Acceptability, feasibility and effectiveness of an eHealth behaviour intervention using self-regulation: 'My Plan'

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Abstract

Objective: The study aims to evaluate the acceptability, feasibility and effectiveness of the eHealth intervention 'MyPlan', which targets health behaviour in adults.

Methods: Flemish adults were randomly allocated to a control (n=155), or one of three intervention groups: a physical activity (PA) (n=158), a fruit intake (n=161) or a vegetable intake group (n=48). PA, fruit or vegetable intake were measured at the start and after 1 month.

Results: Adults with low education, and over 40 years evaluated the personal advice and action plans as more motivating, but also the personal advice as too long than adults with high education and younger adults. Overall, 48% completed the follow-up module after one week, and only 24% after one month. At one-month follow-up, the fruit intake intervention resulted in more fruit intake (F=9.5, p=0.003) and the PA intervention to a higher total physically activity level (F=5.6, p=0.020) than the control group. There was not effect for vegetable intake.

Conclusion: 'MyPlan' was feasible and acceptable, and has the potential to increase PA levels, and fruit and vegetable intake.

Practical Implications: Adaptations to the content of the intervention are further needed, and more attention is needed to motivate participants to complete the different follow-up parts.

Keywords: physical activity, fruit intake, vegetable intake, computer tailoring, eHealth, self-regulation, goal setting, action planning, feasibility, acceptability, efficacy

1. Introduction

The importance of physical activity (PA) and fruit and vegetable intake to prevent chronic diseases among adults has been well documented[1-3]. To gain health benefits, adults are recommended to perform at least 30 minutes of PA at moderate intensity on most, preferably all days of the week, and to eat 300 grams of vegetables and 3 pieces of fruit every day[4-7]. However, in most developed countries these recommendations are not followed by a large part of the population[4]. In Belgium, only 38% of the adult population fulfils the health norm for PA, and respectively 38% and 47% of the Belgian adults eats fruit and vegetables on a daily base[6, 7]. Therefore, interventions that are effective and reach many people are needed.

Computer-tailored interventions are promising to change health behaviour in a large part of the population at a relatively low cost[8-10]. However, the effects of computer-tailored interventions are generally small. There may be many reasons for these results[9, 10]. One reason may be that these computer-tailored interventions target primarily variables that address the adoption of an intention to change (e.g. attitude or social norm), hence leaving many individuals in an intention-behaviour gap. There are recent calls to address this gap by also addressing post-intentional factors (e.g. action planning and problem solving). A self-regulation perspective may be well suited to integrate both pre- and post-intentional processes, and to develop interventions that guide individuals during all phases of behaviour change[11, 12]. Another reason may be related to the limited feedback provided by early computer-tailored interventions. Most often, tailored feedback is only provided at the very beginning of an intervention, but not further on in the process of behaviour change. Therefore, more dynamic tailoring, meaning a personal feedback on the individual's process of behavioural change on several moments, is recommended[9].

To address these two issues, we developed the eHealth intervention, 'MyPlan', which targets PA levels, fruit intake, or vegetable intake of adults (over 18 years). A self-regulation perspective, was used to target pre-intentional and post-intentional processes, with personal feedback through which awareness was raised, with action planning, problem solving, prompting to self-monitor behaviour, and dynamic tailoring[11, 12]. The latter was achieved by introducing follow-up modules that provided repeated

feedback and guidance based upon whether and how individuals changed their behaviour and reached their goals.

Developing effective and efficient interventions is a hazardous enterprise, requiring a planful approach and several phases. Pretesting an intervention program is a necessary step[13]. It is important to test whether the intervention is acceptable and feasible for the target population[14]. Therefore, the primary aim was to investigate the acceptability and feasibility of 'MyPlan' in adults. A second aim was to explore differences in feasibility and acceptability between age groups and educational levels. It is often stated that individuals with a lower educational level and older participants are less experienced with computer-based program, and will find these interventions less feasible and acceptable[15]. The third aim was to explore the potential of the intervention in changing behaviour. This was achieved by evaluating the short-term effectivity of 'MyPlan' on PA levels, fruit intake, or vegetable intake. It was expected that PA levels or fruit or vegetable intake would increase if they completed 'MyPlan', whereas PA levels or fruit or vegetable intake would remain stable among adults who did not receive the intervention program (control group).

2. Methods

2.1 eHealth Intervention

'MyPlan' was programmed in LimeSurvey (LimeSurvey Project Hamburg, Germany. URL http://www.limesurvey.org), a free and open source survey software tool, and is available on the website 'http://www.mijnactieplan.be'. It was developed using models of self-regulation (ref. Maes and Karoly; Schwarzer), and in particular the Health Action Process Approach (ref. Schwarzer). Two sets of behaviour change processes are addressed (a) preintentional processes that lead to a behavioural intention and (b) postintentional processes that lead to actual behavioural change. For each target behaviour (fruit, vegetable or physical activity), there were three modules available.

The first module (T1) addressed both pre- and post-intentional processes. Pre-intentional processes were addressed by the generation of personal feedback to raise awareness and to motivate adults to change their behaviour. Individuals filled in a questionnaire on a particular health behaviour. Based on

their answers, personal feedback is provided: the personal level of the health behaviour was discussed and compared to health norms. Adults were provided the possibility to read more information about the behaviour (e.g. relation with diseases and health, benefits). This is akin previous computer-tailored programs, and, hence, the content was largely based upon previously developed interventions[16, 17]. Post-intentional processes were addressed by facilitating action planning. Participants were invited to make an action plan to bridge the gap between intentions and behaviour. Adults were guided through action planning by answering questions in the tool. Participants were asked what they wanted to do (e.g. being more physically active by walking), when (e.g. every Monday evening), where (e.g. local park), how long (e.g. 60 minutes) and with whom (e.g. friends). Adults were also offered the possibility to identify difficult situations and hindering factors (i.e. coping planning). This was achieved by selecting the relevant options from a predefined list of hindering factors and barriers. Based on these selections, several solutions were listed and participants could select the solutions that they considered relevant for their situation and wanted to apply. Adults were guided to make an if-then plan (e.g. If it is Monday evening, then I go to the aerobic lessons, in the local gym) (figure 1). Finally, adults were advised on how to self-monitor their behaviour (e.g. using an agenda) and to pursue their health goals as stated in their action plan. The personal action plan was sent via email, and adults were offered the possibility to send the action plan to family or friends for social support. The content of the action planning tools was partly based upon the work of Vangenugten et al. (2010) and Springvloet et al. (2014), who also applied self-regulation techniques into computer-tailored interventions[18, 19].

 [Insert figure 1 (action plan) here]

Module 2 was activated one week after finishing module 1. Participants were contacted by email to revisit the website to complete module 2. In this follow-up module, adults received repeated feedback about their behaviour change process (e.g. ate more or less pieces of fruit compared to last week) and their goals (e.g. did reach the goal to eat 3 pieces of fruit every day). Thereafter, adults had the possibility to adapt their action plan. Adaptations could consist of formulating new goals (e.g. more feasible, or when

the identified goal was reached, a further goa), or of reconsidering coping plans, based upon the experienced difficulties and barriers during goal pursuit.

Module 3 was activated 1 month after finishing module 1, and was identical to module 2. An overview of the whole intervention program is given in figure 2.

[Insert figure 2 (intervention program) here]

2.2 Participants and procedure

Data was collected from February 2014 until April 2014. Participants were recruited by asking adolescents of secondary schools to distribute flyers to adults (e.g. their parents, neighbours, grandparents), by using Facebook and Twitter advertisements, and by recruiting university students. Eligible participants were over 18 years, had a sufficient understanding of the Dutch language, and had access to Internet. Adults were asked to indicate in advance which of the three target behaviours that they wanted to change. Next, participants were invited to visit the website. A computer log in system was used to provide a password to allocate them to either the waiting list control condition, or the intervention condition that targeted their selected health behaviour. Participants from the intervention group had direct access to Module 1 after baseline measurement (T1), and were later invited by email for Module 2 (T2, after one week), and Module 3 (T3, after one month). On average, 25 minutes were needed to complete the questionnaire on demographic info, the behaviour questionnaires, to read the feedback and to make an action plan. After completing the first intervention module, adults were asked to fill in an evaluation questionnaire on the feasibility and acceptability of the intervention. At one-week follow-up (T2), questions were included on the feasibility and acceptability of Module 2. Participants from the wailing list control group did not have access to the three interventions modules. The study was approved by the Ghent University Ethics Committee and an informed consent statement was obtained from each participant.

[Insert figure 3 (flow chart) here]

2.3 Measurements

Socio demographic information (age, educational level) was assessed. Adults with a university or college degree were classified into a 'high education group' and adults with a secondary school degree or lower were classified into a 'low education group'. Adults younger than 40 years were indicated as younger participants, while adults older than 40 years were indicated as older participants[16]. The valid International Physical Activity Questionnaire (IPAQ) was used to assess total PA, moderate-intensity and vigorous-intensity PA for those participants who selected PA as the target behaviour[20]. The frequency (days/week) and duration (min/day) of the different activities were multiplied to express the total PA level per week. By summing all reported physical activities executed at moderate and vigorous intensity, and dividing the sum by seven, the total moderate-intensity and vigorous-intensity PA level per day was obtained[21]. In this study we used total PA, moderate PA and vigorous PA as outcome measures.

To assess fruit intake in those participants who selected fruit intake as target behaviour, the average portion of fruit per day was calculated by using the Flemish 'Fruit Test'[22]. The reported pieces of fruit were multiplied with the correct portion size of the corresponding types of fruit to calculate the average gram per week. To calculate the average portion size of fruit per day, average gram of fruits per week were divided by seven and 125 (= 1 portion size of fruit). In those participants who selected vegetable intake as target behaviour, the average grams of vegetables per day as assessed by the Flemish 'Vegetable test' was used[22]. The reported portions of vegetables were multiplied with the correct portion size of the corresponding vegetable to calculate the average gram per week.

The feasibility and acceptability questionnaire was based on available questionnaires on this topic for adults[16, 23, 24]. Five items were used for the evaluation of the questionnaire, 9 items for the first personalised feedback, 11 items for the action plan, and two items for the if-then plan evaluation (Table 2). Items were measured on a five-point Likert scale; ranging from 'totally not agree' to 'totally agree'.

2.4 Statistical analyses

Independent samples t-tests and chi-square tests were conducted to explore baseline differences between the intervention and the waiting list control group for socio demographic and the current level of health behaviour (Table 1). The mean values of the feasibility items and the percentages for interpreting the feasibility were calculated, together with the percentages representing the answers '4' (agree) and '5' (totally agree) on the acceptability and feasibility questionnaire items. Independent samples t-tests were used to explore differences in age (younger than or 40 years vs. older than 40 years), education (low vs. high) and selected target behaviour (fruit, vegetables or PA) on acceptability and feasibility items. Repeated measure ANOVAs, with time (baseline (T1) and 1-month follow-up (T3)) as within-subjects factor and condition as between-subjects factor, were executed on completed data to analyse the effect of 'MyPlan' for the selected target behaviour. Separate analyses were conducted for fruit intake, vegetable intake and PA. The outcome variables were first checked for normality by plotting a normal score plot. All outcome variables were log-transformed for analyses to improve normal distribution. For ease of interpretation, back-transformed mean values are reported in the tables. Analyses were controlled for baseline values of PA, FV intake, age and educational level. Statistical significance was set at a level of 0.05, P-values between 0.05 and 0.1 were considered borderline significant. All analyses were executed with SPSS 21.0.

3. Results

3.1 Baseline characteristics

In the intervention condition, 225 participants started the intervention module for fruit, 84 for vegetables and 267 for PA. In the control group, 201 participants started the questionnaire (See flow chart in figure 1). In total, 194 of the 367 participants who completed the first intervention module for one of the three behaviours (vegetables, fruit or PA) also filled in the acceptability and feasibility questionnaire about Module 1. Acceptability and feasibility questions about Module 2 were filled in by 235 of the 367 participants. Table 1 presents the baseline characteristics for the sample that completed the target behaviour questionnaire at baseline (T1) and the significant differences regarding demographics and

behaviour between the intervention and control condition. In total, 48% completed module 2 and 24% module 3.

[Insert table 1 here]

3.2 *Evaluation of the eHealth intervention*

3.2.1 *Module 1*

The total mean scores (range 0-4) for most items about module 1 were good (higher than score 2)(Table 2). The majority of the participants indicated (agreed to totally agreed) that **the questions** were easy to understand (96.9%), had clear answering options (91.6%) and had clear instructions (96.4%). About 11.5% indicated that these questions were too long and 5.8% found that there were too many questions. Most adults thought that the **personal feedback** was relevant (84.5%), interesting (79.1%), clear (83.3%) and understandable (59.5%). A majority found that the advice was instructive (61.1%) and motivating (59.5%). Only 5.9% found the personal feedback too long, and 10.3% indicated the advice to be too prescriptive. Participants who read **extra information**(n=26; 13,4%) found it positive that they could choose which information they wanted to read. The extra information was evaluated as useful by 84.6% of these participants. Most participants thought that the program contained good questions(85.7%) and tips (77.4%) to make an **action plan**. A large part of the participants indicated that the plan had an attractive lay-out(71.0%), was easy to understand (93.4%), personally relevant (76.3%) and extra motivating(61.5%). The majority of the participants had the intention to live up to the plan (86.3%). Only 36.2% had the intention to print their action plan. Most participants found it positive that they could make an **if-then plan** (70.7%) and 89.5% indicated to have enough information to make such a plan. Some significant differences in acceptance and feasibility of Module 1 were found as a function of age groups, educational level and behavioural target(Table 2).

[Insert table 2 here]

Younger participants(<40y) found the answer options of the questionnaire more clear than older participants(>40y)[t(187)=1.95, p<0.05]. However, older participants reported more that the personal advice was interesting and instructive[t(182)=-2.50, p < 0.05; t(181)=-2.75, p < 0.01]. Older participants also found more that the action plan was extra motivating[t(181)=-3.75, p< 0.001]. Participants with higher education reported more that the questions were easy to understand compared to participants with lower education[t(187)=-2.09, p<0.05]. Those with lower education indicated more that the personal advice was too long[t(181)=-1.71, p<0.10]. However, lower educated participants found the personal advice more instructive [t(181)=1.98, p<0.05] and motivating compared to higher educated participants[t(181)=1.84, p<0.10]. Furthermore, the low educated group reported more that the action plan included all necessary things and indicated more that the lay-out was attractive than participants with higher education[t(179)=2.44, p <0.05; t(179)=2.45, p <0.05]. Participants who completed the PA module, indicated more that there were too many questions compared to those that completed the fruit module. Participants who chose fruit, found the action plan more motivating than those who chose PA. More participants indicated to live up to their plan for fruit compared to participants that had a plan for PA. No differences were found for vegetables compared to fruit or PA.

3.2.2   Modules 2 and 3

There was a high dropout for module 2 and 3 for all conditions. For fruit only 35% participants completed the assessment at T3, for vegetables 14%, and for PA 17%. In the control condition 27% (See flow chart in figure 3). Of the 235 adults that answered the acceptability and feasibility questions about module 2, 48.7% obtained their goal. Most adults(84.3%) found it positive that they could evaluate whether they reached their goals, and indicated that this evaluation is extra motivating(68.1%). About 25% of the participants reported that they had searched for **social support** by sending their action plan to someone else. Of these participants, 64.9% indicated that they were supported by the ones who received their action plan. Goals were **self-monitored** by 38.7% of the participants. No significant differences were found in the acceptability and feasibility questions about module 2 as a function of age and educational level.

However, a significant association was found between age and printing the action plan, between age and monitoring goals and between the choice of behaviour and reaching goals. Participants younger than 40 years, printed their action plan more and also monitored more their behaviour compared to older participants[χ^2 (234)=2.7, p < 0.10; χ^2 (234)=9.5, p < 0.05]. Participants who made an action plan for vegetables or fruit reached their goal more than those who made an action plan for PA [χ^2 (203=6.1, p < 0.05].

[Insert table 3 here]

3.3 Intervention Effects on PA, fruit intake or vegetable intake

The mean values of the self-reported fruit intake, vegetable intake and PA on baseline (T1) and one-month follow-up (T3) of the complete cases per condition are shown in table 4. Fruit intake(F=9.5, p=0.003) and total PA(F=5.6, p=0.020) increased stronger from baseline to follow up in the intervention group compared to the control group (group×time interactions). The intervention group had a stronger increase than the control group. Borderline effects of the intervention were found for vegetable intake(F=3.0, p=0.089) and moderate intensity PA(F=2.9, p=0.092). No significant interaction effect was found for vigorous PA.

[Insert table 4 here]

4. Discussion and conclusion

4.1. Discussion

This study evaluated the acceptability and feasibility of the eHealth intervention 'MyPlan', as well as its potential to promote health behaviour. "My Plan" was developed using a self-regulation framework, and integrated tools to address pre-intentional and postintentional processes. The results can readily be summarized. First, the questionnaires to assess health behaviour and on which the personal feedback was based, were evaluated as understandable and as including clear answering options and instructions. Second, a large majority reported the personal feedback as personally relevant (84,5%), which is

substantially larger than in previous studies (Vandelanotte et al., 2003: 53,8%)[16]. Only a small percentage reported the personal advice to be too directive. Third, the action plan was experienced as interesting, instructive, motivating. Fourth, participants with older age and low educational status did not experience the intervention as less acceptable or feasible. The opposite was rather the case. Nevertheless, there are some issues that warrant attention and will be discussed later. Fifth, the intervention proved to be able to increase PA, and fruit intake in the short term (after one month), but there was only a borderline effect for vegetable intake.

Although the intervention was found overall feasible and acceptable, there some issues that warrant attention. Low educated individuals did found the questions used to guide action planning less easy to understand, and found the personal advice as too long, compared to high educated individuals. Older participants found the answer options less clear than younger participants. Of further note is that participants from the PA intervention reported that there were too many questions, probably owing to the large number of items in the IPAQ. In further adaptations of 'MyPlan' these issues will be taking into account. Shorter questions will be used. In the personal advice, pictures, symbols and short slogans will be added[15]. The use of the short version of the IPAQ may be considered, but this will come along with a cost as domain specific estimates of PA can then not be estimated.

There were some marked differences between the interventions groups. It seems like the PA intervention was more difficult than the vegetable or fruit intervention. In the PA intervention the action plan was rated as less motivating and participants were less inclined to live up to their plan. Although the majority in the PA intervention group had the intention to live up to their plan, only half reached their goals, which is lower than for the fruit and vegetable intervention groups. It may well be that changing PA levels is more difficult than changing fruit intake, since changing PA is a complex behaviour to initiate and maintain[25].

Possible reasons for not living up to the plan can be that participants had no intention to live up to their action plan yet, were not able to change their behaviour, time was too short or goals were too

difficult to reach. Therefore, it should be evaluated if goals are reached and/or adapted after a longer time period.

Only a small group sent their action plan for social support. Those who did, indicated to be supported. Sharing action plans with others seems not to be a preferred technique. Further research is needed to unravel the reasons why participants do not search for social support and how social support in eHealth tools can be improved in other ways than sending an email. Of particular note is the observation that only a small number of participants followed up the suggestion/advice to monitor their behaviour, although research has identified this technique as one of the most effective to change behaviour[26]. Future researchers may integrate various monitoring tools into interventions, from which the participants may select the most doable.

There was a notable large drop-out in our study. Our intervention did contain techniques that have been proposed to enhance sustained use (i.e. goal setting, self-monitoring of behaviour). This is a challenge for many computer-tailored or internet intervention[27, 28], and will need to be addressed to use the full potential of eHealth interventions. Perhaps, time needed (e.g. on average 25 minutes) to complete the first module was too long, or instructions to revisit the website and ways to get access to the follow-up modules were not clear. We only used one email to invite adults to revisit the website. In the future, we may use emails with updated information and an email and SMS reminder system[28]. Another possibility, which was considered from the outset of the design of 'MyPlan', is to implement in settings which may provide face to face support by peers or counsellors[28, 29]. The basic idea is to implement MyPlan in general practice settings. General practitioners (GPs), are likely to be influential because of their credibility, and they can provide personal support during computer-tailored interventions[30-32].

The potential of the eHealth intervention to change behaviour is promising. There were improvement in PA and fruit intake, and the effect on vegetable intake was borderline significant. There are important limitations to consider. We only used self-reports to assess intervention effects which may have led to demand effects and inaccurate responses[33]. Furthermore, the effect could only be evaluated in a small

group who completed all parts of the eHealth intervention, due to a high drop-out at follow-up. Also, to assess the long-term impact of the intervention a longer trial is needed.

4.2. Conclusion

'MyPlan' was evaluated as feasible and acceptable, even by older (>40y) and low educated adults. Despite a good feasibility evaluation of the different intervention parts (i.e. personal feedback, action and coping planning tool), the high drop-out indicated that more effort is needed to increase feasibility and sustained use of follow-up modules. Promising short-term results for the effectiveness of 'MyPlan' in increasing physical activity levels and fruit and vegetable intake were revealed.

4.3. Practical implications

'MyPlan' can be further used in adults, also older (>40y) and low educated adults. Adults should however be motivated more to revisit the intervention follow-up modules by using emails with updated information and an email and SMS reminder system. Also, short intervention programs with clear instructions and easy access to revisit the website should be used. Furthermore, an integrated tool for self-monitoring of behaviour and other ways to integrate social support are needed. Finally, it is also important to investigate the long-term impact of eHealth interventions in a longer trial.

Authors' contributions

JP conducted the data collection, statistical analyses and drafted the manuscript. MV participated in the data analyses and revised the manuscript. IDB and GC helped to draft the manuscript and revised the manuscript for important intellectual content. All authors read and approved the manuscript and declare that they have no competing interests'.

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TABLES

Table 1: Baseline characteristics for the total sample and the four conditions separately.

	Total group (n=529)	Intervention Physical Activity (n=158)	Intervention Fruit intake (n=166)	Intervention Vegetable intake (n=50)	Control group (n=155)
Age (years)	31.6 ± 13.1	30.5 ± 12.6*	28.1 ± 10.9*	33.8 ± 13.4	36.9 ± 14.6
Gender (% male)	40.0	44.5*	47.8*	33.3	28.9
Education level (% high university or college)	78.7	73.6	75.8*	66.6	63.9
Not meeting recommendations (%)					
Fruit		-	95.7*	-	82.6
Vegetables		-	-	97.9	91.0
Physical Activity		52.3	-	-	48.4
Physical Activity level					
Total Physical Activity (min per day)		63.6 ± 58.5*	-	-	80.6 ± 68.3
Moderate- and vigorous-intensity (min per day)		41.3 ± 45.2*	-	-	50.4 ± 57.9
Fruit intake (Portion/day)		-	0.8 ± 0.7*	-	1.1 ± 1.1
Vegetable intake (Gram/day)		-	-	137.1 ± 88.1	141.1 ± 125.4

* a significant difference between the intervention and control condition (p<0.05)

1   **Table 2:** Acceptance and feasibility of module 1: differences between age groups and educational levels.

Items	Total sample mean ± SD	Agree/ Totally agree (%)	age group mean ± SD		educational level mean ± SD		Intervention module		
			<40 year	>40 year	Low education	High education	PA	Fruit	Vegetables
Questionnaire: I think the questionnaire …									
Was easy to understand	3.5 ± 0.61	96.9	3.5 ± 0.56	3.5 ± 0.77	3.3 ± 0.69**	3.5 ± 0.55**	3.4 ± 0.6	3.6 ± 0,5	3.4 ± 0.8
Had clear answer options	3.4 ± 0.68	91.6	3.5 ± 0.63**	3.2 ± 0.85**	3.4 ± 0.78	3.4 ± 0.65	3.4 ± 0.6	3.5 ± 0.6	3.3 ± 0.9
Went with clear instructions	3.4 ± 0.61	96.4	3.5 ± 0.55	3.3 ± 0.81	3.4 ± 0.77	3.5 ± 0.55	3.4 ± 0.6	3.5 ± 0.5	3.3 ± 0.8
Had too long questions	2.8 ± 0.89	11.5	2.7 ± 0.88	2.7 ± 0.85	2.8 ± 0.86	2.6 ± 0.88	2.9 ± 0.7	2.9 ± 0.9	3.1 ± 0.5
Had too many questions	3.0 ± 0.76	5.8	3.0 ± 0.78	3.0 ± 0.66	3.0 ± 0.74	2.9 ± 0.78	2.5 ± 0.9**	2.8 ± 0.8**	2.7 ± 0.8
Personal advice: I think the personal advice …									
Was personally relevant	2.9 ± 0.62	84.5	2.9 ± 0.65	3.0 ± 0.56	2.9 ± 0.56	3.0 ± 0.65	2.8 ± 0.7	3.0 ± 0.6	2.8 ± 0.7
Was interesting	2.9 ± 0.72	79.1	2.8 ± 0.78**	3.0 ± 0.47**	3.0 ± 0.56	2.8 ± 0.78	2.8 ± 0.8	3.0 ± 0.7	2.8 ± 0.7
Was clear	2.9 ± 0.72	83.3	2.9 ± 0.74	3.0 ± 0.64	3.0 ± 0.52	2.9 ± 0.77	2.8 ± 0.7	3.0 ± 0.8	3.0 ± 0.4
Was understandable	3.1 ± 0.54	59.5	3.1 ± 0.57	3.1 ± 0.44	3.1 ± 0.42	3.2 ± 0.58	3.0 ± 0.6	3.2 ± 0.5	3.1 ± 0.4
Has taught me something	2.6 ± 0.88	61.1	2.5 ± 0.90**	2.9 ± 0.72**	2.8 ± 0.65**	2.5 ± 0.94**	2.4 ± 0.9	2.7 ± 0.8	2.6 ± 0.9
Was motivating	2.6 ± 0.94	59.5	2.5 ± 0.98***	3.0 ± 0.66***	2.8 ± 0.80*	2.5 ± 0.99*	2.4 ± 0.9	2.7 ± 0.9	2.8 ± 0.9
Was directive	2.8 ± 0.78	10.3	2.8 ± 0.77	2.7 ± 0.86	2.8 ± 0.70	2.8 ± 0.82	2.9 ± 0.8	2.7 ± 0.8	2.8 ± 0.7
Was too long	2.9 ± 0.70	5.9	2.9 ± 0.72	2.9 ± 0.68	2.8 ± 0.68*	2.9 ± 0.71*	2.9 ± 0.8	2.9 ± 0.7	3.0 ± 0.5
Extra information:									
I think it is good you can choose which info to read	3.3 ± 0.49	100	3.4 ± 0.51	3.3 ± 0.47	3.3 ± 0.50	3.35 ± 0.49	3.1 ± 0.4	3.5 ± 0.5	3.3 ± 0.5
The extra information was useful	3.0 ± 0.72	84.6	3.1 ± 0.83	2.9 ± 0.54	3.1 ± 0.60	3.0 ± 0.79	2.8 ± 0.5	3.2 ± 0.9	3.0 ± 0.1
Action plan: I think the action plan									
Includes the necessary things	2.5 ± 0.84	64.3	2.5 ± 0.86	2.7 ± 0.76	2.8 ± 0.71**	2.5 ± 0.87**	2.4 ± 0.9	2.7 ± 0.7	2.5 ± 0.9
Is extra motivating	2.5 ± 0.93	61.5	2.5 ± 0.99**	2.8 ± 0.64**	2.7 ± 0.86	2.5 ± 0.96	2.3 ± 0.9**	2.7 ± 0.8**	2.6 ± 1.1
Has a an attractive lay-out	2.7 ± 0.84	72.0	2.6 ± 0.86	2.8 ± 0.72	2.9 ± 0.58**	2.6 ± 0.89**	2.5 ± 0.9*	2.7 ± 0.8**	3.1 ± 0.6*
Is easy to understand	3.1 ± 0.53	93.4	3.1 ± 0.57	3.1 ± 0.34	3.1 ± 0.46	3.1 ± 0.55	3.1 ± 0.6	3.1 ± 0.5	3.2 ± 0.6

Is personally relevant	2.8 ± 0.78	76.3	2.8 ± 0.84	2.9 ± 0.44	2.8 ± 0.63	2.8 ± 0.82	2.7 ± 0.8	2.8 ± 0.8	2.9 ± 0.7
Is feasible to reach	3.2 ± 0.50	96.7	3.2 ± 0.51	3.2 ± 0.46	3.2 ± 0.48	3.2 ± 0.51	3.1 ± 0.5	3.2 ± 0.4	3.1 ± 0.6
I think there were good questions to make the plan	2.9 ± 0.63	85.7	2.9 ± 0.67	3.0 ± 0.43	3.0 ± 0.46	2.9 ± 0.67	2.7 ± 0.7*	3.1 ± 0.5*	3.0 ± 0.4
I think there were good tips to make the plan	2.8 ± 0.76	77.4	2.8 ± 0.78	2.9 ± 0.70	2.9 ± 0.70	2.8 ± 0.78	2.7 ± 0.8	2.9 ± 0.8	2.9 ± 0.7
I think it is good the plan was sent to me	3.1 ± 0.65	90.6	3.1 ± 0.68	3.1 ± 0.41	3.0 ± 0.51*	3.1 ± 0.66*	3.1 ± 0.7	3.2 ± 0.7	3.1 ± 0.5
I am going to print the plan	1.9 ± 1.22	36.2	1.8 ± 1.24	2.1 ± 1.11	2.1 ± 1.18	1.8 ± 1.23	1.9 ± 1.2	1.9 ± 1.2	1.9 ± 1.3
I will live up to 'MyPlan'	3.1 ± 0.67	86.3	3.0 ± 0.69	3.1 ± 0.59	3.1 ± 0.51	3.0 ± 0.71	2.9 ± 0.7*	3.2 ± 0.6*	3.1 ± 0.6
If-then plan:								
I think it is good that I could make my own if-then plan	2.8 ± 0.92	70.7	2.7 ± 0.97	2.9 ± 0.70	2.7 ± 0.87	2.8 ± 0.94	2.6 ± 0.9*	3.0 ± 0.8*	2.8 ± 0.8
I had enough information to make an if-then plan	3.1 ± 0.64	89.0	3.1 ± 0.66	3.0 ± 0.58	3.0 ± 0.62	3.1 ± 0.66	3.0 ± 0.7	3.1 ± 0.6	3.1 ± 0.7

A significant difference between the different groups (i.e. age, educational level, intervention module): * p<0.1; ** p<0.05; *** p < 0.001

13   **Table 3:** Evaluation of the second intervention module

Items	Answers (%)
Did you expect the evaluation of your health goals? (% yes)	
Yes, I knew that I reached my goal	44.4
Yes, I knew that I did not reach my goal	44.9
No, I thought that I reached my goal	6.2
No, I thought that I did not reach my goal	4.3
How much do you agree with the following statements? (% agree/totally agree)	
"I think it is good that I can evaluate if I reached my goals"	84.3
"The goal evaluation leads to extra motivation for goal pursuit"	68.1
Did you send your action plan to friends of family? (% yes)	24.7
Did these friends or family supported you in pursuing your goal? (% yes)	64.9
Did you monitor your behaviour? (% yes)	38.7

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16   **Table 4:** Intervention effect on fruit intake, vegetable intake and physical activity

	Intervention Fruit (80) Vegetables (12) Physical activity (45)		**Control** Fruit (48) Vegetables (53) Physical activity (55)		$F_{Group \times Time}$
	Pre $M \pm SD$	Post $M \pm SD$	Pre $M \pm SD$	Post $M \pm SD$	
Fruit intake (Portion per day)	0.7 ± 1.8	1.6 ± 1.9	0.6 ± 2.4	1.0 ± 2.1	9.5**
Vegetable intake (Average gram per day)	124.4 ± 1.9	199.0 ± 1.9	91.9 ± 2.3	107.9 ± 2.4	3.0*
Total Physical Activity (min per week)	231.1 ± 2.4	351.1 ± 1.7	308.1 ± 2.9	375.3 ± 2.9	5.6**
Moderate intensity PA (min per week)	157.4 ± 2.5	252.6 ± 1.7	252.6 ± 2.6	314.8 ± 2.7	2.9*
Vigorous intensity PA (min per week)	67.1 ± 2.4	98.1 ± 1.9	127.1 ± 2.3	145.4 ± 2.2	0.2

17   A significant difference between the intervention and control condition: ** $p < 0.05$; * $p < 0.1$
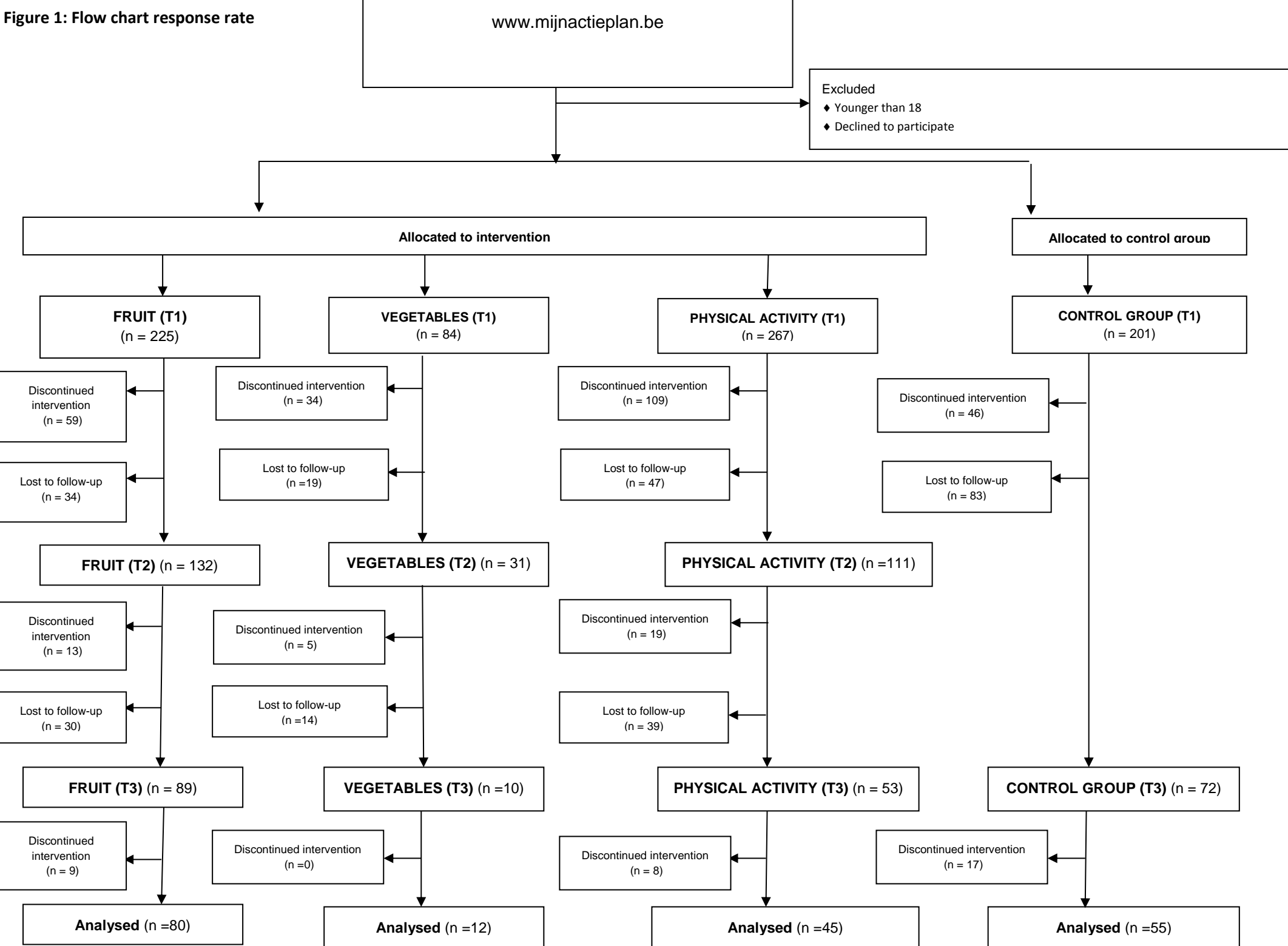
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Figure 1: Flow chart response rate

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Excluded
♦ Younger than 18
♦ Declined to participate

Allocated to intervention

Allocated to control group

| **FRUIT (T1)** (n = 225) | **VEGETABLES (T1)** (n = 84) | **PHYSICAL ACTIVITY (T1)** (n = 267) | **CONTROL GROUP (T1)** (n = 201) |

Discontinued intervention (n = 59)

Discontinued intervention (n = 34)

Discontinued intervention (n = 109)

Discontinued intervention (n = 46)

Lost to follow-up (n = 34)

Lost to follow-up (n =19)

Lost to follow-up (n = 47)

Lost to follow-up (n = 83)

FRUIT (T2) (n = 132)   **VEGETABLES (T2)** (n = 31)   **PHYSICAL ACTIVITY (T2)** (n =111)

Discontinued intervention (n = 13)

Discontinued intervention (n = 5)

Discontinued intervention (n = 19)

Lost to follow-up (n = 30)

Lost to follow-up (n =14)

Lost to follow-up (n = 39)

FRUIT (T3) (n = 89)   **VEGETABLES (T3)** (n =10)   **PHYSICAL ACTIVITY (T3)** (n = 53)   **CONTROL GROUP (T3)** (n = 72)

Discontinued intervention (n = 9)

Discontinued intervention (n =0)

Discontinued intervention (n = 8)

Discontinued intervention (n = 17)

Analysed (n =80)   **Analysed** (n =12)   **Analysed** (n =45)   **Analysed** (n =55)

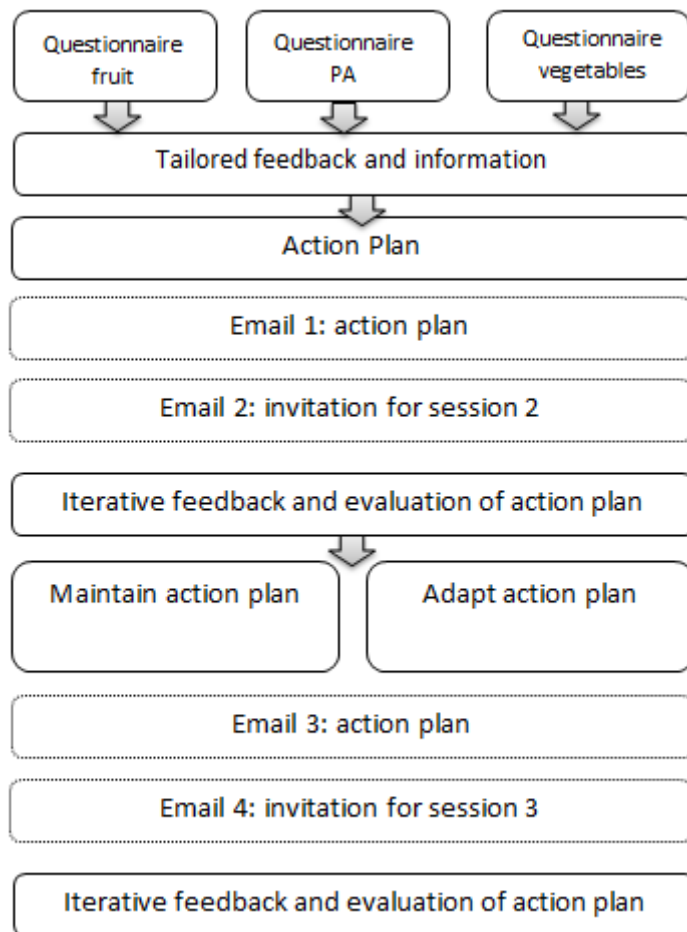**Figure 2: Intervention program**

Figure 2 – My Action plan
Example of an action plan for physical activity

My Action plan

What?
Being more physically active in my free time

How?
By searching an activity that I like

Which Activity?
Aerobics

Where?
In the local gym

When?
One day per week at Monday evening

How long?
60 minutes

If it is Monday evening and I am not in the mood for sports, **then** I call my friend to go to the aerobic lessons together, in the local gym

Start?
7TH July 2014