

# Internet-Based Intervention for the Treatment of Online Addiction for College Students in China: A Pilot Study of the Healthy Online Self-Helping Center

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## Abstract

Internet addiction among college students has become a serious problem in China. This pilot study involved the development of an online expert system named Healthy Online Self-helping Center (HOSC) as an intervention tool to help those who wish to reduce online usage. The study also explored the effectiveness of HOSC for college students' Internet addiction behavior. Participants ( $N = 65$ ) were recruited from a university in Beijing, and were randomly assigned to one of four conditions: using HOSC within a laboratory environment, using HOSC within a natural environment, using a noninteractive program, and a control group. All the participants were asked to answer questionnaires at the baseline and at the 1-month follow-up. The questionnaires included the participants' online hours per week, the legitimate ratio of Internet usage, online satisfaction, and the Young's Diagnostic Questionnaire. The results revealed that HOSC under both natural and laboratory environments could effectively reduce the participants' online hours per week as well as their Young's Diagnostic Questionnaire score, and improve online satisfaction at a 1-month follow-up. Participants using a noninteractive program also had similar results. The article concludes with a discussion of the limitations of the study, as well as the implications of the findings and future research directions.

## Introduction

THE INTERNET HAS BECOME a necessity for college students in China. Along with the positive effects that the Internet has brought to people, the most outstanding negative effect is that some people have developed a dependence upon online activity. This phenomenon is most commonly called Internet addiction (IA), which is defined as the impulsive use and loss of control of online behaviors.<sup>1</sup> A numbers of surveys in China have found that over 10 percent of college students show some level of IA.<sup>2-4</sup> IA hampers college students' ability to study and can have a negative impact on their physical and psychological health as well as their interpersonal relationships.<sup>5-7</sup>

Western scholars have developed interventions for IA based on cognitive behavioral therapy.<sup>7-10</sup> Similar efforts have also been practiced in China.<sup>11,12</sup> Besides applying cognitive behavioral therapy treatments, Chinese psychologists also have developed trials to apply psychoanalytic group intervention,<sup>13</sup> family therapy,<sup>14</sup> sports exercise prescriptions,<sup>15</sup> and Naikan therapy.<sup>16</sup> All these intervention

methods involved face-to-face individual or group intervention, which required qualified counselors and subsequently resulted in high costs to human resources and limitations in service distribution. Given these challenges, the authors sought to create an innovative way to provide an IA intervention via the medium of the Internet to meet large-scale treatment needs.

The expert system (ES) is an integration of technology and therapy that has been widely applied and empirically tested in a variety of psychological disorders, such as depression,<sup>17</sup> anxiety,<sup>18</sup> social phobia,<sup>19</sup> post-traumatic stress disorders,<sup>20</sup> eating disorders,<sup>21</sup> drug abuse,<sup>22</sup> drinking behavior,<sup>23</sup> and smoking behavior.<sup>24</sup> ES interventions have a number of advantages over face-to-face treatments, including complete assessment, integration into existing interventions, adaptability to the larger population, simplicity of data retrieval, and cost effectiveness.<sup>25</sup>

However, there is currently no ES for IA intervention. The purpose of this study was to develop a cost-effective online IA intervention ES for college students and evaluate its

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effectiveness on reducing IA behavior. The hypotheses were that (1) ES intervention in a natural environment or laboratory environment will significantly decrease the participants' online hours per week as well as the degree of IA, (2) ES intervention will result in higher satisfaction with levels of Internet use compared to the control group, (3) a noninteractive intervention system will be less effective than the interactive system (ES).

## Methods

### Participants

Participants included 65 (45 women and 20 men) students from Beijing Normal University. Thirty-nine were undergraduate students (60 percent) and 26 were graduate students (40 percent). Their average number of online hours per week was 33.7 ( $SD=19.6$ ), and their average Young's Diagnostic Questionnaire (YDQ)<sup>1</sup> score was 4.3 ( $SD=1.6$ ). Ninety-one percent ( $n=59$ ) completed the 1-month follow-up.

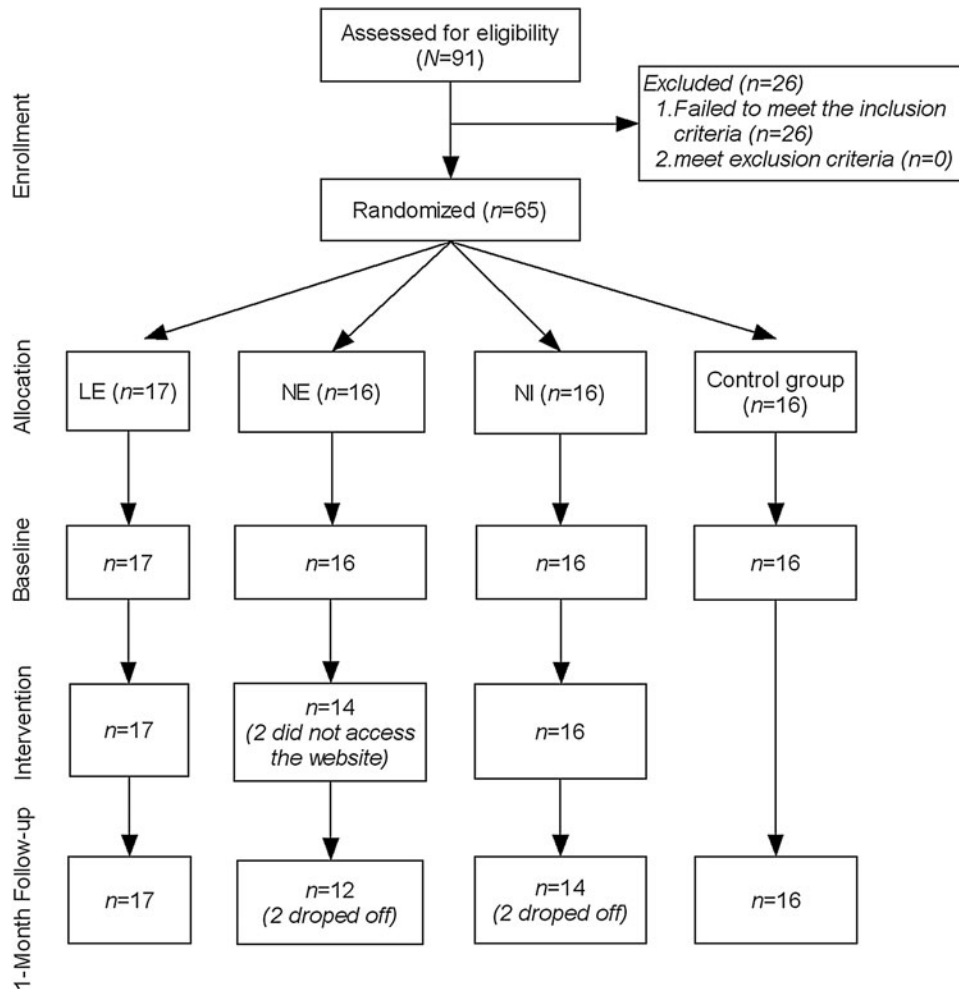
### Procedure

After gaining approval from the Institutional Review Board (IRB), the participants were recruited by distributing

posters on the campus of the university. There were 91 students who volunteered and were initially screened using YDQ and were all interviewed for appropriateness of this study. Participants were included when they met the following criteria: (1) IA with 5 or higher YDQ score,<sup>1</sup> or high risk Internet dependence with a 3–4 YDQ score,<sup>26</sup> and (2) being online for more than 14 hours per week, which was the average number of online hours per week from a sample of 1186 Chinese college students in our previous unpublished survey. Participants were excluded if they were taking any psychotropic medicine or accepting another psychological intervention for their Internet behavior.

Only 65 participants met the inclusion criteria and all of them agreed to participate in the study with informed consent. Participants were randomly assigned to four experimental conditions and took a baseline assessment before treatment (Fig. 1). The baseline measures were designed in a Web version and participants completed these measures on computers in the researchers' laboratory. At the 1-month follow-up, the researcher sent an SMS to participants to remind them to log in and complete the follow-up assessments on the Web site of online ES for IA.

The online ES for IA was named Healthy Online Self-helping Center (HOSC, [www.healthyonline.cn](http://www.healthyonline.cn)), and was based on



**FIG. 1.** Flow diagram of the participants. LE, participants using the expert system in laboratory environment; NE, participants using the expert system in natural environment; NI, participants using non-interactivity system.

Motivational Interviewing (MI)'s procedures and client-centered conversation style.<sup>27</sup> The HOsc has four modules:

1. *Ready to start.* The system welcomes a user's visit, gives an introduction of every station (module) of the journey, and gives instructions on how to use the system. The system invites the participant to register, fill in some relevant demographic information, and choose a nickname.
2. *Understanding myself.* The user is asked to fill in his/her number of hours per week spent online, the single longest period of time spend continuously online, main pursuits while being online, ratio of legitimate online usage, and the YDQ. After assessment, a feedback report is provided using bar charts and pie charts. In the report, the user's data are compared with the norm of the usage by those of the same age and gender in China (Fig. 2).<sup>28</sup> The ES also provides data on how long the user has spent online and its corresponding time of unreasonable usage in the past half year and converts it into the number of days (and working days). It then asks the participants to describe the pros and cons of his/her online activity. Ultimately, the system presents a decisional balance form regarding the participant's online activity.
3. *Goal of change.* This module begins by displaying a ruler indicating the user's readiness to change. The user move a marker on the ruler to indicate his/her level of readiness to change. If the participant is not prepared to change at all, he/she is given the option of exiting the program. If the participant is not ready to change or unsure to change, the program lets the user complete the decisional balance exercise for the second time and then reports his/her level of readiness again. If the user is ready to change or has already taken steps toward change, the system skips the second exercise and goes

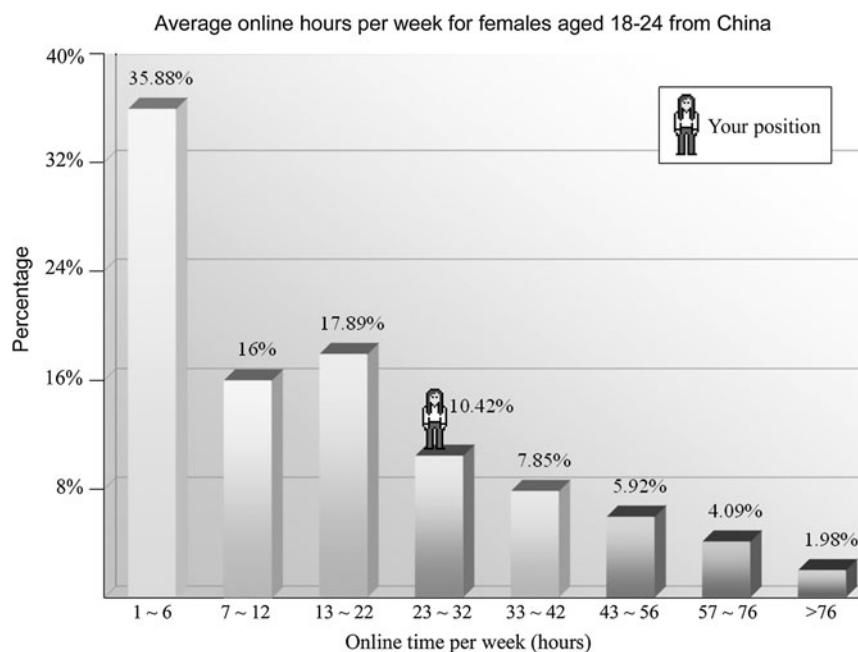
to the goal of change negotiation directly. The decisional balance exercise results in a crosstabulation that contrasts the arguments for and against change and encourages the user's thinking as to whether to change based on the arguments of both sides. After the exercise, if the user is still not ready to change or unsure, the program ends the intervention. In the goal setting section, the user is asked to fill in his/her expected online hours, online activities, and legitimacy ratio, and generate a feasibility report. Once the goal of change has been set, the system calculates the time benefit this change could bring to the participant and ask about his/her confidence of making the change.

4. *Methods of change.* The system first asks about the user's experience of change in the past and if it produced any positive results. The system offers five cognitive-behavioral methods of change for the user to study and practice: (1) adjusting irrational cognitions, (2) creating an online plan, (3) resisting Internet temptation, (4) using reminder cards, and (5) accessing support resources. Besides the above cognitive-behavioral methods, a user can also add their own methods of change. The system lets the user choose his/her next step of change, to learn to evaluate the change, to devise a self-incentive plan, and to learn how to prevent relapse. Finally, the system again asks for the user's confidence in change.

Once a user finishes any of the four modules, individualized reports can be reviewed by the user on a separate screen called the Navigation Center.

*Experimental conditions*

The participants ( $n = 65$ ) were randomly assigned to one of the following four conditions using Latin Square sequences



The time you spent online are more than 73.73% of the people who has the same gender and age with you.

FIG. 2. Example feedback on the online hours per week.

(ABCD,BCDA,CDAB,DABC) based on their order of enrollment.

1. *ES laboratory environment group (LE)*. The participants used the HOSC under laboratory conditions in one session.
2. *ES natural environment group (NE)*. The participants were provided with a registration code and used the HOSC in their own setting (e.g., home or dormitory); they were requested to visit the ES online within 1 week.
3. *Noninteractive group (NI)*. The participants used a non-interactive system under the laboratory conditions in one session; the system is a modified version of the interactive HOSC. It was the same with HOSC in the registration, program interface, operation, and contents of modules except the interactive function, so it provides all possible feedback instead of tailored feedback to the participants.
4. *Control group*. The participants received no intervention during the study, but were given the HOSC intervention after the 1-month follow-up.

## Measures

### Baseline measures.

1. *Online hours per week*. The participants were asked to estimate online hours on each day of the week, averaged over the past month. The sum of online hours each day of the week reported was calculated as the average total online hours per week.
2. *Online satisfaction*. It is a subjective estimation of the participant's satisfaction of his/her Internet usage based on a five-point Likert scale (1 = extremely unsatisfied, 2 = unsatisfied, 3 = general, 4 = satisfied, 5 = extremely satisfied).
3. *Young's Diagnostic Questionnaire*.<sup>25</sup> YDQ was developed by Young, which includes eight "yes" or "no" questions to screen for IA. In this study, the Cronbach  $\alpha$  is 0.70, and the coefficient of test-retest reliability is 0.82.

**Follow-up measures.** The measures were the same as baseline. At baseline, the online behavior of IA was evaluated by the number of hours per week spent online. However, this index may be not sensitive enough because addictive online

behavior often can be masked by legitimate business and personal use.<sup>29</sup> In addition, the *legitimate ratio of Internet usage* was added into the follow-up assessment packet as a new outcome measure, whereby the participants were asked to estimate the percentage of legitimate or rational online usage in the past week.

### Data analysis

Treatment completer (nonintention-to-treat) analysis was employed. Since the size of sample in each group was small, nonparametric tests were more appropriate for data analysis. The effect size (Cohen's  $d$ ) was used to compare different intervention results among different groups.

## Results

### Baseline characteristics

The participants' demographic characteristics and Internet usage variables at baseline are listed in Table 1.

There was a significant difference in gender ratio among groups ( $p < 0.05$ ), but no statistical difference in online hours per week ( $p = 0.08$ ), YDQ scores ( $p = 0.51$ ), or online satisfaction ( $p = 0.46$ ). Therefore, the results indicate some difference in gender.

Since there were six participants who dropped out during the research (two men and two women dropped out of the NE group; two women dropped out of the NI group), the homogeneity in the baseline measures was tested again. No significant difference was found in gender ratio ( $p = 0.06$ ), online hours per week ( $p = 0.19$ ), YDQ scores ( $p = 0.50$ ), or online satisfaction ( $p = 0.32$ ) among groups. Using treatment completer analysis, the data at baseline and at follow-up for subjects are shown in Table 2.

### Outcome of intervention

The LE and NE groups spent an average of 28.5 minutes (range 14–62) to finish the program, whereas the NI group only spent 15.6 minutes in average (range 7–30). They had the option to finish at one time, just like all the participants did in LE group, or finish in a few days in some cases in the NE. For some users, the time was rather short, because they only participated in the first two modules since they were not ready to change their behaviors (1 out of 17 from LE group

TABLE 1. BASELINE DEMOGRAPHIC CHARACTERISTICS AND INTERNET USAGE VARIABLES BY CONDITION (MEAN  $\pm$  SD)

Variables	Conditions				$\chi^2$	
	LE (n = 17)	NE (n = 16)	NI (n = 16)	Control group (n = 16)		
Gender	Male (n)	7	8	4	8.41 <sup>*a</sup>	
	Female (n)	10	8	12		
Internet usage	Online hour/week	36.91 $\pm$ 21.67	32.25 $\pm$ 15.94	25.16 $\pm$ 18.61	40.49 $\pm$ 19.89	6.74 <sup>b</sup>
	YDQ score	4.12 $\pm$ 1.73	4.06 $\pm$ 1.61	4.31 $\pm$ 1.45	4.81 $\pm$ 1.64	2.31 <sup>b</sup>
	Online satisfaction	2.65 $\pm$ 0.93	2.25 $\pm$ 0.86	2.19 $\pm$ 0.98	2.38 $\pm$ 0.96	2.57 <sup>b</sup>

LE, participants using the expert system in laboratory environment; NE, participants using the expert system in natural environment; NI, participants using noninteractivity system; YDQ, Young's Diagnostic Questionnaire.

<sup>a</sup> $\chi^2$  test.

<sup>b</sup>Nonparametric Kruskal-Wallis  $H$ -test.

\* $p < 0.05$ .

TABLE 2. DIFFERENCES BETWEEN BASELINE AND FOLLOW-UP OF EACH CONDITION (MEAN  $\pm$  SD)

Variables		Conditions			
		LE (n = 17)	NE (n = 12)	NI (n = 14)	Control group (n = 16)
Online hour/week	Baseline	36.91 $\pm$ 21.67	30.83 $\pm$ 16.11	26.82 $\pm$ 19.36	40.49 $\pm$ 19.89
	Follow-up	21.00 $\pm$ 13.55	18.25 $\pm$ 10.68	15.21 $\pm$ 10.02	31.78 $\pm$ 13.88
	Wilcoxon test (z)	3.47**	2.82**	2.98**	2.74**
	Effect size (d)	-0.88	-0.92	-0.75	-0.51
Legitimate ratio percent	Baseline	—	—	—	—
	Follow-up	65.00 $\pm$ 15.61	58.92 $\pm$ 25.79	57.71 $\pm$ 19.85	35.50 $\pm$ 21.24
Online satisfaction	Baseline	2.65 $\pm$ 0.93	2.25 $\pm$ 0.87	2.07 $\pm$ 1.00	2.38 $\pm$ 0.96
	Follow-up	3.59 $\pm$ 0.71	3.33 $\pm$ 0.89	3.29 $\pm$ 0.83	2.56 $\pm$ 0.89
	Wilcoxon test (z)	-2.56*	-2.75**	-3.02**	-0.91
	Effect size (d)	1.14	1.23	1.33	0.19
YDQ score	Baseline	4.12 $\pm$ 1.73	4.08 $\pm$ 1.38	4.50 $\pm$ 1.45	4.81 $\pm$ 1.64
	Follow-up	2.88 $\pm$ 1.27	2.67 $\pm$ 2.06	3.14 $\pm$ 2.25	5.25 $\pm$ 1.48
	Wilcoxon test (z)	2.18*	2.58**	2.44*	1.27
	Effect size (d)	-0.82	-0.80	-0.72	0.28

\* $p < 0.05$ ; \*\* $p < 0.01$ .

and 4 out of 14 from NE group). All the participants in the NI group finished the whole program.

At the 1-month follow-up, each group's online hours per week was decreased significantly when compared with the baseline (Table 2). Compared with the baseline, all three intervention groups' YDQ score at follow-up was significantly decreased, and the online satisfaction was greatly improved. Respective changes in the control group were not statistically significant.

Since the data of legitimate ratio of Internet usage were only collected at the follow-up, the Kruskal-Wallis test was used to compare the four groups' differences. The results showed that there was significant difference among the four groups ( $\chi^2 = 14.11$ ,  $p < 0.01$ ). Least-significant difference tests revealed that all three intervention groups' legitimate ratio of Internet usage at the follow-up were all significantly higher than the control group ( $p < 0.01$ ), but the three intervention groups had no significant differences compared to each other ( $p > 0.05$ ). The same results were also found in online hours per week, online satisfaction, and YDQ scores at follow-up.

To evaluate if the degree of change at follow-up was associated with the participants' level of IA, we combined the two ES groups ( $n = 31$ ) and calculated the Pearson correlation between the number of hours per week spent online at baseline and its amount of change at follow-up, and found a significant correlation ( $r = 0.79$ ,  $p < 0.01$ ). This result indicated that the longer the online hours per week at baseline, the larger the amount of change that occurred after ES intervention. Similar results were also found in the YDQ score ( $r = 0.53$ ,  $p < 0.01$ ), which indicated that the higher the degree of IA at baseline the larger amount of change that occurred after intervention.

According to Cohen's criterion of the effect size (0.2 is small, 0.5 is moderate, and 0.8 is large),<sup>30</sup> both ES groups had large changes at follow-up regarding their online hours per week and were larger than that of the NI group. Further, the NI group was larger than the control group. The effect size of YDQ score of both ES groups was larger than the NI group and the effect size of online satisfaction of the NI group was larger than the two ES groups.

## Discussion

This study represents one of the first efforts to utilize an online ES to intervene with IA. Although the HOSC's intervention time was relatively short ( $\sim 30$  minutes), it obtained significant results. First, the HOSC is a standardized procedure that gives immediate feedback. Second, the ES's design was based on MI's counseling style, which enabled easier acceptance of information and feedback for the participants. Finally, the HOSC is designed to meet the participant's level of readiness for change.

This research attempted to discover if there is any significant difference between using the ES within the laboratory environment when compared with usage in a natural environment. By tracing intervention results, both ES groups had significant intervention effects for online hours per week, YDQ score, and online satisfaction. Further, the effect size of both ES groups was larger than those of the control group. The NE and LE group also had significantly higher legitimate ratio of Internet usage than the control group at the 1-month follow-up. However, compared with LE condition, the NE group had a higher drop-out rate (4/16 vs. 0/17), and more participants who were not prepared to change (4 vs. 1) as indicated in the ES. Thus, the participants using the ES in the laboratory may have more involvement with the intervention.

This study also evaluated the effectiveness of the interactive and noninteractive system. Unexpectedly, the NI group showed a middle level of effect size in online hours per week and YDQ score ( $d = -0.72$  to  $-0.75$ ) at the 1-month follow-up and a high level of effect size on online satisfaction ( $d = 1.33$ ), as displayed in Table 2. One possible explanation is that the noninteractive system provided a self-appraisal method and a norm that presented every question and its corresponding feedback beforehand to substitute for the personalized feedback in the ES. Another possible reason is that the tracing period of the study was rather short (1 month only) and the interactive system may need more time to show its actual effects.

In the study, we employed a new index of legitimate ratio of Internet usage, which was demonstrated to be more

sensitive than online hours per week in evaluating the health of online behavior. For example, although the control group and the other three intervention groups all decreased their numbers of online hours per week at follow-up, only the intervention groups improved their legitimate ratio of Internet usage.

One criticism of using the Internet to treat IA is that it is akin to treating an alcoholic in a brewery.<sup>31</sup> In response to this criticism, there is a crucial difference in therapeutic goals of IA and alcohol abuse. Total abstinence is usually recommended for recovery from substance abuse, whereas moderate and manageable use is often the goal for behavioral addictions.<sup>32</sup> Such goals have shown to be effective in treatment of pathological gambling.<sup>33</sup> Second, the Internet is an all-embracing technology that includes either rational or irrational applications. In general, people with IA obsess on only some applications of the Internet (for instance, online games). Finally, the online intervention in this study has demonstrated its effectiveness with many unique advantages compared with traditional intervention, specifically, the availability and cost-effectiveness. The ES is an online service that has no restriction on time, access, or location and has no limitation on participant numbers. Users could easily and conveniently access it by just going online.

The results of our study indicate that the online ES could act as an alternative to traditional intervention methods, especially given that more specialized IA interventions in China are scarce.

#### Limitations

One limitation of this study is that participants volunteered. Almost all the participants' addiction level was not high, and some of them already had a certain level of motivation for change. Therefore, the system may have limitations when it is promoted among the population with a high degree of addiction and a low willingness to change. Because of the small sample size, the four baseline groups were not very well matched for gender. Additionally, there were more female participants (69 percent) than male participants; one reason for this may be that our participants were from one school where female students are in the majority (60–70 percent of all students). This phenomenon may also indicate that female students were more willing to participate in the intervention than male students. No matter what the reason, caution needs to be used when generalizing the results to all college students. Finally, we did not evaluate the system's long-term effect. Future research can test for the long-term effectiveness of change with the ES system.

#### Future research directions

Future research directions in the area of utilization of ES for the treatment of IA will likely include testing each module's effectiveness. In addition, it is also helpful to include covariate variables in the study and analyze their influence to the intervention outcomes, such as the completion of modules, the frequency of logging into the system, the amount of time visiting the system, and the individual's preferences on the ES.

One possible addition to the system may be the inclusion of a qualified professional who could be available through the HOSC system to offer consultation with a real person online, or in person if needed. This addition could provide a valuable

supplement to the overall system and offer a graded approach to intervention for those clients who may benefit from a more direct relationship with a professional.

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#### Disclosure Statement

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