12-1-2003

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APA Citation

Lieberman, D. (2003). Determinants of satisfaction with an automated alcohol evaluation program.. *Cyberpsychology & behavior : the impact of the Internet, multimedia and virtual reality on behavior and society, 6* (6). http://dx.doi.org/10.1089/109493103322725478

Determinants Of Satisfaction With An Automated Alcohol Evaluation Program

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Abstract

High rates of untreated mental illness cause serious health problems in the United States and worldwide. The use of computer-administered therapy has the potential to increase access to mental health care for certain patient populations. An online version of an alcohol check-up was developed that guided subjects through a series of standardized questionnaires, and provided them with feedback designed to enhance their appreciation of the negative aspects of their alcohol use. Ratings of the helpfulness of the questionnaires were evaluated in order to determine the characteristics of individuals who would potentially benefit from an automated substance abuse intervention, and to learn which aspects of an automated program would be most useful. Over a period of 25 months, 1,455 individuals participated in the study, 83 percent of whom had an Alcohol Use Disorders Identification Test (AUDIT) score indicative of problem drinking. Subjects with alcohol problems found the on-line program more useful than other subjects. The questionnaire which compared subjects' alcohol use to national norms provided the most helpful and also the most unexpected information. Alcohol abusers with high levels of ambivalence about their drinking, and other measures of motivation for change, found the program more helpful than those with lower motivation. Automated therapy made available to the general public via the Internet can be accessed by large numbers of individuals. The interaction can be useful to patients with significant levels of substance abuse.

Lieberman, D. Z. "Determinants of satisfaction with an automated alcohol evaluation program." Cyberpsychology & behavior: the impact of the Internet, multimedia and virtual reality on behavior and society 6.6 (2003): 677.

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Introduction

Technology is an enabling tool that allows individuals to leverage their time and talents to accomplish more than they would be able to do otherwise. The integration of technological tools into the workplace has been compared to the increasing use of machinery during the industrial revolution. Machinery allowed workers to leverage their muscle power, enabling them to manipulate objects faster, and in ways that would be impossible without the aid of machines. Information technology has brought about a similar transformation in the abilities of knowledge workers. In the field of medicine, information technology plays a substantial role in drug discovery, diagnostic testing, invasive interventions, and other areas.

Despite the fact that the work of psychotherapists primarily involves information processing, broadly defined, information technology has not yet had a major impact in terms of increased abilities or efficiencies. This condition is unfortunate because there is a great need for the expansion of mental health services. The Surgeon General's report on mental health indicated that over 70 percent of Americans diagnosed with mental and addictive disorders receive no treatment [1]. According to the World Health Organization (WHO), mental disorders are a primary source of morbidity worldwide. Over a quarter of all years lived with disability are caused by mental illness [2]. Despite the development of effective treatments, the global burden persists because too many people fail to seek treatment and, when they do, evidence-based treatments are not always used effectively [3].

Overcoming the obstacles needed to reduce the burden of mental illness will be challenging. Healthcare is the largest segment of the U.S. economy, and already accounts for 15 percent of GDP [4]. It is unrealistic to expect that better access to mental health care will be accomplished with a greater dedication of financial resources. Among the other solutions to this problem that have been proposed, the use of information technology to provide automated treatment may be a particularly effective way to reach untreated individuals with mental illness [5].

Early work has been done in developing and testing automated treatments for obsessive compulsive disorder [6], other anxiety disorders [7, 8], and depression [9, 10]. Automated treatment allows individuals seeking mental health care to overcome a number of important obstacles. The cost of automated treatment is extremely low [11], and the marginal cost of delivering an automated treatment via the Internet approaches zero. Patients can receive treatment without regard to their ability to access transportation to a clinic, and at a time that is most convenient for them. The latter advantage is particularly relevant to patients who work, and may have difficulty arranging their schedules to allow them to attend therapy during working hours. Arranging childcare can be a problem for primary caretakers seeking treatment, and this problem may be somewhat reduced by the ability to access treatment from the home.

As described in the WHO report, those patients who are able to access care may not always receive evidence-based treatment. The process of translating research into clinical practice has remained challenging [12], and practical strategies to help clinicians implement the most up to date interventions need to be developed [13]. To the degree that evidence-based interventions can be

automated, well supported protocols can be incorporated into the algorithms of treatment software, providing wide access to care which is firmly based on scientific principles. Programs that integrate automated treatment with face-to-face sessions can help clinicians who lack special training in the treatment of specific disorders, or who are unfamiliar with a specific evidence-based intervention. Software can guide the patient and the clinician through the technical aspects of an evidence-based treatment, while the clinician provides the therapeutic alliance, and other non-specific elements of therapy. A good example of this strategy is the cognitive therapy for depression program developed by Wright, et al [9]. Cognitive therapy is one of the best supported therapies for depression, but in many areas it is difficult for patients to find well-trained practitioners. The program allows a therapist to offer cognitive therapy to patients, even if the therapist lacks special expertise in this modality.

Software-based therapy lacks the flexibility of conventional therapy, but is able to provide a high degree of standardization. The standardization, along with the ability to record patient interaction with a high degree of detail, allows for continuous incremental improvement. In contrast, therapists who aim to practice a specific kind of psychotherapy actually show wide variation when their sessions are recorded and analyzed [14]. Software-based therapy, however, has the ability to deliver a more predictable intervention, and the different segments of the program can be evaluated for efficacy and patient satisfaction. Initially, automated interventions will be appropriate for only a small percent of patients seeking mental health care, however over time, it is reasonable to expect that the population potentially able to benefit will be both better defined, and expanded as the quality of the software improves.

The current study analyzed subject interactions and level of satisfaction with an on-line alcohol use feedback Web site by 1,207 individuals with alcohol-related problems. The results were evaluated based on the characteristics and attitudes of the subjects regarding their alcohol problems.

Materials and methods

Subjects were individuals who registered for an automated, on-line evaluation of alcohol use at www.alcoholcheckup.com. Inclusion criteria were access to a computer with an Internet connection, the ability to use the computer, and the ability to find the site via a search engine or Web directory. The material was in text form, so users were also required to be literate. The exclusion criteria were unwillingness to indicate that they understood, and agreed to the informed consent. No marketing of the Web site or any other form of recruitment was used. Participants were not offered any kind of incentive for filling out the questionnaires, except the opportunity to receive scores, and individualized feedback based on the results.

The program consisted of a standard HTML interface that could be easily accessed by most Web browsers, software scripts programmed to run on the server computer that would individualize the HTML sent to a browser based on the subject's input, and a database connection that would allow the subject's interaction to be recorded for processing, feedback, and analysis. In order to access the site, subjects were requested to fill out a brief form in which they chose a pseudonymous user name and a password. Subjects were not asked to give their name, email address, or other identifying information.

The evaluation consisted of five questionnaires that evaluated subjects' use of alcohol, the effects of the alcohol use on their lives, and their attitudes towards their alcohol use. The first questionnaire was the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES) [15], which scores patients according to their recognition of having a problem with alcohol, their ambivalence regarding whether or not their drinking is maladaptive, and the degree to which they have already taken steps to change their drinking. Subjects also completed a questionnaire that asked them to record how many standard drinks they consumed on average each day of the week, and were provided with information to help them understand the nature of a standard drink. The amount of alcohol consumed was compared to national averages, and subjects were given their percentile ranking based on the number of drinks they had per week. Subjects were asked to provide information on the age at which they began drinking alcohol, to complete the Alcohol Use Disorders Identification Test (AUDIT) [16], the Family Tree Questionnaire [17], and the Alcohol Decisional Balance Scale [18].

After completing all of the questionnaires, subjects were provided with feedback on their responses. The results were provided in narrative form in which the nature of the tests, and the relevance of their responses, were explained to the subjects. The narrative explanation highlighted any negative effects of alcohol use that were revealed by the questionnaire, and invited participants to consider the advantages and disadvantages of changing their alcohol use behaviors. After subjects reviewed the results of the SOCRATES, AUDIT, and alcohol consumption questionnaire, they were asked whether the information provided to them was unexpected, and whether it was helpful. Subject feedback was not solicited for the Family Tree

Questionnaire and the Alcohol Decisional Balance Scale because the information collected by these questionnaires was not processed or scored. Helpfulness and unexpectedness were both rated on a five point Likert scale. The first question asked, "Do these results surprise you, or are they pretty much what you expected?" The choices ranged from, "Nothing new" to "Very surprising." The helpfulness scale asked, "Was this questionnaire helpful?" The choices ranged from, "No, not at all" to "Yes, very helpful." Variables associated with higher levels of perceived helpfulness were evaluated in order to identify which aspects of the program were most useful, and what kind of patient would be most likely to benefit from this type of automated program.

Results

A total of 1,455 individuals registered to use the site, and completed questionnaires between March 2001 and April 2003. Table 1 summarizes the relevant characteristics of subjects with and without an alcohol use disorder.

The alcohol abusers' total rating of the helpfulness of the three scales was significantly higher than the non-abusers' ratings (10.4 vs. 8.9 $p < 0.001$). The comparison of drinking to national averages was rated significantly more helpful by the alcohol abusers than the SOCRATES (3.8 vs. 3.3 $p < 0.001$) and the AUDIT (3.8 vs. 3.3 $p < 0.001$). Among alcohol abusers, higher levels of motivation as measured by the SOCRATES were associated with higher total helpfulness ratings. Significant correlations were found between the total helpfulness and the total SOCRATES score (Pearson correlation = 0.295, $p < 0.001$) (figure 1), as well as the three subscales representing the ability to recognize the presence of a problem (Pearson correlation =

0.300, $p < 0.001$), ambivalence about the need to make a change (Pearson correlation = 0.302, $p < 0.001$), and having already taken steps to stop drinking (Pearson correlation = 0.156, $p < 0.001$).

In addition to being asked to rate how helpful the three scales were, subjects were also asked to indicate whether the feedback from each scale provided them with new information, or how unexpected they found the results to be. The total unexpectedness score is the sum of the three individual scores. Alcohol abusing subjects found the feedback to be more unexpected than non-abusing subjects (9.4 vs. 8.3, $p < 0.001$). Among alcohol abusers, the comparison of drinking to national averages was rated as providing information significantly more unexpected than the both the SOCRATES (3.5 vs. 2.7, $p < 0.001$) and the AUDIT (3.5 vs. 3.2, $p < 0.001$). The results of the AUDIT were seen as more unexpected than the SOCRATES ($p < 0.001$).

One of the purposes of asking subjects to rate the degree to which the questionnaire provided information that was new to them was to evaluate if the unexpectedness of the result was associated with the perception of helpfulness. The Pearson correlation between the total unexpectedness rating and the helpfulness rating was 0.254 ($p < 0.001$) (figure 2).

Discussion

The concept of the alcohol check-up was developed by Miller in the context of motivational interviewing for behavior change [19]. Patients with alcohol problems who are pressured to change often develop resistance that makes change less likely. An argumentative approach stimulates the

patient to develop counter-arguments for the continuation of the status quo, and tends to solidify their current dysfunctional state. A motivational approach, on the other hand, encourages the patient to explore whatever aspects of their drinking that they identify as problematic in an attempt to allow the patient to verbalize arguments in favor of making a change [20]. One of the basic principles of motivational interviewing is developing discrepancy within the patient. That is, the therapist helps them to identify the differences between their present status, and their desired goal. Although patients tend to respond to pro-sobriety arguments by the therapist with resistance, providing them with objective data on potentially negative aspects of their alcohol use tends to be more acceptable, and can increase internal discrepancy.

Placing the automated alcohol check-up program on the public Internet allowed a large number of individuals to be recruited for the study. Although no resources were used to recruit patients, 1,455 individuals used the site during the study period. The large number of subjects included in the study gave the statistical calculations a high power to detect differences between groups and correlations between variables. Subjects were not specifically asked how they found the site, but because it was not marketed, it is most likely that they used a search engine or a Web directory to help them find information on alcohol use. Patient recruitment can be one of the most costly elements of a clinical trial, and the result of this study suggests that automated interventions that can be safely delivered over the Internet have the potential to attract large numbers of subjects with minimal expense.

The majority of subjects, 83 percent, had an AUDIT score above nine, the cut-off for a putative alcohol use disorder. These subjects reported drinking an average of 36 drinks per week,

suggesting that the individuals who identified the site, and took the time to complete the check-up, had significant problems with alcohol. The AUDIT was developed by the World Health Organization to identify persons whose alcohol consumption has become hazardous or harmful to their health. The AUDIT evaluates the seriousness of alcohol-related problems with three questions on the amount and frequency of drinking, three questions on alcohol dependence, and four on problems caused by alcohol. Subjects with AUDIT scores consistent with an alcohol problem rated the questionnaires as being more helpful than the non-alcohol abusing subjects did.

In addition to rating the helpfulness of three of the questionnaires, subjects were also asked to rate whether the questionnaires provided them with new, or unexpected, information. The questionnaire that asked subjects how much alcohol they drank, and compared the amount to national averages, was rated as both the most unexpected, and the most helpful. The alcohol consumption questionnaire was unique in that it provided additional information - alcohol consumption averages - instead of simply processing data provided by the patient, as the other two questionnaires did. The development of discrepancy within a substance abusing patient is enhanced by giving them objective information about their drinking that is new to them. By providing them with an unexpected finding, it becomes possible for patients to view their drinking from a different perspective.

In clinical practice, abnormal laboratory findings or other pathological diagnostic test results related to alcohol consumption are often used to help patients better appreciate the high-risk aspects of their drinking. This kind of feedback was not possible with an automated intervention,

so a norm comparison was used instead. Heavy drinkers tend to socialize with others who drink as much as they do. Consequently, they can develop ideas about how much alcohol most people drink that are quite unrealistic. They typically compare their alcohol consumption with their drinking partners, and may conclude that their alcohol use is relatively modest. Providing patients with more accurate data tends to evoke surprise, and may make them feel uncomfortable in a way that leads to consideration of behavior change.

In general, alcohol abusing subjects who were more motivated to change their drinking behavior found the program to be more helpful. The SOCRATES measures three aspects of motivation: recognition, ambivalence, and having already taken steps to change. Patients with high scores on the recognition scale directly acknowledge that they are having problems with their drinking, and perceive that they need to change their behavior. High scorers on the ambivalence scale tend to wonder if they are having problems, and are open to reflection on this topic. Patients who have a high score on the taking steps scale are already making changes in their drinking behavior.

Scores on the three subscales of the SOCRATES were all significantly correlated with how helpful the program as a whole was rated. Subjects with higher levels of recognition of having a problem may have been more open to the kind of feedback that the program provided, and this receptivity was associated with the higher levels of perceived helpfulness. Helpfulness ratings also correlated with a subject's level of ambivalence. Patients with high levels of ambivalence are in a state of conflict, in which they may perceive very strong reasons to continue drinking and equally strong reasons to stop drinking. A program of this nature, which is designed to provide objective feedback to problem drinkers with an emphasis on the negative consequences,

would be expected to be most useful to individuals with high levels of ambivalence. The goal would be to tip the decisional scale such that the ambivalence would be resolved in favor of behavior change. The degree to which subjects had already made changes in their behavior, and were primarily interested in maintaining change, had the weakest association with perceived helpfulness. These patients have already come to the conclusion that behavior change is required, and benefit less by interventions designed to develop discrepancy in favor of change. Patients who have reached the stage of taking action would potentially benefit more from a relapse prevention therapy.

There was no follow up after the initial evaluation, so it is not possible to evaluate the efficacy of the check-up as an actual treatment. Furthermore, the anonymity afforded by the Web site made it difficult to evaluate the truthfulness and the accuracy of the responses given by the subjects. Subjects may have given false information for a variety of reasons. They may have distrusted the strategy used to protect their identity, and withheld information they did not want attributed to them. They may not have taken the questionnaires seriously, and provided incorrect information for entertainment, or answered the questions without giving them the amount of consideration they required. Finally, they might have experimented with "what if" scenarios to evaluate how the feedback would change based on ways in which they varied their responses to the questionnaires. The fact that subjects with higher scores on the AUDIT also reported high levels of alcohol consumption, and generally found the program to be more useful, are findings that tend to support the validity of the data.

Automated mental health interventions have the potential to dramatically increase access to evidence-based treatments at a very low cost. An automated alcohol check-up made available to the general public via the Internet attracted over one thousand individuals willing to take the time to complete five standardized questionnaires. Patients with alcohol problems who had higher motivation to change their behavior were most likely to find the program useful. Questionnaires that provided the most unexpected results were generally rated as being the most helpful.

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Table 1

Characteristics of subjects who had an alcohol use disorder as defined by the AUDIT compared to those who did not have an alcohol use disorder.

	Non-alcohol abusers	Alcohol abusers	
N	248	1207	
Percent male	54.5%	52.8%	
Age	35.5	34.8	
Age of first alcohol use	17.2	16.0	$p < 0.001$
Number of drinks per week	9.6	36.4	$p < 0.001$
Total perceived helpfulness	8.9	10.4	$p < 0.001$

Higher Helpfulness Ratings Are Associated With Greater Motivation

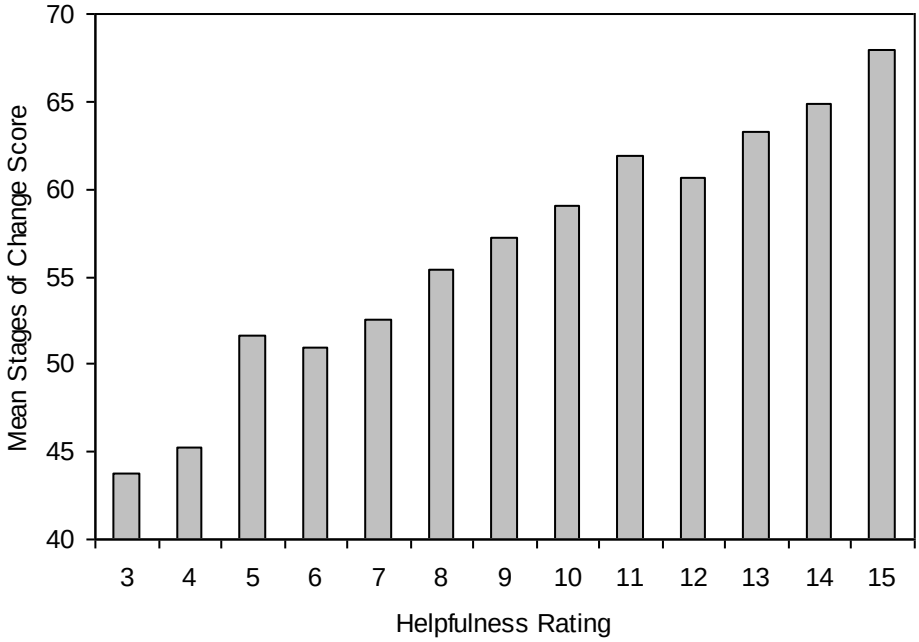

Figure 1. Subjects who reported higher levels of helpfulness of the three questionnaires were likely to have greater motivation for change as measured by the SOCRATES.

Unexpected Results Were Associated With Greater Helpfulness

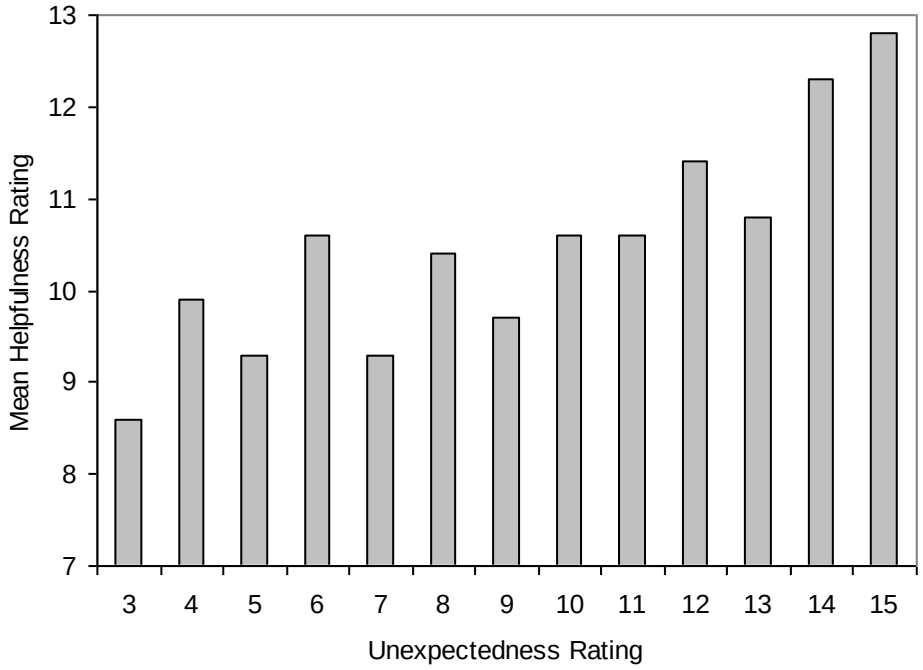

Figure 2. Providing subjects with information that was new to them, as measured by the unexpectedness rating of the feedback, led to greater levels of perceived helpfulness.