

# Persuasive Features in Six Weight Loss Websites: A Qualitative Evaluation

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**Abstract.** Websites for weight loss have been demonstrating promising results. Still, it is unclear which website components contribute to successful outcomes. The purpose of this paper is to explore the utilization of various persuasive features on six weight loss websites. The websites were selected by using a set of criteria for this qualitative evaluation. The Persuasive Systems Design Model was applied to extract and analyze persuasive system features found in the sites. The results of this study suggest that there is room for improvement in both designing and implementing web-based interventions for weight loss. The evaluated sites provided relatively good primary task support and strong social support. However, there were weaknesses in both dialogue and credibility support. Overall, the evaluation showed that the evaluated weight loss websites may not be very persuasive.

**Keywords:** PSD model, persuasive, web-based, weight loss, intervention.

## 1 Introduction

One of the most vibrant areas within health behavior change research has been Web-based software systems promoting weight loss and weight maintenance. Recent research suggests that the Web may be a highly viable channel for delivering weight loss and obesity interventions across diverse populations [1-4]. Barak, Klein and Proudfoot [5] define a web-based intervention as a mainly self-guided online program operated through a website and used by consumers seeking health-related assistance. The intervention program attempts to create positive change and or improve/enhance knowledge, awareness, and understanding via the delivery of reliable, unbiased health-related content and the utilization of interactive functionality.

Web-based weight control applications have the potential to achieve outcomes similar to other lifestyle treatment options [2]. Several randomized trials have demonstrated web-based weight-loss interventions to be efficacious for short-term weight loss [3], [6-10]. However, online programs have not accomplished weight losses of the magnitude typically produced by traditional individual and or group treatment approaches [1], [11]. These findings should be interpreted with caution, however. According to Bennett and Glasgow [1], most randomized controlled trials in

this particular domain have been relatively small and underpowered, suffering from high levels of attrition and occasionally reporting change in only secondary outcomes, e.g., knowledge and self-efficacy, rather than primary outcomes, e.g., behavior change. Tsai and Wadden [12] argue that minimal evidence still exists for recommending the use of commercial Internet-based interventions, whereas Womble and colleagues [13] found in their study that a commercial Internet-based weight loss program produced only minimal weight loss and was not as effective as a traditional manual-based approach. Yet, Harvey-Berino and colleagues [14] reported that participants assigned to an online weight maintenance program sustained similar levels of weight loss over 18 months compared to individuals who continued to meet face-to-face.

The current generation of online weight loss interventions takes advantage of a set of varying software components, such as self-monitoring functionality, food diaries, body mass index calculators, support forums, and coach messaging [1]. Yet, it is unclear which of these features, either in isolation or collectively, are associated with the greatest magnitude of weight loss [1], [2], [11].

Bennett and Glasgow [1] summarize that greater results in weight loss are typically observed with such web-based weight-loss interventions that are highly structured, provide support from a human counselor, utilize tailored materials, and promote a high frequency of website logins. Krukowski and colleagues [11] share this view by concluding that structured interventions comprising behavior therapy components, interactive and dynamic website features, and synchronous communication produce the most significant weight losses.

As noted above, the area of weight-loss applications is still rather unclear. Moreover, the features of the applications, and in particular the persuasive features, are normally not well reported. The purpose of this paper is to explore the utilization of various persuasive features in six web-based weight loss applications. The Persuasive Systems Design Model [15], [16] is applied to extract and analyze persuasive system features from the included web-based weight loss interventions.

## **2 Related Research**

McConnon, Kirk and Ransley [17] highlight the need for process evaluation to help identify the key components of Internet interventions, whether positive, negative, or insignificant. They criticize previous research for focusing primarily on examining the ability of online weight control interventions to promote weight loss, with limited investigations of acceptance, satisfaction, and patterns of use. They suggest that a more comprehensive approach to evaluating the role of computer-based tools, beyond simply demonstrating improved outcomes, is needed.

Krukowski and colleagues [11] underscore the importance of dynamic and interactive website features. They suggest that such Web features which provide participants with visual representations of goal progress, self-monitoring feedback, and social support are predictive of weight loss and maintenance. Different features seem to be important during treatment and maintenance. In their study, progress

charts, calculators, and past diaries were included in the factor best predicting weight loss during the baseline to 6 months treatment period. The factor comprising chats and e-mail addresses of peer participants was the best predictor during the maintenance period.

A major challenge in Internet-based weight loss interventions is that participant attrition [18] is generally high (typically more than 25%), and among those participants who are retained, engagement rates usually decline over time [1], [2]. As reducing attrition and increasing website utilization would likely enhance weight loss and management success, designing, implementing, and evaluating features that participants find attractive and captivating should clearly be a priority [11]. This type of knowledge will assist in designing, implementing and evaluating effective interventions that are able to engage and retain large numbers of individuals, potentially enhancing population weight-related health and well-being, and thus of significant public health value [2].

Stevens and colleagues [19] have identified several major lessons from their experience in developing and implementing an interactive website to support the maintenance of weight loss. According to them, it is critical to designate the theoretical underpinnings of the intervention program and the website objectives early in the design process. They point out that website design does not iterate the same way as the development of in-person, counseling-based interventions. Making solid decisions about website objectives and abiding by them during the development process helps eradicate expensive rework.

### 3 Evaluating Persuasive Systems

Research on persuasive technology has been introduced relatively recently [20]. Briñol and Petty [21] outline persuasion as follows: “In the typical situation in which persuasion is possible, a person or a group of people (i.e., *the recipient*) receives an intervention (e.g., *a persuasive message*) from another individual or group (i.e., *the source*) in a particular setting (i.e., *the context*).” (p. 71)

Persuasive systems may be defined as computerized software or information systems designed to reinforce, change or shape attitudes or behaviors or both without using coercion or deception [15]. Successful persuasion takes place when the target of change (e.g., attitudes, beliefs) is modified in the desired direction [21].

Oinas-Kukkonen and Harjumaa [15], [16] have conceptualized a framework for designing and evaluating persuasive systems, known as the Persuasive Systems Design (PSD) model. The PSD model presents a way to analyze and evaluate the persuasion context and related techniques. Persuasion context analysis includes recognizing the intent (persuader, change type) and the event (use context, user context, and technology context) of persuasion, and recognizing the strategy (message, route) used. In the PSD model, the categories for persuasive system techniques are primary task support, dialogue support, system credibility (the more credible the system is, the more persuasive it is), and social support (the system motivates users by leveraging social influence). Primary task support addresses the

target behaviors and employs seven principles, namely reduction, tunneling, tailoring, personalization, self-monitoring, simulation, and rehearsal. Dialogue support addresses the feedback that the system offers in guiding the user to reach the intended behavior and employs praise, rewards, reminders, suggestion, similarity, liking, and social role. System credibility support is a persuasive element, and the PSD model describes seven design principles for supporting it. These are trustworthiness, expertise, surface credibility, real world feel, authority, third party endorsements, and verifiability. The category of social support describes how to design the system so that it motivates users by leveraging social influence. The model operates with the following design principles: social learning, social comparison, normative influence, social facilitation, cooperation, competition, and recognition.

In this study, the PSD framework was applied for identifying the persuasive features that have been incorporated into the web-based weight loss interventions.

## 4 Research Setting

The research question is: *What kind of persuasive system features, and to what extent, do current web-based weight loss interventions convey?*

Our aim was to gather a short but representative list of current state-of-the-art weight loss websites. The site had to be in English, free of charge (or providing a free trial), require registration, accept international users, and provide extensive interactivity. Web-based weight loss applications were searched for during December 2009–January 2010 from the Internet using public search engines (e.g., Google, Yahoo!, Bing), using the following search terms: weight, loss, control, diet, nutrition, obesity. Even if the search was extensive, the search method cannot be considered as exhaustive. The search phrase “weight loss” yields millions of hits on Google alone. Moreover, going through all possible combinations and variations for search terms is practically impossible and will only lead into highly redundant search results.

Based on the abovementioned criteria, we chose six websites for further evaluation. The sites were:

- Calorie Count (<http://www.caloriecount.about.com>, later CC)
- CalorieKing (<http://www.calorieking.com/>, CK)
- Diet.com (<http://www.diet.com/>, DIET)
- ObesityHelp (<http://www.obesityhelp.com/>, OH)
- WebMD Healthy Eating & Diet Center (<http://www.webmd.com/diet/default.htm>, WMD)
- Project Weight Loss (<http://www.projectweightloss.com/>, PWL)

Four of the sites were free of charge (CC, OH, PWL, WMD), one (CK) offered a free trial for seven days (CK), and one (DIET) charged for premium membership (the free standard membership was evaluated). See table 1 for the types of content the sites provided.

**Table 1.** Type of content on evaluated weight loss websites

Type of content	CC	CK	DIET	OH	PWL	WMD
Health advice	●	●	●	●	●	●
Nutrition	●	●	●	●	●	●
Diet	●	●	●	○	●	●
Physical activity	●	●	●	○	●	●
Weight loss	●	●	●	●	●	●
Weight maintenance	●	●	●	○	●	○
Obesity	○	○	○	●	○	○

● = yes, ○ = no

The websites included in the study were evaluated based on the persuasive system context and functionality presented in the PSD model. The model does not suggest that all systems should always implement all of the features described in it. However, due to the nature of this study, and as the quality of the implemented features varied tremendously, we found it appropriate to use a scoring system. The authors independently reviewed the sites feature-by-feature. The resulting tables were then compared, discussed and combined. See table 3.

## 5 Results: Persuasion Context

The persuasion context is composed of the intent, the event, and the strategy [16]. Dey [22] states that context is all about the whole situation relevant to an application and its set of users, and he defines context as any information that can be used to characterize the situation of an entity.

**The intent.** The *persuaders* behind the websites appeared to be commercial companies. Yet, only two of the sites (CC, WMD) clearly stated the background organization. In fact, it was very hard to determine the underlying motives for persuading users and/or biases other than what was obvious. All of the evaluated sites ultimately aimed at individuals’ enhanced health, essentially weight loss, through the utilization of different types of software tools and information. For this reason, self-help, personal goal-setting, and motivation play an important role in the change process in all of these sites. All of the sites failed to explicitly state whether they targeted a change in individuals’ behavior only or also in their attitudes (*change type*). However, it is relatively safe to assume that the sites favored behavior change over attitude change. Furthermore, three out of six interventions did not reveal the purpose of the website beyond very general statements. In our view, these shortcomings lower the overall persuasiveness of the website.

**The event** contains the *use, user* and *technology contexts*. The use context refers to the problem domain dependent features. The user context refers to the individual users’ characteristics, including, but not being limited to, users’ goals, abilities, and cultural factors. The technology context refers to the features and requirements of the technological platform and/or application.

The use context was described on a very general level in all of the evaluated sites. It would appear that half of the sites failed to recognize different user groups, leading to a questionable one-fits-all approach. In our view, web-based health behavior change interventions without predefined user groups and with at least minimal tailoring for the groups cannot offer much more than educational content with minimal effect on users' behavior. For example, differences in age, gender, culture and lifestyle may play an important role in persuasion. Specific to the users of the evaluated weight loss websites is that they are typically people who are interested in weight loss and/or they are motivated to losing weight personally. None of the sites was targeted at a certain demographic group. See table 2 for an overview of the technology context.

**Table 2.** Technology context

	CC	CK	DIET	OH	PWL	WMD
Web2.0 functionality	●	●	●	●	●	●
Mobile functionality	●	●	○	○	○	●
Video	●	●	●	●	●	●
Podcasting	●	○	●	○	○	●
Downloadable tools	●	●	○	○	○	●
Social media connectivity	●	○	○	●	●	●

● = yes, ○ = no

Every site provided video clips, and half of the sites offered mobile functionality to the user. Two of the sites provided weight-loss related podcasts. The results from a recent study [23] suggest that the use of behavioral, theory-based podcasting may be an effective way to promote weight loss. Half of the sites offered downloadable tools, and the majority had some type of social media connectivity (e.g., Facebook, Twitter). Bennett and Glasgow [1] argue that the most critical design gap concerns the underuse of Web2.0 features in the current generation of Internet interventions.

**The strategy** in the PSD model emphasizes two elements, namely the *message* and the *route*. The message refers to the form and/or content selected to deliver the intended transformation in behavior and/or attitude change. The content could be, for instance, statistical data about the health risks of drinking, but the information could be presented to the user in plain text, streaming video, or it could be embedded in a game. The route for persuasion can be direct, indirect, or both. A direct approach provides one or a few solid and convincing arguments, whereas an indirect route is based on a number of facts rather than a single strong argument.

Presumably, the wider the content, the more embedded messages and arguments are likely to be presented to the user. Some of the sites offered very wide content (CC, CK, DIET, WMD) whereas others relied on more compact presentation (OH, PWL). It has to be noted that the total number of embedded arguments may not be necessarily relevant, compared with the manner in which they are presented.

The embedded arguments in all of the sites seem to target appealing to both the emotions and the logic of the users. All of the sites appeared to target the individuals'

behavior change through a set of arguments, instead of using one convincingly strong argument only (route, direct vs. indirect persuasion).

## 6 Results: Persuasive Features

The persuasive features listed of the PSD Model [16] found in the evaluated weight loss websites are presented in table 3.

**Table 3.** Persuasive features in evaluated websites

<i>Persuasive features</i>	CC	CK	DIET	OH	PWL	WMD
Reduction	●●	●●●	●●	●	●●	●
Tunneling	○	○	○	○	○	○
Tailoring	●●	●●	●	●	●	●
Personalization	●●	●●	●●	●●	●●	●●
Self-monitoring	●●●	●●●	●●●	●●●	●●	●
Simulation	●●	●●●	●	●	●●	●●
Rehearsal	●	●●●	●●	●	●	●
Praise	○	●	●	○	○	○
Rewards	○	●●	●●	○	○	○
Reminders	●	●●	○	○	○	●
Suggestion	●	●●	●	○	●	●
Similarity	●	●	●	●●	●	●
Liking	●	●	●	●	●	●
Social role	●●	○	○	○	○	○
Trustworthiness	●●	●●	●	●●	●●	●●●
Expertise	●●	●●	●●	●●	○	●●●
Surface credibility	●●	●●●	●	●●	●●	●●
Real-world feel	●●	●	●	●	●	●●
Authority	○	○	○	○	○	●●
3rd party endorsements	○	○	○	○	○	●●
Verifiability	○	○	●	○	○	●●
Social learning	●●	●●	●●	●●	●	●
Social comparison	●●●	●●	●●	●●	●	●
Normative influence	●●	●●	●●	●	●	●
Social facilitation	●●●	●●●	●●●	●●	●●	●
Cooperation	○	○	○	○	○	○
Competition	●	●●	●	○	○	○
Recognition	○	●●	●●	●	●	●

●●● = high support, ●● = medium support, ● = low support, ○ = no support

### 6.1 Primary Task Support

All of the evaluated sites were relatively strong in their primary task support. Self-monitoring functionality (e.g., food/activity/weight logs and trackers) was highly supported in all of the sites. According to Krukowski and colleagues [11], there is some indication that Internet-based programs may facilitate greater self-monitoring

than in-person programs due to the ease of self-monitoring through online tools. This may be partially true, but based on our experience, using these tools can initially be quite a laborious task and require a rather high motivation level. After the user is familiar with the tools, and is being provided with an opportunity to save day-to-day patterns (favorite meals, favorite physical activity) into the system, the burden of self-monitoring may decrease slightly.

All of the sites demonstrated functionality that fits within reduction, i.e., the system/application reduces complex behavior into simple tasks helping users to perform the target behavior. This is important because a system that guides users through a process or experience provides opportunities to persuade them along the way. A closely related feature is tunneling [24]. Tunneling may enhance the change process since the user is led through a predetermined sequence of steps and receives the most appropriate content at a proper time. Surprisingly, tunneling was not used in any of the sites.

The level of tailoring, i.e., providing different content for different user groups, was average in two sites and weak in four sites. Bennett and Glasgow [1] urge for future research to determine how and under what circumstances tailored messaging might be used most effectively to stimulate sustained website utilization. According to them, despite tailored approaches being generally accepted and preferred, only a few trials have systematically studied the outcome of different types or the extent of tailoring.

Personalization was relatively good in all of the sites. The quality of web personalization depends on how well the content generated by the personalization agent matches the preferences of the user in a particular domain [25].

Simulation and rehearsal were rather common features. A typical example of simulation was calculating how much calories a specific physical activity burns, or the type and duration of exercise needed to burn the calories from, e.g., a chocolate bar. The rehearsal feature was supported by providing workout plans and exercise ideas to the user. As a highlight, two of the sites (CK, DIET) provided extensive video-based, customizable workout builders.

## 6.2 Dialogue Support

In comparison to primary task support, the sites demonstrated much weaker support for system-to-user interaction. There was great variety in the feedback the sites offered in guiding the user to reach the intended behavior.

Two of the websites demonstrated praise (e.g., the user is presented with a positive message upon completing a specific task) and also offered virtual rewards, such as medals, and points. Three sites presented suggestions for action to the user. Only one site adopted a social role. This was done by facilitating communication between the user and a nutrition specialist (“Ask Mary, your personal nutrition coach”).

Overall, the dialogue support demonstrated throughout the sites was at a below average level. Strategies to improve retention rates and engagement with the web-based intervention (e.g., through email reminders, or via enhanced program features) should be further explored [2]. A persuasive system should remind users of their target behavior during the course of the intervention. A recent systematic review

showed that the use of periodic prompts can be effective in behavior change interventions [26]. In the present evaluation, one site provided average support and two sites weak support for reminders.

### 6.3 Credibility Support

There is a general concern that people are unable to assess the reliability and quality of information presented on websites. Miles, Petrie and Steel [27] examined the first 50 websites found on an Internet search with the search term 'weight loss diets', finding that only three offered good dietary advice, while 26 sites offered the sale of vitamins, minerals, supplements and diet replacements. They concluded that the information available on these websites ranged from solid advice to information that was potentially misleading and dangerous.

In this study, we evaluated the credibility of the selected websites. Obviously, as information systems researchers, we cannot fully evaluate the quality of the advice *per se*, but we can say if the information *appears* trustworthy; showing expertise, authority and verifiability. Combining the elements in the credibility support category gives a good overview of the credibility, reliability and quality of information presented to the potential users.

None of the six sites had any remarkable problems with credibility issues. All of them successfully demonstrated trustworthiness (i.e., the presented information is truthful, fair and unbiased) and expertise (except for PWL). Surface credibility was relatively strong in most of the sites, but at the same time, distracting advertisements and confusing/changing layouts weakened the sites' overall credibility. The real-world feel was weak or at an average level. Only one site referred to an authority, whereas two sites presented third party endorsements. Verifiability of the claims presented to the user was weak or nonexistent in all sites with one exception (WMD).

### 6.4 Social Support

Most of the evaluated sites offered seemingly strong social support. Several techniques were employed for this purpose, such as journals/diaries/blogs, mailbox, friends/buddies, forums/message boards, groups/clubs, and chat. Harvey-Berino and colleagues [14] claim that the group meetings in the chat forum offer a powerful format to improve overall outcomes for a group-based intervention. Accordingly, synchronous communication could facilitate social support, a component that has been previously found to enhance weight loss in behavioral obesity programs.

The social learning principle means that an individual may be more motivated to perform a target behavior if she can observe others performing the behavior while using the system. This principle was supported in all of the sites. A closely related principle is social comparison; users will be more motivated to perform the target behavior if they can compare their performance with the performance of others. People are also more likely to perform target the behavior if they are able to observe others performing the behavior, or are being observed by others. This principle is called social facilitation. Social comparison and social facilitation were supported widely.

Leveraging competition and cooperation may persuade users to adopt a target attitude or behavior. Features supporting competition were found in half of the sites while none of the sites provided means for cooperation. Normative influence was utilized to some extent in all of the sites.

By offering public recognition for an individual or group, a system can increase the likelihood that the person and/or group will adopt a target behavior. Recognition was utilized in five of the six sites.

Bennett and Glasgow [1] claim that there are no examples of trial designs that would allow for systematic investigation of the relative benefits of various social-networking features.

## 7 Discussion and Conclusions

This paper provided a qualitative evaluation of the persuasive features in six weight loss websites. The selected sites represent the current state-of-the-art of web-based weight interventions. The results of this study suggest that there is room for improvement in both designing and implementing web-based interventions for weight loss. The evaluation showed that the weight loss websites may not be very persuasive.

Primary task support features were utilized relatively strongly in many of the sites. Tailoring was surprisingly weak, as half of the evaluated sites did not utilize it at all. This finding implies that the interventions may be targeted at too broad an audience. It is reasonable to assume that different approaches might work well for different user groups. In other words, if the user feels the content is not designed for her needs, there is a high possibility that the user will discontinue using the program (i.e., attrition).

The dialogue support (system-to-user) provided by the evaluated sites was not very strong. Half of the websites provided some praise, and some offered some virtual rewards. The use of periodic prompts can be effective in persuasion. Half of the sites used reminders as a persuasion technique and three sites presented suggestions for action to the user.

None of the six sites had any remarkable problems with credibility issues. All of them successfully demonstrated trustworthiness and expertise. However, real-world feel was relatively weak. None of the sites referred to an authority, whereas some of them presented third-party endorsements. Worryingly, the verifiability of the claims put forward was weak or nonexistent for all but one site.

Social support was relatively strong as all of the sites provided online social support to some extent. Several techniques, such as blogs, forums, groups, instant messaging, and chat rooms were employed for this purpose. In our view, providing (expert-moderated) support groups as a part of a web-based intervention is a very important aspect of such interventions. As demonstrated, there are various techniques readily available to facilitate communication between peers. In anonymous online support groups, the participants may overcome the feeling of being stigmatized, and time and location are no longer obstacles for participation. We suggest that web-based interventions and support groups should not be considered as substitutes, but rather as supplements to traditional forms of treatment and peer support.

There are some limitations to this study. First, the evaluated sites represent only a fragment of the available web-based weight loss sites. Second, no outside evaluators were used, and thus the evaluations were at least partially based on the authors' subjective views. Third, the evaluation of the quality of the actual information presented on the sites is critical but beyond the scope of this paper. Finally, the relation between persuasive features and weight loss outcomes was not studied. The results should be regarded as indicative for future studies.

The use of persuasive technology in the health behavior change arena is still in its infancy. While the field is expanding, it is evident that more research is needed to better determine how the persuasiveness of the systems affects users' intended behavior. Effective face-to-face counseling interventions may not be directly translatable into the Web environment. Designing, implementing and evaluating systems aiming at individual's behavior change requires a thorough understanding of the problem domain, underpinning theories, and the strategies of persuasive systems design. An interdisciplinary team of professionals is often needed. Establishing such teams will be a demanding task for building successful web-based health behavior change interventions.

Current research tends to reveal very little about the underlying persuasive mechanisms that have been built in the systems which target health behavior change. Focusing on the validation of the outcome results only is insufficient; more emphasis should be put on studying what software features and functionalities contribute to the success of the interventions and how they could and/or should be implemented and delivered to diverse populations.

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