

Effectiveness of a Computer-Based Interactive Eating Disorders Prevention Program at Long-Term Follow-Up

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Computer-based delivery of health-related psychoeducational programming is increasingly popular. In the present study, 72 non-symptomatic undergraduate women were randomized to an Internet-based prevention program for eating disorders with or without accompanying discussion groups, or a control group. Sixty-one of the women (84%) completed the Student Bodies program, and were assessed at short and eight–nine month follow-up. Participation in the program resulted in better outcomes across all groups compared to controls, and women in the unmoderated discussion group appeared to have the most reduction in risk. Benefits of the program continued at follow-up. Decrease in risk also was associated with time spent using the Internet-based program. The present study suggests that the use of Student Bodies may reduce risk of eating and body image concerns over the long term, and that moderation of discussion groups may not be essential for successful outcomes. Further research on larger samples will help determine the degree to which discussion groups or the Student Bodies program alone are effective.

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Weight and body image concerns are endemic in college women, and have been linked to subclinical and clinical eating disorders (Killen et al., 1996). Estimates of the prevalence of bulimia nervosa range from 1–2%, and sub-clinical eating concerns are estimated to effect up to a quarter of adolescent women (Fairburn & Beglin, 1990; Hart & Kenny, 1997). A variety of risk factors has been identified, including internalization of the media-defined thin ideal (Thompson & Stice, 2001; Low, Charansomboon, Brown, Hiltunen, Long, & Reinhalter, 2003), weight concerns, poor body image (Stice & Shaw, 2004), and peer-induced pressure to diet (Leon, Fulkerson, Perry, & Early-Zald, 1995). Up to 25% of college-aged women are believed to be at risk for developing eating disorders (Drewnowski, Yee, Kurth, & Krahn, 1994), and the transition to college appears to be a particularly high-risk time (Schwitzer, Bergholz, Dore, & Salimi, 1998).

Prevention strategies for weight-preoccupied women include cognitive dissonance prevention programs (Stice, Mazotti, Weibel, & Agras, 2000; Stice & Shaw, 2004), psychoeducational groups (Kaminski & McNamara, 1996), and computer-based psychoeducation (Winzelberg, Taylor, Sharpe, Eldrege, Dev, & Constantinou, 1998). In addition, recent research suggests that interactive computer-based interventions may be effective in preventing eating concerns in young women regardless of risk (Abascal, Brown, Winzelberg, Dev, & Taylor, 2003; Luce, Winzelberg, Zabinski, & Osborne, 2003; Walstrom, 2000; Winzelberg, et al., 1998; Winzelberg, Eppstein, Eldredge, Wilfley, Dasmahapatra, Dev, & Taylor, 2000; Zabinski, Celio, Jacobs, Manwaring, & Wilfley, 2003).

Computer-assisted health interventions of all kinds have become increasingly popular because they are low cost and easy to access. They also offer a unique opportunity for program evaluation and online data collection (Abascal et al., 2003; Luce et al., 2003; Taylor, Jobson, Winzelberg, & Abascal, 2002). Previous studies suggest that both psychoeducational interventions and assessments may be delivered online (e.g., Talbot Nix, Ibanez, D'Agostin, Strobino, & Williams, 1999; Taylor et al., 2002; Taylor & Luce, 2003), and that technology-based therapy for the prevention of eating disorders may be effective (Fairburn & Carter, 1996; Celio, Winzelberg, Wilfley, Eppstein-Herald, Springer, Dev, & Taylor, 2000; Zabinski, Wilfley, Pung, Winzelberg, Eldredge, & Taylor, 2001; Zabinski et al., 2003). Computer-based interventions deliver programming in the privacy of a home or dormitory room, are highly accessible, may be individually tailored, and may minimize stigma related to seeking help (Taylor & Luce, 2003). For example, both Robinson and Serfaty (2003) and Finfgeld (2000) posit that the availability of Internet-based therapy for eating disorders may increase the likelihood of patients seeking treatment.

Self-help therapies delivered online appear to be effective, but less is known about the impact of specific aspects of these Internet-based prevention programs. Many prevention programs have been accompanied

by clinically-moderated online synchronous or asynchronous discussion groups. The degree to which an eating and body image intervention like *Student Bodies* (Winzelberg et al., 2000) requires clinical moderation and discussion groups to be effective is unknown, however, as previous trials of the program have always been accompanied by such groups. Recent research indicates that Internet chat rooms may be effective in delivering cognitive-behavioral therapy for eating concerns, but whether or not the group interaction contributes to improvements is similarly unknown (Zabinski et al., 2001; Zabinski et al., 2003). Several researchers have raised questions about the potential risks inherent in online interactions between women with eating disorders such as the potential for groups to reinforce restrictive or disordered eating patterns, threats to privacy, and difficulties managing crises (Walstrom, 2000; Robinson & Serfaty, 2003; Zabinski et al., 2003). For this reason, and based on the assumption that moderated groups are more effective than unmediated groups, many interventions include mental health professionals for clinical oversight. However, such groups are more expensive to run (mainly because of therapist time) than unmediated or unmonitored groups. Programs with no online groups have a further advantage of not introducing the risk inherent in online interactions.

The present study was a randomized trial of the *Student Bodies* web-based computer program exploring the effectiveness of the program with and without clinically moderated discussion groups in healthy college students. Previous research has not tested the effectiveness of the program without clinical moderation. In addition, volunteers were assessed at long term follow-up (greater than eight months) in order to determine the effects of the *Student Bodies* intervention over time.

METHOD

Participants

Participants were 72 first and second year female students enrolled in a private, liberal arts college in the northeast and recruited through e-mail announcements. The women were invited to participate in an online program designed to “deliver information about nutrition, exercise, and diet, and improve body image.” Students of color made up 8.4% of volunteers. Participants received \$40 for completing assessments at all three times. Women with previous diagnoses of eating disorders or who were currently purging were ineligible for the study. The participants’ baseline scores on a variety of eating and body image scores were average relative to other college samples (Garner & Olmsted, 1984). The research was reviewed and approved by the host institution’s Institutional Review Board, and was carried out according to APA ethical standards.

Student Bodies

Student Bodies is a web-based computer program designed to address body image concerns, weight, exercise, nutrition, and other issues related to risk for eating disorders. The program, which consists of tailored, interactive sessions delivered over eight weeks and a follow-up session, has been described in detail elsewhere (see Winzelberg et al., 1998; Winzelberg et al., 2000), and is based on cognitive-behavioral body image interventions similar to those developed by Cash (Cash, 1991). *Student Bodies* begins by addressing risk factors for eating disorders. The program incorporates text, audio, online journals, self-assessments, and behavioral assignments. Each session is geared toward improving body image. Topics include media influences on body image, nutrition, exercise, and cognitive-behavioral strategies for decreasing body dissatisfaction. Typically, the program is accompanied by an asynchronous online discussion group with clinical moderators. Moderators oversee the online discussion, respond to topics or posts, make observations, or correct misinformation. The content of messages ranges from observations about media, to dieting, to critiques of the program.

Participants are asked to post responses to the weekly program for the discussion group, and may use the group for support, feedback, or additional information. Individual activity can be monitored by the program administrators.

Measures

Dependent variables were standardized measures of eating disorders and body image. The Eating Disorders Inventory (EDI; Garner & Olmsted, 1984), and in particular, raw scores for the Drive for Thinness (EDI-DT), Bulimia (EDI-B), and Body Dissatisfaction (EDI-BD) subscales were used to assess body image concerns. Internal consistency for these scales is high (Cronbach's alphas ranging from .65 to .95) (Winzelberg et al., 1998), and their validity in college women is acceptable (Shoemaker, van Strien, & van der Staak, 1999). Further, the EDI has been widely used to assess outcomes in prevention programs (Winzelberg et al., 2004). The Weight and Shape Concerns Scale (WSC; Killen et al., 1994) is a five-item measure used to assess fears about weight and body image. It is correlated with EDI scores, has a test-retest reliability of .85, and demonstrates good predictive validity (Celio et al., 2000; Killen, Taylor, Hayward, Haydel, & Wilson, 1994). The Stunkard Figure Rating Scale (Stunkard, Sorensen, & Schulsinger, 1983), an assessment involving self-evaluation using silhouettes in which a high score indicates more discrepancy between a self-identified image and an ideal, also was used. The Stunkard approach has reasonable reliability and validity in college samples (Stunkard, Sorensen, & Schulsinger, 1983). In addition, The Sociocultural Attitudes Toward Appearance Questionnaire

(SATAQ)'s Internalization and Awareness Subscales (Heinberg, Thompson, & Stormer, 1995) was incorporated to measure the degree to which the thin ideal had been internalized. High scores indicate more awareness and/or internalization; the measure's internal consistency has been historically high (alphas ranging from .71 to .92) (Heinberg et al., 1995). Other variables of interest included body mass index (BMI) and variables related to utilization of the program (frequency and duration of log ins).

Procedure

Participants gave informed consent and were administered baseline questionnaires in November or December, 2001; they were instructed to begin the program in early January. Post-intervention questionnaires were administered in February and March of 2002, and long-term follow-up assessment occurred the following October through December, at least eight months later. After baseline assessment, women were randomized into four groups: *Student Bodies* with a clinically moderated discussion group; *Student Bodies* with an unmoderated discussion group; *Student Bodies* with no discussion group; and a control group. The moderator for the discussion group was a clinical psychologist, who in addition, monitored the discussion-alone condition to insure that participants' contributions were appropriate. In both discussion conditions, the program invites participants to read messages from other group members, and to select message options that suggest they want feedback, are posting a "success story," or are "just sharing."

At long-term follow-up, data were available for 61 (84.7% of the original participants) compliant respondents. Of the 72 original participants, there were seven non-compliers (9.7%) who never logged on to the program, and who were excluded from analyses. Non-compliers tended to have larger BMIs and more self-reported eating issues than compliers, although the differences were not significant given the small N . An additional four participants could not be located at long-term follow-up, resulting in a 6% attrition rate. Both groups were considered "non-completers." There were no significant differences in attrition rates by condition. Intention-to-treat analyses were run separately, using baseline measures in place of missing post-treatment or follow up data.

Analyses Related to Non-Completers

Non-completers were the 11 participants who either failed to complete assessments at short- or long-term follow-up, or who never logged on to the program. MANOVA comparing completers to those who were non-compliant was significant (Hotelling's $T = .84$, $F(10,60) = 3.7$, $p = .001$). Although univariate analyses suggested that non-completers only had significantly higher perfectionism scores on the EDI subscales at baseline, drop outs tended to report more concerns on every eating and body image

dimension, and were slightly heavier than the completers. The proportion of non-completers in each condition was not significantly different. Analyses reported below are for the 61 respondents for whom there were complete data.

RESULTS

Baseline comparisons of participants in the four groups revealed no significant differences in weight, shape, or eating-related variables between women in the randomly assigned conditions, although controls tended to be somewhat higher on a eating and body image measures.

Completer Analyses

A three (pre, post, and long-term follow-up) by four (condition) repeated measures analysis of variance on selected eating and body image variables was run to test for differences between groups over time (see Table 1). For EDI-DT, Drive for Thinness (DT), there were no main effects of time ($F(2,59) = .095, p = .91$) or group ($F(3,58) = 1.6, p = .19$), and the group by time interaction was also non-significant ($F(3,58) = .91, p = .49$). On the

TABLE 1 Means by Group Over Time (N = 61, all completers)

	Time 1	Time 2	Time 3 (8–9 months)
Controls (<i>N</i> = 14)			
EDI-DT	4.0(5.6)	5.0(4.6)	5.5(5.7)
EDI-B	1.2(1.6)	1.1(1.0)	2.0(1.9)
EDI-BD	9.4(8.0)	7.9(8.2)	9.4(7.8) ^c
WSC	37.0(22.3)	41.8(22.8)	43.2(21.1) ^d
Moderated Discussion (<i>N</i> = 14)			
EDI-DT	2.5(6.0)	2.0(2.0)	2.3(5.6)
EDI-B	1.4(4.2) ^a	1.7(1.7)	.46(1.9) ^a
EDI-BD	8.1(6.8)	7.6(7.6)	7.0(4.9)
WSC	33.8(22.4)	32.2(33.8)	29.9(23.1)
Unmoderated Discussion (<i>N</i> = 19)			
EDI-DT	2.3(3.4)	2.3(2.3)	1.2(1.5)
EDI-B	1.4(2.2) ^b	.85(.86)	.42(.84) ^b
EDI-BD	7.9(6.4)	5.9(5.9)	5.2(4.2) ^c
WSC	29.5(16.6)	28.5(29.3)	27.5(14.5) ^d
Program Alone (<i>N</i> = 14)			
EDI-DT	4.0(5.0)	3.7(3.6)	3.7(4.6)
EDI-B	1.2(1.5)	.47(.53)	1.3(1.6)
EDI-BD	9.0(6.7)	7.1(7.1)	6.3(7.8)
WSC	38.3(17.0)	38.2(26.7)	34.6(16.7)

Note: ^{a-d} designate significant pairwise comparisons, $p < .05$.

bulimia subscale (EDI-2), main effects were again, non-significant, but there was a significant group by time interaction ($F(3,58) = 2.5, p = .025$), in the direction of controls increasing bulimia scores over time, while other groups remained the same or decreased in self-reported bulimia. On the body dissatisfaction subscale of the EDI, there was a significant main effect for time ($F(2,59) = 7.6, p = .001$) in the direction of body concerns decreasing across all groups over time, but there were no significant effects of group and a non-significant group by time interaction. In addition, the group by time interaction was not significant for Weight-Shape Scores (WSC) ($F(3,58) = .9, p = .49$).

To assess outcomes at follow-up, analyses of eating and body image variables by group assignment at follow-up (Time 3) were carried out controlling for baseline scores (see Figure 1 and Table 1). On Drive for Thinness, there was a marginal effect of group ($F(1,60) = 2.6, p = .068$) after controlling for baseline DT scores. Post hoc testing suggested no significant pairwise differences between groups at follow-up, although the control group tended to be higher than the intervention groups on DT. There were no significant main effects of group assignment on the EDI Bulimic subscale at follow-up ($F(1,60) = 1.01, p = .36$). Group assignment did, however, have a significant effect on the EDI Body Dissatisfaction subscale scores at time 3 ($F(1,60) = 2.8, p = .05$), after controlling for baseline BD scores. Post hoc tests revealed

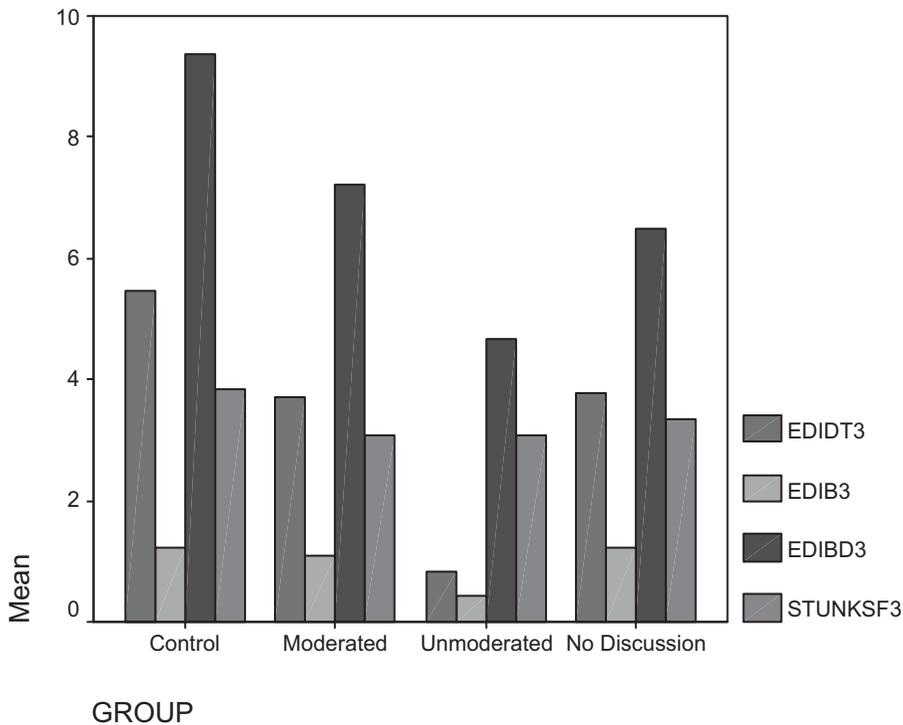


FIGURE 1 EDI and Stunkard Scores at Long-Term Follow-Up by Group.

that the unmoderated discussion group had significantly lower BD scores than controls ($p = .045$). For Weight and Shape Concerns, there was a main effect for group ($F(1,60) = 5.3, p = .026$) after controlling for baseline WSC scores. Post hoc analyses suggest that, in this case, controls also were higher on WSC than the unmoderated discussion group ($p = .045$).

Because differences between the three groups receiving the *Student Bodies* intervention were predictably modest, the three intervention groups were collapsed, and a two (intervention versus control) by three (pre, post, and follow-up) split-plot analysis of variance was run (see Table 2). For the EDI-DT scale, there was a marginally significant group by time interaction ($F(2,59) = 3.1, p = .072$), and a significant effect of group ($F(1,60) = 3.7, p = .05$). Post hoc analyses suggest that the treatment group had significantly lower DT at Times 2 and 3 than controls. In contrast, there was no significant group by time interaction for the Bulimia subtest of the EDI ($F(2,59) = .05, p = .81$). For the EDI-BD scale, the group by time interaction was again significant ($F(2,59) = 3.3, p = .05$). In addition, there was a main effect of time on BD scores ($F = 4.6, p = .015$). Post hoc analyses suggest that BD scores decreased significantly across the three assessments in the treatment group ($F(2,59) = 8.2, p = .001$), but not in the controls ($F(2,59) = 2.9, p = .12$). Similar analyses of WSC scores revealed a significant group by time interaction ($F(1,60) = 3.2, p = .05$). Pairwise comparisons of means suggest that WSC concerns increased in the control group from Time 1 to Time 2 ($p < .05$), but remained the same in the treatment group.

TABLE 2 Changes in Eating and Body Image Variables Over Time across All Treatment Groups (N = 47) Compared to Controls (N = 14)

Variable	Time 1 Baseline X(SD)	Time 2 Post Intervention X(SD)	Time 3 8–9 Month FU X(SD)	F Group × Time
EDI-DT				
Treatment	3.00(5.1)	2.69(3.7) ^d	2.35(4.4) ^f	3.1
Controls	4.10(5.6)	5.00(4.6) ^d	5.46(5.9) ^f	
EDI-B				
Treatment	1.23(2.8)	.95(1.9)	.74(2.1)	.69
Control	1.15(1.6)	1.15(2.0)	2.01(1.9)	
EDI-BD				
Treatment	8.12(6.7) ^a	6.61(5.4) ^{a, c}	5.84(5.7) ^{c, g}	3.3*
Control	9.38(8.0)	7.9(8.2)	9.38(7.8) ^g	
WSC				
Treatment	36.07(19.5)	33.38(17.9) ^e	32.8(18.5) ^h	3.2*
Control	37.07(22.3) ^b	41.78(24.5) ^{b, e}	43.20(21.1) ^h	
BMI				
Treatment	21.64(2.6)	21.54(2.2)	21.45(2.0)	NS
Control	22.93(1.3)	22.62(1.7)	22.69(1.9)	

Note: * $p < .05$; ^{a-g} denote significant pairwise comparisons at $p < .05$.

Stunkard figure ratings and SATAQ subscales were administered at baseline and long-term follow-up only. Two by two repeated measures analysis of time by treatment vs. control groups for Stunkard ratings produced a significant time by group interaction ($F(1,60) = 6.5, p = .013$) and a marginally significant main effect for group ($F(1,60) = 3.1, p = .08$). Stunkard discrepancy scores increased over time in the control group, and decreased in the treatment group. Pairwise between group comparisons were significant at Time 2 and Time 3, with controls having more discrepant body image ratings than those in the treatment conditions. There were no between group differences in SATAQ subscale scores at long-term follow-up, nor did SATAQ subscale scores change over time.

Intention-to-Treat Analyses

Intention-to-treat analyses were carried out entering baseline scores for missing data for non-completers. At long-term follow-up, there was a main effect for group on Drive for Thinness ($F(1,70) = 3.0, p = .036$), and a marginal effect on WSC ($F(1,70) = 2.2, p = .089$) and Stunkard ratings ($F(91, 70) = 2.4, p = .069$). As in completer analyses, post hoc analyses resulted in the unmoderated discussion group being significantly different from the control groups in each case.

Compliance and Outcomes

Finally, the relationship between time spent on the program and change in eating and body image concerns over the 8–9 month period following the program was explored correlationally. Table 3 summarizes these relationships. On average, women assigned to the intervention spent 241.4 ($SD = 172.06$) minutes logged on to the program over eight weeks. Treatment condition had no effect on use of the program or number of log ins. Overall, time spent using the *Student Bodies* program was significantly correlated

TABLE 3 Correlations between Change in Eating and Body Image Variables and Use of the Program (N = 61)

Variable	1	2	3	4	5	6	7
1. Total Time	—	.84**	.25*	.15	.09	.27*	-.09
2. Number of Log Ins	—	—	.001	-.07	-.02	.13	.00
3. Change in DT	—	—	—	.38*	.34*	.48**	-.14
4. Change in BD	—	—	—	—	.14	.29*	.40**
5. Change in Stunkard	—	—	—	—	—	.28	.07
6. Change in WSC	—	—	—	—	—	—	-.11
7. Change in Internalization Score	—	—	—	—	—	—	—

Note: DT = EDI Drive for Thinness Subscale, BD = EDI Body Dissatisfaction Subscale, and WSC = Weight and Shape Concerns Scale.

with decreasing drive for thinness ($r = .25$ (61), $p < .05$) and lower reported weight and shape concerns at long-term follow-up ($r = .27$ (61), $p < .05$). Time was not associated with change in bulimia scores ($r = -.056$, $p = \text{NS}$). Further, use of the program did not appear to have an impact on the degree to which the thin ideal was internalized ($r = -.09$, $p = \text{NS}$).

DISCUSSION

The present study was designed to test the long term effectiveness of a computer-based eating disorders prevention program, *Student Bodies*, in non-eating disordered college students, and to test the effectiveness of the program without clinical moderation of an accompanying discussion group. In general, the college students in the present study report fewer initial eating and body image concerns than other at risk samples using the *Student Bodies* program (Winzelberg et al., 1998; Winzelberg et al., 2000). Means of the EDI subscales are consistent, however, with previously reported norms for healthy college women (Garner & Olmsted, 1984). Recruitment strategies appear to be similar in this and other primary prevention studies; differences may be related to the fact that the present study was carried out in New England, whereas other trials have been run in the Western United States.

Time by condition repeated measures analyses were significant only for the bulimia subscale of the EDI, suggesting that the use of the program may have prevented the onset of bulimic behaviors in this sample of college women. Based on treatment-control comparisons both post-treatment and at long-term follow-up, the use of the *Student Bodies* program decreased selected risk factors for eating disorders in the women using the Internet-based program, and the reductions persisted at long-term follow-up. These results are more promising than some reported previously, which suggest only short-term gains related to the program (Brown, Winzelberg, Abascal, & Taylor, 2004).

Differences between treatment groups were difficult to evaluate because of the modest sample size, but participants using the *Student Bodies* program without a moderator for the online discussion fared best with the program, and had significantly lower scores on selected measures assessing eating and body image concerns at long-term follow-up when compared to controls. These findings are consistent with previous research, which suggests that clinical moderation of discussion may have little impact on outcome (Zabinski et al., 2001), and addresses concerns like Walstrom's (2000) that online programs could foster self-evaluative or non-therapeutic exchanges. Participants in the present study, however, were non-eating disordered, and the effectiveness and risk of Internet based groups for treatment of clinical eating disorders may differ.

The present study had insufficient power to detect small differences between treatment groups with and without accompanying discussion, although effect sizes suggest that either type of discussion group may enhance the effectiveness of the program in reducing risk when compared to *Student Bodies* without accompanying discussion or controls.

The outcomes of discussion treatment conditions also may have been compromised by testing the intervention on a relatively small campus—several participants expressed concern about writing to the moderated discussion group despite using a pseudonym, and few students in either group volunteered personal information out of concern that they could be identified. Such concerns may make computer-based discussions less effective on small campuses, although creating discussion groups across multiple institutions could easily eliminate this difficulty. Although the number of online postings is comparable to those reported in previous studies (Winzelberg et al., 1998), suggesting adequate participation, and time spent on the program was in the expected range (30.1 minutes per log in (Winzelberg et al., 1998)], it may be that the content of the postings was affected by student concerns related to privacy.

In general, *Student Bodies* appears to have reduced risk for eating and body image concerns in this sample of college women, and these effects continued over long-term follow-up. These findings are consistent with previous research, which has reported ongoing effects at three month and six month follow-up (Brown et al., 2004; Winzelberg et al., 1998; Winzelberg et al., 2000). The persistence of these effects is particularly important in light of the risk for eating difficulties associated with the first year or two of college, and because many interventions fail to demonstrate improvements at long-term follow-up (Brown et al., 2004; Stice, Mazotti, Weibel & Agras, 2000). Based on our data, *Student Bodies* delivered in the first year of college continues to have an impact well into the sophomore year.

Compliance in the present study was comparable to that reported previously, with 64% of the sample logging on at least eight times (Winzelberg et al., 1998; Winzelberg et al., 2000). In previous research, course credit or academic components enhanced adherence (Celio, Winzelberg, Dev, & Taylor, 2002). In this case, compliance may have been enhanced by easy access to computers and the Internet (all student dormitory rooms are wired), and by the fact that student participants were sometimes recruited by peers and faculty. Consistent with previous reports (Winzelberg et al., 1998), compliance as assessed by total time spent using the program was associated with improvement in selected eating and body image variables, suggesting that getting a sufficient “dose” of the program may be important for outcomes.

Although these data are promising, results should be interpreted cautiously. The sample was small and homogeneous, and many of the participants knew each other, although they remained anonymous for the purposes of the study. Further, the variety of analyses run increases the

possibility of Type I error. The women also appeared to have few initial concerns about eating and body image when compared to other samples. In addition, future research employing larger samples should explore the specific contribution of online discussion groups to the effectiveness of such programs in younger samples. Nonetheless, *Student Bodies* appears to have an impact on risk factors for eating and body image concerns in college women, and these effects do not appear to depend on clinical moderation.

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