

The HealthierU Portal for Supporting Behaviour Change and Diet Programs

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Abstract. The use of online technologies for supporting participants of behaviour change and diet program is a timely and important research direction. We present HealthierU, adaptive online portal offering a suite of interactive support tools. The portal was evaluated in a 24-week study, which shows that regular reminders trigger increased interaction with the portal. We also analyse interaction patterns conducive to weight loss and discuss possible factors of the attrition rates observed in the study.

Keywords. Diet program, online support, usage logs, data analysis

Introduction

With close to 2 Billion adults worldwide classified as obese², health professionals investigate the use of information technologies and social support to motivate people to adopt a healthier lifestyle [1]. Weight loss systems have progressed from manual food recording to intelligent systems, in which informative content and interactive services persuade people to change their behaviour [8]. Many people, however, may lack the knowledge and skills required to effectively change their lifestyles.

To address this, we have developed HealthierU, an online portal for supporting people on behaviour change and diet programs, and increasing their engagement with the program. HealthierU is an adaptive portal, underpinned by a high-protein and log-GI diet program [9]. The portal contains several key components: diary, eating and exercise plans, regular reminders, and a suite of tracking tools. In combination, these aim to increase the interaction of the diet participants with the portal and sustain their engagement with the diet program. Hence, HealthierU uniquely offers to diet program participants adaptive support tools and is based on a scientifically validated diet.

This work reports partial results of a 24-week workplace study involving a cohort of employees of a large supermarket chain in a corporate setting. We focus on three metrics of engagement: (i) the overall activity of the HealthierU portal, (ii) the use of the diary by the participants, and (iii) the achieved weight loss. The results show that regular email reminders triggered an increased portal interaction and that sustained

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² World Health Organisation, <http://www.who.int/mediacentre/factsheets/fs311/en/>, accessed May-2015.

engagement of the participants was found to be conducive to their weight loss. We also discuss the factors of the observed levels of engagement and participant attrition.

1. Related Work

Online delivery of diet and lifestyle programs allows interactivity, anonymisation, and personalisation of the program [2], and facilitates tracking and social support tools that may assist lifestyle changes [1]. The online environment presents an opportunity to widely reach, engage, support, and educate participants towards a healthier behaviour.

However, online delivery of lifestyle programs have so far had mixed success. Neve *et al.* concluded that it was not possible to determine the effectiveness of an online intervention in achieving weight loss due to heterogeneity of designs [8]. Wieland *et al.* showed that, compared to offline interventions, digital interventions offered an effective means for weight loss and maintenance [10]. Digital interventions were found to lead to greater weight loss than offline interventions, but to lower weight loss than in-person treatment. The work of Brindal *et al.* on an online weight loss program with no face-to-face interaction showed a moderate weight loss [2]. Although the observed attrition was high, the reach of the program was very broad, counting more than 8,000 participants.

Workplace programs promoting healthy eating have also been evaluated. A review by Mhurchu *et al.* suggested that workplace health promotion programs were associated with moderate improvement in dietary intake [7]. Others have reported limited to moderate evidence for positive effects of nutrition interventions at the workplace [6]. Participation in workplace programs can be a major barrier to the program external validity. For example, a program may be effective in changing lifestyle behaviours for those that participate – but if the observed participation is low then the utility of the program in other settings would be low too [3].

2. The HealthierU Portal

HealthierU was conceived as a lifestyle and behaviour change portal for workplaces, which combines a diet intervention program content with online support tools. The portal provides to the participants a suite of resources aimed at sustaining their engagement with the program and supporting them in a long-term lifestyle change journey.

The underlying diet was a higher-protein and low-GI eating program, associated with greater weight loss and maintenance when delivered in a face-to-face setting [5]. The diet eating plan was based on core food groups as per the dietary guidelines of [9], with stronger emphasis on healthier low-GI carbohydrate foods. The program could be customised for weight loss whereby protein foods are retained, but energy restriction was achieved by reducing carbohydrate and discretionary foods [11]. The workplace implementation of the program offered an opportune environment to reach a large number of people – mainly in sedentary office work – having access to the online portal.

All the participants were provided with a tailored diet plan adjusted to their BMI and weight loss goals. This program was delivered completely online and included the following components and interaction modes:

Static program content. Overview of the higher-protein and low-GI diet program, nutrition tips, meal recipes and exercise instructions, tutorials on the food groups, related articles, and video clips about the use of the portal.

Tailored eating plan (Figure 1-left). Diet compliant menu plan with recipes adapted to the participant's BMI, food intake level, physical activity, and weight loss goals. The plans could have been adjusted to the participant's individual preferences and restrictions, e.g., vegetarian or allergies.

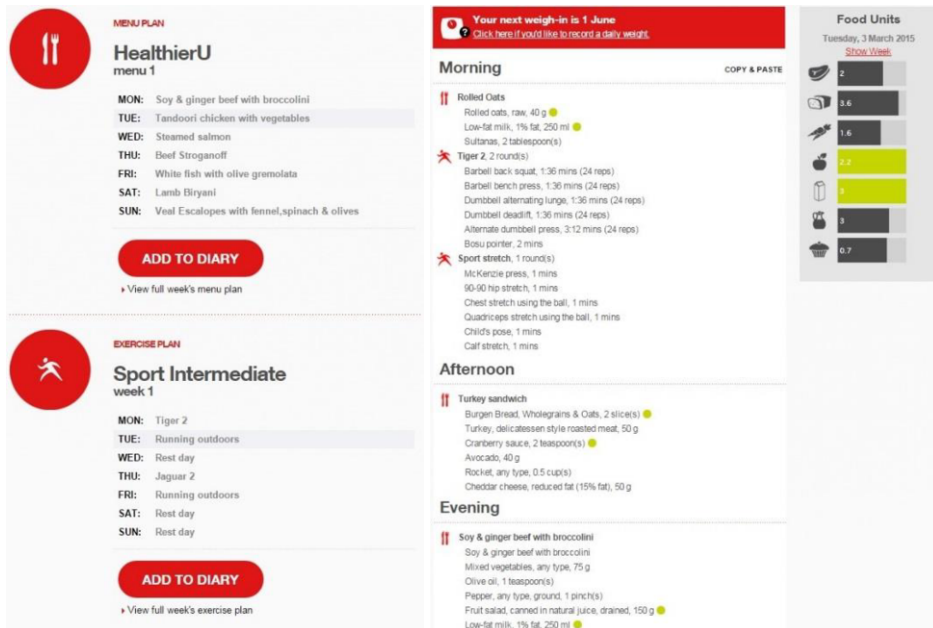


Figure 1. HealthierU screens: (left) weekly food and exercise plan, (right) one day in the diary.

- Weekly messages. The participants received weekly emails, conveying relevant program information and encouraging them to interact with the portal.
- Personal diary (Figure 1-right). Food and exercise tracker as an electronic diary. The diary allows the participants to plan their meals and exercises, and to report on the food consumed and activity performed. The diary was conceived to be the primary self-monitoring tool of the portal.
- Weight tracker. Weight recording and tracking tool asking for a weekly weight input and visualising the progress towards the weight target.
- Personal results. A suite of interactive tools that allows the participants to view their records, measurements, and progress towards their goals.
- Forum. Online social environment (limited to the program participants) aimed at peer support and increased engagement of the participants.

3. Evaluation

An online study of the Healthier Portal was carried out in 2014. The overarching goal of the study was to evaluate the effectiveness of the HealthierU portal in supporting healthy lifestyle and weight loss. In this work, we focus on three factors: overall portal activity, use of the diary, and weight loss of the participants.

Close to 3,000 employees of a large Australian supermarket chain were invited to participate in the study through direct emails. Out of these, about 1,000 completed the health assessment questionnaire (scores various dimensions of health) and were eligible to participate in the study. The duration of the study was 24 weeks, and it included two cycles of a 12-week diet program. Overall, more than 50,000 actions were logged by the portal over the 24 weeks. We present and analyse a selection of the results.

3.1. Portal Activity

We start with the overall activity of the portal, as quantified by the number of participants logging into the portal. Overall, 655 participants interacted with the portal over the course of the study. As expected, the peak was observed at the first weeks the study, and then the weekly number of unique participants decreased and stabilised at about 50 participants starting from week 7 (Figure 2-left). We observed another activity burst of activity around week 13, when the participants were offered to start the second cycle of the diet. This, however, also stabilised from week 16.

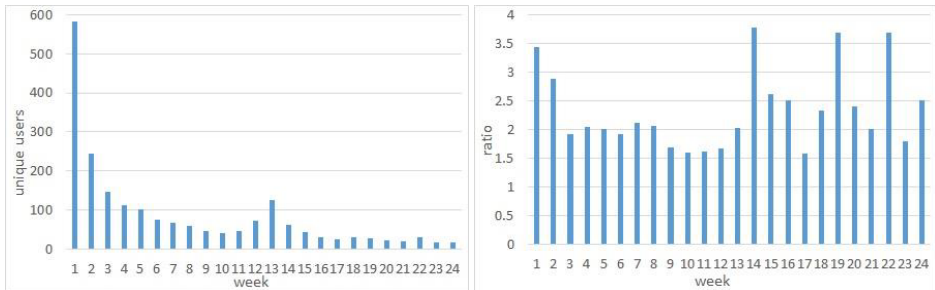


Figure 2. Portal interaction: (left) number of unique participants, (right) ratio between the number of participants on 2 days following email reminders and on other days.

It is interesting to note the role of the weekly emails in triggering the portal activity. For this, we average the number of unique participants seen on Mondays and Tuesdays (the day that the emails were sent out and the following day) and the number of unique participants seen on the other days. The ratio between the averages is shown in Figure 2-right. As can be seen, the number of participants following the Monday emails was consistently greater than on the other days, with the ratio between the two being steadily greater than 1.5 and the average standing at 2.33. This shows that the emails triggered an increased portal activity and brought the participants to the portal.

3.2. Diary Use

As food recording is recognised as one of the factors supporting diet compliance, it is important to analyse the interaction of the participants with the diary. Over the course of the study, the participants created more than 32,000 entries in their diaries. Out of these, 92.5% of entries referred to food intake and 7.5% to physical activity.

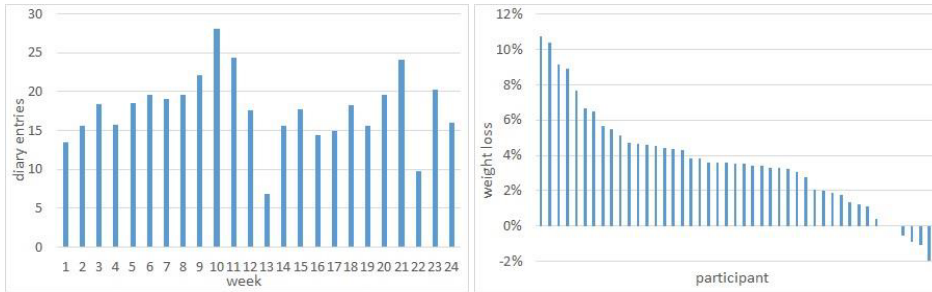


Figure 3. Diary use and weight loss: (left) number of diary entries, (right) relative weight loss.

Looking at the average number of weekly diary entries created by the participants (Figure 3-left), we observe that this hovers between 15 and 25 for most of the weeks. Specifically, in 21 weeks the participants created more than 14 entries, corresponding to average of more than 2 daily entries per participant. The overall average is 17.7 weekly entries per participant. Given that 92.5% of these were food entries, we conclude that the active participants used the diary to plan and record, on average, 2.34 food entries.

3.3. Weight Loss

Finally, we point to the reported weight loss, one of the main metrics of a diet program. In the following analysis, we focus on a group of 45 participants, who reported their weight at least twice, such that the gap between the first and the last report is between 10 and 14 weeks (close to the recommended diet program duration of 12 weeks).

The reported weight loss of these 45 participants ranges from 11.5 kg to -1.8 kg (weight gain). The average weight loss stands at 3.16 kg (SD=2.86 kg), over the average gap of 80.9 days (11.56 weeks) between the first and the last reports. This results in a relative loss of 3.62% (SD=2.86%) of the initial body weight or an average weekly loss of 0.275 kg. The histogram of the relative body weight loss reported by these 45 participants is shown in Figure 3-right.

We further divide the 45 weight loss analysis participants into two groups: those who lost more than the median weight loss of 3 kg (AM group) and those who lost less than that (BM). The former, as expected, reported a higher absolute and relative average weight loss than the latter, 5.21 kg vs 1.12 kg or 5.66% vs 1.53%, respectively, although the gap between the first and the last report was comparable, at 80.7 days vs 81.2 days. See the comparative analysis of the two groups in the left part of Table 1.

Table 1. Above and below median weight loss groups.

	<i>weight loss</i>	<i>relative weight loss</i>	<i>gap between reports</i>	<i>weight reports</i>	<i>portal actions</i>	<i>diary entries</i>
above median (AM)	5.21 kg	5.66%	80.7 days	13.86	517.05	465.36
below median (BM)	1.12 kg	1.53%	81.2 days	8.05	292.68	264.50

In the right part of Table 1, we analyse the portal activity of the participants in these two groups with regards to several actions. First, we note that the average number of weight reports in the AM group was 13.86, which is substantially higher than the 8.05 reports observed in the BM group (72.3% difference between the two). Second, the average number of portal actions in the AM group was 76.7% higher than in the BM group, 517.05 vs 292.68. Third, the average number of diary entries in the AM group was 465.36, compared to only 264.50 observed in the BM group (75.9% difference). Hence, we conclude that frequent weight reporting, sustained interaction with the portal, and regular food recording are found to be conducive to weight loss.

4. Discussion

This paper presented the HealthierU portal for online support of participants of behaviour change and diet programs. We evaluated the portal in a 24-week study of a higher-protein and low-GI diet program, conducted in a workplace setting. The results showed the effectiveness of weekly emails in triggering portal activity and the role of portal interactions in achieving weight loss. Having said that, the observed participation levels were lower than in earlier studies and, in particular, the attrition was high at the initial stages of the program [2]. This may be attributed to the following factors:

- The participants were encouraged by their employer to take part in the diet program rather than joined the program due to intrinsic motivation to improve their lifestyle. Thus, their motivation was possibly lower than of normal diet program participants, which might have negatively affected their engagement.
- The HealthierU portal was evaluated as part of a workplace program. Hence, the participants inherently had less time to interact with the portal than in their natural environment, e.g., at home. As a result, the observed participation rates were lower and the attrition was higher than expected.
- The forum implementation was not found as appealing and engaging as the state-of-the-art social networks. Also, the forum was not accessible for the first 2 weeks of the program. The highest attrition was observed in this period, whereas afterwards the forum did not reach the desired levels of popularity.
- The HealthierU portal was conceived as a Web-based portal and did not have the complementary mobile interface. This inherently limited its accessibility and could have negatively affected the observed participation rates.

However, we did not conduct post-study interviews with the participants or usability questionnaires to support or refute these conjectures. We intend to address these issues and develop a mobile version of the portal in the future works.

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