Mobile Technologies for Self-reporting of Food Intake and Life Style Behaviour - Weight Management Using Mobile Phone Technology

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Important features of mobile technologies and programmes for weight loss

1. Aimed at micro-level: individual-level weight loss;
   - Self-monitoring or for intervention
2. Aimed at macro-level: environmental changes (foodscapes)
   - Other presenters during this course.

Individual-level weight loss programme sources of effect

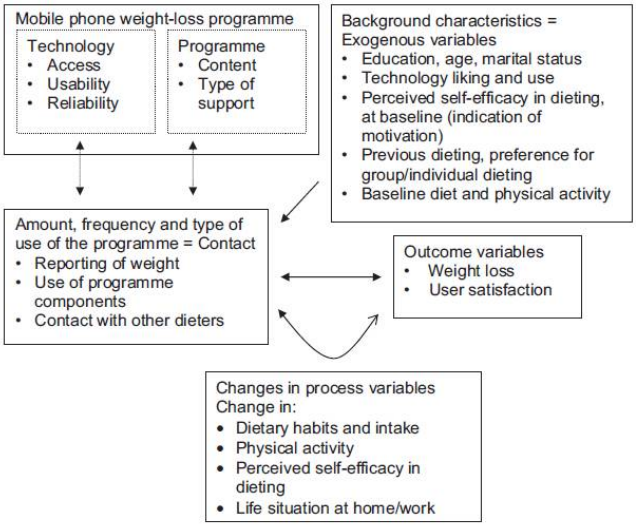


Fig. 1 Contingency model in mobile phone weight loss

Haapala I et al. 2009. Weight loss by mobile phone: 1-year effectiveness study. Public Health Nutrition, 12,2,2382-2391.

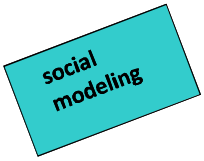
Motivation – Self-efficacy

Motivation can be sustained by strengthening self-efficacy in weight-loss.

”Self-efficacy is the major predictor of self-regulation of motivation.”

(Bandura, 1997)

Teletechnology (mobile-) in sustaining motivation



- reasonable goal setting
- external support with patience
- immediate feedback
- tracking progress in multimedia
- vast source of information
- source of social contacts
- time- and place independence
- cheap, easy, daily contact

Teletechnology in weight loss programs: How intensive and how much contact?

- Bi-weekly meetings on-line with therapist vs. face-to face for 6 months + 15-week behavioral program (Harvey-Berino, Pintauro & Gold, 2002).
- Web-based, therapist-led, 6-month behavioral program vs. educational program (Tate, Wing & Winett, 2001)
  - One initial meeting
  - Weekly home assignments via e-mail

Teletechnology in weight-loss programs

- Tate, Wing & Winett, JAMA 285(9), 2001
- Weight loss at 6 months:
  4,1 ± 4,5 kg vs. 1,6 ± 3,3 kg
- Visit to the web site once per week (3 months), and at the end, once every two weeks (6 months),
- In educational condition 1x /2 w – 1x /3months

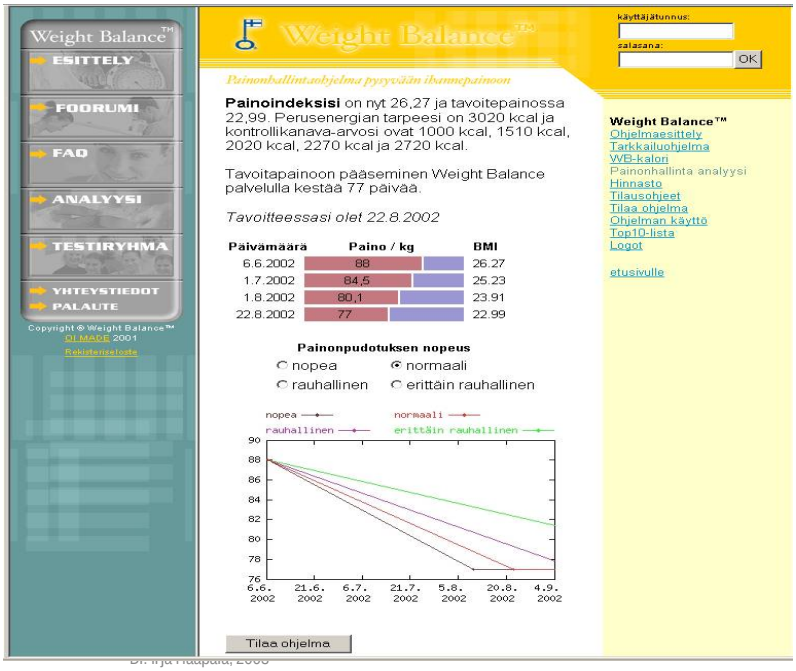
Teletechnology in weight-loss programs

- Tate, Wing & Winett, JAMA 285(9), 2001
- Weight loss at 3 months was maintained at 6 months despite the reduction in frequency of contact
- 15% dropouts at 3 months, 22% at 6 months
- Less than in most minimal-contact programs
- Can weight loss be increased by increased frequency of contact?

Weight Balance weight control program contains:

- weightloss program
- weight maintenance program
- calorie counter
- personal analysis
- discussion forum

WB-personal analysis can help you individualize the weight loss program



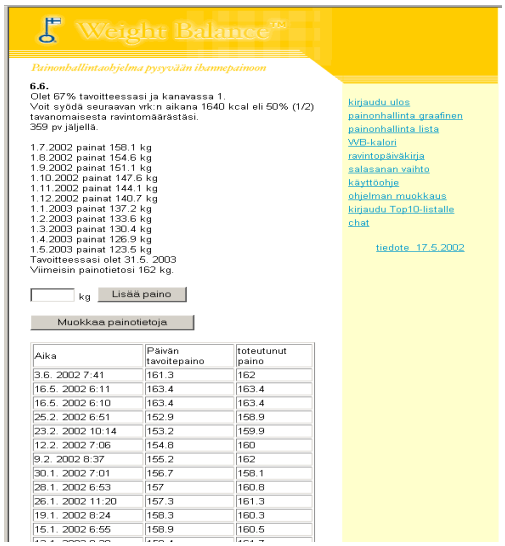
WeightBalance™ weight loss and **maintenance** program

- Daily weight reporting via text message or the internet
- Immediate, automated feedback on:
  - % achievement of daily weight goals
  - Instructions on daily dietary intake, physical activity and amount of rest
  - Remaining days in the program

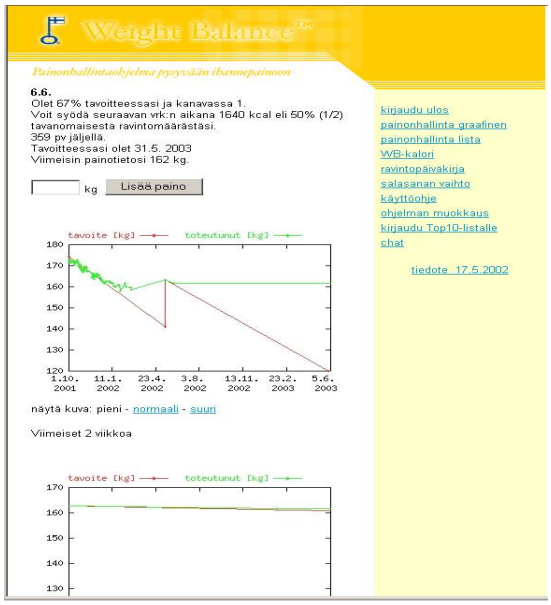
WB-program users report their weight on a daily basis, via mobile phone or the Internet.

The program immediately responds with instructions for the next day.

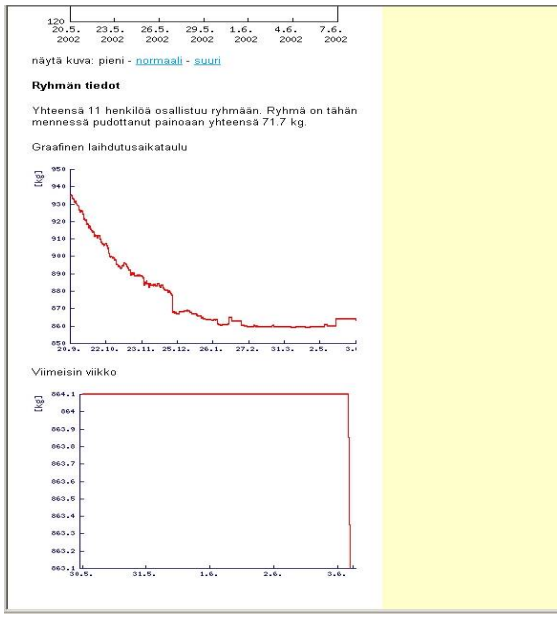
Weight information is stored on the dieters' personal web pages.



Also in graphic format.

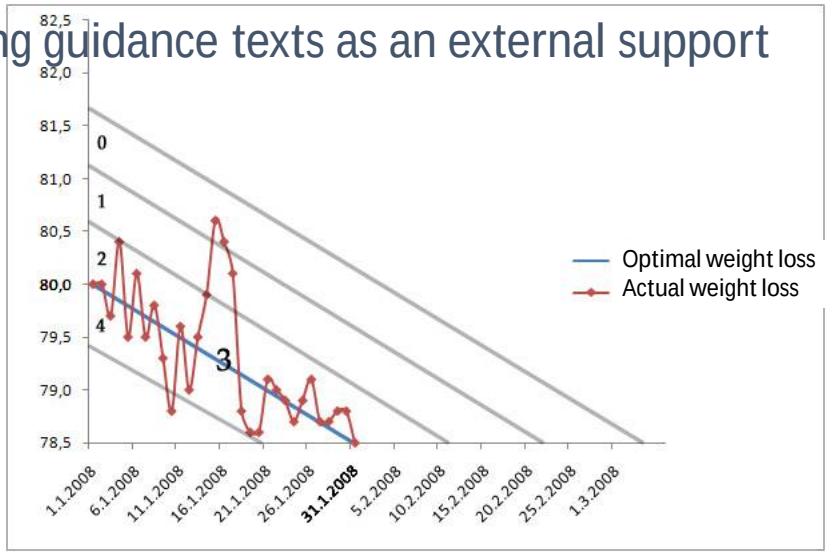


For groups, the results can be presented for the entire group – like the test group, in real time.



Setting the target right &

Receiving guidance texts as an external support



Simple, supportive, automated text messages in response to weight reporting via text

- Restart the program if in “Channel 0” for too long
- Cut down on meal size if in “Channel 1-2”
- Well done, do not cut down in meal size if in “Channel 3”
- Slow down if too fast in “Channel 4”

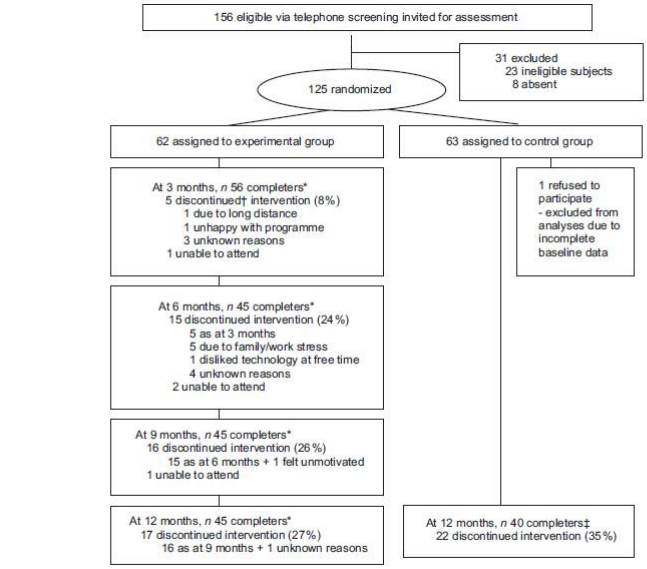


Fig. 2 Participant flow in the study (*three excluded from all analyses due to long-term medical problems (not reported at baseline); †discontinue = drop-out = withdraw from the study; ‡one excluded from all analyses due to use of the commercial weight-loss programme under study)

Study Team

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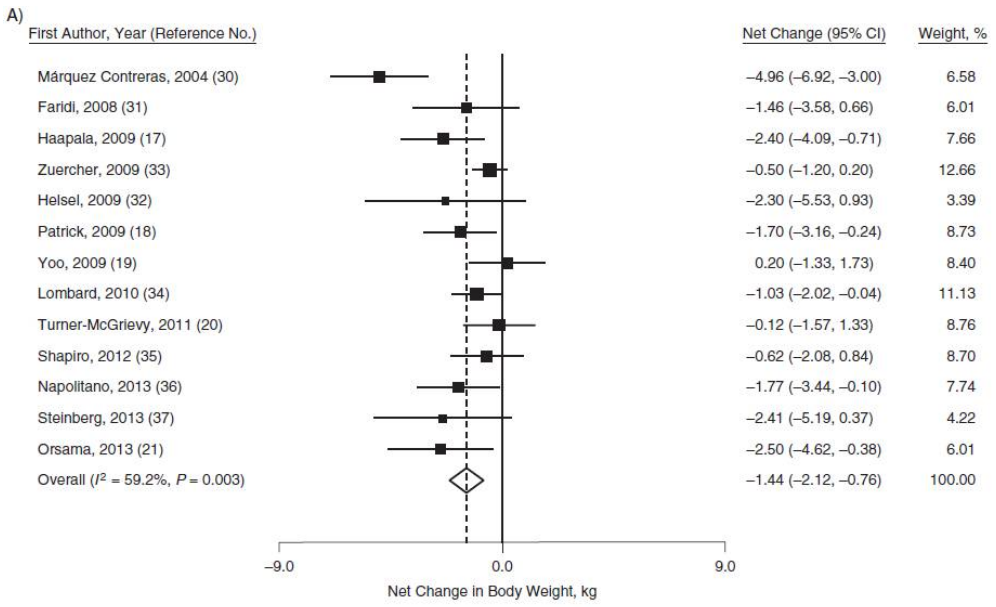
Table 2 Outcome variables by group at 3-month intervals for completers of 12 months in both groups: overweight healthy adult volunteers, Finland, June 2001 to June 2002

	Baseline		3 months		6 months		9 months		12 months	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Body weight (kg)*										
EG (*n* 42)	86·6	12·7	82·0	12·9	81·4	13·6	81·8	13·8	82·1	14·1
CG (*n* 40)	85·1	12·5	–	–	–	–	–	–	84·0	13·2
Percentage weight loss†										
EG (*n* 42)	–	–	5·3	3·5	6·1	5·1	5·6	5·6	5·4	5·8
CG (*n* 40)	–	–	–	–	–	–	–	–	1·3	6·5
Waist circumference (cm)‡										
EG (*n* 42)	97·6	10·5	91·7	10·4	90·9	11·2	91·1	11·6	91·3	11·7
CG (*n* 40)	95·7	10·9	–	–	–	–	–	–	93·3	11·1
Self-efficacy in dieting§										
EG (*n* 40)	7·0	1·1	7·0	1·2	6·7	1·1	6·6	1·3	6·4	1·7
CG (*n* 40)	7·0	1·0	–	–	–	–	–	–	6·6	1·4
Energy-dense food score‖										
EG (*n* 41)	2·9	0·6	–	–	2·4	0·6	–	–	2·6	0·6
CG (*n* 40)	2·7	0·7	–	–	–	–	–	–	2·6	0·7

EG, experimental group; CG, control group.
*Time effect: $F(4,38) = 24·5$, $P = 0·0001$; time by group interaction: $F(1,80) = 8·0$, $P = 0·006$. For EG, significant difference from baseline at each time point ($P < 0·0001$); for CG, non-significant change.
†Significant difference between groups at 12 months: $t = 3·0$, $P = 0·003$.
‡Time effect: $F(4,38) = 30·1$, $P = 0·0001$; time by group interaction: $F(1,80) = 55·2$, $P = 0·0001$. For EG, significant difference from baseline at each time point ($P < 0·0001$); for CG, significant change: $t = 2·8$, $P = 0·0008$.
§Trust in one's capability of achieving the self-set goals for weight loss, reducing food intake, increasing physical activity and maintaining the weight loss on 10-point scales: 0 = 'I am not at all certain' to 9 = 'I am absolutely certain'. Significant decrease for EG, Friedman test and Kendall's W: $\chi^2 = 10·2$, $P = 0·05$. Significant decrease in CG, Wilcoxon test: $Z = -2·08$, $P = 0·04$. In EG, significant change only between 3-month and 12-month scores: $Z = 2·05$, $P = 0·05$.
‖Energy-dense foods score scale, consumption frequency for eight food items (internal consistency coefficient = 0·71, n 116): 1 = 'less than once per month or never', 2 = 'once or twice per month', 3 = 'once per week', 4 = 'once or twice per week', 5 = 'once per day or more often'. Time effect: $F(2,39) = 27·6$, $P = 0·0001$; time by group interaction: $F(1,80) = 5·6$, $P = 0·03$. For EG, significant difference from baseline at each time point ($P < 0·0001$); for CG, non-significant change.

Haapala I et al. 2009.

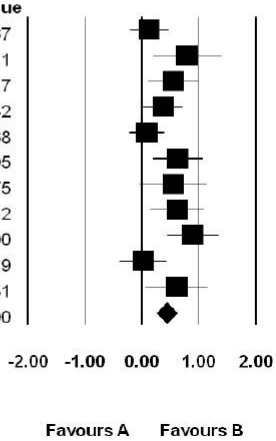


Liu F, Kong X, Cao J, Chen S, Li C, Huang J, Gu D, Kelly TN. Am J Epidem 2015;181,5:337-348.

Figure 2. Mobile Devices and Weight loss Meta-analysis.

Meta-analysis: Effect sizes (standardized mean differences) for individual studies and pooled effect size, for difference in weight loss between intervention group (B) and combined control groups (A)

Study	Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
Shapiro	0.129	0.177	0.031	-0.218	0.475	0.727	0.467
Napolitano	0.792	0.313	0.098	0.178	1.406	2.528	0.011
Carter	0.547	0.229	0.053	0.097	0.996	2.385	0.017
Prestwich	0.370	0.182	0.033	0.014	0.726	2.037	0.042
Burke	0.090	0.158	0.025	-0.220	0.400	0.571	0.568
Haapala	0.629	0.226	0.051	0.185	1.073	2.780	0.005
Brindal	0.547	0.307	0.095	-0.055	1.150	1.781	0.075
Spring	0.617	0.246	0.061	0.134	1.100	2.504	0.012
Turner-Mcgrievy 1	0.890	0.238	0.056	0.424	1.356	3.744	0.000
Turner-Mcgrievy 2	0.022	0.216	0.047	-0.401	0.445	0.102	0.919
Patrick	0.610	0.284	0.081	0.054	1.167	2.151	0.031
	0.430	0.091	0.008	0.252	0.609	4.725	0.000



Lyzwinski LN. 2014. A Systematic Review and Meta-Analysis of Mobile Devices and Weight Loss with an Intervention Content Analysis. J Pers Med. Sep; 4(3): 311–385.

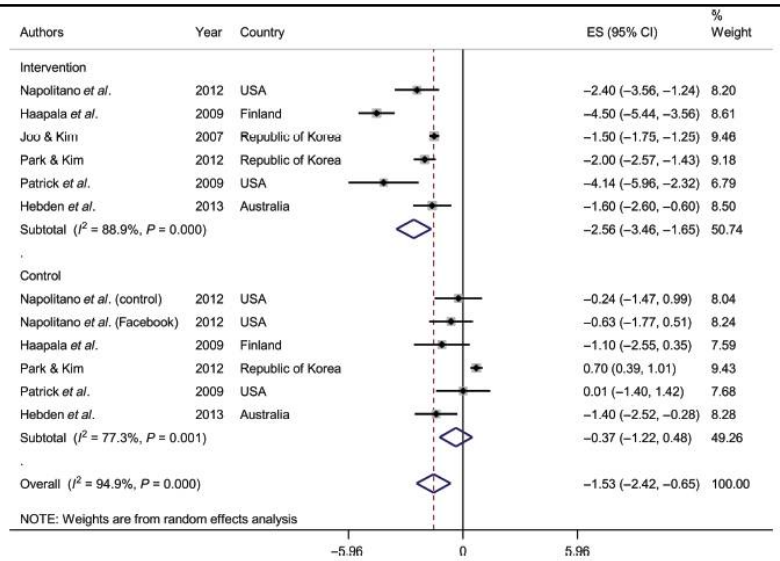


Figure 2 Forest plot: mean weight change in body weight of intervention and control participants with the combined meta-regression shown below. Effect size (ES) is indicated by black diamonds; percentage weighting of each study towards the overall effect is indicated by the size of grey squares; 95% confidence interval is indicated by horizontal lines; the overall treatment effect lies at the centre of the diamond with left and right endpoints indicating the 95% confidence interval (CI).

Siopis G, Chey T, Allman-Farinelli M. J Human Nutr & Diet 2014, 28,S2:1-15.

Predicting the outcome

Table 5 Multiple regression models for predicting contact, 3-month and 12-month weight loss: overweight healthy adult volunteers, Finland, June 2001 to June 2002

Variable	Cumulative R^2	*B* coefficient	SEE	*P*	Univariate R^2	*B* coefficient	SEE
Predicting weekly amount of contact at 3 months: $R^2 = 0{\cdot}41$, $R = 64$, $F(4,46) = 8{\cdot}0$, $P < 0{\cdot}0001$							
Number of positive self-reported changes in dietary habits	0·16	0·84	4·08	0·003	0·18	1·74	4·10
Baseline liking of the use of teletechnology (1 = no, 2 = yes)	0·25	−7·27	3·90	0·020	0·15	−8·82	4·18
Seeking more information on nutrition, reported at 3 months (1 = no, 2 = yes)	0·35	2·60	3·68	0·011	0·16	3·46	4·10
Changes at work by 3 months (1 = yes, 2 = no)	0·41	2·45	3·54	0·033	0·17	3·78	4·15
Predicting weight loss at 3 months: $R^2 = 0{\cdot}62$, $R = 79$, $F(4,46) = 18{\cdot}5$, $P < 0{\cdot}0001$							
Seeking more information on nutrition, reported at 3 months (1 = no, 2 = yes)	0·28	1·68	3·37	0·0001	0·28	4·11	3·37
Change in self-efficacy from baseline to 3 months (3 months minus baseline value)	0·42	0·77	3·04	0·001	0·26	1·35	3·41
Weekly amount of contact with the programme reported at 3 months	0·55	0·28	2·71	0·001	0·38	0·54	3·13
Grade for the programme at 3 months	0·62	1·06	2·53	0·007	0·31	2·0	3·30
Predicting weight loss at 12 months: $R^2 = 0{\cdot}65$, $R = 81$, $F(2,38) = 35{\cdot}2$, $P < 0{\cdot}0001$							
Change in self-efficacy from baseline to 12 months (12 months minus baseline value)	0·46	1·66	4·20	0·0001	0·46	2·13	4·20
Percentage weight loss from baseline	0·65	0·72	3·40	0·0001	0·40	1·0	4·50

B coefficient, unstandardized *B* coefficient; *P*, significance of contribution of each additional parameter to the stepwise multiple regression model; univariate R^2, single variable entered into the prediction equation; SEE, standard error of the estimate.

Haapala I et al. 2009.

Contact with the Program

Weight reporting by mobile phone faded as time went by,
χ^2 (3, N = 39) = 67.7, p < .0001)
....from an average of:

”a couple of times a week” at 3 months
”once a week” at 6 months
”once or twice a month” at 9 months and 1 year.

- Predictors of Contact Frequency: Attitudes toward the medium, changes in work (less stress), positive changes made in dietary habits and self-directed seeking of nutrition information

Factors supporting long-term (1 year) weight loss

Results from the prediction equations:

Both 1 & 2 help keep up the motivation!

1. Positive results early in the programme
   - Early weight loss
   - Improvement in self-perceived self-efficacy in dieting

2. External control and support
   - Factors supporting contact at 3 months
     - Positive attitudes toward the medium
     - Less stress at work
     - Encouraging self-directed changes and learning

What More Might Have Been Needed?

Table 3. Percentage (%) of subjects who reported ”Somewhat agreeing” and ”completely agreeing” with the suggestions of what more should they have needed during the program. (n = 45).

	Week			
“What more would I have needed”	12	24	36	48
Personal will power	75	83	91	91
Personal self-trust (self-efficacy)	70	76	81	84
Advice on dietary control in special situations	66	72	75	64
Advice on physical activity to support weight-loss	61	53	58	41
Advice on a healthy diet	55	53	48	47
Contact with a group leader	52	52	54	62
…				

Table 3. (Continued) Percentage (%) of subjects who reported ”Somewhat agreeing” and ”completely agreeing” with the suggestions of what more should they have needed during the program. (n = 45).

	Week			
“What more would I have needed”	12	24	36	48
Written feedback on my progress	39	34	48	44
Oral feedback on my progress	32	39	41	47
Contact with a group	34	34	44	42
Support from my environment	34	43	53	44
Longer intervals in contact	7	11	2	9

Conclusions

- The programs are feasible and effective in supporting short- and long-term weight loss in healthy adults with access to mobile phones and the Internet.

Conclusions (cont'd)

- Additional information for dieters on a healthy diet and physical activity might be helpful.
- The results might be improved by on-line presence of a therapist, instructor, or group leader.

Conclusions (cont'd)

- Good results in minimal-advice teletechnology-based interventions are an indication of people's self-directedness and the need for client-centered options in the treatment of overweight.
- In the future, similar programs aimed at the adolescents should be developed and tested.

Important features of programmes and technologies used

- Aimed at micro-level: individual-level weight loss
  - Meta-analysis on content and effectiveness:
  - **Lyzwinski LN. 2014.** A Systematic Review and Meta-Analysis of Mobile Devices and Weight Loss with an Intervention Content Analysis. J Pers Med. Sep; 4(3): 311–385.
- Aimed at macro-level: environmental changes (foodscapes)
  - Focus of this course
  - **King A, Glanz K, Patrick K.** Technologies to measure and modify physical activity and eating environments. Am J Prev med 2015,48,5:630-638.

Future programmes by yourselves?

- Needs assessment, target selection
- Market assessment
- Media developer, funding source
- Programmer
- Intellectual property rights
- Content planning: frequency and type of contact, content of feedback
  - Theory-selection
  - See for example De Craemer et al. Intervention Mapping protocol. Obesity Reviews (2014) **15** (Suppl. 3), 14–26
- Research, Evaluation, Reporting, Marketing

Thank you!

Student input, please: How to utilise mobile phones in the future?

Task 3.

- Have mobile phones become addictive?
- Can they help manage and/or monitor for example, psychological disorders?

Thank you!

- Task 4 relates to mobile technology.