CHAPTER 8:

GENERAL DISCUSSION
Prevention and treatment of overweight are important to reduce the burden of overweight on public health. The work setting presents an opportunity to offer weight loss and weight maintenance programs to a large number of people. Programs making use of distance counseling, by internet and telephone, seem especially promising in this setting. However, the short- and long-term effectiveness and cost-effectiveness of distance counseling for weight management in overweight workers, and differences in effectiveness between the two counseling modes, are not known. The general aim of this PhD dissertation was to address these issues. To that end, a randomized controlled trial, ALIFE@Work, was conducted among overweight employees from seven organizations in the Netherlands. The effectiveness and cost-effectiveness of a lifestyle program called ‘Leef je Fit’ with two modes of counseling, i.e. phone and e-mail, was studied in this trial.

In this general discussion, we first present the main findings of the study. Secondly, methodological considerations regarding the study and its findings will be discussed. Thirdly, suggestions for future research will be proposed and the public and occupational health implications of the main findings will be addressed.

**MAIN FINDINGS**

**Accuracy of self-reported body weight, body height and waist-circumference**

The accuracy of self-reported measures for body weight, body height and waist circumference were reported in chapter 3. We found that body weight was under-reported, on average by 1.4 kg. Conversely, body height was over-reported by 0.7 cm. As Body Mass Index (BMI) is calculated from the ratio of body weight relative to body height, an average under-reporting of BMI was found by 0.7 kg/m^2. For waist circumference over-reporting by 1.1 cm was observed. Intra Class Correlation showed high concordance between measured and self-reported values. Also, substantial agreement existed between the prevalences of BMI status and increased waist circumference based on measured and self-reported data. We concluded that self-reported BMI and waist circumference are satisfactorily accurate for the assessment of the prevalence of overweight/obesity and increased waist circumference in large scale studies among a middle-aged overweight working population. Thus, self-report can be used to assess the distribution of overweight and obesity in similar populations as we studied. Nevertheless, limits of agreements showed considerable individual differences in the accuracy of self-reported anthropometrics. Consequently, self-reported anthropometrics are less suitable to classify an individual as overweight or obese. For this, direct measurements are recommended.

**Effects on body weight and waist circumference**

Effectiveness of the program was studied at six months, as described in chapter 4, and at two years, which was reported in chapter 5. Based on analyses in which missing body weight data were imputed with multiple imputation techniques, we found that the lifestyle program was effective for weight loss at six months as the phone group reduced body weight by 1.5 kg (95% CI -2.2 to -0.8), and the internet group did
so by 0.6 kg (95% CI -1.3 to -0.01), compared with the control group. These effects were more pronounced among study-participants for whom body weight data were available at both measurements, i.e. the complete cases. Among them, weight loss was 1.6 kg (95% CI -2.2 to -1.0) and 1.1 kg (95% CI -1.7 to -0.5), respectively, compared with the controls. Waist circumference in the phone group was reduced with 1.9 cm (95% CI -2.7 to -1.0) while the reduction was 1.2 cm (95% CI -2.1 to -0.4) in the internet group, compared with the control group.

At two years some of the effect on body weight remained in both groups, but failed to reach a level of statistical significance in the multiply imputed samples. Among complete cases, weight loss in the internet group was 1.2 kg (95% CI -1.9 to -0.4) and the phone group was more likely to reduce body weight by 5% (OR 1.7, 95% CI 1.1 to 2.7), compared with the control group. Differences in waist circumference between the groups were not found after two years.

We concluded that the program was effective for reducing body weight and waist circumference, but that these reductions were not sustained after discontinuation of the program.

**Effects on diet and physical activity**

Effects on behavioral outcomes at six months and two years were also reported in chapter 4 and 5. For these outcomes, only complete cases were included in the analyses. Relative to the control group, participants who had been counseled by phone decreased their fat intake with 1 to 4 grams/day (95% CI -1.7 to -0.2) and increased their physical activity with 866 MET-minutes/week (95% CI 203 to 1530) after six months. No effects on behavioral outcomes were seen in participants from the internet group. At two years effects in the phone counseling group had disappeared and again no effects were found in the internet group. This may indicate that no behavioral effects were present, but this contradicts the significant weight loss we found in the same participants from the internet group. Thus, we concluded that it is possible that the program changed lifestyle behavior outcomes but that inaccurate measurement may have limited detection of this change.

**Effects on blood pressure, total cholesterol level, sum of skinfolds and cardiovascular fitness**

The results with regard to cardiovascular risk factors are reported in chapter 6. These outcomes were studied in a random subset of 141 employees. At six months a significant reduction in total cholesterol by 0.2 mmol/l (95% CI -0.5 to -0.0) was observed in the phone group and a trend for an increase in aerobic fitness by 1.9 ml O₂/kg/min (95% CI -0.2 to 3.9) in the internet group. At two years, a trend for an increase in aerobic fitness (2.3 ml O₂/kg/min, 95% CI -0.2 to 4.8) was observed in the internet group. No differences were found between the phone group and the internet group. In conclusion, we found little evidence that the lifestyle intervention was effective in reducing cardiovascular risk factors in a group of overweight workers that were not selected on a cardiovascular risk profile aside from being overweight.
Effectiveness of phone-counseling compared with counseling by e-mail

Direct comparison of the phone with the internet group only resulted in significant differences in weight regain at two years (chapter 5). Adjusted for weight change at six months, internet participants gained 1 kg less (95% CI -1.7 to -0.3), as compared with phone participants. Other differences between the groups did not reach statistical significance. The results suggest that the internet version is more effective than the phone version for preventing weigh regain. Further research of other differential effects is warranted.

Cost-effectiveness for body weight and QALYs gained

Chapter 7 gives the cost-effectiveness outcomes. Two years after baseline, small and statistically non-significant differences in effects and societal costs were found. The direction of the differences implied that both interventions were more effective but also more costly than self help. The incremental cost-effectiveness ratios of the internet group were lower (€16/kg and €1337/QALY) than those of the phone group (€1009/kg and €245,243/QALY) and quite favorable. The phone group had the lowest probability of cost-effectiveness and cost-utility of all groups, whereas the internet group had the highest probability at most willingness to pay thresholds, ranging from 47% at €0/kg to 80% at €450/kg, and 60% at €20,000/QALY. Similar as before, more effect was seen in participants with complete data. Consequently, in complete cases the probability of cost-effectiveness of the internet intervention was approximately 86% at a ceiling ratio of €20,000/QALY. In conclusion, the phone intervention was not cost-effective compared with usual care. The internet program with e-mail counseling showed some promising results but firm conclusions cannot be drawn due to large numbers of missing data.

METHODOLOGICAL CONSIDERATIONS

The randomized controlled trial (RCT) is the acknowledged method for incurring valid conclusions about the efficacy and effectiveness of interventions. It was therefore the type of trial we selected to study the effectiveness of the lifestyle counseling intervention. Nevertheless, implementing a RCT of a behavioral intervention in a real-world setting is a challenge. Our design exhibits a number of strengths, but also has some drawbacks, as will be explained in this section.

Main strengths of the study

As mentioned, the RCT is a strong design to study efficacy and effectiveness. Randomization to study groups minimizes the chance of baseline differences influencing the results. Furthermore, the use of a control group that differs only with regard to the intervention received makes it possible to distinguish intervention effects from the effects of other influences. Few worksite weight management interventions have been studied using a control group and using a truly randomized allocation procedure.\(^\text{23,185}\) By using this type of design, our study has added to the strength of evidence concerning the effect of weight management at the worksite. Performing the trial in
A real-world setting gave us the opportunity to draw conclusions about the effectiveness of the intervention rather than its efficacy. The external validity was also strengthened by having few exclusion criteria.

A further strong point was the objective measurement of the main outcome, i.e. body weight, for the majority of the study population. Moreover, we used multiple imputation for handling missing data. While having complete data is of course preferred, multiple imputation is considered to be one of the best methods when data are missing. Yet, very few weight control studies choose this method. The majority of studies analyzed only the available data, or used simple imputation methods such as imputing missing data with data from a previous measurement. A major weakness of these imputation methods is that they underestimate the true variability in the data and therefore increase the probability of making a type 1 error, i.e. observing a statistically significant difference when in reality there is none. Multiple imputation uses available information to produce estimates (e.g. means, standard errors) that, under the assumption that the data are missing at random (MAR) and the imputation model is correct, are more reliable than those derived from a complete-case analysis.

Another strong point of the study is that we performed the economic evaluation of the lifestyle program from a societal perspective. This perspective is the most suitable to judge the value and costs an intervention has for public health or, in a broader sense, public welfare. The societal perspective makes it possible to assess possible transfers of costs between stakeholders. Furthermore, payers interested in a narrower perspective can extract the costs and benefits they are interested in from those included in the societal perspective.

Finally, our study is the first to report about the sustainability of the effects of distance counseling on weight management and the first to report the effects of a weight management program in the work setting at 18 months post-intervention.

Limitations in the internal validity
Internal validity refers to the strength of a study design to draw true conclusions about causes and effects.

Comparison intervention
In economic studies, the comparison intervention has to be relevant for the policy question being addressed. Typically this involves a comparison with usual care. At the time the study was initiated, structured efforts to identify overweight employees were not part of standard Dutch occupational health care. Moreover, no standard care existed for employees that were found to be overweight during voluntary health examinations. Maybe these employees received lifestyle advice from their occupational physician and information in the form of brochures, or a referral to a dietitian, but it is quite likely that they received no help at all. That is why we chose to compare the experimental intervention with widely available self-help brochures. All groups
received brochures on overweight, physical activity and diet. These self-help materials were briefly explained to the control participants during the baseline appointment. Other research has shown that self-help materials may be more effective for weight control than no-treatment. As a consequence of this choice, the [cost-]effectiveness of the weight management program could be somewhat underestimated, compared with the state-of-affairs at the time the study started.

**Blinding**
Blinding is the masking of treatment allocation and other aspects of the study following randomization. It is critical to minimize bias. However, blinding is not always feasible in non-pharmacological interventions. Due to the nature of the intervention we studied, it was not possible to blind participants for group assignment. Prior information about the intervention was brief, but enough for participants to distinguish between the experimental and control conditions.

Lack of blinding of group allocation could lead to several biases. First, knowledge of group assignment could influence participants’ participation. This would have been observable in differences in dropout between groups. To gain insight in the influence of knowledge of group assignment, we asked the participants at six months how content they were with the group they were randomized to. Of the control group 68/215 (32%) participants were content, whereas this was 205/223 (91%) in the phone group and 166/207 (80%) in the internet group. Despite these differences in satisfaction, we found no differential dropout. Another concern about failure to blind participants for group allocation is that participants in the perceived to be inactive (control) group might seek alternative treatment that would interfere with the outcome of the study. We found no evidence for this. At six months 30/268 (11%) of controls, 23/264 (9%) of phone-participants and 18/269 (7%) of internet-participants said they had initiated co-interventions like a slimming course, consulting a dietician or taking weight-loss medication. A test for differences in proportions reached no significance ($X^2=3.38$, p=0.184).

**Participation rate**
Out of the 5250 (25% of 21,000) employees expected to be eligible for the study, one-fourth participated. This shows that considerable numbers of Dutch employees are interested in lifestyle counseling, a finding that is confirmed in other studies. Yet, the majority of eligible employees did not take part in the study. We could not study differences between participants and non-participants, and only limited information is available from other studies. These studies show that participation is more likely among female employees, low risk and healthier employees, and older employees. In men, perceptions of already being healthy play a role in choosing not to participate in lifestyle programs.

In general, women are more health conscious and worried about their body weight. A recent review concluded that incentives and multi-component programs...
result in higher participation levels. More research is needed to elicit what drives differences in participation, to enable development of tailored recruitment strategies and more fitting programs.

**Intervention**
Some possible shortcomings of the intervention have to be discussed: its content and duration, number and frequency of counseling sessions, and participants’ adherence to the intervention. In conclusion the need for an intervention mix is discussed.

**Intervention content**
First off, due to time constraints we could not pretest the intervention. Process evaluation data collected during the study showed that some parts of the intervention were experienced as less engaging. In general the information in both the workbook and on the website was appraised positively, but only 50% of the participants said the information applied to them personally. The evaluation of the assignments was less positive. Around 60% of participants valued them as helpful in changing their dietary and physical activity habits and only 21% (internet group) and 38% (phone group) found them enjoyable. Opinions of the website were fairly positive, as 76% found it easy-to-use and 89% judged the navigation on the site to be straightforward. Not all elements of the website were valued favorable. Specifically, only 41% thought the calorie intake, calorie expenditure and body weight trajectory graphs were useful. The appraisal of the program most likely affected its uptake, and the adherence to the modules.

With respect to the self-monitoring materials we supplied, 73% of the participants of the phone group said that they had used the food and activity logs, against 57% of the internet groups. Conversely, 36% of the phone group and 48% of the internet group had used the provided step counter on a regular basis. These numbers are of concern because self monitoring has been shown to be an important factor for weight control success.\(^\text{266, 267}\) It is unclear why not all participants used these materials. This requires further study, so the intervention can be adjusted accordingly.

**Number and frequency of counseling sessions**
In the phone group 87% of respondents said their counselor contacted them a sufficient number of times. This was 56% in the internet group. As the offered number and frequency of sessions were the same in each group, this difference probably reflects a need for scheduled contact moments and a more personal approach. The latter is confirmed by the appraisal of the counseling, which was more positive in the phone group than in the intervention group. That is, 76% of the phone group said that the contact with the counselor was personal and individual, while this was 22% in the internet group.

Level of satisfaction aside, several reviews show that frequent and many sessions enhance lifestyle change and weight loss, but the optimal dose is unknown and could be more frequent than ten sessions in six months.\(^\text{266, 268}\)
**Duration of the intervention**

After completion of all modules, contact with the counselor ended. A recent review concluded that weight loss was better maintained if there was ongoing communication with the participant after the active weight loss phase of in-person counseling interventions, provided this was with the same counselor. This suggests that our intervention could have been more effective in maintaining initial changes if it had been prolonged. The development of maintenance strategies for lifestyle programs with distance counseling warrants further attention.

**Adherence to the intervention**

Adherence to the intervention was far from optimal, as was described in chapters 4 and 5 of this thesis. In the phone group 20% of the participants did not start the program, whereas 34% finished all counseling sessions. In the internet group 26% did not start the program, and 18% was counseled on all modules. An explanation for the high number of participants that did not start their allocated intervention could be that the pre-trial information (i.e. before randomization) about the intervention was quite general. Participants who did not commence the intervention were possibly expecting something different. Another reason could be that participants reconsidered their intention to change their lifestyle habits. Unfortunately, hardly any of the participants who did not start the intervention filled out the process evaluation questionnaire, so we cannot verify reasons for not initiating the program. Nevertheless, if the intervention would be implemented in occupational health care, it seems sensible to give detailed information about the program, assess participants’ willingness to make behavioral changes and willingness to invest time and effort in this, and offer a trial session.

Differences in adherence to the two intervention modes might be explained from the way participants were contacted. To start the program, participants in the phone group were contacted by their counselor. Thereafter participants had prescheduled biweekly appointments for reviewing the modules. Internet participants received automated e-mail reminders to start the program and to start and finish modules. This was probably less stimulating than the scheduled in-person contact that was offered to phone participants. This is supported by results from the process-evaluation. Among the phone group participants 81% found the counseling motivating against 46% in the internet group. Adherence to the internet program could probably be enhanced by additional in-person contact.

**Intervention mix**

The intervention aimed at changing lifestyle behavior by efforts of the employees themselves. However, specifically for dietary behaviors, systematic reviews have shown that physical aspects of the working environment, such as the assortment of food in the cafeteria, are important in changing these behaviors. There is some evidence that social support at the worksite is also of influence on diet and physical activity. It is plausible that individual lifestyle counseling and environmental
changes support each other, to make their combined effect larger than that of each of these interventions alone. Changing the physical and social environment in conjunction with distance lifestyle counseling could be important to achieve better and sustained results.

Finally, it is unlikely that ‘one size fits all’. Weight loss can be accomplished through a multitude of approaches. A single magic bullet that achieves adherence to a healthy lifestyle in all at whom it is aimed does not exist. There is a need for a more varied and personalized approach.

**Study outcomes**

*Body weight*

There is no consensus on the outcomes that are relevant for evaluating the effectiveness of weight control lifestyle interventions in large field studies. Effects are usually reported as mean body weight difference or BMI difference. Most trials in obese subjects also report the proportion of people that experience a weight loss of 5% or more. This threshold has long been considered clinically relevant, based on trials in obese subjects with impaired glucose tolerance (IGT), a precursor for Type 2 Diabetes Mellitus type 2 (T2DM). Recent research among subjects with a BMI ≥ 24 and IGT, showed that the risk for T2DM reduced with 16% for each kg of body weight that was lost. This effect was already discernible at a weight loss of 2%. No evidence is available for thresholds of clinical effectiveness for obese subjects without co-morbidities or subjects with a BMI between 25 and 30 kg/m². However, the previous research suggests that all weight loss should be considered relevant.

As explained in the introduction, the real health problem is an excess of fat mass, specifically of visceral fat. BMI correlates with fat mass, but is not sensitive to a decrease in fat mass if this is accompanied by an increase in muscle tissue. The latter is possible in lifestyle programs that endorse physical activity. Moreover, BMI gives no indication of the distribution of fat mass. A proxy measure for visceral fat is waist circumference. Some have argued that this should be the main outcome of lifestyle interventions aimed at weight control. Our results show that there is considerable variation in the self-report of waist circumference and the consistency of misreport is not known. Therefore, if waist circumference is used as the main study outcome, we recommend it to be measured by research personnel.

In conclusion, the most relevant outcome to judge the effect of lifestyle interventions for weight control in large field studies has not been identified so far. We recommend the development of uniform standards in the report of these studies.

*Quality Adjusted Life Years*

For the cost-utility analysis we used the EuroQol-5D (EQ-5D) to estimate the amount of Quality Adjusted Life Years (QALYs) gained. The EQ-5D consists of five health domains: mobility, self care, usual activity, pain/discomfort, and anxiety/depression. Each domain has three possible states: no problems or limitations, some problems or limitations and extreme problems or limitations. From the EQ-5D, 243 health
states can be derived. Important advantages of the EQ-5D are that the questionnaire is short, easy to fill out and translations to utility scores are available.

The mean health utility at baseline was 0.91, which is in the upper limit of all possible preference scores of the EQ-5D. Only ‘perfect health’ scores higher than 0.9. This ceiling effect causes the EQ-5D to be unresponsive to an improvement in the health of people with few and limited problems. It is therefore not surprising that hardly any QALYs were gained. As preventive interventions such as ours are aimed at still-healthy individuals, no immediate impact on QALYs gained is to be expected. Nevertheless, lifestyle programs may have an impact on other well being outcomes besides health.

For example, having more control over your own lifestyle behavior increases empowerment. Currently attempts are undertaken to conceptualize these non-health benefits and to develop a questionnaire that measures them.\textsuperscript{239} This type of questionnaire might be more suitable to judge the immediate cost-utility of preventive interventions than the EQ-5D. Furthermore, as the effects of lifestyle programs on morbidity and mortality, and hence QALYs, occur after a longer time than intervention studies permit, modeling studies should be performed to judge their long term cost-effectiveness.

**Accuracy of self-reported diet and physical activity**

We measured dietary intake and physical activity because these are important mediators for weight loss, as well as independent risk factors for cardiovascular disease. Studies show that food intake is usually under-reported,\textsuperscript{76} whereas physical activity (PA) is both over- and under-reported.\textsuperscript{80} With regard to diet and PA, some evidence exists that exposure to an intervention influences the self-report of these behaviors to match the goals of the intervention program.\textsuperscript{275, 276} This implies that the significant changes in fat intake and PA we found in the intervention groups at six months, could have resulted from bias in the self-reported data. We asked participants in our intervention to record their diet and PA for the duration of intervention. It is also possible that, as a consequence of this, accuracy of self-reporting of lifestyle behaviors increased in comparison to baseline. In the absence of objective lifestyle behavior data, presence and direction of self-report bias cannot be determined in our study. The observed differences in PA do however seem rather large. At six months a significant comparative difference of 866 MET-minutes/week was found in the phone group, equivalent to cycling at a speed of 18 km/hour for two-and-a half hours each week or walking at 4 km/hour for about five hours. The questionnaire we used to measure PA has been developed to measure PA in minutes of moderate and vigorous physical activity to judge adherence to national guidelines, and not to measure MET-minutes of PA, including those from light intensity activities.\textsuperscript{97} This could have resulted in over-reporting of PA, in conjunction with bias due to self-report. Future large scale studies would do well to include more objective PA measurements in a sample of the study-population.
Time horizon of the economic evaluation

The time horizon of the economic evaluation was two years, equal to the length of the trial. Analyses were based on cost data that were collected alongside the effectiveness study. The two-year period is too short, because health benefits of a preventive intervention such as ours are likely to lie further in the future. A solution for this is to model costs and effects for a time period that extends that of the study. To do so, we would have had to make assumptions about the sustainability of weight loss from the intervention. These assumptions could not have been corroborated with other data from similar interventions, making the model very tentative. Because of this limitation, and for reasons of feasibility, we decided to limit the time horizon to the study length. We do acknowledge that a modeling study with different scenarios for sustainability of the results could shed more light on the long term cost-effectiveness of the intervention.

Loss to follow-up

A serious limitation of this study is the amount of loss to follow-up. Loss to follow-up occurred due to considerable participant dropout, but also because the participants who remained in the study did not take part in all measurements. Specifically, there was a very low response to the cost diaries.

Most weight control trials suffer from considerable loss of data; average dropout is 37% at one year after baseline. According to a prediction algorithm, dropout increases to around 60% at two years. These numbers indicate that conclusions regarding efficacy and effectiveness in the weight control field are seriously hampered and that our study is no exception. Future studies must improve retention of participants to the trial.

Limitations in the external validity

External validity refers to the application of results to other populations and other contexts than those in the study. We placed few restrictions on the eligibility of companies and employees. The study was also performed in the ‘real world’, thus enhancing generalization of the results to practice. However, there are some limitations on the generalization of the results to other companies and employees than those taking part in the study.

No specific inclusion criteria were devised for the companies of which the employees could take part. However, for logistic reasons, we only included companies that had more than 1000 employees working at the same location and who could facilitate measurements at the worksite. We did not document which and how many companies we approached, or why companies were not willing to participate. Companies that joined the study mostly employed white collar employees and all companies belonged to the service industry. This limits the generalization of our results to larger service sector companies.
RECOMMENDATIONS FOR FUTURE RESEARCH

Measurement and analysis

- More research is needed to develop methods for collecting anthropometric and lifestyle behavior data that are more valid than the current self-report methods, and appropriate for use in large-scale studies. Minimizing the burden that data collection places on study participants should be an important consideration in the development of these instruments.
- A broader set of well-being outcomes should be considered to assess the immediate cost-utility of lifestyle programs. More research is therefore needed to identify these outcomes and on how to value them.
- Modeling studies are needed to judge the long term cost-effectiveness of lifestyle programs.

Dropout

- It is important to prevent dropout in future weight control studies, particularly those with follow-up beyond one year. In that light, researchers should practice restraint in the number of outcomes they wish to examine, to reduce the burden to participants. Upcoming technologies, such as weighing scales that are connected to the internet, could make measurement less burdensome. Participants should be selected on motivation to complete the trial and their motivation could be further enhanced. Research is needed to discover other ways to increase retention to weight control trials.
- The collection of cost data deserves more attention.
- Researchers should make use of proper methods such as multiple imputation to handle missing data.

Mediators for effectiveness of distance counseling

- With regard to lifestyle programs using distance counseling, questions remain about the elements that influence their effectiveness and (continued) use. This should be subject of further study. Additionally, participant characteristics that determine initial and continued participation should be studied. Results from such research could be used to improve the effectiveness of distance counseling programs and to selectively offer them to those who are more likely to use these programs and benefit from them.
- Research is needed to develop a follow-up intervention aimed at maintenance of initial results of distance counseling.

Generalization of results

- The effectiveness of the studied intervention in employees in other sectors than the service industry is uncertain. Further research could be done to assess if distance counseling is effective among employees from these companies. Small companies should be included in that research as well.
- The intervention developed for this study could be used in other settings than
occupational health care. Because the companies were not involved in the implementation of the intervention it would be easy to transfer the program to other settings and populations. It is important to study the effectiveness of the program when doing so.

**RECOMMENDATIONS FOR PUBLIC AND OCCUPATIONAL HEALTH**

**Achieving the promise of workplace health promotion**

- Interventions at the worksite have the potential to reach a large part of the population. This study confirmed that a considerable number of employees have an interest in lifestyle programs at the workplace. Yet, few Dutch companies offer them. More effort should be placed towards this end by the companies themselves, but other stakeholders such as the employees (by way of the employees’ council), health care and sickness absenteeism insurance companies, and the Dutch government could take steps to stimulate work health promotion as well.

- The initial interest did not always lead to taking part in the program, or in following it through. Considering the complex causality of overweight and the difficulties in achieving lifestyle change, it is doubtful that ‘one size fits all’ in realizing weight control among Dutch employees. We propose to offer a variety of programs, to increase overall participation in workplace health promotion and to create a better match between participant and program.

**Implementation of distance lifestyle counseling**

- After six months, both the program with counseling by phone and the program with counseling by e-mail resulted in modest average weight loss. After adjustments as explained below, we believe that the program is a worthwhile addition to the variety of programs that should be on offer.

- It is a promising strategy to embed the program in a wider intervention in which the physical environment and company culture are conducive to a healthier lifestyle.

- The adherence to the program and subsequent weight loss could be improved by giving detailed information about the content and the counseling methods, and to only offer it to those employees who like the format and think they will be able to commit themselves to the program and the time investment needed.

- The content of the program, especially the interactive website, could be improved.

- Adherence to the internet version could be enhanced by adding phone contact with the counselor.

- Follow-up interventions should be provided, to increase the chance of a long-lasting outcome.

- The adjusted intervention should be accompanied by a study of its effectiveness and cost-effectiveness, as well as its impact on the company’s bottom line.
CONCLUSION
This study has shown that a program with six months of distance counseling by e-mail and phone can produce short-term weight loss. This weight loss was not preserved at the two-year mark. After some adjustments in format and recruitment, the program could form a useful addition to workplace health promotion programs aimed at energy balance and modest weight loss, but the effectiveness of this adjusted program should be evaluated.