all 398 study participants, estimated that the mean 12-month weight change for all participants who started the 'Leichter Leben' program was –3.88 kg (95% confidence interval (95% CI) –4.48, –3.29 kg, $p < 0.001$). The estimates at 3, 6 and 9 months are given in table 2.

The number of available weights and the spacing of these differed greatly between participants, as shown in figure 2 for a random sample of 9 participants. Using all recorded weights in the analysis, but assuming a linear change over time, it is estimated that the mean monthly weight change was –0.37 kg (95% CI –0.43, –0.31), with an estimated mean weight change over 12 months of –4.45 kg (95% CI –5.19, –3.72). It is also estimated from this model (using the estimated components of variance) that there was only a very weak correlation between starting weight and change over time of –0.05 (95% CI –0.20, 0.10).

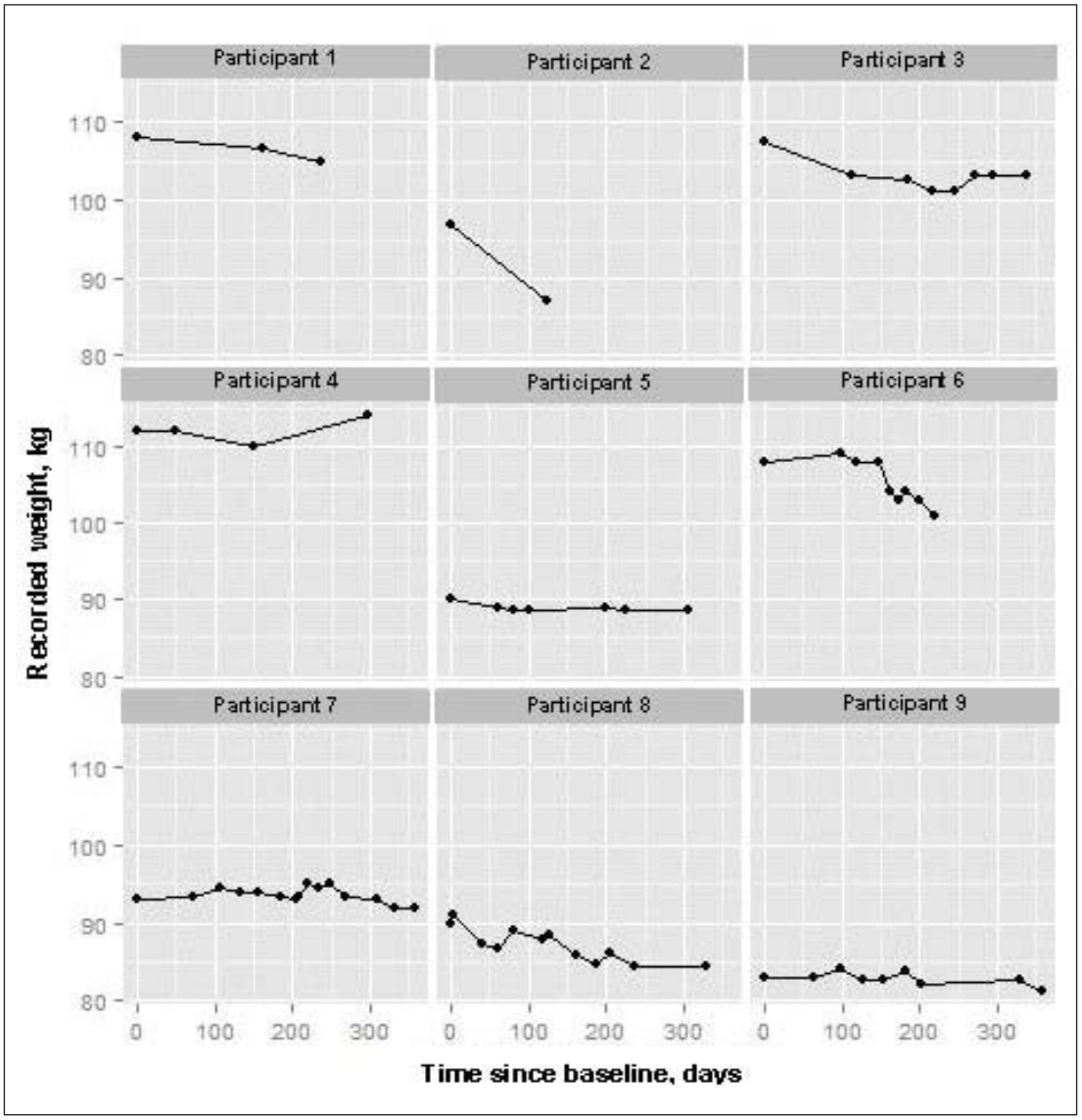

Fig. 2. Weight trajectories over the first 12 months for a random sample of 9 participants.

Change of Abdominal Girth and Metabolic Parameters

The results of the regression analyses to assess the effect of weight change on abdominal girth, blood pressure, and metabolic parameters are given in table 3. These results demonstrate the association between weight change and change in abdominal girth, with an estimated reduction of 0.59 cm in abdominal girth for every kilogram of weight lost. Measurement of blood pressure and metabolic data at a second time point was not mandatory to continue the program, and therefore data were only available for a small number of participants. Although a mean reduction was observed for all metabolic parameters, with the exception of HDL-cholesterol, a statistically significant association with weight change was only observed for total cholesterol.

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Table 3. Abdominal girth, blood pressure, and blood parameters at baseline and second time point[a]

Parameter	n	Mean change ± SD	Mean number of days between measurements ± SD	Coefficient estimate (95% CI) for association with weight change	p value
Abdominal girth, cm	117	–4.53 ± 6.23	235.23 ± 80.39	0.59 (0.34, 0.85)	<0.001
Systolic blood pressure, mm Hg	55	–3.96 ± 13.60	256.45 ± 74.25	0.85 (–0.01, 1.70)	0.051
Diastolic blood pressure, mm Hg	53	–1.47 ± 8.92	256.53 ± 74.96	0.07 (–0.52, 0.66)	0.807
Total cholesterol, mg/dl	51	–9.53 ± 28.39	262.57 ± 72.89	1.55 (0.04, 3.05)	0.044
HDL-cholesterol, mg/dl	46	1.19 ± 11.68	267.85 ± 66.22	–0.05 (–0.72, 0.61)	0.873
LDL-cholesterol, mg/dl	47	–9.17 ± 27.29	267.87 ± 68.61	0.91 (–0.58, 2.40)	0.225
Triglycerides, mg/dl	49	–20.18 ± 108.76	268.00 ± 70.15	2.68 (–3.31, 8.68)	0.373
Glucose, mg/dl	39	–1.56 ± 19.74	264.31 ± 75.05	–0.05 (–1.32, 1.21)	0.935

HDL = High-density lipoprotein; LDL = low-density lipoprotein.
[a]Results are shown as mean ± SD if not indicated otherwise; the covariates included in the models were weight change and number of days between the two measurements. Measurements are only included if corresponding weights were available (e.g., abdominal girth were only included if a weight measurement was recorded within 30 days).

Number and Duration of Calls

For the completers, the mean number of phone calls over the 12-month period was 12.0 ± 3.3 ranging from 4 to 22, with a mean total duration of 321 ± 113 min. There was no evidence of an association between number of calls or total duration and 12-month weight change, with estimated correlation coefficients of –0.10 (95% CI –0.22, 0.02) or –0.12 (95% CI –0.24, 0.01).

Discussion

To date, randomized controlled studies have investigated the effectiveness of a telephone-based weight loss program compared to other intervention methods using highly standardized methods [5, 6]. In contrast, results from such programs in real-world settings are very limited. Our analysis is the first evaluation of a telephone-based lifestyle program delivered in daily life and offered by a private German health insurance. This pragmatic approach is unique as it provides a wide range of data for a systematic analysis from a rather large sample collected in a real-world setting.

First of all, the results show that the program 'Leichter Leben' is effective in weight reduction and improvement of metabolic parameters under these uncontrolled conditions. The present evaluation indicates a moderate weight loss of 4 kg after 12 months with a large variation between individuals (fig. 2). Although the mean weight change was moderate, almost one-third lost at least 5% of initial body weight. There is, however, agreement that such a moderate weight loss after 1 year of lifestyle intervention is clinically relevant and recommended by current obesity treatment guidelines [7– 9].

The continuing mean weight loss observed up to 12 months differs from the results reported by other studies. Most programs aim to achieve a rapid weight loss in the first 3 to 6 months followed by weight maintenance thereafter [5, 6, 10– 12]. In contrast to this strategy, our program does not focus on rapid early weight loss, but targets small changes in lifestyle behavior with moderate but sustained weight loss as a secondary goal. The program is planned to run for 27 months. It will be interesting to see if this 'slow' weight reduction is more effective than conventional programs in the long run. However, recent data suggest that

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the velocity of initial weight loss is not relevant for long-term weight maintenance [13]. Nevertheless, the results of this evaluation clearly indicate that the lifestyle program achieves weight loss effects comparable to face-to-face intervention within a 12-month time frame [10, 14].

In the study by Rock et al. [6], the group receiving a telephone-based intervention which included free delivery of pre-packaged meals during the initial weight loss phase lost a mean of 8.5 kg after 12 months (intention-to-treat analysis). Furthermore, the results published by Appel et al. [5] indicate a weight change of about 5.5 kg after 1 year in the intervention group supported by telephone, email, and website. In a randomized clinical study evaluating the effectiveness of phone- and mail-based weight loss interventions in a managed care setting, participants (n = 1,801) lost 1.93, 2.38 and 1.47 kg at 6 months in the mail, phone and usual care group, respectively. The mean weight loss at 12 months was higher compared to 6 months and did not differ by treatment group (2.28 kg mail, 2.29 kg phone, and 1.92 kg usual care). This is comparable to our study in which continuing weight loss from the beginning onwards was found [15]. In contrast to our study, the Drop It At Last (DIAL) pilot study [16] showed that weight loss was dependent on number of phone contact sessions. There was moderate weight loss after 6 months: –2.3, –3.2 and –4.9 kg in the self-directed, 10-session and 20-session group, respectively.

It has to be emphasized that in these studies the primary endpoint was weight loss. Unlike these controlled weight loss studies, the program 'Leichter Leben' is a lifestyle program focusing on both step-by-step improvements in lifestyle and slow weight loss. It is important to note that the results of our program are not fully comparable with telephone-based weight loss programs investigated in study settings.

The evaluation of Australia's Get Healthy Information and Coaching Service® to improve lifestyle behavior by telephone-based intervention has shown that participants from a population-wide sample lost 3.9 kg weight after 6 months by increasing physical activity and changing dietary behavior. This real-world application was associated with weight loss of 2.9 kg (n = 277) after 12 months [17, 18].

As a comparator, the telephone-delivered Optimal Health Program provided by a primary health care organization in a real-world setting led to a weight change of –5.4 kg after 12 months in the 'completers'. Similar to the program 'Leichter Leben', the Optimal Healthy Program aimed to promote a healthy lifestyle and weight loss [19].

It is noteworthy that 56% of the participants withdrew before program completion. In our program, the dropout rate was approximately 35% which is small compared to weight loss studies with high attrition rates of up to 90% [20]. These findings suggest that telephone-delivered weight loss programs can provide an effective weight loss tool in a primary care setting. Furthermore, they overcome geographical distances and increase accessibility to the programs [21, 22].

According to the literature, the majority of participants in weight loss programs are female [23]. In the program 'Leichter Leben' 61% of the participants were male. This non-representative over-selection of men might be due to the fact that the private health insurance DKV which offers this program has more men than women insured. Moreover, men might be more willing to participate in telephone-based weight loss programs compared to face-to-face group sessions. A clinical study conducted by Spring and colleagues [24] investigated the weight loss effect of a standard-of-care group treatment versus a standard treatment plus mobile technology (personal digital assistants and coaching calls) in which 85.5% of study participants were men.

Due to the real-world setting, the program offers high flexibility concerning the intensity of the intervention. All patients receive regular phone calls on an individual multimodal lifestyle modification program comprising an energy-restricted diet and an increase in physical

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activity. Despite the individualized counselling the components of the program are standardized. A limitation of the study is that most data are self-reported. Therefore, data collection must be interpreted with caution. Recent data on self-reported versus measured weight from a national representative population in the UK showed that, on average, women underestimated their weight by 2.4 kg and men by 1.4 kg [25]. However, the additional investigations and documents requested from the respective general practitioners, which are additionally obtained for a minority of participants, are more 'objective'.

Furthermore data are limited to 12 months, are collected at different time points and there was a possibility to change between program modules. As a consequence, there was a heterogeneous and poorly synchronized dataset. The challenge of this procedure was to find an analysis strategy for this highly unbalanced dataset with weight recorded at different time points for each participant. Two different approaches were taken to analyze this data. One limitation of the first approach is that it did not use all of the data recorded and did not take into account the actual time of measurement. A limitation of the second approach is that it assumed that weight change is linear over time. Furthermore, the participants of the program 'Leichter Leben' represent a highly selective sample, because participants are recruited by a private health insurance company comprising more men than women as well as a group with higher socioeconomic status.

Conclusion

Due to the fact that obesity has a major impact on long-term health and health care providers have limited resources for obesity management, it is necessary to offer alternative tools for weight loss management. According to our data, telephone-based interventions have a high potential to address this issue in both a flexible and affordable manner. Future studies need to further refine and evaluate such programs in primary care and to calculate the cost effectiveness of telephone-based weight loss programs.

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Disclosure Statement

CH is a member of the advisory board of 4sigma GmbH. HH is a member of the advisory board of almeda GmbH. He supported the preparation of the material for the dietary support and reviewed the program. MM and LS have nothing to declare.

We verify that all authors had access to the data and a role in writing the manuscript.

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