Electronic monitoring and health promotion: an evaluation of the E-MOVO Web site by adolescents

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Abstract

The explosive increase in Internet accessibility and use offers unique opportunities for providing health information to adolescents via the Internet. The purpose of this evaluation study was to explore the opinions of adolescents regarding an Internet-based health monitoring instrument and its individually tailored electronic feedback so that recommendations for improvement can be provided. A self-administered evaluation questionnaire was completed by 672 adolescents aged 12–18 years the Dutch equivalent of the 8th and 10th grade of secondary education. Semistructured group interviews were conducted with 53 adolescents to obtain more in-depth information regarding the monitoring questionnaire and the individually tailored feedback. All the respondents preferred the electronic monitoring questionnaire to a paper and pencil questionnaire and the individually tailored feedback was appraised rather favorably. However, 28% of the respondents claimed that the information was not new to them and 39% indicated that the information failed to provide them with additional insight into their behavior. In order to increase the number of adolescents reached, we recommend (i) embedding monitoring and feedback in school curriculum, (ii) providing immediate feedback and (iii) adapting tailored messages to educational levels and age. Although several improvements can and should be made, we conclude that the Internet-based monitoring questionnaire and the individually tailored feedback were appreciated by adolescents and are therefore a promising method for engaging adolescents in health promotion.

Introduction

The end of the 20th century was characterized by a rapid development of information technology [1]. In this rapid growth, the Netherlands has been a leading country in terms of Internet access and use with 90% of Dutch families having an Internet connection by 2003 [2]. The explosive growth of the Internet has generated an increase in the availability of health information [3] and its applications in health education practice [4]. For instance, the Internet has made it possible to provide individualized behavioral feedback [5]. The main reasons reported by adolescents for their Internet use are surfing, chatting and downloading music [1, 6]. Additionally, one in five adolescents uses the Internet to search for specific (health) information [7]. The main health-related topics for which the Internet has been used as a source of information are specific conditions and diseases, illness prevention, sexual health, fitness and exercise, diet and nutrition, body image, alcohol and drugs and violence and rape [8, 9]. Furthermore, when ranked among 15 proposed sources of information on

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health-related issues (ranging from illness support groups and mental health issues to sex-related issues), the Internet was ranked as the sixth or seventh most valuable source of information [7].

Health risk behaviors such as excessive alcohol consumption, cigarette smoking, low consumption of fruit and vegetables and a lack of physical activity have frequently been observed among Dutch adolescents [10]. Many of these risk behaviors are acquired during adolescence and carry on into adulthood, thereby negatively affecting health in later life [11–13]. Health promotion should therefore focus on risk behaviors among adolescents in order to prevent death and illness caused by controllable behavioral risk factors [14]. Computer-tailored interventions provide good opportunities for adapting health messages to individual health behavior and behavioral determinants [15, 16] and are therefore more likely to be effective in changing behavior and its determinants when compared with non-tailored messages [17]. The Internet may serve as both an access point and a tool in this respect [18, 19]. As such, it provides several advantages for adapting health messages to individual health behavior and behavioral determinants [15, 16] and are therefore more likely to be effective in changing behavior and its determinants when compared with non-tailored messages [17]. The Internet may serve as both an access point and a tool in this respect [18, 19]. As such, it provides several advantages for health promotion, namely widespread access to health information, interactivity, tailored information, anonymity and the potential to facilitate interpersonal interaction and social support [3, 20]. Moreover, health communication via the Internet is convenient, novel, appealing and flexible. It allows automated data collection and stimulates openness in communication [20]. Additionally, the anonymity offered by the Internet makes it possible for adolescents to gather information on topics that would otherwise be embarrassing or difficult to discuss [7, 9]. Therefore, the Internet is considered an innovative and attractive medium with significant potential to promote health and prevent illness, particularly among adolescents [21, 22]. Furthermore, the Internet has the capacity to not only diffuse health information but also enable monitoring. Earlier research has shown that, for various health-related issues, data gathered via Internet monitoring are comparable to data obtained with paper and pencil questionnaires [23–26].

Since tailored interventions are more useful in motivating persons to perform the desired behavior than the non-tailored ones [15, 17], we have combined such an intervention with a health monitoring instrument to provide individually feedback on a variety of lifestyle behaviors among adolescents. These materials have recently been developed in the Netherlands as part of a project called E-MOVO (Electronic Monitoring and Health Promotion). The purpose of the present study was to explore adolescents’ opinions on this instrument so that recommendations for improvement can be provided. In order to put the outcomes of the evaluation described in this article into context, a brief outline of the E-MOVO project is provided below.

The E-MOVO project

In the Netherlands, the Community Health Services (CHSs) have a legal obligation to monitor the health and well-being of adolescents and to set priorities for health promoting activities. In 2003, seven CHSs, situated in the eastern part of the Netherlands, collaborated together with Maastricht University on the E-MOVO project (for a detailed description see [27]). This electronic monitoring instrument was developed to provide insight into the health and well-being of adolescents and, in turn, formed the basis for planning health promoting activities and policies at the individual, school and municipal level. The seven CHSs invited 184 secondary schools to participate in the E-MOVO project, of which 151 (82%) agreed to do so. A total of 35,104 adolescents between the ages of 12 and 18 years completed the monitoring questionnaire. The individual response rate ranged from 73 to 93% for six of the seven CHSs. The seventh CHS reported a response rate of 44% due to a lack of capacity to approach schools and stimulate adolescents to participate.

During one class session (~45 min), adolescents completed the monitoring questionnaire which contained questions about demographics, school, physical and psychological health, well-being, lifestyle, criminality and leisure time activities. The answers were saved to a data file and used to generate tailored feedback at the individual level ~3 days after the completion of the questionnaire. A time lag of
3 days was necessary since it was not clear whether the main server could provide the tailored feedback for >35,000 adolescents immediately after these individuals completed the electronic questionnaire. The individually tailored feedback targeted lifestyle behaviors and psychological well-being. The lifestyle information included the adolescents’ present behavior, recommendations for that specific behavior and, if needed, tips on how to change the present behavior in the direction of the recommended behavior. The feedback on their present behavior was displayed in red, orange or green, indicating that the adolescent behaved unhealthily, just below the norm, or according to the Dutch health norm, respectively. For each topic, links to other Web sites were given where additional information could be found. The respondents’ answers were not only used to generate the individually tailored feedback but also used to generate health reports at the school, municipal and regional levels in order to set the agenda for health promoting policies and activities. The project was registered at the Dutch Data Protection Authority, which supervises the fair and lawful use and security of personal data.

Methods

Procedure

To explore the respondents’ opinions on the E-MOVO project, data were collected using two different methods. First, a self-administered evaluation questionnaire was sent by e-mail to the respondents 2 months after completion of the monitoring questionnaire. Twenty cinema vouchers were raffled among those who returned a completed evaluation form. Of all the respondents who completed the monitoring questionnaire (N = 35,104), 25,195 provided their e-mail address. Of these 25,195 respondents, 672 returned their evaluation questionnaire generating a response of 3%.

Additionally, in the spring of 2004, seven complementary semistructured group interviews were conducted with 53 adolescents in groups of 8–10 adolescents per interview. One interview was held with only two adolescents because the other adolescents had other priorities at time the interview was held. The aim of the interviews was to obtain more in-depth information regarding their evaluation of the monitoring questionnaire and the individually tailored feedback. Two interviewers conducted the interviews; one asked the questions while the other facilitated the interviews (i.e. making notes, checking the tape recorder). The interviews were organized separately according to educational level (lower vocational school and higher secondary education or university preparatory education) and grade (the Dutch equivalent of the 8th and 10th grade). Both those adolescents who had read their individualized tailored feedback and those who had not were invited to participate. Adolescents in the Dutch equivalent of the 10th grade attending lower vocational school were not able to participate since they were doing their final exams at the time.

Questionnaire

The evaluation questionnaire completed by the respondents consisted of a minimum of 11 questions and a maximum of 143 questions, depending on the extent to which the adolescent had read the individually tailored feedback. The minimum 11 questions consisted of seven questions assessing the intention to change lifestyle behavior (i.e. ‘Do you intend to change your behavior regarding physical activity, fruit consumption, smoking, alcohol consumption, and sexual behavior?’). The adolescents were also asked to indicate the extent to which they had read the individually tailored feedback by selecting one of the following answer options: ‘yes, all of it’, ‘yes, part of it’ or ‘no’. Additionally, the participants were asked to convey their reasons for reading the individually tailored feedback with answer options such as ‘it was interesting’, ‘I wanted to know why the score was red, orange, or green’ or ‘I was curious’. When the participants had not read the feedback, they were asked to indicate their reason for this with answer options such as ‘I had no time’, ‘I forgot’, ‘I was not interested’ or ‘I had no opportunity to do so’.

Nine questions assessed the individually tailored feedback. Respondents were asked to convey the
extent to which they thought the feedback was interesting, new, easy to understand, valuable, childish, trustworthy or too long. They were also asked whether the feedback provided them with useful tips. Answers to these questions were provided on a five-point scale that ranged from totally agree (+2) to totally disagree (−2). An example of one of these questions was ‘To what extent do you think the individually tailored feedback was easy to understand?’

Suggestions for improvements to the feedback were acquired via two statements for which respondents could give their opinion, namely ‘I would prefer the feedback immediately after completing the questionnaire’ and ‘I would prefer more practical tips to change behavior’. The following three additional questions were also asked: ‘Did the tailored feedback provide you with greater insight into your own behavior?’, ‘Do you intend to change your behavior as a result of the tailored feedback?’ and ‘Do you intend to read the tailored feedback in the future?’ All answers were provided on a five-point scale that ranged from totally agree (+2) to totally disagree (−2).

The layout of the Internet site was evaluated using four questions that assessed the extent to which the adolescents thought the Internet site was boring, childish, fun or attractive. Again, the answers were provided on a five-point scale that ranged from totally agree (+2) to totally disagree (−2).

Socio-demographic variables were not assessed since these were already provided by the monitoring questionnaire.

The group interviews started with the interviewer showing the respondents copies of the monitoring questionnaire and examples of the individual feedback. This was done to refresh the respondents’ memory. Questions were then asked about the monitoring questionnaire (i.e. comparison with a paper and pencil questionnaire; was it boring, interesting, clear) and the individually tailored feedback (i.e. reasons for reading or not reading it; whether the information was new, easy to understand and interesting; the topics on which the adolescents had read the information). At the end of the interview, respondents were asked how E-MOVO could be improved to reach more adolescents in the future.

Analyses

The quantitative data were analyzed using SPSS version 12.0.2. A total of 672 adolescents returned the evaluation questionnaire and those questionnaires that were completely blank were deleted (n = 31). Depending on the routing of the questionnaire, not all respondents answered the same number of questions. However, every respondent should have answered a minimum of 11 questions. Those questionnaires with <11 responses were also deleted (n = 39). The dataset used for analyses therefore consisted of the answers provided by 602 adolescents. We used mainly descriptive analyses and t-tests.

The qualitative data were analyzed with QSR Nvivo. First, the interviews were tape-recorded and then transcribed. Then, these transcriptions were analyzed using a thematic approach. The questions posed in the interviews were categorized per topic addressed (i.e. the monitoring questionnaire, the individually tailored feedback and suggestions for improvement) and subtopics (factors related to these main topics). Subsequently, the two researchers analyzed each transcript, selected relevant topics and assigned these to the categories. The researchers then discussed their individual results and sought consensus. The most relevant results are described in this paper.

Results

Respondents

The response on the evaluation questionnaire was 1.9% for Grade 8 (323/16 775) and 2.0% for Grade 10 (327/16 215). Of the respondents, 66% (n = 400) were female, 49% (n = 298) were enrolled in the Dutch equivalent of the 10th grade and 36% (n = 215) were attending lower vocational school. The mean age of the respondents was 14.3 years (SD 1.24) and ranged from 12 to 18 years. To assess whether the respondents who returned the evaluation questionnaire were representative of the entire E-MOVO population, intentions about lifestyle were analyzed. The only significant difference found was for future condom use. Respondents
who returned their evaluation questionnaire had a significantly greater intention to use condoms in the future than the non-respondents ($t = -5.6, P < 0.01$).

Of the 53 adolescents participating in the group interviews, 34 were male and 29 were attending the lower vocational school. Additionally, 45 of the 53 participants were enrolled in the Dutch equivalent of the 8th grade (~age 13–14 years).

**The monitoring questionnaire**

Group interviews revealed that all the respondents considered the monitoring questionnaire to be fun (‘It was fun to do, better than our usual lessons’), even though they thought the questionnaire was too extensive and a little boring toward the end. All the respondents attending a higher secondary school or university preparatory school (hereafter referred to as respondents with a higher level of education) reported that they were easily able to complete the monitoring questionnaire in one class session. These respondents also mentioned that the monitoring questionnaire was easy to understand, despite the fact that the answer options were occasionally unclear. The group interviews with the respondents from lower vocational school (hereafter referred to as respondents with a lower level of education) revealed that they really needed the entire class session to complete the monitoring questionnaire. For some, one session was not enough. They also reported that some questions were difficult to understand and that some respondents therefore needed the help of a teacher: ‘For the questions on sports, you were asked to indicate how many hours you spent for walking, cycling, etc. That required a lot of thinking.’ All the respondents said they preferred an electronic questionnaire to a paper and pencil questionnaire because it took less time and effort to complete.

**The individually tailored feedback**

Of the respondents who returned the evaluation questionnaire, 97% ($n = 584$) reported having read their individually tailored feedback and, of this group, 86% ($n = 519$) reported having read their feedback in its entirety. Table I shows how many respondents had read the individualized tailored feedback according to health topic. The majority of the respondents had read all the topics. The information on fruit consumption was most read while information on drug use was least read. The main reasons for reading the tailored feedback for these topics were (i) being interested in the topic ($n = 334$), (ii) current behavior was in accordance with the norm ($n = 154$) and (iii) current behavior was not in accordance with the norm ($n = 166$).

Many of the other reasons mentioned for reading individually tailored feedback were related to curiosity and interest. These outcomes were supported by the information obtained during the group interviews, in which being curious or interested and wanting to know about one’s health were also the reasons most frequently mentioned: ‘I wanted to know what my scores were’.

The respondents’ opinion on the tailored feedback is summarized in Table II. In general, their opinion was quite favorable. The majority of the respondents considered the information to be personal, easy to understand, valuable, interesting, not childish, credible and not too long. They also thought the feedback contained useful tips. However, the information was not new to most of the respondents and therefore did not give them additional insight into their behavior. With respect to the respondents’ intention to change behavior as a result of the tailored feedback, 45 and 33% of the respondents in the Dutch equivalent of the 8th and 10th grade, respectively, reported intentions

### Table I. Percentages of adolescents who had read the various topics of the individually tailored feedback

<table>
<thead>
<tr>
<th>Health behavior</th>
<th>8th grade ($N = 289$), n (%)</th>
<th>10th grade ($N = 299$), n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical activity</td>
<td>257 (89)</td>
<td>248 (83)</td>
</tr>
<tr>
<td>Alcohol consumption</td>
<td>236 (82)</td>
<td>256 (86)</td>
</tr>
<tr>
<td>Smoking</td>
<td>239 (83)</td>
<td>238 (80)</td>
</tr>
<tr>
<td>Fruit consumption</td>
<td>263 (91)</td>
<td>272 (91)</td>
</tr>
<tr>
<td>Sexual behavior</td>
<td>230 (80)</td>
<td>244 (82)</td>
</tr>
<tr>
<td>Drug use</td>
<td>229 (79)</td>
<td>226 (76)</td>
</tr>
<tr>
<td>Psychological well-being</td>
<td>225 (78)</td>
<td>250 (84)</td>
</tr>
</tbody>
</table>
to change (some of) their risky behaviors as a result of the feedback. A small majority intended to read their tailored feedback in the future if given the opportunity.

The group interviews also revealed that respondents had expected a graph or a real score like a number or percentage instead of the written information they received. Some said, however, that the written information probably gave them more insight into their behavior than a number would have. Respondents with a lower level of education indicated that the structure of the tailored feedback was not entirely clear to them. They had difficulty understanding that the colors (red, orange, green) indicated whether their behavior was unhealthy, just below the norm, or in accordance with norm, respectively. These respondents also indicated that they perceived the information to be personally relevant. In contrast, respondents with a higher level of education said that they clearly understood the structure of the individually tailored feedback, despite not being instructed about the feedback beforehand. They too confirmed that not all information was new.

Reasons for not reading the tailored feedback reported in the evaluation questionnaire were as follows: lack of time (n = 7), forgot (n = 4) and had no opportunity [no computer available at home or at school (n = 4)]. Other reasons mentioned were as follows: not interested in the topics discussed in the feedback, not wanting to know whether they were living a healthy life, not thinking it was important and having lost the correct username and password to log on to the Web site. Respondents in the group interviews mentioned that not reading the tailored feedback was mainly related to not being interested in the feedback or health in general: ‘I already know all about myself’.

### Suggestions for improvement

The majority of the respondents who returned the evaluation questionnaire or participated in the group interviews reported that they would prefer to read their individually tailored feedback immediately after having completed the monitoring questionnaire. Additionally, almost half of the respondents (47%) who returned the evaluation questionnaire preferred to receive more practical tips on how to change their behavior. Respondents with a lower level of education mentioned during the group interviews that bright colors and simple language should be used in the future. Furthermore, these respondents indicated that they needed better instructions from the teacher on how to fill in the monitoring questionnaire.

According to the respondents with a lower level of education, a competition that is somehow related to reading the tailored feedback could increase the percentage of adolescents who actually read the feedback. Also those with a higher level of education indicated that they would prefer to receive more instructions before completing the monitoring questionnaire, despite having understood the introduction to the monitoring questionnaire on the Internet.

Respondents with a higher level of education mentioned that the teacher should remain at the front of the class and should not stroll around during the completion of the questionnaire as this interferes with respondents’ privacy. Furthermore, they mentioned that it would be more interesting if their behavior was compared with the average behavior of their class or school or with other adolescents living in the same region. All group interviews yielded suggestions for minimizing the likelihood that adolescents forget to check their individually tailored feedback.
tailored feedback. In particular, suggestions for ensuring that adolescents do not forget their username and password, which is necessary to read the individually tailored feedback, were also provided. All adolescents mentioned receiving their feedback by e-mail as a solution to forgetting their username and password.

**Discussion**

The purpose of this evaluation study was to explore adolescents’ opinions about a monitoring instrument and its corresponding individually tailored feedback in order to provide recommendations for improvement. Before conclusions can be drawn, some limitations of the study must be discussed, namely the non-representative study sample and the time lag between the application of the E-MOVO instrument and its evaluation. Of all the adolescents participating in the E-MOVO project who provided their e-mail address \((n = 25195)\), only 672 returned the evaluation questionnaire (3%). The majority of these reported having read their individually tailored feedback, either partially or fully, while a little more than half of the total group of adolescents participating in the E-MOVO project had read their individually tailored feedback [27]. This suggests that the respondents who choose to return the evaluation questionnaire were not representative of the whole E-MOVO population. Nonetheless, the adolescents who did return the evaluation questionnaire did not differ significantly from those who had not in terms of their intentions to change lifestyle behaviors, with the exception of their greater intention to use a condom. As a result, we contend that the respondents in this evaluation study were likely no more involved in health-related issues than the non-respondents. Another limitation is the time lag between completion of the monitoring questionnaire and the group interviews (6 months), which may have generated less accurate recall by the respondents. Nevertheless, these interviews did provide in-depth information that helped to interpret and clarify the quantitative findings obtained by the evaluation questionnaire [27]. Nonetheless, the conclusions that follow should be considered in light of these limitations.

Given the content of the group interviews, we conclude that the respondents preferred the electronic questionnaire to a paper and pencil questionnaire even though these methods generate very similar outcomes [23–26]. Nearly all the respondents who had returned the evaluation questionnaire had also read the individually tailored feedback and, of this group, the majority had read all of it. The respondents were also reasonably positive about this feedback.

In addition to these general results, we also found differences between the respondents with a lower level of education and respondents with a higher level of education. The respondents with a lower level of education appeared to require more time to complete the monitoring questionnaire and experienced more difficulties with understanding the questions than the respondents with a higher level of education. They also had problems in understanding the structure of the individually tailored feedback. The respondents also put forth various suggestions for improvement. Those with a lower level of education mentioned the use of bright colors and simple language, whereas those with a higher level of education mentioned the need for a comparison with others in their class, school or region. The results of this evaluation study, together with the fact that more than half of the total number of the adolescents participating in the E-MOVO project had read their individually tailored feedback, indicate that adolescents are indeed interested in feedback on lifestyle behaviors when it is communicated via the Internet. This is in contrast to the findings of Van Exel et al. [28] who concluded that the majority of youth is not concerned with his/her current or future health.

Based on our findings, we make the following recommendations:

1. Provide the feedback immediately upon completion of the monitoring questionnaire, for instance, by planning a 2-hour session instead of 1-hour session. This would have several advantages. Firstly, it would exclude the possibility of...
behavior change between the behavioral measurement and the individually tailored feedback, thereby ensuring that the information is appropriate [15, 29]. Secondly, providing the feedback immediately would increase the likelihood that adolescents will actually read the individualized tailored feedback. Thirdly, this would also decrease adolescents’ risk of forgetting the username and password required to read the individually tailored feedback. The suggested solution of sending the individualized tailored feedback via e-mail is difficult given the current privacy regulations. Although a 2-hour session would allow adolescents with a lower level of education more time to complete the monitoring questionnaire, it would provide them with less time to read the individualized tailored feedback. Another option that could help to save time would be to monitor only one or two behaviors and then generate individually tailored feedback concerning those behaviors only, rather than feedback on all the lifestyle behaviors that were monitored in this study.

2. Health monitoring and the provision of feedback on lifestyle should be embedded in high school curriculum. Embedding this in a specific school subject, such as biology, may make it easier for adolescents to put the monitoring questionnaire and the individualized tailored feedback in context. In the present study, they struggled to understand the context. Embedding the monitoring and feedback in school curriculum could also create opportunities to combine the monitoring and the feedback with specific lessons and home activities on lifestyle behaviors. Currently, E-MOVO is being adopted by the National Institute for Public Health and the Environment [27]. To ensure the full participation of all stakeholders, we recommend the ‘schoolBeat’ approach [30], which provides guidelines for developing, implementing and evaluating health promotion in schools.

3. We further recommend tailoring the individually feedback not only to behavioral outcomes but also to educational level and age. The rationale behind using tailored feedback is that the information is personally relevant and not redundant which then results in greater attention to personalized information and more thoughtful consideration [16, 29]. Ultimately, tailored information should be more useful than non-tailored information in encouraging the performance of a desired behavior, in motivating respondents to read the information and in stimulating respondents to read all the information. It should also increase the likelihood that respondents will effectively store the information and discuss it with others [29, 31]. We assume that this is also true for online tailored interventions. However, evidence comparing similar online and off-line interventions is scarce [18].

4. It would also be advantageous to add an extra element of social comparison to the individually tailored feedback, at least for the adolescents with a higher level of education. According to Festinger’s social comparison theory, most people feel the need to evaluate their opinions, abilities and performances, preferably in relation to an objective standard [32, 33]. Social comparison could have an effect on motivation and subsequent behavior. The present study has revealed that social comparison with an objective standard (the Dutch health norm) was not satisfactory to our respondents. By contrast, they desired a chance to compare their own behavior with that of similar adolescents.

In conclusion, this study has demonstrated the unique opportunities offered by the Internet with respect to conducting health monitoring and providing its corresponding individually tailored feedback on health and well-being to adolescents. The monitoring of health and well-being via the Internet, as well as the individually tailored feedback, was evaluated favorably by the respondents in this study. Implementing our recommendations might offer further promising opportunities for the diffusion and implementation of the E-MOVO project in schools. However, more research is necessary to investigate the possible effects of individually tailored feedback on the health behaviors of adolescents.
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Conflict of interest statement

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