

## Web-Based Intervention for Developing Long-Term Health Literacy of Individuals: Possibilities and Limitations

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### Abstract

Web-based interventions (WBI) are purposefully developed online programs designed for wide range of users (clients, patients, health care specialists, as well as medical practitioners) which allow obtaining and using information on various issues related to health maintenance and improvement.

On the basis of the analysis of scientific literature, the article provides an overview of WBI types and components, as well as a structural model of WBI and its user in the context of environment factors. The possibilities of using WBI for developing long-term health literacy of individuals are specified. By summarising the main advantages and limitations of using WBI, the possible suggestions for the WBI use and development are offered.

*Keywords:* web-based intervention, information literacy, health literacy, advantages and limitations, health literacy development

In the Information Age when the amount of information is constantly increasing, it is not only required from an individual to know how to use new technologies, but he/she must also possess skills to select and evaluate information according to his personal and professional goals. These information processing skills become extremely important during the process of education, especially during one's studies at the university. To provide a qualitative study process it is equally important for both parties (lecturers and students) to supplement and purposefully structure their knowledge and competences, which nowadays is impossible to picture without intensive use of global network resources.

Information literacy has become a topical issue of scientific discussion since the appearance of first computers, primarily interpreted as effective possibility of information search, intentional selection of information sources, as well as a skill to transfer the searched information to others (Webber & Johnson, 2000). Information literacy is often reduced to computer literacy / e-literacy or the so-called media literacy. Nevertheless computer literacy is only one of the elements of information literacy and is an integral part of contemporary educational and cultural environment (Ivanovic, 2014). In the study process, information literacy is interpreted as the ability to select and use only

verified information, to work with sufficient amount of facts in order to draw equitable conclusions.

For qualitative educational process it is as equally important to be able to use various information acquisition strategies as to develop such qualities as persistence, attention to details and precaution while using limited number of information sources (Breivik & Gee, 2006). In searching and selecting information the following factors are important: initial level of an individual's education, problem-solving skills and computer literacy, of course.

The continuous development of computer software during the last decade improves it by making it easier to use. Online communication options enable various types of professionals to carry out their research and educational work (Ritterband & Thorndike, 2006). The Internet is recognized as a fully-fledged social tool / social environment, which provides its users with huge amount of information without the necessity to leave home. At the same time, it opens up more new cognitive opportunities in issues concerning individuals' health, and patterns of changes in their behaviour (Ritterband et al., 2009) are developed with the purpose of making health care and treatment available for everyone everywhere and any time via the use of the Internet (Perle, Langsam & Nierenberg, 2011).

Health literacy is a widely used concept in the health literature, which is connected with the educational level of people (patients) and their ability to maintain health, to improve it or to follow a prescribed treatment routine. Traditionally, in the pedagogical literature the term "literacy" is interpreted as a person's ability to understand complicated issues, essential interconnections (of issues, fields), primarily through reading, writing, calculating, speaking, and listening (Doak, Doak & Root, 1996). The World Health Organisation defines health literacy as cognitive and social skills which determine one's motivation and chances to get access, to understand and to use information in order to promote and to maintain good health (Health literacy and health behaviour). At the same time, it includes an individual's skills to process and understand the basic information about health and health care services, including treatment, in order to make appropriate decisions (Information Society Development Guidelines for 2014–2020). In a broader sense, health literacy not only motivates an individual to evaluate and change his/her behaviour and health habits, but also encourages such behaviour, which generally provides effective public activity and would contribute to social capital development on a long-term basis.

Historically, experience and knowledge about maintaining health among both family members and professionals for a long time were passed from generation to generation. Originally, it was face-to-face communication, later joined by a written word and telephone consultations. The only way for a person to get some information about questions concerned was to see a doctor. Some decades ago, the press, radio and television were considered the main information sources. However nowadays the Internet has become a vital source of daily information. Statistical data show that in 2014 77.7% of the population in Latvia was the Internet users (Latvian Internet Association, 2014). The World Wide Web offers a wide range of possibilities to acquire and exchange information on health literacy, including the following:

- Internet journals or blogs (Brice, 2009);
- Online databases / encyclopaedias (Wiki, Medpedia), which allow users to share their experience, as well as to add and modify a certain content;

- Online social networks (for example, Facebook, Youtube and Twitter together form about 23% of all communication resources used on the Internet). There are opportunities to create forums related to health issues and to read opinions of others (Spila & Znotina, 2014);
- Web-based interventions for expanding one's knowledge about health and health behaviour.

Web-based intervention (WBI) is a specially designed online program, which allows the Internet user (patient, health care professional, student, lecturer or other interested person) not only to find the answer to his/her question, but also to be consulted by a professional, to fill in different self-assessment questionnaires or tests and to receive feedback, for example, *happinessindicator.com* (Ritterband et al., 2003). Because of the continuous development of different WBI, there are various studies carried out on the efficacy of WBI for the development of an individual's health literacy and possible changes in behaviour (Schulz et al., 2014; Smit et al., 2015; Webbetal., 2010). The important research questions are: how to attract users, how to exactly design a website, what are the options for the users' interactive engagement.

### Objective

The aim of the study was to conduct a literature review on the application of web-based interventions (WBI) for an individual's health promotion and health literacy development, as well as to identify some advantages and limitations of particular types of WBI for developing health literacy on a long-term basis.

### Design and Methods

From December 10, 2014 to April 10, 2015 using the keywords "web-based interventions" and "health literacy", and their connection with the Boolean operator "AND" in EBSCO and SCIENCE DIRECT databases 74sources were found. According to the aim of the study, 40 publications were selected for the analysis.

### Results

#### **Genesis and Connection of Concepts "Web-based Intervention" and "Health Literacy"**

Considering the development of concepts "web-based intervention" and "health literacy", for the time being, one can discuss only the genesis of the mentioned concepts, which covers a relatively short period of time.

The first discussion about health literacy dates back to the 1980–90s, when the so-called biomedical approach dominated in medical treatment of patients. It was a time when specialists started to believe that existing "command & control" based health care organization is non-effective (Sackett et al., 1996). From the moment when the concept of health literacy was mentioned for the first time (1974) in publications in the peer-reviewed scientific journals (1990) a considerable period of time has passed (Report, 2013).

Data obtained in researches in different countries show quite different and limited level of understanding of health maintenance and improvement. Originally, USA scientists

(Rudd, 2007; Rudd et al., 2007), then also scientists in other countries (Nutbeam, 1998; Kutner et al., 2006; Jordan, et al., 2011) came up with the research results showing quite a low level of awareness, interest and understanding of respondents' own health issues. In most cases, low health literacy turned out to be closely related to the respondents' general educational level including previously mentioned limited reading, writing, calculating, speaking and listening skills (Nutbeam, 2000; Comparative Report, 2012; Sykes & Wills, 2014). More larger-scale studies in the field of health literacy pave the way for discussions about a wide range of health literacy types and their use in everyday life (Nutbeam, 2000; Schwartzberg et al., 2005; Rudd, 2007).

However, during the longitudinal study of eight European countries (Austria, Bulgaria, Greece, Germany, Denmark, Ireland, Spain and Poland) (The European Health Literacy Project 2009–2012) it was established that 46.3% of respondents had limited health literacy skills. Health literacy level (high, sufficient, low or very low) is directly related to an individual's education, social and financial condition. The risk group is formed by 80% of people with low level of education, 75% of them have very bad health condition, 60% – are older than 75 years, more than 70% consider themselves of low social status, 50% of the risk group are unemployed and pensioners (Comparative Report on Health literacy in eight EU Member States, 2012).

Literacy as a complex qualitative indicator of an individual's competences includes certain skills and knowledge in different areas of life, including health issues (one's own health, health of family members, and society's health in general). Already in the middle of the 1990s, in order to broaden individuals' awareness of health literacy, various web-based resources appeared (Ritterband & Tate, 2009). For example, special online programs offered different opportunities to find answers to the most frequently asked questions on websites: *What is good health? What can I do to improve and maintain my health? Where can I find a health care specialist to solve a particular problem?* Various scales and tests were developed as screening tools for evaluating an individual's health related knowledge, for example, HALS (Health Activity Literacy Scale), TOFLA, & REALM (The Rapid Estimate of Adult Literacy in Medicine), NAAL (National Assessments of Adult Literacy) (Pleasant, 2009).

### Types and Components of Web-based Intervention

The analysis of the selected scientific literature sources (Glanz, Rimer & Viswanath, 2008; Kerr, et al., 2006; Lustria et al., 2013; Ruwaard & Kok, 2015) has allowed identifying different types of WBI that are useful for the improvement of an individual's health literacy and health behaviour, and most effectively attract WBI users, for example:

- Acquisition of information about one's physical and mental health,
- Monitoring (detection, follow-up, comparison) of the health status, behaviour and habits,
- Goal setting and intentional change of behaviour,
- Specialists' consultations by using communication options via the Internet (including: questions – answers; consultations via Skype),
- Therapeutic interventions for reducing physical and mental symptoms.

Alongside the mentioned ones, it is worth distinguishing also WBI types by their didactic goal, including (1) Patient Education Websites and (2) Interactive Health Communication applications (IHCAs) (Ritterband et al., 2003).

The key question is the following: What kind of WBI characteristics allows attracting potential WBI users most effectively? Studies in the field of health literacy show that various characteristics of the intervention itself can impact the probability of the engagement of potential clients (Lustria et al., 2013; Portnoy, et al., 2008; Short et al., 2015; Smit, Linn & van Weert, 2015).

According to Barak, Klein and Proudfoot (Barak, Klein & Proudfoot, 2009), there are four main WBI components providing the attraction of potential users: (1) Content of the program, (2) The multimedia use / choice, (3) Interactive online activities, (4) Guidance and supportive feedback (see Figure 1).

*Content of the program* is the most important WBI component. Starting the process of the content choice and development it is important to define precisely the target audience for which the program is envisaged. As far as health literacy is concerned, there are two main types of content direction the WBI provides: the content envisaged to educate the user about health related issues and the content designed to create changes in the user’s health related behaviour.

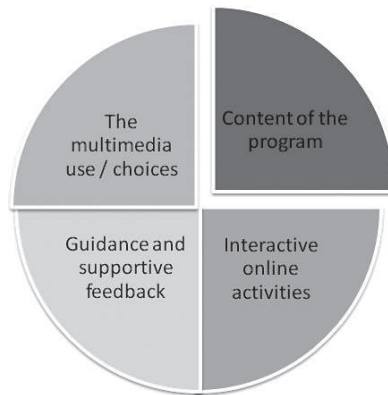


Figure 1. Main components of WBI

*The multimedia choice options and diversity.* WBI largely uses text to disseminate the program content, although other multimedia options including pictures/graphics, animations, audio, and video can make the resource offered online more attractive for its users. It is important that the user can modify the format of WBI content and receive the given information in a more personalized way (Ritterband & Thorndike, 2006; Lauder, et al., 2013). The choice option itself also has the potential to enhance engagement and improve the outcomes (Barak, Klein & Proudfoot, 2009). Usually, the information published on a particular website is supplemented by references (links) to other similar educational programs, for example, in the section “Health Communication and Health Information Technology” of the website “Healthy people 2020” (<http://www.healthypeople.gov/>) the user can find references to many other programs, including: “Educational and Community-Based Programs”, which, in its turn, has the hyperlinks “Related Topic Areas” or “Learn more about...” and offers additional information on particular issues. Each of the websites is enhanced by graphic, animation, audio and video elements.

*Interactive online activities.* The third component relates to whether the WBI offers a patient the opportunity to participate within the program in a more interactive way

(e.g., the possibility to broaden the knowledge about one's health by using self-assessment and self-monitoring tools offered by WBI). "Non face-to-face" communication mode allows the WBI user to be more open to himself/herself about his/her own health behaviour and habits, for example, by assigning a computer to "calculate" one's eating and drinking or alcohol use habits (for example, "Welcome to Down Your Drink"; "How much is too much").

**Guidance and Supportive Feedback.** This WBI component indicates if the WBI users can get some "external" information about themselves and their progress when using a certain online program or website. Although all WBI require users to act by themselves to some extent, the type and the degree of feedback offered can vary considerably; from none (no guidance or supportive feedback mechanism provided) to high (provision of sufficient amounts of tailored feedback) (Barak, Klein & Proudfoot, 2009).

### Structural Model of Cooperation Between WBI and Its User for Developing Health Literacy

Already by its nature WBI is evaluated as a multi-dimensional category; therefore, a clear definition of it is not possible. Barak, Klein and Proudfoot treat WBI as the intervention guided by a client himself/herself, which is based on specially designed online program and operates on the website. WBI is used by clients, who look for help related to physical and mental health issues. As to health literacy, the aim of WBI is to create positive changes in the client by improving his/her knowledge, awareness and understanding of physical and mental health by using various information reflection and interactive communication types.

The use of WBI, its diversity and productivity are determined by the factors that can be relatively combined into three categories: environmental factors, individual characteristics of a potential client/user, and support / information provided on the Internet, namely – WBI itself (Short et al., 2015; Ritterband & Tate, 2009) (see Figure 2).

**Potential Internet user** lives in certain circumstances and his/her resources largely depend on environmental factors (O'Brien & Toms, 2008; Kelders et al., 2012). An individual's health literacy is developed and expanded by the context – the total amount of information about health and healthy lifestyle in the media, the emphasis on health as an individual and cultural value, financial support given by state and local government for promoting public health. Another essential factor is the health care system – if a person can easily approach a health care specialist, the proportion of educational and preventive work – whether the available services are oriented only towards treatment of disease symptoms or to prophylaxis and health education. Evaluating the environmental factors of WBI use, also the Internet coverage in the particular region shall be taken into consideration – access to the Internet, the Internet speed and connection quality, as well as personal resources and material options of the potential user, including simple and convenient device by mean of which to access the Web (Short et al., 2015).

When developing WBI, even the most favourable environment alone cannot guarantee the development of the public health literacy in general. Much depends on the potential WBI user, his/her demographic indicators – age, social status and level of education. Young people with at least an average level of material well-being use opportunities offered by

the Web more actively in comparison with elderly people or people with unstable material security. The characterising attributes of an individual and his/her personality are the qualities of character, motivation to work and search for information (Short et al., 2015).

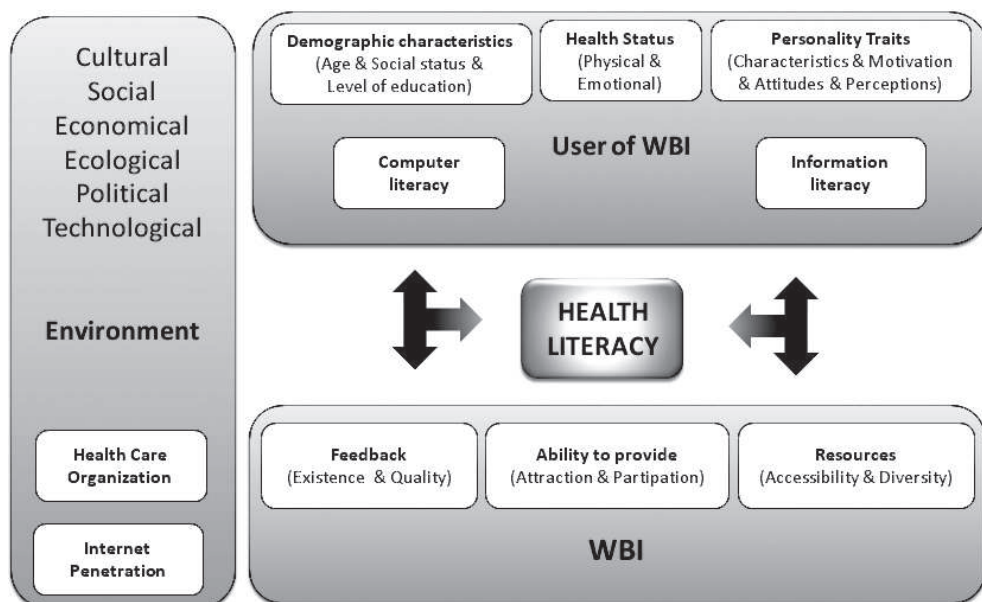


Figure 2. Structural cooperation model of WBI and its users in the context of environmental factors for developing health literacy

The interest to maintain and to improve health by practising habits of healthy lifestyle may come from a person himself/herself. The motivation to search and use WBI thus improving health literacy can be related to the existing / previous emotional and physical health condition of an individual or his/her family member, which can stimulate (or on the contrary – hinder) the performance of the necessary procedures for search of possible help (Crutzen, Ruiters & de Vries, 2014). An equally important qualitative indicator of a potential WBI user is his/her information processing skills (Williams-Piehotka et al., 2003) and computer literacy (information literacy & health literacy) and whether the client him/herself (according to the definition of WBI) is able to manage and direct WBI as a process. Thus, only those users who possess the originally determined set of skills described above can develop health literacy via WBI.

**WBI as a cooperation component.** The role of intervention as the mode component and element developing health literacy is related to the characteristics of the resources available on the Web. Despite the fact that nowadays the Internet sources are very diverse, scholars are still discussing the issue of how to adapt WBI to its user in a most accurate and effective way, how to ensure regular and active engagement of clients, what kind of content, visualisation and interactivity elements should be included in order to achieve the desired changes (Abbott et al., 2014; O’Brien & Toms, 2008; Smit, Linn & van Weert, 2015). The use or non-use of WBI is determined by its client. Creating interest in the user is the first step in the adoption of intervention, which might ultimately result in people actually using it. Thereby, it is important to explore and balance the

WBI structure (content, visual attraction, usability) with characteristics of the potential target group (interest, topicality, level of initial skills and abilities). The process of adjusting the WBI characteristics and intervention materials to the user's individual characteristics is called tailoring or computer-tailoring (de Vries & Brug, 1999). The results of meta-analysis on web-based tailored health behaviour change interventions indicate that online interventions that are tailored to the individual participant can effectively improve health related behaviour (Lustria et al., 2013). A lack of consistency between someone's individual characteristics (for example, learning style, information literacy, motivation) and the delivery mode of health message can inhibit the processing of the information (Smit, Linn & van Weert, 2015). In contrast, the congruence between the user's individual characteristics and the delivery mode is expected to enhance the motivation to attend to and process the presented information (Rimer & Kreuter, 2006).

Each WBI shall choose its evaluation criteria. Besides, the received feedback is not easily and unequivocally evaluated. For example, the evaluation criteria in WBI educating an individual about the basic principles of healthy diet or health behavioural issues will be different. In the same way, also the planned result will differ, but neither one nor the other intervention will solve sleep disorders of its user, which as a side effect could be observed in one, as well in the other case (Evers et al., 2005). Thus, it is problematic to understand and evaluate to what extent the observed changes are direct WBI consequences, and to what extent – a visit of a particular specialist is stimulated by WBI and a result of therapy.

Taking into account only the factors mentioned and deliberative application of each particular case could promote health literacy of a WBI user – the development aimed at achieving such level of literacy that the user is able to keep and maintain health, to improve it, as well as to follow a prescribed treatment routine.

### Possibilities and Limitations of the WBI

While analysing the selected scientific literature sources, particular WBI possibilities and limitations were identified. As it is seen in Table 1, WBI possibilities and disadvantages revealed can be grouped by the following aspects, some of which:

- 1) are related to the specific features of the method itself;
- 2) affect customer engagement;
- 3) are attributed to the invested resources.

Regarding the *characteristics of WBI as a method*, one of the most important advantages is that the use of Web resources allows the user/client to overcome the so called “stigma” barrier (Greek “stigma” (stigmatos) ‘a mark, dot, puncture’]. It is an opportunity to search for the necessary information and/or to receive online help maintaining anonymity. On the one hand, an opportunity to look for the answer to a topical question without directly contacting medical personnel, the client's anxiety, concerns and sense of shame can be reduced (Abbott, et al., 2014). On the other hand, indirect contact with the Web as the information provider and the ability to access impersonal information on health promote dehumanization of the health care system (Lovejoy et al., 2009). The “human contact” with a professional is lost, as well as the opportunity to receive support or encouragement, which in many cases is evaluated as an additional resource for the improvement of an individual's health condition. Studies show that in communication with computer program, people have greater self-revelation and self-



reflection than by communicating with other people (Suler, 2002). The fact that, when using Web resources, a client tends to be more truthful to his/her answers, can be reflected in a more precise feedback. At the same time, the absence of a direct contact can also be expressed as a WBI disadvantage. It is the case when a more precise feedback is created directly by contacting a specialist, because his expert conclusion is based not only on the information provided by the client, but also on his/her personal experience and observations during the contact. Furthermore, a direct contact with a specialist can be a motivating reason for a client to use WBI to comprehend more his/her condition and to receive feedback (Paxton et al., 2007).

Another WBI advantage is that the information available on the Web can help specify / clarify one’s health condition, attract attention to the significance of health maintenance, reduce prejudices of health care and treatment methods, as well as motivate for searching help from a particular specialist. The risk is the great availability of web intervention and information diversity that can keep the clients with severe health problems back from seeking appropriate help (Gould et al., 2002). On the one hand – network facilitates possibilities to start and/or maintain mutual communication among clients who are trying to solve similar problems (Fuller & Kroese, 2015), on the other hand – communication on the Internet is related to the risk of spreading confidential information (see Table 1).

Table 1  
*Advantages and Limitations of the WBI*

Advantages	Limitations
The characteristics of the WBI method	
Overcoming the stigma barrier.	Dehumanization of mutual communication environment.
Greater self-disclosure and self-reflection.	No direct contact with a specialist that may be necessary.
Realization of actual difficulty and motivation to seek a particular professional.	Preventing clients with severe mental and physical health problems from seeking appropriate assistance.
Initiation and / or facilitation of communication between clients who are dealing with similar difficulties.	The risk of spread of confidential information.
Engagement of clients	
24/7 availability regardless of the living region.	Low involvement of the target group.
Covering a wide range of clients, including those who do not have access to face-to-face assistance.	Difficulty to adjust intervention to the individual characteristics of clients (interest, ways of perception, etc.).
	Difficulties to provide the client’s participation with the required regularity.
Effectiveness and resource consumption of WBI	
Effective way to evaluate and change behaviour.	Not suited to all customers.
Cost-effectiveness and at the same time showing similar results as structured face-to-face interventions (effect size).	Public access to web-based intervention implies the risk that it will be used disregarding important conditions.
Allowing one to collect data.	A lot of resources to design and develop original intervention.

*Regarding clients' engagement*, WBI is available 24 hours a day and 7 days a week, which opens opportunities for people from various regions to use them at any time of a day (Wienert & Kuhlmann, 2015). WBI can have a wide range of clients, including those who have no chance to get on-site assistance and consultations (a specialist is not available, demand exceeds supply) (Perle, Langsam & Nierenberg, 2011). Comparing the quantitative indicators of people engaged in communication, one can imagine the difference between people engaged in non-site prophylactic or informative conversations and the number of people learning the same information at the same time from various places (sometimes even without leaving home) by using the Web resources. Alongside the mentioned aspects, some empirical studies report the low engagement of the specific target group users in WBI (Davies et al., 2012; Kelders et al., 2012). The authors provide several explanations of this phenomenon: a potential client is not interested in assistance, there is a lack of motivation to seek answers to unclear questions on their own, and there is no confidence in WBI efficiency. Potential disadvantages of WBI are also related to the fact that the Web resources do not secure the necessary regularity of users' participation. In order to achieve changes in the client's behaviour, to promote healthy lifestyle, to develop health literacy, single connection to the website (to the relevant issue or theme) is not enough, it is important to provide a purposeful activity by the WBI user for a long term (O'Brien & Toms, 2008).

Regarding efficiency and invested resources, studies show that WBI is an effective way to evaluate and change an individual's behaviour (Portnoy et al., 2008; Ritterband & Tate, 2009; Perle, Langsam & Nierenberg, 2011). However, such interventions do not fit all clients, because they largely depend on one's information processing skills, computer skills, abilities to evaluate information critically, to reflect on it and to answer the necessary questions in indirect contact. The empirical studies on the efficiency and cost-effectiveness of WBI aimed to improve health allow suggesting that WBI is definitely more economically advantageous and at the same time shows similar results as analogous structured face-to-face interventions (Klein, Richards & Austin, 2006; Mihalopoulos et al., 2005; Ruwaard & Kok, 2015). Analysing the cost-effectiveness of different Internet-based lifestyle interventions, for example, WBI aimed at alcohol reduction, decreasing depressive symptoms, smoking cessation, reducing lifestyle associated risk factors, Smit and colleagues (Smit et al., 2015) have concluded that the Internet-based interventions are not only effective, but also cost-effective.

At the same time, scientific literature provides also references to important WBI threats. For example, public and free access to WBI creates the risk that it will be used ignoring important conditions, among them, the client does not acquaint himself/herself with all necessary information, misunderstands it, and uses information from dubious Web (Perle, Langsam & Nierenberg, 2011).

### **Conclusions and Practical Implications**

WBI development is a time-consuming and laborious process, which is based on clearly defined goals. In order to achieve these goals, the chosen methodology and also the way interventions are reflected in literature must be appropriate. Clear communication, information on health care services in a simple and understandable language improves and broadens an individual's knowledge in the field of health literacy.

WBI in the field of health care:

- rapidly develops and offers additional alternatives for individuals' education and promotes positive changes in their behaviour and habits,
- is an additional tool, not a substitute for the traditional direct, face-to-face consultations with a health care specialist,
- allows extending / enriching the methods of mutual communication and engages clients, who have no opportunities or resources to receive a direct contact,
- creates a need to develop guidelines for the implementation of this practice, as well as for the research of WBI efficiency and its potential limitations.

Qualitatively developed WBI aimed at promoting health literacy is an intentionally developed product that includes a large number of characteristics (content/ information offered to users, interactive tasks, options for choice, opportunities to develop new habits through various purposefully developed tasks and to achieve desired goals). Only the identification of a problem and community education prepares an individual for making an autonomous decision concerning his/her health.

The results of the literature overview performed allowed for the identification of potential advantages and limitations in WBI usage. This analysis is important in order to develop an intervention for improving health literacy in a particular target group. The results show that WBI is widely used, economically beneficial and useful in health maintenance and development of health literacy on a long-term basis and has prospects of longevity.

By creating and developing WBI in Latvia, on the basis of the already existing experience, it is important to approbate its use, primarily developing health literacy in a particular target group. One of the respondent groups, for whom WBI would be especially effectively applicable, is young people with the developed computer and Internet usage skills.

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