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An Automated Treatment For Jet Lag Delivered Via The Internet

Abstract

Seventy percent of individuals who suffer from psychiatric illness do not receive

treatment. Cost effective, automated treatment can be delivered via the Internet,

but can be complicated by the lack of professional supervision. This open study

piloted a fully automated, publicly available treatment for jet lag. Participants

were asked to rate their jet lag symptoms, and to rate how closely they followed a

light exposure schedule calculated to accelerate adaptation to a new time zone.

There was a significant negative correlation between how closely subjects

followed the light exposure schedules, and the severity of their jet lag symptoms.

Introduction

Seventy percent of Americans with mental health disorders do not receive

treatment (1). The use of computer-assisted therapy is one way of approaching

this problem. Applications designed to provide psychotherapy have been

developed for a number of conditions. Some are designed to run on stand-alone computers (2), while others have used the Internet to expand their reach (3). On-line therapy permits communication via email or other forms of message exchange (4), but does not necessarily reduce the amount of therapist time needed to treat a patient. Partially-automated interventions require less therapist involvement (5), while fully automated systems can be scaled to serve as many patients as desired (6). Although fully automated Internet-based programs have the greatest potential for expanding access, a major challenge is that they are unsupervised.

This report describes a fully automated treatment for jet lag, delivered over the Internet, that proposed to use a calculated schedule of exposure to bright light to reduce jet lag.

Jet lag occurs when an individual's circadian rhythms become desynchronized after a trip crossing several time zones. Common symptoms of jet lag include insomnia, fatigue, cognitive impairments, and negative mood states. Symptoms tend to peak one day after arrival, and then gradually diminish (7). Scheduled exposure to bright light can alleviate the symptoms of jet lag by accelerating adaptation to the new time zone (8). The effect of bright light on circadian rhythms varies by time of exposure, and phase response curves have been

obtained (9). In order to have an effect on circadian rhythms, the intensity of light must be at least 2500 lux. Indoor light in a room with shaded windows ranges from 100 to 500 lux. Outdoor light ranges from 5000 lux on a cloudy day to greater than 20,000 lux in bright sunlight. Therapeutic lamps provide 10,000 lux. In order to affect phase adaptation, exposure to outdoor light or a therapeutic lamp is required.

Method

The treatment program was posted to the Internet, and registered with the major search engines. Visitors to the web site were asked to enter six pieces of data about their trip: cities of origin and destination, and the dates and times of the outbound and return trips. Visitors did not enter their name, or any other identifying information. Individuals known to the investigators who were planning to travel overseas were requested to visit the web site. Most of the subjects who returned completed rating scales visited the web site as a result of such a request. No identifying information was collected, and data from subjects recruited directly was not distinguished from data sent in spontaneously.

Based on the trip data, a schedule of light exposure and avoidance was generated. Travelers were advised to spend as much time as possible outside or next to a

bright window during exposure times, and avoid exposure to daylight or wear sunglasses during avoidance times. Therapeutic lamps were not used.

Subjects were not paid for their participation, and none of the visitors to the web site were charged fees. The informed consent process, like the treatment itself, was fully automated. The automated informed consent process, as well as the other details of the study, were approved by the George Washington University Institutional Review Board.

Subjects were asked to periodically complete the Columbia Jet Lag Scale (7) to measure symptom severity. Subjects were also asked to rate how closely they followed the light schedule. There was no control condition. Data were collected between June, 2000 and January, 2001. Reported jet lag severity on day three of the trip was used for analysis. Day three was chosen for the analysis because it is the earliest day one can expect to see a robust effect of the intervention. Jet lag resolves rapidly after short trips, so selecting the earliest possible time to take a measurement allowed the inclusion of the maximum number of trips.

Results

4644 people accessed the program. Visitors accessed the site from countries on all continents except Antarctica. Twenty subjects returned completed study materials, most of whom had been directly solicited by the investigator. The average trip crossed eight time zones. Compliance was measured on a scale of zero to four, and averaged 2.5. Jet lag severity was also measured on a scale of zero to four, and averaged 1.3 on day three. Travelers who reported greater compliance with the intervention reported significantly less severe jet lag symptoms on day three (2-tailed Pearson correlation=-0.47, $p<0.01$). Controlling for the number of time zones crossed, the partial correlation coefficient was -0.41, $p=0.027$. The correlation between the number of time zones crossed and the compliance was not significant.

In order to help evaluate several possible explanations for the data, subjects were divided into two groups based on outcome, and the distribution of these groups was evaluated according to several different variables. The results are summarized in Table 1. Travelers who crossed greater than eight time zones reported more severe jet lag symptoms than those who crossed eight or fewer (chi-square(1)=4.3, $p<0.05$).

Discussion

This project was designed to highlight some of the issues involved in delivering treatment over the Internet. The management of jet lag was chosen because calculating a complex light exposure schedule is a task that is well suited to a computer. Furthermore, the risks associated with timed light exposure are minimal, so that it was possible for the IRB to approve a fully automated informed consent process, and freely available treatment, in the absence of professional supervision.

In addition to safety, the issue of confidentiality is central to the delivery of psychiatric interventions over the Internet (10). The Internet is a public medium, and inherently insecure. This problem was addressed simply and directly by avoiding all personal data.

No funds were spent on advertising or providing incentives to potential subjects, however most of the subjects who returned data were directly asked to use the web site. Over an eight month period, over 4600 individuals accessed the site, which suggests that interest can be generated by simply making a treatment publicly available. Because no identifying information was collected, it was not possible to contact subjects who did not return their completed scales. Only a small number of users spontaneously provided complete study materials, thereby introducing a potentially large selection bias. A program that automatically stored

clinical data as subjects interacted with it might be more successful in terms of data collection.

A significant negative correlation was found between the severity of jet lag symptoms on day three, and the reported level of compliance with the light exposure schedule. Because there was no control, this effect cannot be linked causally to the intervention. Those subjects who made the effort to adhere to the schedules might have expected diminished symptoms of jet lag, and been influenced by their expectation. Conversely, those subjects with less severe symptoms, might have rated their compliance higher than their actual behavior justified.

Conclusions

It is possible to use the Internet to treat jet lag in the absence of professional supervision. Future studies will need to continue to focus on privacy, confidentiality, and the ethical issues associated with fully automated, publicly available treatment.

	Good Outcome		Bad Outcome	
	N	%	N	%
Direction				
East	7	35%	3	30%
West	13	65%	7	70%
Time Zones				
<=8	12	60%	2	20%
>8	8	40%	8	80%
Season				
Fall/Winter	9	45%	4	40%
Spring/Summer	11	55%	6	60%
Relation to Home				
Outbound	10	50%	5	50%
Inbound	10	50%	5	50%
Compliance				
Low	7	35%	6	60%
High	13	65%	4	40%

Table 1: Outcomes organized by multiple variables.

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