Health Diary 2

SOFTWARE REQUIREMENTS SPECIFICATION

Version 1.00

Project mWellness

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Version history

Version	Date	Author(s)	Reviewer	Description
0.1	14.1.2005	ELa	IKo, JPä	First draft
0.3	17.2.2005	ELa, JPä		Weight + exercise
0.5	25.2.2005	ELa, JPä		Weight + exercise
0.6	28.2.2005	ELa		The rest of the items
0.7	7.6.2005	JPä		Updated Introduction
0.8	17.6.2005	JPä		Updated inputs
0.92	22.6.2005	JPä		Updated structure graph
0.93	23.6.2005	JPä		Updated health view mode description & sports list
0.94	6.7.2005	ELa		Configuration, WMI, feedback graphs, statistics feedback, algorithms in appendices.
0.95	12.7.2005	ELa		Changes made based on 11.7. meeting with Janne Vainio and Kai Samposalo.
0.96	8.8.2005	JPä		Changes made based on 8.8. meeting with Janne Vainio, Kai Samposalo, Ilkka Korhonen and Juha Pärkkä
0.97	22.8.2005	JPä	ELa, IKo	Added Weight Management Tips (in Finnish)
0.98	24.8.2005	JPä		Changes made based on 23.8. meeting with Ilkka and Elina. E.g., Diet was split into two variables: "Eating Management" and "Eating Summary".
0.99	25.8.2005	JPä		Changes made based on 25.8. meeting with Kai, Janne, Ilkka, Elina and Juha.
1.00	7.12.2005	JPä	ELa, IKo	Updated version to 1.00

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1 Introduction

1.1 Health Diary version 2.0

This document describes Health Diary v2.0 (HDv2.0, HD). HD is a user-configurable application for managing personal health. The application runs in Nokia Series 60 (S60) mobile phones. The main focus of the application is on weight management, but the application supports other sectors of personal wellness management, as well.

The main characteristic of HD is mobile phone centricity, which means that the application is easily portable in everyday life. HD integrates to S60 calendar, which facilitates the adoption and use of the application.

Another important feature is the toolbox approach, which helps to personalize the application for each user's individual needs. The user may select how to use the application, i.e., which features to use and how to use them.

HD also supports use of health-related appliances, e.g., pedometers and personal scales. However, the application does not require other appliances to function.

The mobile phone serves as the long-term storage of health information, which makes health data easily accessible at all times. The ease of use is emphasized; the application needs to guide the user at the beginning and during the use. Configuration and actual health monitoring should be made as effortless as possible; it is the only way to enable long-term use. The user should also be motivated with meaningful, interesting feedback that helps the user in making self-observations.

1.2 Definitions and abbreviations

HD   Health Diary

1.3 References

[WMI]   Elina Lamminmäki, mWellness - Weight Management Index, 27.5.2005

1.4 Overview

Chapter 1   Introduction to the application

Chapter 2   Overall structure of the application.

Chapter 3   General configuration options.

Chapter 4   Description of each item of the toolbox individually.

Chapter 5   Description of data exchange in the application.

2 Overall structure of Health Diary

2.1 Perspective

The application is used for recording, storing and presenting various types of health-related information over long term. It enables life-long support for making observations of parameters and events that affect health. HD also provides objective and value-free feedback on the inputs. The key is to trust the user; the user is the expert of his/her life and capable of drawing conclusions and making decisions based on feedback.

HD aids health management by providing a set of tools from which the user can choose the most suitable ones. The use of the application can be started by using, e.g., only one of the features. Additional tools can be taken into use or left out at any time. The application needs to be highly configurable to achieve a sense of personalized health management tool. The appearance of the application has to be user-configurable to some extent.

To achieve ease of use and motivation, help files, configuration, and goal setting wizards are implemented, and information about weight management is included into the package. The configuration and goal setting also need to be continuous and modifiable to keep the user motivated. The user's personal needs and desired way of using the application are taken into account every step of the way. For example, feedback needs to be tuned according to whether the user wants to lose weight or maintain current weight.

HD supports the use of external health-related appliances such as pedometers and personal scales. These devices add features to the application, but their use is not required. The user can choose whether to use the devices or to stop using them, and they can be added to the system at any time.

2.2 Structure

Health Diary 2 views and navigating between views is shown in the navigation map below:
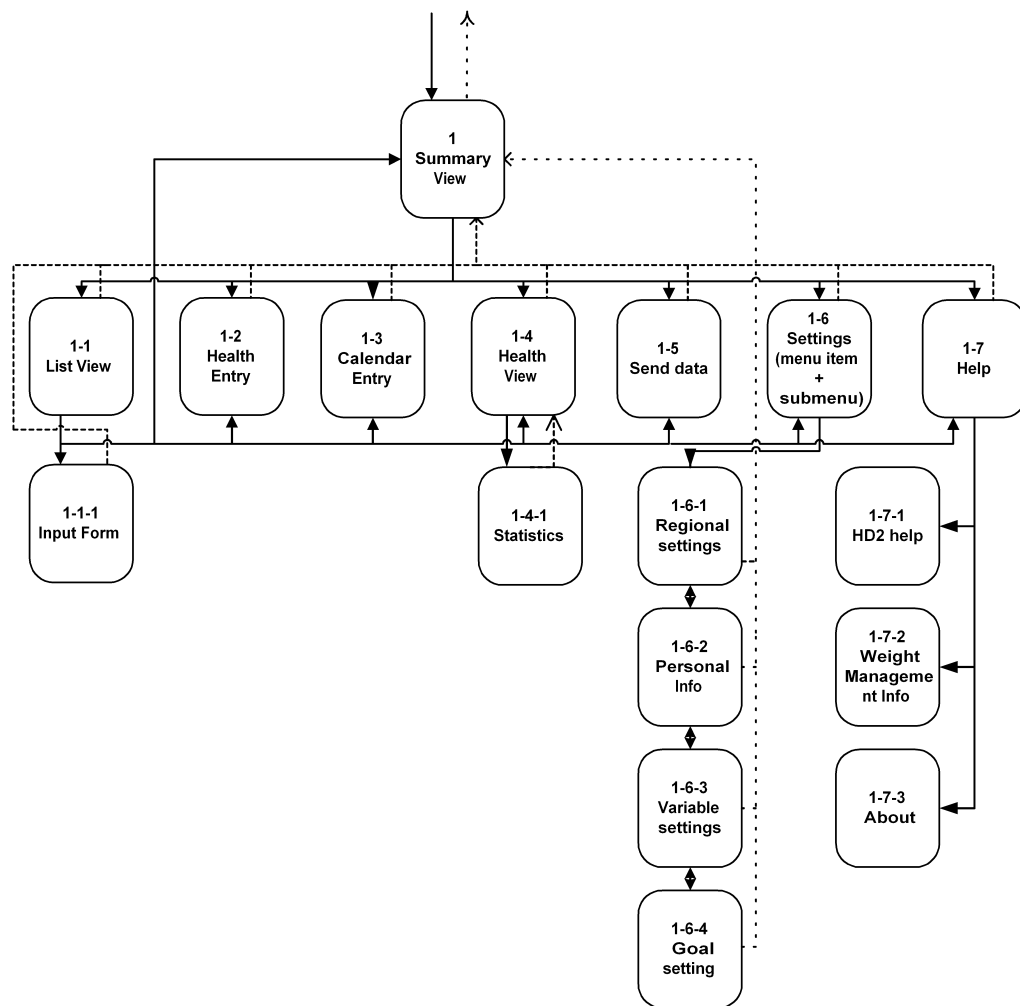
Figure 1: Health Diary 2 navigation map.

Table 1: Option menus for different views.

Summary View Yhteenvetonäkymä	Options Valinnat		Exit Poistu
	Open Avaa		
	List View Listanäkymä	Submenu [Show all + selected variables] [Näytä kaikki + selected variables]	
	Health Entry Terveysmerkintä	Submenu [selected variables]	
	Calendar Entry Kalenterimerkintä	Submenu [Anniversary, ...] [Vuosipäivä, ...]	
	Health View Terveysnäkymä		
	Send Data Lähetä merkintöjä	Submenu [Via multimedia, Via email, Via Bluetooth, Via Infrared] [Multimediaviestinä, sähköpostina, Bluetoothilla, Infrapunalla]	

	Settings Asetukset		
	Help Ohjeet	Submenu [HD help, Weight Management info, About] [HD Ohjeet, Painonhallintaohjeet, Tietoja HD:sta]	
List View Listanäkymä	Options Valinnat		Back
	Open Avaa		
	Show only Näytä vain	Submenu [selected variables]	
	Summary view Yhteenvetonäkymä		
	Health Entry Terveysmerkintä	Submenu [selected variables]	
	Calendar Entry Kalenterimerkintä		
	Health View Terveysnäkymä		
	Send data Lähetä merkintöjä	Submenu [Via multimedia, Via email, Via Bluetooth, Via Infrared] [Multimediaviestinä, sähköpostina, Bluetoothilla, Infrapunalla]	
	Settings Asetukset		
	Help Ohjeet	Submenu [HD help, Weight Management info, About] [HD Ohjeet, Painonhallintaohjeet, Tietoja HD:sta]	
Health Entry Terveysmerkintä	Options Valinnat		Done Valmis
	Delete Poista	Delete entry? Poistetaanko merkintä?	
	Help Ohjeet	Submenu [HD help, Weight Management info, About] [HD Ohjeet, Painonhallintaohjeet, Tietoja HD:sta]	
	Exit Poistu	Exits HD !?!	
Calendar Entry Kalenterimerkintä	Options Valinnat		Done Valmis
	Delete Poista		
	Help Ohjeet	Submenu [HD help, Weight Management info, About] [HD Ohjeet, Painonhallintaohjeet, Tietoja HD:sta]	
	Exit Poistu	Exits HD !?!	
Health View	Options		Back

Terveysnäkymä	Valinnat		Takaisin
	Time range Aikaikkuna	Submenu of time ranges	
Only **Exercise**	Show sports Näytä lajit	Submenu or Radio button list of selected sports + "All" (Only in exercise) (All is default) [Kaikki + selected sports]	
Only **Exercise**	View parameter Näytä parametri	Submenu [Duration, Distance, Mean HR, Statistics] (duration is default) [Kesto, Matka, Keskisyke, Tilastotietoja]	
Only Steps	View parameter Näytä parametri	Submenu [Steps, Distance, Energy, Statistics] [Askeleet, Matka, Energia, Tilastotietoja]	
Eating management, and Eating Summary	View parameter Näytä parametri	Submenu [Quality, Energy, Statistics] [Laatu, Energiasisältö, Tilastotietoja]	
Only **Sleep**	View parameter Näytä parametri	Submenu: [Duration, Quality, Statistics] [Unen pituus, Unen laatu, Laatu*määrä, Tilastotietoja]	
Others	View parameter Näytä parametri	Submenu [Graph (or e.g. Weight), Statistics] [Käyrä, Tilastotietoja]	
	Add/remove curve Lisää/poista käyrä	Multiselection list of variables	
	Active curve Aktiivinen käyrä	Function for selecting active curve and axis (same which is done by moving the joystick up/down in multigraph) Submenu of items: e.g., [Weight, Steps]	
	Browse mode Selaustila	Option for changing Graph mode, Submenu: [Tab, Time, Data] [Välilehti, Aika, Data]	
	Send graph Lähetä kuvaaja	Submenu: [Via multimedia, Via email, Via Bluetooth, Via infrared] [Multimediaviestinä, sähköpostina, Bluetoothilla, Infrapunalla]	
	Help Ohjeet	Submenu [HD help, Weight Management info, About]	
	Back Takaisin	This should only exit Health View.	
	Statistics	Shows statistics about currently selected variable and over currently selected time range.	
Send data Lähetä merkintöjä	Options (of message browser)		Close Sulje
	Options of		

	message browser		
Settings Asetukset	Options Valinnat		Back Takaisin
	Edit		
Only in **Variables**	New variable Uusi muuttuja	Selection list/Submenu: 1)VAS, 2)Numerical, 3)Note	
	Help Ohjeet	Submenu [HD help, Weight Management info, About]	
	Exit Poistu	Exits HD	
Help Ohjeet	Options Valinnat		Back Takaisin
	Open Avaa	Opens description selected in "contents"	
	Keyword search Avainsanahaku		
	HD Help HD Ohjeet		
	Weight Management Info Painonhallintaohje		
	About Tietoja sovelluksesta		
	Exit Poistu		

2.3 Functions

The basic functions of HD are inputting health data; storing and processing it; and creating feedback based on the data. The data are input and processed in HD and stored into a database. Also processed variables may be stored into the database, requiring automatic update of the processed and stored data whenever raw data used in their calculation are updated or added. Feedback is provided in graphical form as well as trends, indices, and statistics.

Other functions of HD include configuration and goal setting, and the possibility for data transfer.

2.3.1 Summary View

Figure 2: Health Diary summary view.

Summary view shows summary of health status for each day. The variables to be shown in summary are selected in configuration. Also the next calendar entry is shown. If the calendar entry is for the current day, time of the event is shown, otherwise only date is shown. Weight Management Index (WMI) is shown on the bottom of the screen. Optimally, there should be a possibility to change the order of items in Summary view, for example, with Move function similar to the one in S60 Menu.

Background color indicates current status of the variable: red - requires attention, transparent - ok, green - doing well. The rules for color coding are specified in Appendix 5.

The information shown on summary view is specified individually for each variable in the following table. In configuration, the user may choose what information (previous measurement or summary) is shown by default.

Table 2: Summary view information.

Variable name	Previous measurement	Description	Summary	Description (not shown in HD)
1. Weight Paino	20.6. 75.5 kg	Previous weight input, date and value	Ave 7d 75.6 kg Ka 7pv 75.6 kg	Average of weight entries over 7 days
2. Exercise Liikunta	17.6. 60 min	Previous exercise date and duration	This week 135 min Tämä viikko	Sum of exercise duration over the current week (Mon-

			135 min	Sun or Sun-Sat).
3. Steps Askeleet	19.6. 3540	Previous input date and steps	Ave 7d 5540 Ka 7pv 5540	Average of steps entriesover 7 days.
4. Eating management Syömisen hallinta	20.6. 2/3 healthy 20.6. 2/3 terveellistä	Date of last input, and number of healthy per all meals	Ave 7d 3/5 healthy Ka 7pv 3/5 terveellistä	Average of healthy meals daily / average of all meals daily over 7 days.
5. Eating Summary Syömisen yhteenveto	20.6. Healthy 20.6. Terveellinen	Date of last input, and assessment of the day's eatings (Healthy, Can't say, Unhealthy)	7d 3/5 healthy days 7pv 3/5 terveellistä	Number of healthy days / number of "Eating summary" entries over 7 days.
6. Sleep Uni	20.6. 6h 35min 20.6. 6t 35min	Date of last input, duration of sleep	Ave 7d 5h 20 min Ka 7pv 5t 20 min	Average of sleep duration entries over 7 days.
7. Blood pressure Verenpaine	19.6. 120/80	Previous measurement, date and bp.	Ave 7d 115/79 Ka 7pv 115/79	Average of blood pressure entries over one week.
8. Stress & Fatigue Stressi ja väsymys	19.6. s4,f5 19.6. s4, v5	Stress and Fatigue values last entered into HD	Ave 7d s3.6, f4.5 Ka 7pv s3.5, v4.5	Average of stress entries and average of fatigue entries over 7 days.
9. Illness / Symptom Sairaus/Oire	20.5. Flu	Previous illness input		
10. Doctor visit Lääkärissäkäynti	24.5. Head ache	Previous doctor visit input		
11. Medication /	24.5. - 31.5. Ditrim	Previous medication		

Treatment Lääkitys/Hoito		input		
12. Working time Työaika	17.6. 8h 5min 17.6. 8t 5min	Previous working time input	This week 36h 50min Tällä viikolla 36t 50min	Weekly sum, Monday to Sunday
13. [Own variable]	19.6. 53.2 [unit]	Last entry	Ave 7d 52.8 Ka 7pv 52.8	Average of own variable entries over 7 days. Only for numerical and VAS variables.
14. Calendar entries Kalenterimerkinnät	24.12. 18:00	Date and time of next entry		
15. WMI PHI	5 (9)	WMI today(yesterday)	Ave 7d 7.5 Ka 7pv 7.5	Average of abailable weight management indices over 7 days.

2.3.2 List View

List view is an alternative to the summary view, which allows quick browsing on inputs. In list view, the items are ordered in chronological order such that old events are above and new/upcoming events are below. Jumping from one day to another may be done by moving the joystick left (previous day) and right (next day). List view is opened either via clicking on an item in the summary view, or by selecting List view from Options menu.

There are two modes for the list view: filtered and nonfiltered view. To get a filtered view of one variable, one can click on the item in the summary view (if it is visible there), or select **Options => List view => Item**. Selecting **Options => List view => Show all** takes the user to the nonfiltered view. Opening an item in the list view shows the user the original entry, and it may also be modified. In the case of WMI, clicking on the item shows the subscores making up the total score.

On the list view, each entry is represented on one line. Filtered and nonfiltered views have identical layout (time, short name, value). In the nonfiltered view (Figure 3), the date of the current day is shown on the upper pane, and time, short name and value are shown for the items on that day. Other days' items have date and name.

List View

All 03/07/2005

09:05	Wt.	75.9 kg
17:00	Exer	60 min
20:00	Exer	30 min
21:00	Step	6855

Options   Back

Figure 3: Nonfiltered list view.

In the filtered view, the upper pane shows the name of the item and the date, and the list shows the time of the entry for the active day and date for other days, short name and some detail about the entry (Figure 4). The details to be shown are listed in table 3.

List View

Weight 03/07/2005

26.6.2005	Wt.	69.3 kg
27.6.2005	Wt.	69.4 kg
28.6.2005	Wt.	69.5 kg
28.6.2005	Wt.	70.1 kg
1.7.2005	Wt.	69.7 kg
09:05	Wt.	69.6 kg

Options   Back

Figure 4: List view filtered according to Weight items.

Table 3: Details in the list view.

Variable name	Detail
1. Weight	Weight value
2. Exercise	Sport and duration
3. Steps	Steps
4. Eating management	Type of meal [Healthy, can't say, Unhealthy]
5. Eating summary	Type of day [Healthy, can't say, Unhealthy]
6. Sleep	Sleep duration and quality
7. Blood pressure	Systolic / diastolic
8. Stress & Fatigue	Stress assessment , Fatigue assessment (s4, f5)
9. Illness / Symptom	Name of illness (or as many letter from the beginning as possible)
10. Doctor visit	Reason for visit (or as many letter from the beginning as possible)
11. Medication / Treatment	Name of medication (or as many letter from the beginning as possible)
12. Working time	Working time hh:mm
13. [Own variable]	Input value
14. Calendar entries	Subject (or as many letter from the beginning as possible)
15. WMI	WMI for that day – when opened, there should be Weight subscore, Steps subscore, and Exercise subscore along with the combined score. (Figure 5)

<table>
<tr><td colspan="2">Pisteet: 7
22.4.2005</td></tr>
</table>

Painopisteet	**8.4**
nopea muutos - kg/vko	
hidas muutos -0.35 kg/vko	

Liikuntapisteet	**7.3**
kesto	80 / 120 min
kerrat	4 / 3

Arkiaktiivisuus	**4.5**
Askeltavoitteesta	45%

Takaisin

Figure 5: WMI score, list item details. These are for the current day, although previous score is shown in parentheses.

2.3.3 Data input

All data is input manually in specific forms in HD. Input of data is moved one step up in the hierarchy. Instead of inputting data via **Options – New entry**, a new menu called **Health entry** is created in **Options** menu. Thus, the sequence to input data would be **Options – Health entry –** desired item.

2.3.3.1 Storing and processing

Raw data (i.e. data input to the HD via input forms) are always stored as such in the database. Before storing, the validity of the data may be checked and in case of suspicious input data the validity may be confirmed. However, the data may only be modified by the user, not by the system. The validity checking may be based on:

1. comparison with some threshold values, which are the same for all the users (e.g. HR must be a positive integer between 30 and 220)

2. comparison with the data entered earlier in the database (e.g. weight may not change too much from the previous entries)

HD v2.0 supports also generation and storage of processed variables. These variables are computed on the basis of raw data acquired via input forms. The variables may be based on several raw variables from different input forms and from different time instants. Hence, there needs to be a mechanism for dynamically and automatically calculating and storing the processed variables as new data are entered and/or old data are modified. The processing algorithms are described in later chapters in detail.

The processed variables may be stored in the same database as raw data, or in a separate database, as convenient.

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2.3.4 Health View

Graphical feedback is presented for each item in **Health View**. Each graph will have user-definable options for the shown parameters and the appearance of the graph. In general, the graphs will have following characteristics:

Time range: User can change the graph time range by selecting: **Options - Time range**. Six time ranges are available: 4, 12, 26, 52, 260 weeks and whole data (~ 1 month, 3 months, 6 months, 1 year, 5 years and whole data). In longer time ranges, the graphs use averaged data, which varies according to variable (see table below).

Table 4: Averaging in Health View.

Time range [weeks]	Stress	Blood press.	Sleep	Health Events	Steps	Exerc.	Weight	Eating Manage-ment	Eating Summary	Own variable
4	raw	raw	raw	-	raw	sum(7)	raw	raw	raw => 4 bars	raw
12	raw	raw	raw	-	raw	sum(7)	raw	avg(7)	raw => 12 bars	raw
26	avg(7) days	avg(7)	avg(7)	-	avg(7)	sum(7)	avg(7)	avg(7)	avg(1 month) in one bar => 6 bars	avg(7)
52	avg(7)	avg(7)	avg(7)	-	avg(7)	sum(7)	avg(7)	avg(28)	avg(1 month) in one bar => 12 bars	avg(7)
260	avg(28)	avg(28)	avg(28)	-	avg(28)	sum(7), avg (4 weeks)	avg(28)	avg(28)	avg(1 year) => 5 bars	avg(28)
Whole data	avg(365)	avg(365)	avg(365)	-	avg(365)	sum(7), avg(52 weeks)	avg(365)	avg(365)	avg(1 year) => many bars	avg(365)

Graph modes: User can change health view mode by **pressing the selection key** (see Figure 6).
1. Tab mode: Tab mode is used to move between tabs (variables) with left and right arrow buttons. Mode is indicated, e.g. by yellow coloring of tabs
2. Scrolling mode: Scroll mode is used for scrolling the time axis, i.e., to move the graph, e.g., 1/4 screen at a time using left and right arrow buttons. Scroll mode is indicated, e.g., by yellow coloring of x-axis and x-labels. *Optimally, the Y range should stay fixed during scrolling, until the curve exceeds the range – then the Y range should be automatically corrected.*
3. Toggle mode: Toggle mode is used to browse individual entries on the graph using left and right arrow buttons. A vertical & horizontal hairline is drawn via the point in

focus. A tool tip is shown beside the point in focus. The tooltip gives Date and Value of the point in focus.
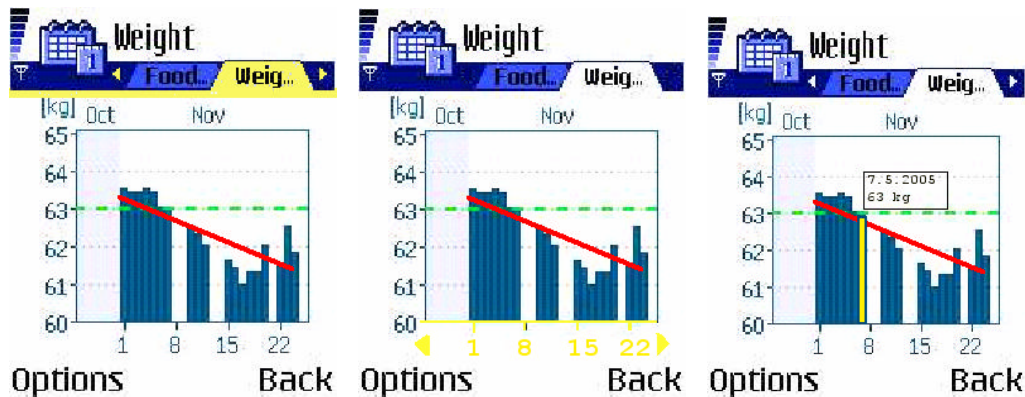
Figure 6: Different modes in Health View.

Combination graphs: User can add more curves to any of the graphs, and remove added curves selecting: **Options – Add/remove curve** (Multiselection list of variables). The variables may be ticked on and off from the list.

In the graph, active curve is selected with selection key up/down. Y-axis scale and unit are updated according to the active curve. Active curve is indicated with different line style or color.

Statistics: Statistics is another form of feedback accessible from Health View Options => View. Statistics gives feedback in numerical form for the duration of the current time range. The statistics may be, e.g., averages, sums, minimums, maximum, etc. The statistics calculated for each item are presented in each item's chapter in the feedback section. Statistics view has only Send option for sending the data, but otherwise there are no functions in Statistics view. When there are several graphs combined, statistics from all items involved are printed one after another.

Graph types for different items and time ranges are specified in Table 5:

Table 5: Graph types

Time range [weeks]	Stress	Blood press.	Sleep	Health Events	Steps	Exerc.	Weight	Diet	Own variable
4	Curve	BP (Blood pressure graph, example presented in Blood Pressure section)	Duration: Stacked bar, Quality: Curve	-	Curve	Duration, Distance: Stacked bar, color-coded with intensity HR: Curve	Curve	1 (after every meal): Stacked bar, 2(once per day): Curve 3(Energy): Curve	Curve

12	Curve	BP	Duration: Stacked bar, Quality: Curve	-	Curve	Same as above	Curve	1: Stacked bar, 2: Curve 3: Curve	Curve
26	Curve	BP	Duration: Bar (averages), Quality: Curve	-	Curve	Same as above	Curve	1: Stacked bar, 2: Curve 3: Curve	Curve
52	Curve	BP	Same as above	-	Curve	Same as above	Curve	1: Stacked bar, 2: Curve 3: Curve)	Curve
260	Curve	BP	Same as above	-	Curve	Bar	Curve	1: Stacked bar, 2: Curve 3: Curve	Curve
Whole data	Curve	BP	Same as above	-	Curve	Bar	Curve	1: Stacked bar, 2: Curve 3: Curve	Curve

2.3.5 Configuration

Configuration is made in Settings (formerly Health Tool). The configuration is made in a tabbed dialog with the following tabs: Regional settings, Personal Information, Variables, and Goals. When configuring the application for the first time, the configuration has to be done in the correct order, meaning that the following tabs in configuration are blocked until the previous ones have been filled. The configuration is described in more detail in chapter 3.

2.3.6 Data transfer

HD data can be sent by selecting **Options– Send data**. Sending can be done via email or multimedia, and the user can select which items are sent, and the time range for the data to be sent. If the data file does not fit into one MMS, several MMS messages are generated.

NOTE: also processed variables should be able to be sent.

The user can also send images from the **Health view** as multimedia messages. In this case, sending is done via the **Options** menu of the image to be sent in **Health view**.

2.3.7 Calendar integration

A new calendar will be implemented into HDv2.0, but a link to the Series 60 calendar will be maintained. The user can use the calendar in HDv2.0 solely, but the calendar events are stored into calendar database, and thus the entries are synchronized with S60 calendar. The user can choose in configuration which items are also shown in S60 calendar.

2.4 User Characteristics

The users of HD are people who have motivation for observing their health and wellness. The use of HD does not require specific experience or technical expertise, but familiarity in using mobile phone and calendar applications is helpful.

2.5 Assumptions and Dependencies

The requirements described in this document are based on the concept of HDv1.0 (see mWellness concept specification v0.91 and HD_spec_v0.4). The currently known constraints related to implementation of HD are taken into account.

3 Configuration

3.1 Settings

The HD needs to be highly configurable to accommodate for individual needs of the users. On the other hand, configuration must be as effortless to the user as possible – the user needs to be guided through the task in correct order, and default values need to be provided. Furthermore, configuration needs to be modifiable at any time by the user.

The configuration is a tabbed dialog, which includes: Regional settings, Personal information, Variables, and Goals setting. When taking the application into use, these need to be gone through in the correct order, because information from the previous phases is needed in later phases, e.g., personal information is needed in goal setting. This is done by disabling other tabs until all necessary information is filled in previous tabs.

The configuration dialog is presented in Figure 7.

Figure 7: Main view of settings with Regional settings. Other settings are in the tabs to the right.

3.2 Regional settings (Aluekohtaiset asetukset)

Item	Field type	Alternatives	Default
Language Kieli	Selection list	1)Finnish, 2)English, 3) phone setting 1) Suomi, 2) Englanti, 3) puhelimen asetus	3)Phone setting 2) English (if phone language other than english or finnish)
Calendar alarm tone Kalenterin merkkiääni	Selection list		Default alarm tone
Week start Viikon alkupäivä	Selection list	1)Monday, 2)Sunday 1) Maanantai, 2) Sunnuntai	1)Monday
Units	Selection list	1)Metric, 2)Imperial	1)Metric

Yksiköt		1) Metrinen, 2) Imperiaalinen	
Energy unit Energian yksikkö	Selection list	1)Kcal, 2)KJ, 3)Other 1)Kcal, 2)KJ, 3)Muu	1)Kcal

3.3 Personal Information (Omat tiedot)

Item	Field type	Alternatives	Default
Name Nimi	Text	-	Empty
Date of birth Syntymäaika	Date	-	Current date
User ID Käyttäjä ID	String	-	Empty
Gender Sukupuoli	Selection list	1)Male, 2)Female, 3)Not specified 1) Mies, 2) Nainen, 3) Ei määritelty	3)Not specified 3) Ei määritelty
Height Pituus	Int [cm]	-	Empty
Weight Paino	Float [kg]	-	Empty
Usage mode Käyttötila	Selection list	1)Weight maintenance, 2)Weight loss 1) Nykypainon ylläpito, 2) Laihdutus	1)Weight maintenance
Send-Time range Lähetä-Aika	Selection list	1) All data 2) Latest 52 weeks 3) Latest 4 weeks 4) Latest week 1) Koko data 2) Viimeiset 52	1) All data

		viikkoa 3) Viimeiset 4 viikkoa 4) Viimeinen viikko	
Send-Variables Lähetä-Muuttujat	Multiselection list (of variables available)		All variables selected
Receiver phone# Vast.ott. puh.nro	String		None Ei mitään
Receiver's email Vast.ottajan sposti	String		Empty string

When moving away from this tab, the BMI is calculated. If BMI is smaller than 18.5 and the selected usage mode is 2) Weight loss, the user has to be notified that BMI indicates underweight and that it is not advisable to lose more weight.

Personal information is also used in goal setting both in determining suitable default goals for the user and checking the user-defined goals.

3.4 Variables (Muuttujat)

Variables configuration is meant for selecting and configuring the variables. The fixed variables are all in a list. New, user-specified variables can be added via Options menu. Figure 8 presents the Variable configuration. The list items may be opened and configured on at a time.

Figure 8: Variables configuration. OwnVAS1 and OwnNUM1 are user-definable variables added via Options menu.

The common configuration options for every item are presented in the following table. The variable-specific configuration options are presented in each item's configuration options in chapter 4.

Name	Type of field	Additional info	Default
Use this item? Käytetäänkö muuttujaa?	Radio button	1)Use, 2)Don't use 1) Käytetään, 2) Ei käytetä	1)Use
Show in summary view? Näytetäänkö yhteenvetonäkymässä?	Radio button	1)Show, 2)Don't show 1) Näytetään, 2) Ei näytetä	1)Show
Summary detail Yhteenvetonäkymässä näytetään	Radio button	1)Previous input, 2)Summary 1) Edellinen merkintä, 2) Yhteenveto	1)Previous input
Synchronize with	Radio button	1)Don't	1)Don't

calendar? Synkronoidaanko kalenterin kanssa?		synchronize, 2)Synchronize 1) Ei synkronoida, 2) Synkronoidaan	synchronize

3.5 Goals (Tavoitteet)

The user is not forced to set any goals – the application calculates default goals based in the personal information set by the user, and generally accepted recommendations. If the user changes these default goals, the application must check the goals (at least for weight) and notify of unrealistic or unhealthy goals.

In goal setting, **a similar list of items as in Variables setting is presented. When opening an item, the user is shown the default goals and can edit them.** When closing the form, the goals are checked, and if there is something wrong with the goals, it is notified to the user and the user is given an opportunity to modify them again. However, the user can also choose to accept the goals he/she has set and ignore the warnings. The goals to be set are listed in Table 6.

Table 6: Goals for HD entries.

Item	Goals
Weight in weight loss mode Paino laihdutustilassa	Weight target Tavoitepaino
Weight in weight maintenance mode Paino painonhallintatilassa	Upper weight target Ylin sallittu paino
	Lower weight target Alin sallittu paino
Steps Askeleet	Steps target (number of steps) Askeltavoite
Exercise Liikunta	Weekly duration goal Viikon liikuntatavoite (min)
Sleep Uni	Target of sleep duration per night. Unitavoite (tuntia)
Blood pressure Verenpaine	Systolic target Tavoiteyläpaine

	Diastolic target Tavoitealapaine
Working time Työaika	Weekly working time Viikottainen työaika
Own variable Oma muuttuja	Own variable target Tavoitearvo

The calculation of default goals and checking the goals is presented in each item's own chapter in Chapter 4.

4 Tools

4.1 General

The tools of the toolbox are described individually in this chapter. The information provided for each item includes: configuration, input form, goal setting, data processing, and feedback.

Configuration chapter presents item-specific configuration information. For example, display options and desired type of feedback are selected.

Input section describes the input form for the item, the names and types of fields, the default values, and the importance of each field. The obligatory fields are denoted with an asterisk (*). The tables describing the input forms also define the order of fields in the form.

Goal setting section presents the default goal setting logic for the item, if it is possible to set any goals for the item. Default goals are calculated based on personal information and generally accepted recommendations. Also the logic for checking goals set by the user is presented for each item.

Data processing describes the steps taken to process the data for visualization and feedback calculation. Data processing includes, e.g., outlier detection and handling with missing data.

In the feedback section the alternative feedbacks for the item are described. Algorithms for calculating trends and indices are presented.

4.2 Weight Management Index (Painonhallintaindeksi, PHI)

4.2.1 Introduction

Weight Management Index (WMI) is an index calculated based on weight management related variables, such as weight, steps, and exercise. The purpose of the index is to combine the information obtained from these variables, and give feedback on the overall success of weight management and weight management related behavior.

The index is calculated based on the usage mode (weight loss or maintenance), and personal goals. The index is a combination of subscores for each item.

4.2.2 Calculation of WMI

The algorithm for calculating the subscore of WMI and combining the scores is presented in Appendix 1. Appendix 1.1 presents the WMI algorithm, i.e., calculation of the subscores and combining them, and Appendix 1.2 presents the trend detection and statistical testing for the significance of the trend. Scoring functions are specified in Appendix 1.3.

Update rules for WMI are presented in Appendix 1.4.

4.2.3 Feedback

The graph is by default the first tab in Health View. Score feedback can be selected/unselected in Settings - Variable selection (Weight) and thus it is possible to get rid of score graph. The graph visualizes history of WMI.
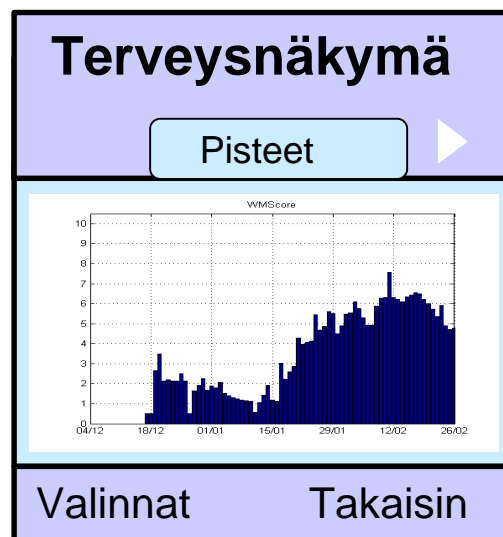
Figure 9: WMI feedback graph.

4.3 Weight (Paino)

4.3.1 Configuration

These fields are added to settings list in Summary View > Settings > Variables, when Weight variable is selected in Settings. (See chapter 3.4 Variables.) Also configuration fields of other variables are similarly added, when the variable is selected in settings.

Name	Type of field	Additional info	Default
Title Otsikko	Text	-	Weight Paino
Short name Lyhyt nimi	Text	-	Wt. Pain
Unit Yksikkö	Selection list	List of units	kg
WMI in use PHI käytössä	Selection list	1)Yes, 2)No 1) Kyllä, 2) Ei	1)Yes 1) Kyllä

4.3.2 Input

Name	Type of field	Additional info	Default
Weight (*) Paino	Number *[unit: configuration]*	-	0
Time Aika	Time	-	Current time
Date Päivä	Date	-	Current date
Note Kommentti	Freetext	-	Empty string
Alarm Hälytys	Selection list	1)Off, 2)On 1) Ei, 2) Kyllä	1)Off 1) Ei
Alarm time Hälytysaika	Time	-	Current time

Repeat Toista	Selection list	1)Not repeated, 2)Every day, 3)Every week, 4)Every 2 weeks, 5)Every month 1) Ei toisteta, 2) Päivittäin, 3) Viikoittain, 4) Joka 2. viikko, 5) Kuukausittain	1)Not repeated 1) Ei toisteta

4.3.3 Goal setting

Calculation of weight goals requires knowledge of usage mode and the initial BMI of the user. The algorithm for calculating default goals and checking user-defined weight goals is presented in Appendix 2.

4.3.4 Data processing

Weight inputs need to be checked. The basic principles of checking the value are:
1. Must be a number
2. Must be nonnegative
3. Must be within certain range compared to previous measurements If not within +/- 5% of previous measurement, validation is asked from user..

If value is invalid, the form is opened for modification. If the user accepts the value again, it is stored. If value is not a number, zero is stored. This allows generation of alarms for any measurement.

4.3.5 Feedback

Weight graph is a representation of weight as a function of time. Figure 10 presents weight graph in weight loss mode. The red line represents the weight goal. Figure 11 presents the weight graph in weight maintenance mode. The red lines represent the upper and lower weight targets.
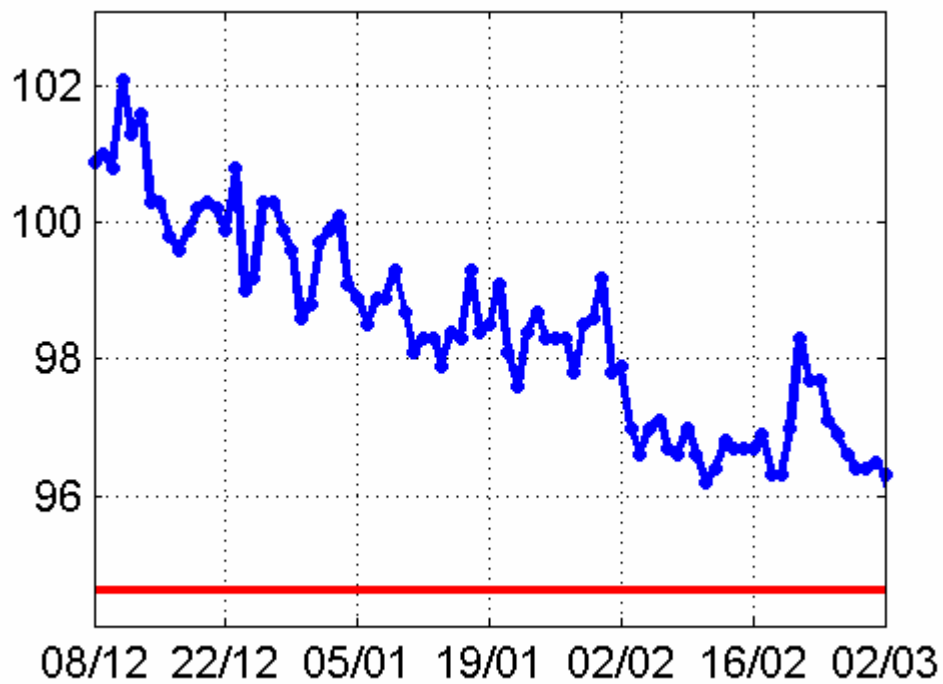
Figure 10: Weight graph in weight loss mode.
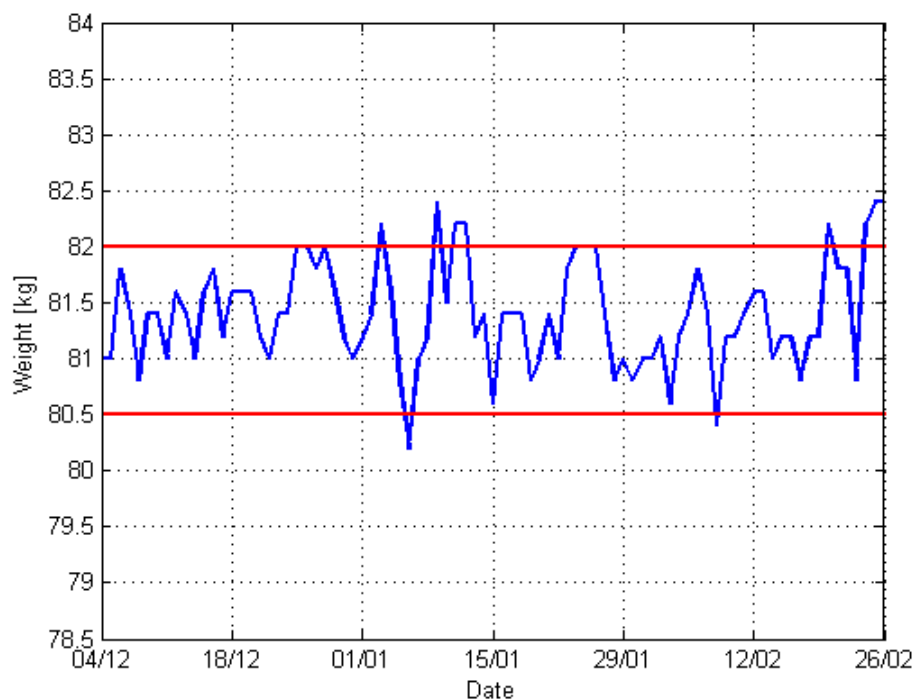
Figure 11: Weight graph in weight maintenance mode.

4.3.5.1 Statistics

Statistics is an alternative feedback to graph, and can be viewed by selecting **Options => Show statistics**. The statistics are always shown for the same time range as is active in the graph. The time range is shown on the statistics sheet as well. The following statistics are calculated for weight:

1. Average weight (Keskiarvo)

2. Standard deviation (Keskihajonta)

3. Minimum (Minimi)

4. Maximum (Maksimi)

4.4 Steps (Askeleet)

4.4.1 Configuration

Name	Type of field	Additional info	Default
Title	Text	-	Steps Askeleet
Short name	Text	-	Step Aske
Distance unit Matkan yksikkö	Selection list	List of units	*Configuration (regional settings)(=>metric = km)*
Energy unit Energian yksikkö	Selection list	List of units	*Configuration (regional settings)*

4.4.2 Input form

Name	Type of field	Alternatives	Default
Steps Askeleet	Int	-	0
Distance Matka	Float *[unit: configuration]*	-	0
Energy	Int *[unit: configuration]*	-	0

Energia			
Time Aika	Time	-	Current time
Date Päivä	Date	-	Current date
Note Kommentti	Freetext	-	Empty string

4.4.3 Goal setting

Goal setting is described in Appendix 2.

4.4.4 Data processing

-

4.4.5 Feedback

Steps graph represents the number of steps as function of time. The graph is a line curve (Figure 12).
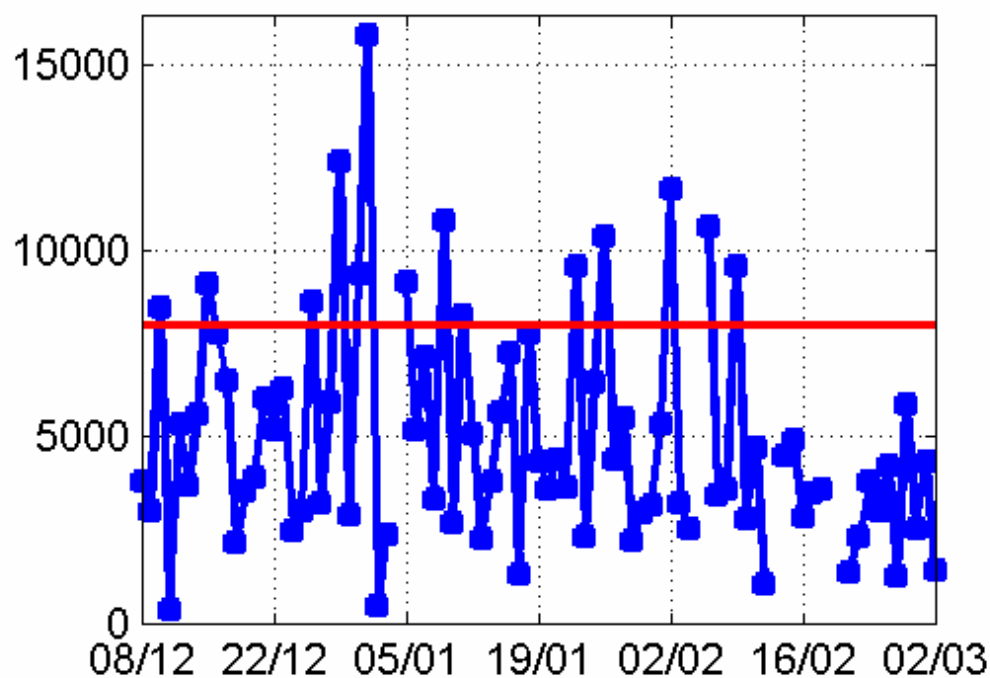
Figure 12: Steps graph. The red line represents the step target.

4.4.5.1 Statistics

The following statistics are calculated for steps:

1. Average of steps per day (Keskimäärin askelia päivässä)

2. Sum of steps (Askelsumma)

4.5 Exercise (Liikunta)

4.5.1 Configuration

Name	Type of field	Additional info	Default
Title	Text	-	Exercise
Short name	Text	-	Exer
Distance unit	Selection list	List of units	*Configuration (regional settings)(=>metric = km)*
Sports Lajit	Multiselection list	List of sports, *Appendix 3*	
Default graph Oletuskäyrä	Selection list	1)Duration, 2)Distance, 3)Statistics 1) Kesto, 2) Matka 3) Tilastotiedot	1)Duration
Names for intensity levels Intensiteettitasojen nimet	Editable list	*Possibility to restore default names*	1) Not defined, 2) No exercise effect, 3) Easy, 4) Moderate, 5) Heavy, 6) Too heavy 1) Ei määritelty, 2) Ei harjoitusvaikutusta, 3) Kevyt, 4) Kohtalainen, 5) Raskas, 6) Liian raskas

A predefined long list of sports ("All sports") (see Appendix 3 for complete list) is used in configuration. In addition to the predefined sports, the "All sports" list includes five

editable entries, e.g., "Own sport 1". These are user-configurable sports that the user can define the name for. The "All sports" list is used for giving the user the option to create a dynamic short list of sports ("My Sports").

The "My Sports" list is used in input forms. The "My Sports" list can be edited in configuration. Selection of sports to "My Sports" list is done using a multiselection list with a possibility to search entries by typing their first letters (Figure 13).
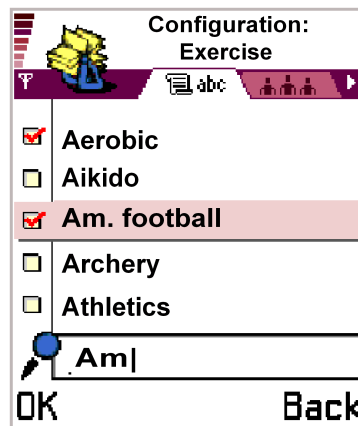
Figure 13: Configuration of Exercise form: Selection of sports available in input form

4.5.2 Input form

The exercise input form consists of:

Title	Type of field	Alternatives	Default
* Duration Kesto	Number [min]		Current time
Sport Laji	Selection list	Fixed list of sports (can be edited in configuration)	Previous input
* Start time Alkuaika	Time		Current time
Distance Matka	Number [km]		NaN
Intensity Intensiteetti	Radio button	1) Not defined, 2) No exercise effect, 3) Easy, 4) Moderate, 5) Heavy, 6) Too heavy 1) Ei määritelty, 2) Ei harjoitusvaikutusta,	1)Not defined

		3) Kevyt, 4) Kohtalainen, 5) Raskas, 6) Liian raskas	
Mean HR Keskisyke	Number [bpm]		0
* Date Päivä	Date		Current time
Note Kommentti	Freetext		Empty string

In the exercise input form the user can input an "intensity" for each entry. This is a five-level assessment of the intensity. Names for intensity levels 1-5 can be altered by the user. The default names are given in the above table.

The input form should be dynamic: as the sport is selected and focus moves to next field, "distance" field is either enabled or disabled depending on the sport. Sports with "distance" enabled are marked in Appendix 2: Sports list with "Dist".

4.5.3 Goal setting

Goal setting is presented in Appendix 2.

There is also a possibility to set distance goals for distance sports, such as walking, running, cycling, skiing, and running, etc. individually. When setting sport-specific distance goals, the user is presented with a multiselection list of distance sports from "My Sports" list, and is allowed to select to which sports he/she would like to set distance goals. The goal setting consists of the following fields:

Name	Type of field	Alternatives	Default
Target *Tavoite*	Number [km/miles => configuration]	-	0
Use target date *Käytä tavoitepäivää*	Selection list	1)No, 2)Yes *1)Ei, 2) Kyllä*	1)No *1)Ei*
Target date *Tavoitepäivä*	Date	-	Current date

4.5.4 Data processing

4.5.5 Feedback

Exercise feedback is presented in the form of exercise graph representing information about weekly exercise as stacked bars (see Figure 14) and automatically calculated statistics below the graph or in a tab of its own. Statistics feedback are presented in textual format, for example: "Total duration of exercise: 300 min", "Total distance: 500 km", and "Average HR: 130 bpm".

Figure 14: Exercise graph.

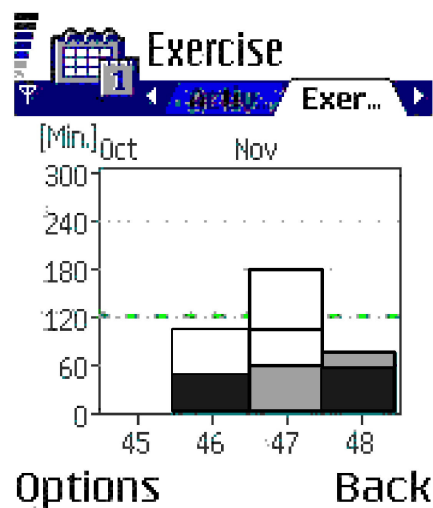4.5.5.1 Statistics

The following statistics are calculated for exercise:

1. Total duration of exercise (Liikunnan kokonaiskesto)

2. Average duration per week (Keskimääräinen kesto viikossa)

3. Average duration per day (Keskimääräinen kesto päivässä)

4. Number of exercise sessions (Liikuntasuoritusten määrä)

5. Average number of sessions per week (Keskimääräinen liikuntasuoritusten määrä viikossa)

If filtered view is active, statistics are calculated based on the selected options, i.e., for the selected sport and selected variable (Distance/Duration):

1. Total (distance/duration) (Kokonaismatka/Kokonaiskesto)

2. Average duration/distance per week (Keskimäärinen kesto/matka viikossa)

3. Total number of sessions (Suoritusten kokonaismäärä)

4. Average number of sessions (Keskimääräinen suoritusten määrä)

4.6 Eating management (Syömisen hallinta)

4.6.1 Configuration

Name	Type of field	Additional info	Default
Title	Text	-	Eating management Syömisen hallinta
Short name	Text	-	EatM SyöH
Mode Tila	Selection list	1)Intervention, 2)Continuous, 3)Not in use 1) Interventio, 2) Jatkuva 3) Ei käytössä	1)Intervention 1) Interventio
Default graph Oletuskäyrä	Selection list	1)Satisfaction, 2)Calories 1) Tyytyväisyys, 2) Kalorit	1)Satisfaction 1) Tyytyväisyys

In principle, when the user chooses Intervention mode, the diet input form and feedback should only be visible when the intervention period is on. When the condition for starting an intervention is detected, the user is suggested to take diet monitor into use, and when the condition disappears, the diet monitor should be switched off. The rules for triggering diet monitor are presented in Appendix 4.

4.6.2 Input forms

Variable name: "**Eating management**" (default). The form is filled in every time the user eats something. ("Syömisen hallinta")

Title	Type of field	Additional info	Default
Time	Time		Current time

Aika			
Satisfaction Tyytyväisyys	Selection item	1) Healthy 2) Can't say 3) Unhealthy 1) Terveellinen, 2) En osaa sanoa, 3) Epäterveellinen	2) Can't say 2) En osaa sanoa
Energy content Energiasisältö	Number *[unit: configuration]*		0
Date Päivä	Date		Current date
Note Kommentti	Freetext		Empty string

4.6.3 Goal setting

No goals for this yet.

4.6.4 Data processing

4.6.5 Feedback

Figure 15 is an example of "After every meal" feedback graph.
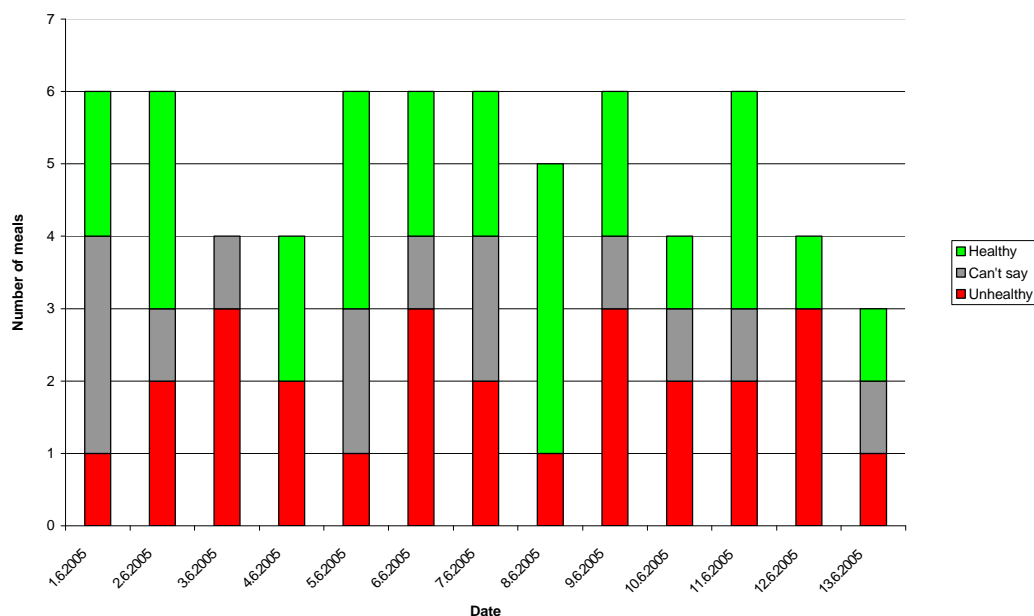
Figure 15: Feedback for Diet entries made after every meal. The colors represent the satisfaction for the meal quality and the height of the bar represents the number of meals.

The energy graph can be selected in the Options menu. An example of energy graph is shown in Figure 16.
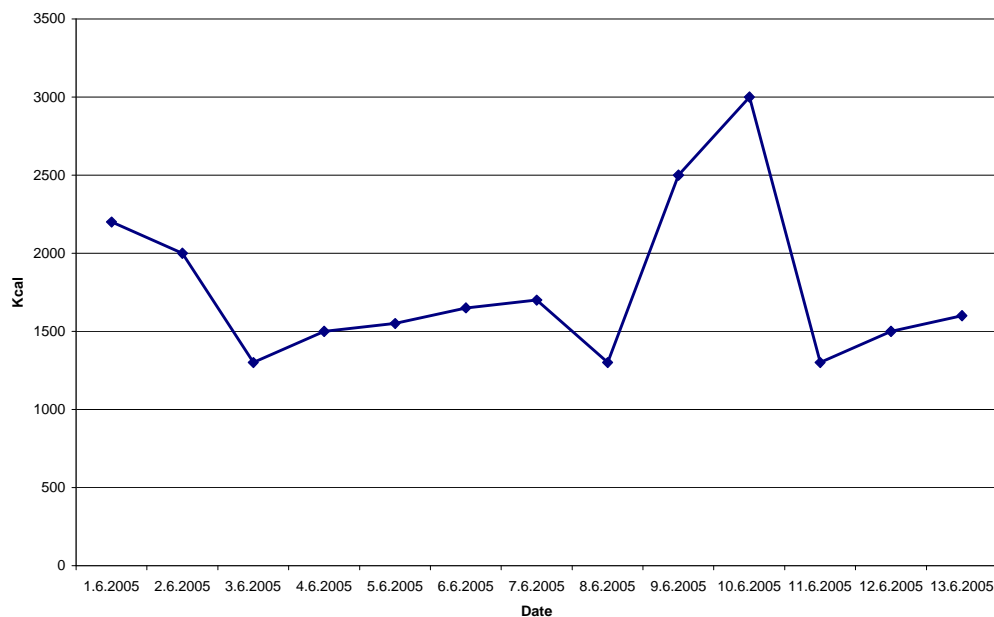
Figure 16: Energy graph.

4.6.5.1 Statistics

The following statistics are calculated for Eating Management:

1) Average number of meals per day (Keskimääräinen syömisten määrä päivässä)

2) Average percentage of healthy/can't say/unhealthy (Keskimääräinen osuus terveellisiä/en osaa sanoa/epäterveellisiä)

4.7 Eating Summary (Syömisen yhteenveto)

4.7.1 Configuration

Name	Type of field	Additional info	Default
Title	Text	-	Eating summary Syömisen yhteenveto
Short name	Text	-	EatS

			SyöY
Mode Tila	Selection list	1)Intervention, 2)Continuous, 3)Not in use 1) Interventio, 2) Jatkuva 3) Ei käytössä	1)Intervention 1) Interventio
Default graph Oletuskäyrä	Selection list	1)Satisfaction, 2)Calories 1) Tyytyväisyys, 2) Kalorit	1)Satisfaction 1) Tyytyväisyys

In principle, when the user chooses Intervention mode, the diet input form and feedback should only be visible when the intervention period is on. When the condition for starting an intervention is detected, the user is suggested to take diet monitor into use, and when the condition disappears, the diet monitor should be switched off. The rules for triggering diet monitor are presented in Appendix 4.

4.7.2 Input form

Variable name: "**Eating summary**". The form is supposed to be filled in every evening as a summary of the day's eatings. ("Syömisen yhteenveto")

Title	Type of field	Additional info	Default
Satisfaction Tyytyväisyys	Selection item	1) Healthy 2) Can't say 3) Unhealthy 1) Terveellinen 2) En osaa sanoa 3) Epäterveellinen	2) Can't say 2) En osaa sanoa
Energy content Energiasisältö	Number *[unit: configuration]*		0
Date Päivä	Date		Current time
Note Kommentti	Freetext		Empty string

4.7.3 Goal setting

No goals for this yet.

4.7.4 Data processing

4.7.5 Feedback

"Once per day" satisfaction graph can be a bar graph where satisfaction is presented with colors (Figure 17). When time range changes and several weeks are averaged, the color of e.g., monday is calculated based on average of, e.g., 6 week's mondays. Thus unhealthy = 0, can't say = 1, healthy = 2. Red = [0...0.5], Gray = (0.5 ... 1.5) and Green=[1.5 ...2]. White = no entry/entries.
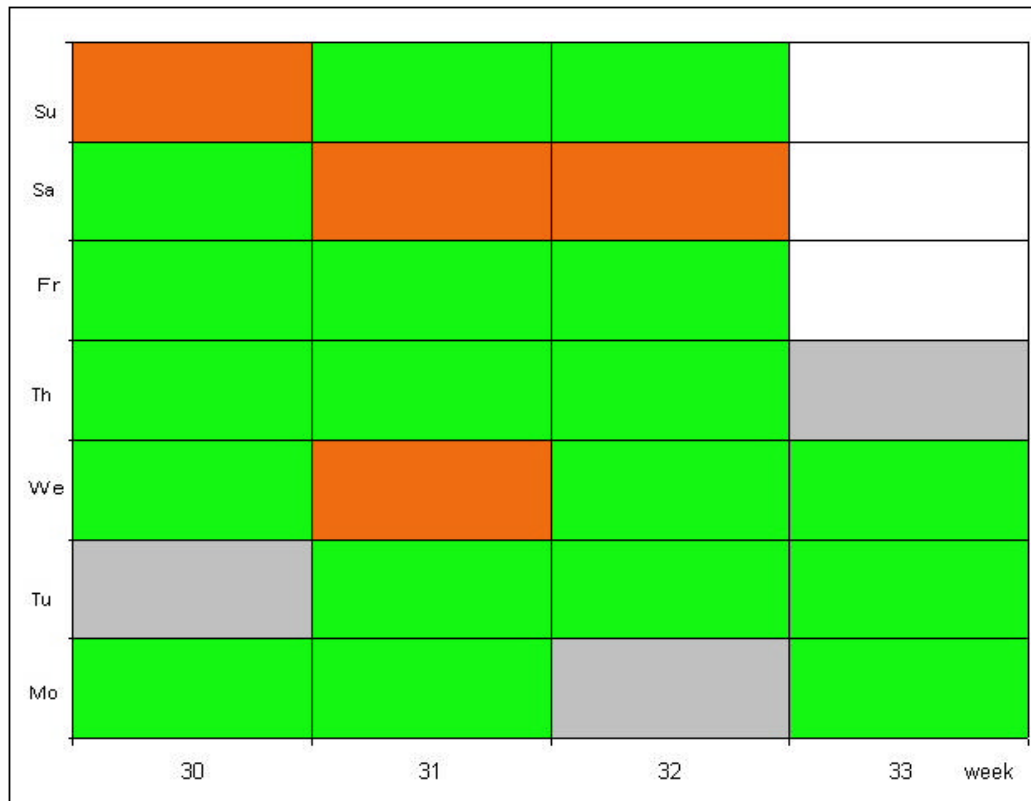
Figure 17: "Once per day" diet input graph. Green means "Healthy", Gray means "Can't say", and Red means "Unhealthy". White would mean "no entry".

The energy graph can be selected in the Options menu. An example of energy graph is shown in Figure 16.

4.7.5.1 Statistics

The following statistics are calculated for Eating Summary:

1. Average percentage of healthy/can't say/unhealthy (Keskimääräinen osuus terveellisiä/en osaa sanoa/epäterveellisiä)

4.8 Sleep (Uni)

4.8.1 Configuration

Name	Type of field	Additional info	Default
Title	Text	-	Sleep Uni
Short name	Text	-	Slee Uni

4.8.2 Input form

Name	Type of field	Alternatives	Default
Bedtime start Nukkumaanmenoaika	Time	Range 00:00 - 23:59	Current time
Wakeup time Heräämisaika	Time	Range 00:00 - 23:59	Current time
Sleep quality Unen laatu	Slider	Slider with values -1...10	None (-1)
Wakeup date Heräämispäivä	Date	-	Current date
Note Kommentti	Freetext	-	Empty string

4.8.3 Goal setting

See Appendix 2.

4.8.4 Data processing

If bedtime start date&time > wakeup date&time notify user of illegal entry and ask for correction.

4.8.5 Feedback

1) Sleep durations per day (Figure 18), 2) Sleep times (graph like in blood pressure, will look like calendar week view) 3) Sleep Quality, 4) Sleep duration * quality.
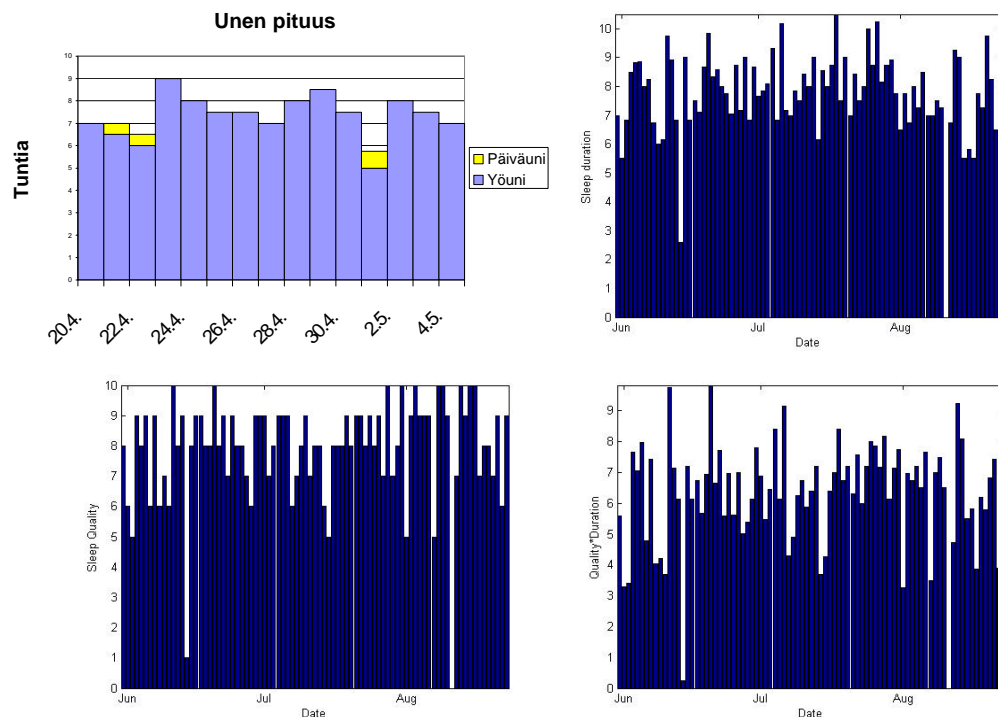
Figure 18: a) Sleep duration graph. Coloring of daily entries: longest duration entry is colored blue (night), shorter entries (naps) are colored yellow. b) 3-month sleep duration from real data, c) 3-month sleep quality from real data, d) 3-month sleep duration * quality from real data

4.8.5.1 Statistics

The following statistics are calculated for sleep:
1. Average sleep duration per night (Keskimääräinen yöuni)
2. Average sleep quality (Keskimääräinen unen laatu)
3. Minimum sleep duration per night (Lyhin yöuni)
   - Use only longest duration entry of each day
4. Maximum sleep duration per night (Pisin yöuni)
   - Use only longest duration entry of each day
5. Minimum sleep quality (Huonoin unen laatu)
6. Maximum sleep quality (Paras unen laatu)
7. Sum of sleep duration (Unta yhteensä)

4.9 Blood Pressure (Verenpaine)

4.9.1 Configuration

Name	Type of field	Additional info	Default
Title	Text	-	Blood pressure

			Verenpaine
Short name	Text	-	BP Veri
Unit	Selection list	List of units	mmHg

4.9.2 Input form

Name	Type of field	Additional info	Default
* Systolic BP Yläpaine (Sys)	Number [mmHg]	-	0
* Diastolic BP Alapaine (Dia)	Number [mmHg]	-	0
Pulse Pulssi	Number [1/min]	-	0
Time Aika	Time	-	Current time
Date Päivä	Date	-	Current date
Note Kommentti	Freetext	-	Empty string

4.9.3 Goal setting

See Appendix 2.

4.9.4 Data processing

Blood pressure values must be > 0.

Pulse must be > 0

4.9.5 Feedback

Systolic and diastolic pressure values are drawn into the same graph, using the same axis. This can either be done as two line graphs or as in Figure 19. Pulse may be drawn on top of the graph as an added curve (See 2.3.4, Combination graphs).
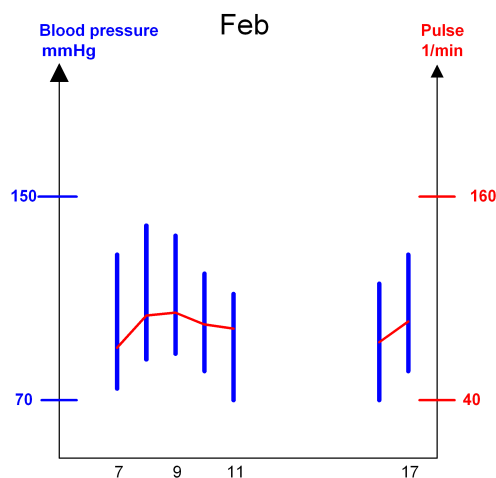
Figure 19: Blood pressure + pulse graph.

4.9.5.1 Statistics

The following statistics are calculated for blood pressure:

1. Average systolic/diastolic (Keskimääräinen yläpaine/alapaine)
2. Maximum systolic (Korkein yläpaine)
3. Minimum systolic (Matalin yläpaine)
4. Maximum diastolic (Korkein alapaine)
5. Minimum diastolic (Matalin alapaine)
6. Average pulse (Keskimääräinen pulssi)
7. Maximum pulse (Korkein pulssi)
8. Minimum pulse (Matalin pulssi)

4.10 Stress (Stressi)

4.10.1 Configuration

Name	Type of field	Additional info	Default
Title	Text	-	Stress Stressi
Short name	Text	-	Stre Stre
Unit	Selection list	List of units	None Ei mitään

4.10.2 Input form

Name	Type of field	Additional info	Default

Stress Busyness / Stress / Pressure Stressi Kiire / Stressi / Paineet	Slider	-1...10	-1 (not available)
Tiredness Väsymys	Slider	-1...10	-1 (not available)
Time Aika	Time	-	Current time
Date Päivä	Date	-	Current date
Note Kommentti	Freetext	-	Empty string

4.10.3 Feedback

Show both variables in one graph, e.g. as overlapping line graphs (Figure 20). Also "0" values should show, but missing values not.

Figure 20: Stress and tiredness graph.

4.10.3.1 Statistics

The following statistics are calculated for stress:
1. Average stress (Keskimääräinen stressi)
2. Average tiredness (Keskimääräinen väsymys)

4.11 Own variable (Oma muuttuja)

4.11.1 Configuration

Own VAS variable:

Name	Type of field	Additional info	Default
Title	Text	-	OwnAssessment*X* (X = number) OmaArvioX
Short name	Text	-	AsmX ArvX

Own numerical variable:

Name	Type of field	Additional info	Default
Title Otsikko	Text	-	OwnMeasurement*X* (X = number) OmaMittausX
Short name Lyhyt nimi	Text	-	MeaX MitX
Unit Yksikkö	Selection list	List of units	None Ei mitään

Own note variable:

Name	Type of field	Additional info	Default
Title Otsikko	Text	-	OwnNote*X* (X = number) OmaKommenttiX
Short name Lyhyt nimi	Text	-	NotX KomX

4.11.2 Input form

Two different input forms for own variables: Assessments (slider) and Measurements (value). User can change the name of assessment in configuration (default names: "Assessment1" and "Measurement1", etc.)

Assessment input form:

Name	Type	Additional info	Default
Configuration (*)	Slider	Range: -1 ... 10	-1
Time Aika	Time	00:00-23:59	Current time
Date Päivä	Date		Current date
Note Kommentti	Freetext		Empty string

Measurement input form:

Name	Type	Additional info	Default
Configuration (*)	Float	*Unit from configuration*	0
Time Aika	Time	00:00-23:59	Current time
Date Päivä	Date		Current date
Note Kommentti	Freetext		Empty string

Note input form:

Name	Type	Additional info	Default
Configuration (*)	Text field		Empty string
Time Aika	Time	00:00-23:59	Current time
Date	Date		Current date

Päivä			
Note Kommentti	Freetext		Empty string

4.11.3 Feedback

A feedback tab is created for each own variable. The Assessment and Measurement variables are displayed as line curves. *Are notes displayed elsewhere than in list view? Should there be some type of graph for browsing the notes with the hairline?*

4.11.3.1 Statistics

The statistics calculated for own variable (only VAS and numerical) are:

1. Average (Keskiarvo)

2. Standard deviation (Keskihajonta)

3. Maximum (Maksimi)

4. Minimum (Minimi)

4.12 Illness/Symptom (Sairaus/Oire)

4.12.1 Configuration

Name	Type of field	Additional info	Default
Title	Text	-	Illness Sairaus
Short name	Text	-	Ill Sair

4.12.2 Input form

Name	Type	Additional info	Default
Name of illness (*) Sairauden nimi	Text field or selection list + add new	-	Empty
Start date Alkamispäivä	Date	-	Current date

Start time

Alkamisaika | Time | - | Current time |
| End date

Päättymispäivä | Date | - | Current date |
| End time

Päättymisaika | Time | - | Current time |
| Note

Kommentti | Text field | - | Empty |

4.12.3 Feedback

- list of health events

    o First field as the name + start date and end data/start date, duration, ordered by start date

    o More information by selecting the entry

- graph?

4.13 Doctor visit (Lääkärissäkäynti)

4.13.1 Configuration

Name	Type of field	Additional info	Default
Title	Text	-	Doctor visit

Lääkärissäkäynti |
| Short name | Text | - | Doc

Lääk |

4.13.2 Input form

Name	Type	Additional info	Default
Reason (*)

Syy | Text field or selection list + add new | - | Empty / previous reason |

Doctor's name Lääkärin nimi	Text field or selection list + add new	-	Empty / previous doctor
Clinic Klinikka	Text field or selection list + add new	-	Empty / previous clinic
Diagnosis Diagnoosi	Text field or selection list + add new	-	Empty / previous diagnosis
Start date Alkamispäivä	Date	-	Current date
Start time Alkamisaika	Time	-	Current time
End date Loppumispäivä	Date	-	Current date
End time Loppumisaika	Time	-	Current time

4.13.3 Goal setting

No goals.

4.13.4 Data processing

No processing.

4.13.5 Feedback

- List of doctor visits (Date, Reason, Clinic). Each item (date, reason, clinic) is on its own line in the list. Thus one list item consists of three lines.

4.14 Treatment/Medication (Hoito/Lääkitys)

4.14.1 Configuration

Name	Type of field	Additional info	Default
Title	Text	-	Treatment Hoito
Short name	Text	-	Meds Hoit

4.14.2 Input form

Name	Type	Additional info	Default
Name of treatment (*) Hoidon nimi	Text field or selection list + add new	-	Empty
Dose Annos	Text field		Empty string
Frequency Taajuus	Text field		Empty string
Start date Alkamispäivä	Date	-	Current date
Start time Alkamisaika	Time	-	Current time
End date Loppumispäivä	Date	-	Current date
End time Loppumisaika	Time	-	Current time
Note Kommentti	Text field	-	Empty

4.14.3 Goal setting

No goals.

4.14.4 Data processing

4.14.5 Feedback

- List of treatments (Start date - End date, Name of treatment)

4.15 Working Time (Työaika)

4.15.1 Configuration

Name	Type of field	Additional info	Default
Title	Text	-	Working time Työaika
Short name	Text	-	Work Työ

4.15.2 Input form

Name	Type	Additional info	Default
Working time Työaika	Time	User writes down working duration (hours and minutes).	00:00
Date Päivä	Date	-	Current date
Note Kommentti	Text field	-	Empty

4.15.3 Goal setting

4.15.4 Data processing

4.15.5 Feedback

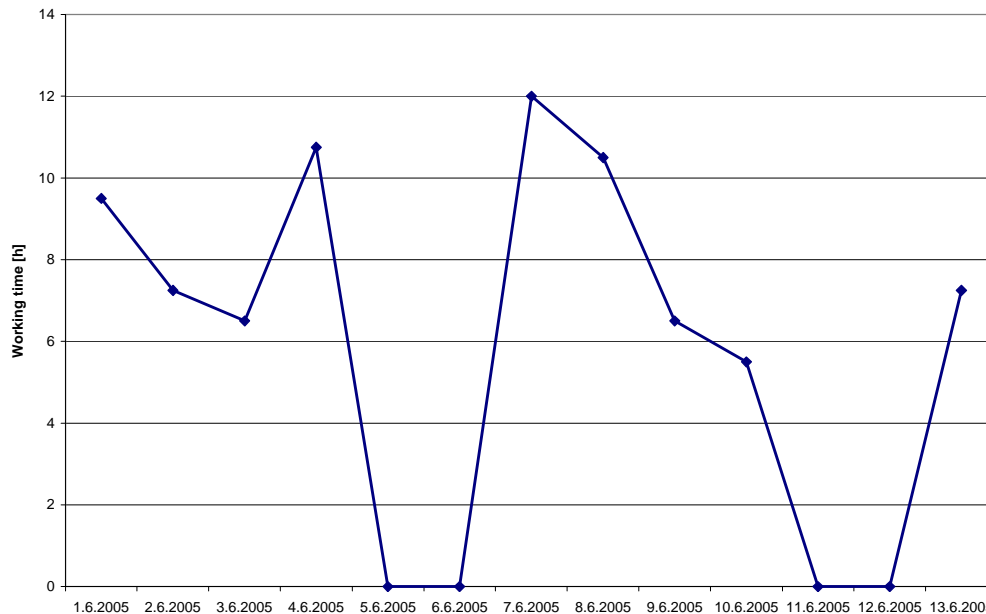Curve graph of daily working times, Figure 21.

Figure 21: Working time graph.

4.15.5.1 Statistics

The statistics calculated for working time are:

1. Sum of working time (Työaika yhteensä)

2. Average daily working time (excluding weekends/including weekends) (Keskimääräinen työaika päivässä (mukaanlukien/poislukien viikonloput))

5 Configuration and goal setting wizard

When the application is opened for the first time, the settings dialog should pop up automatically. The configuration needs to be done in the correct order. In the first configuration, the next tab should be enabled only when the previous has been filled, or at least the necessary information has been filled.

6 User support, help

Help file containing both user's manual and information about CBT in weight management.

Painonhallintaohjeet

Syömistä edeltävät tilanteet

Ota vähemmän tai pienempi määrä ruokaa, tee päätös ennen ruokailua.

Jätä jokin ruokalaji ottamatta. Mieti mikä ruoka tai ruokalaji etukäteen.

Valmista ruokaa pienempi määrä kuin ennen.

Juo lasi vettä ennen ruokailua, se vähentää nälän tunnetta.

Syömistilanteet

Syö vähemmän kuin tavallisesti syöt.

Jätä jokin ruokalaji ottamatta. Voit syödä ja valita sen seuraavalla kerralla.

Vaihda runsaasti rasvaa sisältävä ruokalaji vähemmän rasvaiseen.

Jos ruokailun hallinta on sinulle vaikeaa, kirjoita muistiin mitä ja miten paljon syöt.

Juo lasi vettä ruokailun aikana, se lisää kylläisyyden tunnetta.

Syömisen jälkeiset tilanteet

Älä pidä liian pitkää väliä ruokailujen välillä.

Syö välipala, jos ruokailujen välille tulee useita tunteja, se lisää syömisen hallintaa.

Ylensyömisen riskitilanteet

Mieti mitä muutoksia voisit tehdä ruokailutottumuksissasi juhlapyhinä.

Liikunta

Käytä useammin rappuja.

Liiku polkupyörällä, jos mahdollista.

Pyydä ystäväsi tai naapurisi ulos kävelylle.

Milloin viimeksi olet käynyt kuntosalilla?

Yleiset elämäntavat

Jos koet itsesi kiireiseksi ja olet usein ärtynyt ja väsynyt, tee joku muutos päivärutiineissasi.

Oletko varannut tarpeeksi aikaa itsellesi?

Nukutko tarpeeksi? Pitäisikö sinun mennä aikaisemmin nukkumaan?

Ostokset

Älä mene kauppaan nälkäisenä.

Suunnittele etukäteen mitä ostat. Tee luettelo ostoksistasi.

Kulje ruokakaupassa eri reittiä kuin tavallisesti.

Valitse vähärasvaisia ruokia.

Lue pakkausselostuksia.

Juhlat ja muut sosiaaliset tilanteet

Uskalla poiketa muista. Voi olla, että sinä et voi hakea lisää ruokaa, vaikka muut tekevät niin.

Lisää veden juomista juhlissa, se lisää kylläisyyden tunnetta.

Mielipaha ja epämiellyttävät tunteet

Puhu tunteistasi jollekin.

Lähde kävelylle.

Kirjoita paperille, mikä sinua harmittaa.

Kirjoita paperille eri vaihtoehtoja, mitä voisit tehdä tunteen muuttamiseksi.

Soita ystävällesi.

Sano ääneen, mikä sinua harmittaa.

Hyväksy se miltä sinusta tuntuu.

7 Data exchange

File name is created from "UserID"-field and date. Two first characters of userID are used and date is given as "MMDD". Example: "u17d0824.txt" created from user ID "17" on 24th of August.

NOTE: Month before day number to allow automatic ordering of files into chronological order by file name.

- phone – other storage => GPRS, multimedia

- phone- other people (friends, physician) => multimedia

8 Changes required to S60 calendar

- deleting a form is too complicated, there should be a calcel

Appendix 1: Weight management index (WMI)

Appendix 1.1: WMI algorithm

Weight Management Index (WMI) reflects the success of weight management. It is determined based on three items: weight, activity, and exercise. Each item is scored individually, and WMI is determined based on the subscores.

Weight entries are required; if there are no weight entries, WMI is not calculated. Otherwise, WMI may be determined based on weight or the combinations of weight and activity, weight and exercise, or all three items depending on which are available.

The score is first calculated when there are at least 7 days between the first and the last weight entry. Thereafter, the score is updated at midnight. The score shown today is yesterday's score.

GENERAL PRINCIPLES

The mode of use is taken into account. Slightly different algorithms are used for weight loss and weight maintenance purpose.

If the purpose of use is weight loss, then the role of weight is emphasized by giving more points for weight loss than for exercise and activity.

If the purpose is to maintain weight, more emphasis is placed on physical activity. Maximum weight points are awarded for staying at target weight, which is defined as a target weight range with upper and lower limits.

The calculation of WMI is represented in Figure A1.1.
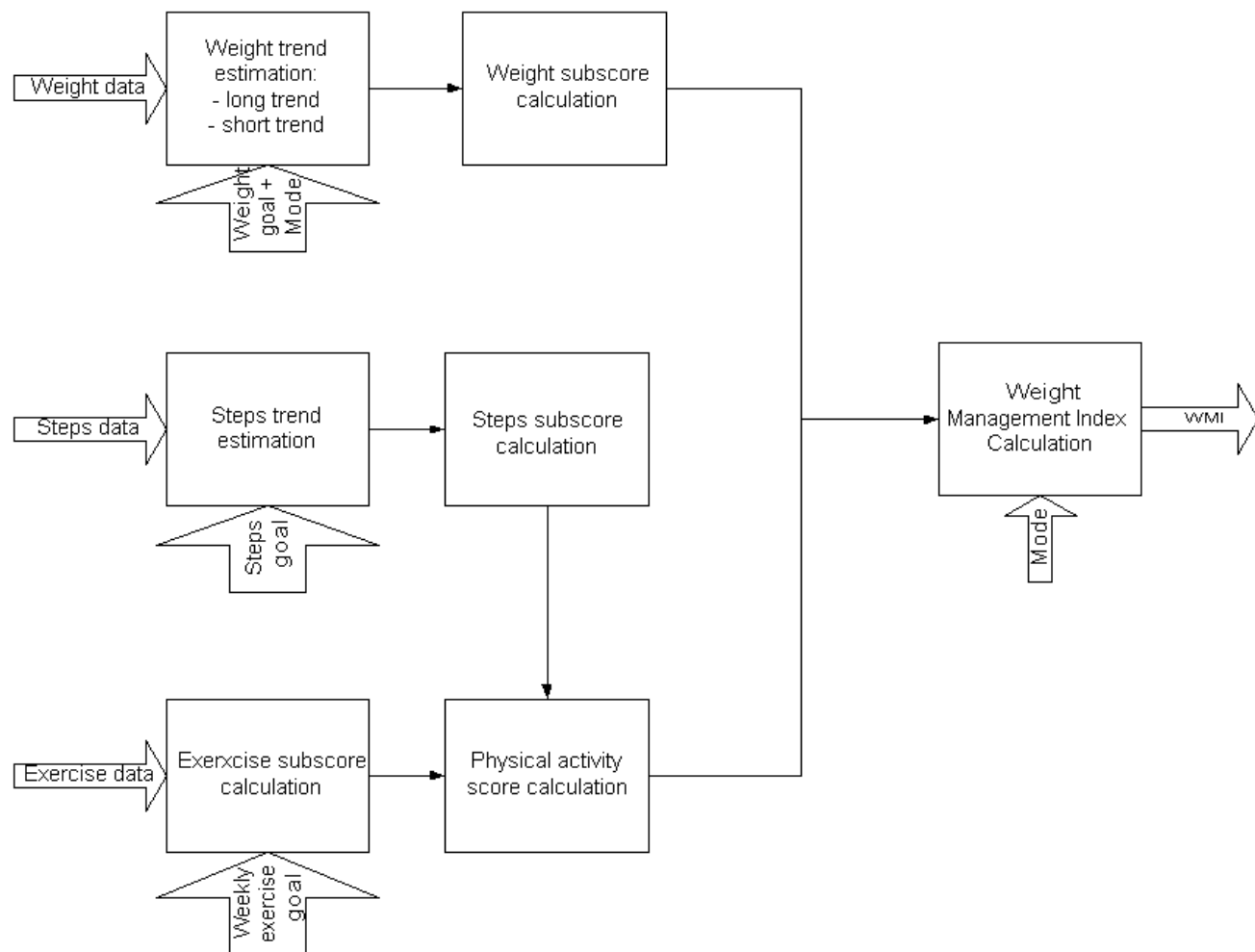
Figure A1.1: Basic principles of WMI calculation.

WEIGHT SUBSCORE

Weight score is determined based on the weight target and short and long term weight trends. The trends are calculated from data windows represented in Figure A1.2. The trend is detected by fitting a regression line on the data in the data window and testing the significance of the regression coefficient (i.e. the slope of trend). The trend detection algorithm is described in detail in Appendix 1.2.

Figure A1.2. Data windows in weight trend calculation.

Definitions:

N = Length of data vector

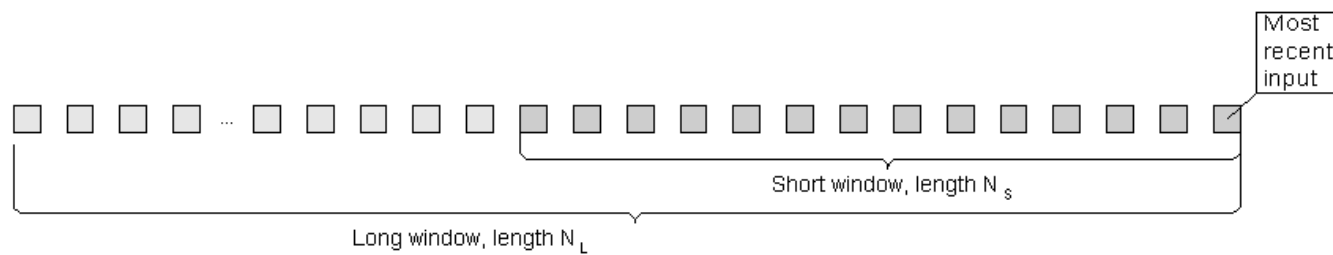N_S = Short window length (7…14)

N_L = Long window length (14…45)

slope_reg = Slope obtained from regression, to be tested for significance (B in Appendix 1.2)

Slope = Final slope of trend to be used in scoring

F = F-value for slope obtained from statistical test (See Appendix 1.2)

DFD = Degree of freedom for denominator, N-2

Fcrit = Critical F-value obtained from F-distribution table for Alpha and DFD (Appendix 1.2)

Alpha = Significance threshold, needed for checking Fcrit (Alpha = 0.05 or 0.10)

Wfactor = Weighing coefficient for short window score, e.g., 1/4

WScoreFunction_WL = Weight score function for weight loss mode

WScoreFunction_WM = Weight score function for weight maintenance mode

TrueScores = Vector for storing the calculated WScores

WScores = Vector for storing the final WScores, obtained by averaging TrueScores over three days

WinScore = Score for data in window (short or long)

Algorithm 1: Weight Loss Mode

The following procedures are applied on both short and long window for each data point.

Basic steps of weight subscore calculation:

1. Calculate trend for window (Appendix 1.2)

2. Determine significance of trend slope (Appendix 1.2)

3. Determine the final slope value

4. Use the scoring function for determining the points

5. Calculate weighted sum of WinScore for short window and WinScore for long window

6. Store the result in a vector (TrueScores)

7. Calculate a three-day average from TrueScores vector

8. Store the average in another vector (WScores)

Detailed description of weight subscore calculation:

Fit regression line to data

Determine slope of trend

Calculate F-value and degree of freedom

Compare F-value to Fcrit from F-distribution table

IF (F > Fcrit) **THEN**

    Slope = slope_reg

ELSE

    Slope = 0

END

Determine WinScore with WeightScoreFunction_WL

WScore_WL = Wfactor*WinScore(short window) + (1-Wfactor)*WinScore(long window)

Store WScore_WL in TrueScores vector

Calculate average of the three last scores in TrueScores => WScore_WL

Store the final WScore_WL in WScores vector

The score function for weight loss mode is presented in Figure A1.3. The points needed for scoring functions in weight loss and weight maintenance modes are determined in Appendix 1.3.
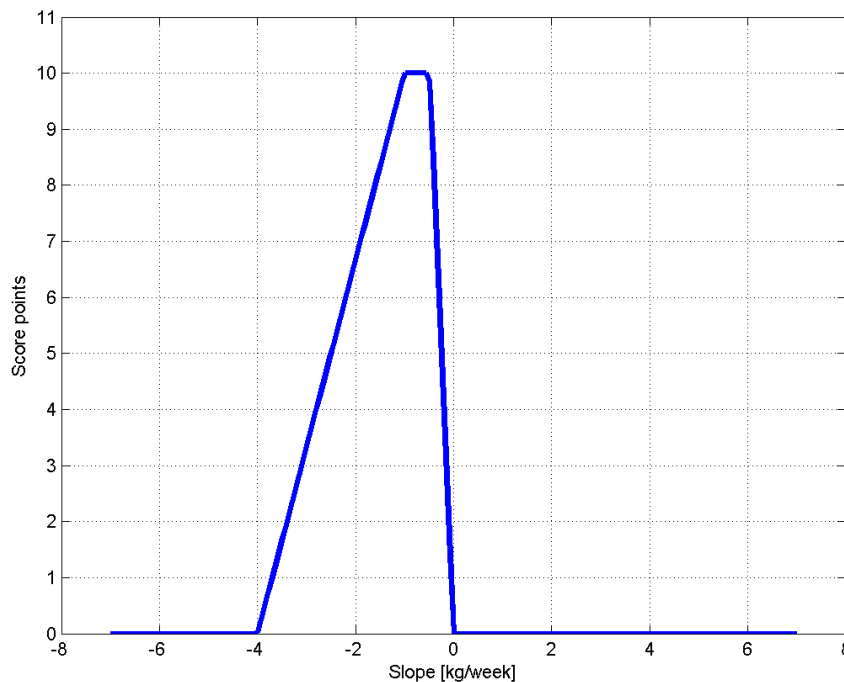
FigureA1. 3: Scoring function in weight loss mode.

Algorithm 2: Weight Maintenance Mode

For both long and short window, the following procedures are applied for each data point.

Basic steps of the algorithm:

1. Calculate average of window

2. Compare the average to the range, i.e. the targets (low and high limits)

3. If average not in the range, calculate trend of window and determine its significance

4. Use scoring function for determining the points

5. Calculate weighted sum of WinScore for short window and WinScore for long window

6. Store the result in a vector (TrueScores)

7. Calculate a three-day average from the TrueScores

8. Store the average in another vector (WScores)

Weight subscore calculation, detailed algorithm:

IF (WeightTarget_low <= AveWindow <= WeightTarget_high) **THEN**

    WinScore = 10

ELSE

    Fit regression line to data

    Determine slope of trend

    Calculate F-value and degree of freedom

    Compare F-value to Fcrit from F-distribution table

    IF (F > Fcrit) **THEN**

       Slope = slope_reg

    ELSE

       Slope = 0

    END

    IF (AveWindow > WeightTarget_high) **THEN**

       Determine WinScore with WeightScoreFunction_WM for Slope

    ELSE IF (AveWindow < WeightTarget_low) **THEN**

       Determine WinScore with WeightScoreFunction_WM for –Slope

    END

END

WScore_WM = Wfactor*WinScore(short window) + (1-Wfactor)*WinScore(long window)

Store WScore_WM in TrueScores vector

Calculate average of the three last scores in TrueScores => WScore_WM

Store the final WScore_WM in WScores vector

The scoring function for Weight Maintenance mode is presented in Figure A1.4.
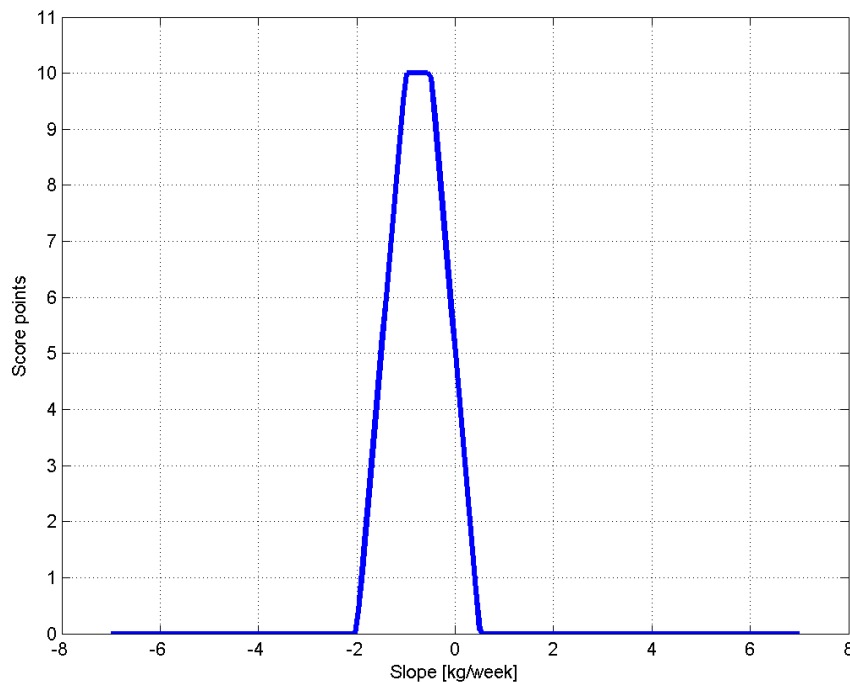
Figure A1.4: Scoring function in weight maintenance mode.

STEPS SCORE

Steps score is calculated based on a few days' averaged steps data and daily target. Points are given based on a scoring function. If the target is not reached for a given day, long term trend is calculated, and rising trend is awarded extra points. The trend is determined with linear regression, described in detail in Appendix 1.2. If the daily target is exceeded enough, extra points are given. These extra points may be used for compensating for smaller score in exercise.

Usage mode is not taken into account.

Definitions:

N = Length of steps data vector

StepTarget = Steps target defined by the user

StepWindow = Steps window, e.g. three days

AveSteps = Average of steps over StepWindow

StepTrendWindow = Long window for calculating steps trend

F = F-value obtained from statistical testing

DFD = Degrees of freedom for the denominator, N-2

Fcrit = Critical F-value, obtained from F-distribution table for Alpha and DFD

Alpha = P-value for checking Fcrit (Alpha = 0.05 or 0.10)

DScore = daily score based on average activity over StepWindow

TScore = The score determined by the trend

SSlope = Slope of steps trend

SScore = Steps score

Basic steps of steps subscore calculation:

1. Calculate average of StepWindow => AveSteps

2. Determine points with ActivityScoreFunction

3. If AveSteps is smaller than StepTarget

    a. Determine trend

    b. Determine significance of trend slope

    c. Calculate points according to trend

4. Determine final SScore

Detailed algorithm for steps subscore calculation:

Calculate AveSteps = average of StepWindow

Determine DScore with ActivityScoreFunction

IF (AveSteps < StepTarget) **THEN**

   Fit regression line to data in StepTrendWindow

   Determine slope of trend

   Calculate F-value and degree of freedom

   Compare F-value to Fcrit from F-distribution table

   IF (F > Fcrit AND SSlope > 0) **THEN**

      TScore = 10

ELSE

   SScore = 2/3*DScore + 1/3*TScore

END

Steps scoring function is presented in Figure A1.5. The points for determining the function are presented in Appedix 2.
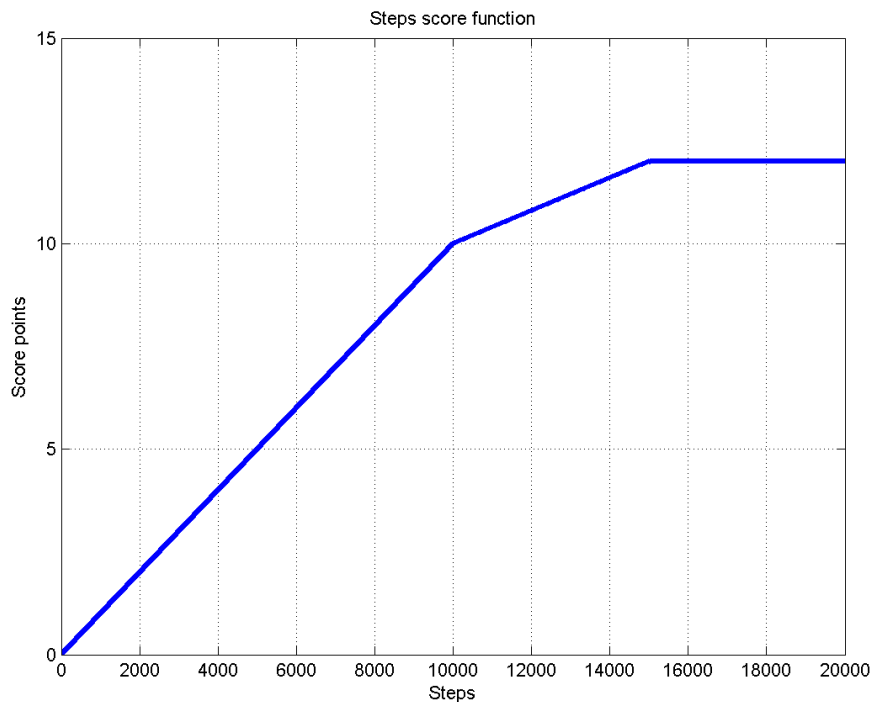
Figure A1.5: Steps scoring function.

EXERCISE SCORE

Exercise score is determined based on weekly number of exercise sessions, weekly sum of exercise durations and weekly target. If weekly exercise duration target is exceeded enough, extra points are given. Extra points may be used for compensating for small score in steps.

Definitions:

ExerciseWindow = One week (today-6: today)

ESum = Sum of exercise durations in ExerciseWindow

ETarget = Weekly target of exercise

ENum = Number of exercise sessions per week

EScore = Exercise subscore

Basic steps of exercise subscore calculation:

1. Calculate the sum of exercise duration over ExerciseWindow => ESum
2. Calculate the number of sessions over ExerciseWindow => ENum
3. Use ExerciseScoreFunction for scoring exercise duration.
4. Use rules for scoring the number of exercise sessions.
5. Calculate weighted sum of the SessionScore and DurationScore

Detailed algorithm:

Calculate ESum = sum over ExerciseWindow

Calculate ENum = number of sessions over ExerciseWindow

Determine DurationScore with ExerciseScoreFunction

IF (ENum < 2) **THEN**

    SessionScore = 0

ELSE IF (ENUM < 3) **THEN**

    SessionScore = 5

ELSE IF (ENum > 3) **THEN**

    SessionScore = 10

END

EScore = 1/3*SessionScore + 2/3*DurationScore

ExerciseScoreFunction is presented in Figure A1.6. The points needed for determining the function are presented in Appendix 1.3.
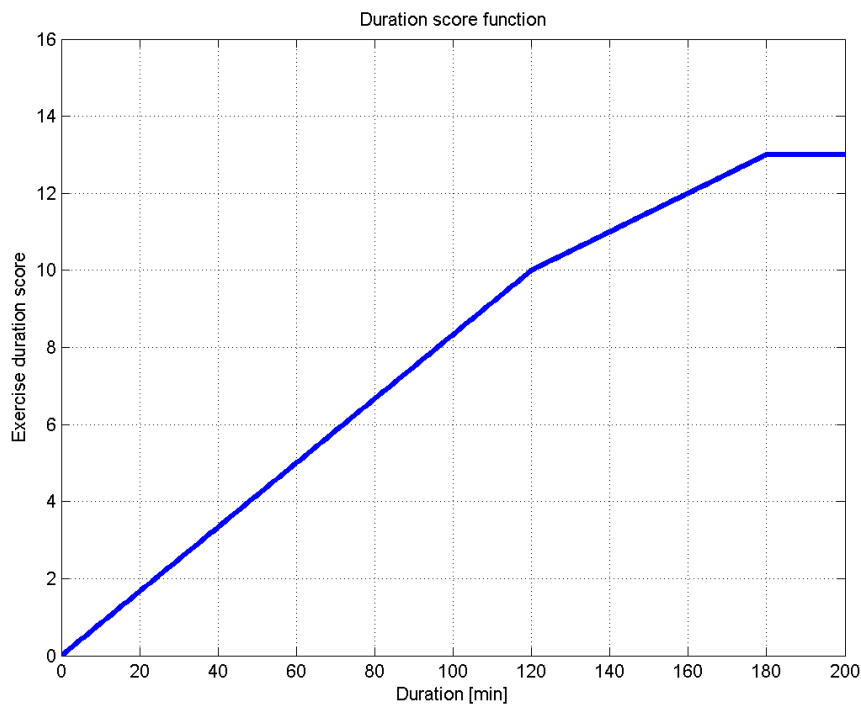
Figure A1.6: Exercise duration scoring function.

COMBINING SUBSCORES

First, steps and exercise scores are combined into the physical activity score, PhysAct. Finally, weight subscore and physical activity score are combined. Usage mode is strongly emphasized in this latter phase.

Physical activity score

items = vector that tells which variables are present, [W S E], e.g. if items(1) = 0, weight does not exist

W = Weight

S = Steps

E = Exercise

NumInputs = Number of steps inputs during the past week

Sfactor = Weighing coefficient for steps subscore, depends on how many steps inputs there have been during the past week, maximum is 0.5

Sfactor = minimum of 0.5 and 0.5*(NumInputs/7)

IF (items = [W 0 0]) **THEN**

   PhysAct = NaN

ELSE IF (items = [W S 0]) **THEN**

   PhysAct = SScore

ELSE IF (items = [W 0 E]) **THEN**

   PhysAct = EScore

ELSE IF (items = [W S E]) **THEN**

   PhysAct = Sfactor*SScore + (1-Sfactor)*EScore

END

IF (PhysAct > 10) **THEN**

   PhysAct = 10

END

Combining weight score and physical activity score

WLfactor = Weighing coefficient for weight in weight loss mode (e.g., 0.67)

WMfactor = Weighing coefficient for weight in weight maintenance mode (e.g., 0.33)

1. Goal is losing weight (weight is emphasized)

IF (items = [W 0 0]) **THEN**

   WMI = WScore_WL

ELSE

   WMI = WLfactor*WScore + (1-WLfactor)*PhysAct

END

2. Goal is maintaining weight (physical activity is emphasized)

IF (items = [W 0 0]) **THEN**

   WMI = WScore_WM

ELSE IF (items = [W S 0] **OR** items = [W 0 E]) **THEN**

   WMI = 0.5*WScore_WM + 0.5*PhysAct

ELSE

   WMI = WMfactor*WScore + (1-WMfactor)*Physact

END

HANDLING WITH MISSING DATA AND ITEMS

Weight

If there are no weight inputs for a week, WScore is not calculated. Since WMI cannot be calculated without weight, other subscores are not calculated. Weight item is marked as a missing item (items(1) = 0), and as long as weight item is missing, the score is not calculated. When weight reappears, WMI is calculated again.

Steps

If there are no steps inputs for the length of the StepWindow, SScore is not calculated, and steps item is marked as missing (items(2) = 0). When steps item is not available, only exercise (if it exists) may be used for calculating physical activity score.

Exercise

If the user has marked in the configuration that he/she is using the exercise item, the exercise item is always used in score calculation. If there are no exercise entries for a week, EScore is set to zero. If there is no input for the current day, previous EScore is used. Otherwise, a new EScore is calculated.

Appendix 1.2: Trend detection

LINEAR REGRESSION

Trend is determined by fitting a regression line to the data. Regression solves the least squares fit of Y (weight vector) on X (time vector) by solving the linear model for B (parameter vector):

$$Y = A + BX$$

We want to find out the slope B and y-intercept A that minimize the sum of squared error between the observed values and the regression model. The procedure for solving A and B is presented below. The definition of variables is presented first. Let's take weight data as an example.

W – Weight vector
T – Date vector
B – Slope
A – W-intercept (y axis)
N – Length of date vector T

The linear model is now in the form:

$$W = A + BT$$

The procedure is:

1. Remove missing values from weight and time vector
2. Normalize time vector $T = T - T(1)$
3. Solve parameters A and B

$$B = \frac{N \cdot \sum_{i=1}^{N} T_i \cdot W_i - \sum_{i=1}^{N} W_i \cdot \sum_{i=1}^{N} T_i}{N \cdot \sum_{i=1}^{N} T_i^2 - \left(\sum_{i=1}^{N} T_i\right)^2}$$

The above equation is actually the covariance between T and W divided by the variance of T.

The y-intercept may be calculated by the following equation:

$$A = \frac{\sum_{i=1}^{N} T_i^2 \cdot \sum_{i=1}^{N} W_i - \sum_{i=1}^{N} T_i \cdot \sum_{i=1}^{N} T_i \cdot W_i}{N \cdot \sum_{i=1}^{N} T_i^2 - \left(\sum_{i=1}^{N} T_i\right)^2}$$

STATISTICAL TESTING FOR REGRESSION COEFFICIENTS

The significance of the trend is determined by performing an F-test on the regression coefficient B (slope). F-test is a hypothesis test. Our null hypothesis is that slope is zero, if the hypothesis is rejected the slope is significantly different from zero.

First, we need to determine an F-value for the hypothesis test. This can be done by determining the mean squared error (MSE) and the sum of squares (SSR) for the regression fit with the following equations:

$$MSE = \frac{\sum_{i=1}^{N} e_i^2}{N - 2} \text{ , where}$$

$$e = W-A-B*T$$

$$SSR = B^2 \cdot \left(\sum_{i=1}^{N} T_i^2 - \frac{1}{N} \cdot \left(\sum_{i=1}^{N} T_i \right)^2 \right)$$

$$F = \frac{SSR}{MSE}$$

To find out, whether the null hypothesis may be rejected, i.e., whether our slope is significant, we need to compare the F value to the critical F-value. For this purpose, we need to know the degrees of freedom of nominator and denominator. The degree of freedom of the nominator (DFN) is known for linear regression: DFN = 1. The degree of freedom of the denominator (DFD) can be calculated as: DFD = N-DFN+1.

If we obtain an F-value which is larger than the critical F-value for the given DFD, we have a significant slope.

The table below presents the critical F-values for $p < 0.10$ and $p < 0.05$.

DFD	Critical F p < 0.10	Critical F p < 0.05
1	39.8635	161.4476
2	8.5263	18.5128
3	5.5383	10.1280
4	4.5448	7.7086
5	4.0604	6.6079
6	3.7759	5.9874
7	3.5894	5.5914
8	3.4579	5.3177
9	3.3603	5.1174
10	3.2850	4.9646
11	3.2252	4.8443
12	3.1766	4.7472
13	3.1362	4.6672

14	3.1022	4.6001
15	3.0732	4.5431
16	3.0481	4.4940
17	3.0262	4.4513
18	3.0070	4.4139
19	2.9899	4.3807
20	2.9747	4.3512
21	2.9610	4.3248
22	2.9486	4.3009
23	2.9374	4.2793
24	2.9271	4.2597
25	2.9177	4.2417
26	2.9091	4.2252
27	2.9012	4.2100
28	2.8939	4.1960
29	2.8870	4.1830
30	2.8807	4.1709
40	2.8354	4.0847
60	2.7911	4.0012
120	2.7478	3.9201
Inf	2.7055	3.8415

Appendix 1.3: Scoring functions

The scoring functions are formed with linear interpolation between given points. The points are presented in this appendix.

WEIGHT LOSS SCORING FUNCTION

Slope = [-1, -0.571, -0.286, -0.071, 0, 1]
Score = [0, 0, 10, 10, 0, 0]

The slope points correspond to following weight changes per week:
[-7, -4, -2, -0.5, 0, 7] kg/week

WEIGHT MAINTENANCE SCORING FUNCTION

Slope = [-1, -0.286, -0.143, -0.071, 0, 0.071, 1]
Score = [0, 0, 10, 10, 5, 0, 0]

The slope points correspond to weight changes:
[-7, -2, -1, -0.5, 0, 0.5, 7] kg/week

STEPS SCORING FUNCTION

Steps = [0, ATarget, 1.5*ATarget, 100*ATarget]
Score = [0, 10, 12, 12]

EXERCISE SCORING FUNCTION

Duration = [0, ETarget, 1.5*ETarget, 100*ETarget]
Score = [0, 10, 12, 12]

Appendix 1.4: WMI update rules

Weight, steps, and exercise inputs constitute the items needed for calculation of Weight Management Index (WMI). In configuration, the user specifies which of these items he/she uses, and those are assumed to be in use in calculation of WMI as well. Weight input is the only item that is always required for calculating the index. The problem is that these items may be input at different times of day, and there may be several inputs in each category, especially exercise.

The idea in updating WMI is to start at zero in the morning, and start growing it with inputs.

The first update of the day is done when the first WMI-related input is made. Other inputs are substituted with:
- Weight – use the most recent weight value
- Steps – use zero (not NaN, this allows for growing the score during the day)
- Exercise – use a seven-day sum, as usual (this also allows for growing the score)

Example situation:
Weight input is done in the morning, exercise input in the afternoon, steps input in the evening, and another exercise input in the evening. In the morning, weight subscore is calculated – both trends are decreasing – and maximum points are awarded. There are no steps inputs for the day, so the subscore for steps is zero. Exercise score is calculated based on the seven day sum, as usual. WMI is calculated based on this information. When exercise in input is made in the afternoon, new exercise subscore and WMI are calculated. In the evening, when daily steps and another exercise session are input, steps subscore and exercise subscore are updated, and new WMI is calculated.

The items that the user is not using (not chosen in configuration) are always left out. If the user is using steps input, but does not make the input during the day, the steps item is not used in determining that day's score. However, this cannot be taken into account during the day in question, because we cannot know whether the user intends to make the input. Therefore, when the first input of the next day is made, the steps item is checked for the previous day, and the score is updated accordingly. This may lead to the previous day's score increasing.

Feedback
WMI for the current day is shown as feedback, and WMI of the previous day in parentheses after it, e.g., 5.5 (9.5). The true WMI for the previous day can only be calculated when the first input of the next day is made.

Appendix 2: Default goals

This appendix describes the calculation of default goals for different items in Health Diary. The default goals are presented to the user in the configuration, and the user may change them.

The user-defined weight goals are checked, and unrealistic or unhealthy goals are notified to the user along with a suggestion for a better goal. The procedure for checking the weight goals and calculating new goals is also presented in this document. After notifying the user of the unrealistic weight goal, **the user may choose to stick with the goal he/she has set,** or use the goal calculated by the application.

Other goals – steps, exercise, sleep, and blood pressure goals – are not checked. These goals do not significantly affect the functions of the application, and therefore it is enough to give reasonable default goals are provide further information on safe goals in the user manual and/or help file.

WEIGHT GOALS

Weight loss mode – default goals

initial_weight = current weight, set by the user in personal information

target_weight = weight goal

weight_BMI_X = weight corresponding to BMI value X

BMI_initial = BMI corresponding to initial weight

IF (BMI_initial >= 18.5 **AND** BMI_initial <= 25) **THEN**

   target_weight = initial_weight

 ELSE IF (BMI_initial < 18.5) **THEN**

   target_weight = weight_BMI_18.5

 ELSE IF (BMI_initial > 25) **THEN**

   target_weight = max(weight_BMI_25, 0.95*initial_weight)

END

Checking user-defined goals

BMI_initial = BMI corresponding to initial weight

mode = usage mode, WLoss for weight loss and WMaint for weight maintenance

goal = user defined target

new_goal = suggested new goal

valid = parameter indicating a valid target, 0 = invalid, 1 = valid

IF (goal > initial_weight) **THEN**

 valid = 0

 message = "Check target! Target above current weight."

 IF (BMI_initial > 25) **THEN**

  new_goal = max(weight_BMI_25, 0.95*initial_weight)

 ELSE

  new_goal = max(weight_BMI_18.5, initial_weight)

 END

ELSE

 valid = 1

END

IF (BMI_goal < 18.5 **OR** goal < 0.90*initial_weight) **THEN**

 valid = 0

 message = "Check target! Target is too low."

 new_goal = max(weight_BMI_18.5, 0.90*initial_weight)

ELSE

 valid = 1

END

The checks are processed sequentially, and the "most recent" message and new_goal are presented to the user.

Weight maintenance mode – default goals

upper = upper weight target

lower = lower weight target

BMI_lower = new BMI calculated based on the lower limit

BMI_upper = new BMI calculated based on the upper limit

IF (BMI_initial >= 18.5 **AND** BMI_initial <= 25) **THEN //** if normal weight, symmetrical limits

    upper = 1.02*initial_weight   // according to initial weight

    lower = 0.98*initial_weight

    IF (BMI_upper > 25) **THEN //** check that new targets do not exceed normal weight limits

        upper = weight_BMI_25

        new_range = (upper-lower)/initial_weight // width of weight target range

        IF (new_range < 0.04) **THEN** // Check that range is wide enough

            lower = (0.98-(0.04-new_range))*initial_weight //extend range downwards

        END

    END

    IF (BMI_lower < 18.5) **THEN**

        lower = weight_BMI_18.5

        new_range = (upper-lower)/initial_weight

        IF (new_range < 0.04) **THEN**

            upper = (1.02+(0.04-new_range))*initial_weight // extend range upwards

        END

    END

ELSE IF (BMI_initial < 18.5) **THEN //** This is our "weight gain mode", we cannot support

    lower = weight_BMI_18.5 // maintenance of underweight

    upper = 1.04*weight_BMI_18.5

ELSE IF (BMI_initial > 25) **THEN**

    upper = 1.02 *initial_weight

    lower = 0.98*initial_weight

END

Checking user-defined weight goals

BMI_initial = BMI corresponding to initial weight

mode = Usage mode, WLoss for weight loss and WMaint for weight maintenance

goal = user defined target

new_goal = Suggested new goal.

IF (upper > 1.05*initial_weight) **THEN**

   message = "Check upper target! Target too high."

   new_upper = 1.05*initial_weight

ELSE IF (upper < initial_weight) **THEN**

   message = "Check upper target! Target too low."

   new_upper = initial_weight

END

IF (lower > initial_weight) **THEN**

   message = "Check lower target! Target too high."

   new_lower = initial_weight

ELSE IF (lower < 0.95*initial_weight) **THEN**

   message = "Check lower target! Target too low."

   new_lower = 0.95*initial_weight

END

References and recommendations:

- Healthy BMI limits 18.5-25:
    - Käypä hoito: www.kaypahoito.fi/kotisivut/sivut.koti?p_sivusto=6
- Safe weight loss targets 5-10%:
    - Käypä hoito: www.kaypahoito.fi/kotisivut/sivut.koti?p_sivusto=6

STEPS TARGETS

Default steps target = 10000 steps / day.

References and recommendations:

- 10 000 steps per day, which includes a typical amount of steps taken per day (6000-7000) and a 30-minute walk (3000-4000). Less than 5000 steps is inadequate for health, 5000-7499 low activity, 7500-9999 some activity in free time, and over 12 500 high activity:
    - UKK Institution, www.ukkinstituutti.fi/index.php?cid=323&aid=3697

EXERCISE TARGETS

Default exercise target = 120 min / week.

References and recommendations:

- At least 120-180 minutes of formal exercise per week:
    - UKK Institution, www.ukkinstituutti.fi/fi/forward/file/250

SLEEP DURATION

Default sleep target = 8 h. (This is a commonly known and accepted target.)

References and recommendations:

- 7 hours, www.uniliitto.fi/
- Individual need, some people need only five hours of sleep, others as much as 10, www.kuh.fi/~pk-web/tiedottaa/unettomuus.html

BLOOD PRESSURE

Systolic_upper = 130 mmHg

Diastolic_upper = 85 mmHg

References and recommendations:

- upper limits 130/85:
    - Suomen Sydänliitto ry, www.sydanliitto.fi/.
    - Käypä hoito, www.kaypahoito.fi

WORKING TIME

Default = 40 hours.

Appendix 3: Sports list

Nro	Urheilulaji suomeksi	Sports discipline in English
1.	Aerobic	Aerobic
2.	Golf	Golf
3.	Hiihto	Skiing
4.	Jalkapallo	Football (Soccer)
5.	Jumppa	Gymanstic exercises
6.	Juoksu	Running

7.	Koripallo	Basketball
8.	Kuntosali	Gym
9.	Kävely	Walking
10.	Pyöräily	Cycling
11.	Rullaluistelu	Rollerskating
12.	Salibandy	Floorball
13.	Sauvakävely	Nordic walking
14.	Soutu	Rowing
15.	Squash	Squash
16.	Sulkapallo	Badminton
17.	Tennis	Tennis
18.	Uinti	Swimming
19.	Yleisurheilu	Athletics

Appendix 4: Diet monitor triggering

Diet monitoring is used as an intervention to undesirable changes in weight. When an alarming trend occurs in weight data, diet monitoring function is triggered and suggested to the user. The user may then accept or reject the function. If the user rejects the diet monitor, the intervention is not used that time. The monitoring possibility is next presented to the user when the trigger is on the next time.

In configuration, the **user may choose whether to use diet monitoring continuously or as an intervention.**

What situations are considered alarming depends on the mode of usage, i.e., the reasons for triggering the diet monitor are different in weight loss and maintenance modes.

Weight loss mode

In weight loss mode, alarming changes are detected based on long weight trend (calculated as in Weight Management Score, can use the same long trend).

long_trend = long trend of weight data, 0 = constant, +1 = increasing, -1 = decreasing
time = time elapsed after ending the previous monitoring period or declining the previous diet monitoring suggestion
weight = current weight at triggering moment
weight_target = target in weight loss mode

IF (weight > weight_target) **THEN**

    IF (time > 2 weeks **AND** (long_trend = 0 **OR** long_trend = +1)) **THEN**

        trigger on

        IF (long_trend = 0) **THEN**

            message = "Weight loss has stopped! Start diet monitoring?"

        ELSE IF (long trend = +1) **THEN**

            message = "Weight is increasing! Start diet monitoring?"

        END

        IF (diet monitor accepted) **THEN**

            start monitoring

            continue while long_trend ~= -1

            when long_trend = -1, trigger off, diet monitor to stand-by

        ELSE

            trigger off, diet monitor to stand-by

        END

    END

END

Weight maintenance mode

weight_week = average of one week's weight measurements

upper = upper limit of weight target range

lower = lower limit of weight target range

IF (weight_week > upper) **THEN**

    trigger on

    message = "Weight above weight range. Start diet monitoring?"

    IF (diet monitor accepted) **THEN**

        start monitoring

        continue while weight_week > upper

        when weight_week < upper, trigger off, diet monitor to stand-by

    ELSE

        trigger off, diet monitor to stand-by

    END

ELSE IF (weight_week < lower) **THEN**

    trigger on

    message = "Weight below target range! Start diet monitoring?"

    IF (diet monitor accepted) **THEN**

        start monitoring

        continue while weight_week < lower

        when weight_week >= lower, trigger off, diet monitor to stand-by

    ELSE

        trigger off, diet monitor to stand-by

    END

END

Appendix 5: Logic for Summary View color coding

Item	
Weight	WMI subscore or goal
Steps	WMI subscore or goal
Exercise	WMI subscore or goal
Diet monitor	-
Sleep quality	Based on goal
Blood pressure	Based on goal
Stress	-
Working time	Based on goal