Reducing At-Risk Adolescents’ Display of Risk Behavior on a Social Networking Web Site

**A Randomized Controlled Pilot Intervention Trial**

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**Objective:** To determine whether an online intervention reduces references to sex and substance abuse on social networking Web sites among at-risk adolescents.

**Design:** Randomized controlled intervention trial.

**Setting:** www.MySpace.com.

**Participants:** Self-described 18- to 20-year-olds with public MySpace profiles who met our criteria for being at risk (N=190).

**Intervention:** Single physician e-mail.

**Main Outcome Measures:** Web profiles were evaluated for references to sex and substance use and for security settings before and 3 months after the intervention.

**Results:** Of 190 subjects, 58.4% were male. At baseline, 54.2% of subjects referenced sex and 85.3% referenced substance use on their social networking site profiles. The proportion of profiles in which references decreased to 0 was 13.7% in the intervention group vs 5.3% in the control group for sex (P=.05) and 26.0% vs 22% for substance use (P=.61). The proportion of profiles set to “private” at follow-up was 10.5% in the intervention group and 7.4% in the control group (P=.45). The proportion of profiles in which any of these 3 protective changes were made was 42.1% in the intervention group and 29.5% in the control group (P=.07).

**Conclusions:** A brief e-mail intervention using social networking sites shows promise in reducing sexual references in the online profiles of at-risk adolescents. Further study should assess how adolescents view different risk behavior disclosures to promote safe use of the Internet.


**Virtual Communities Play an Increasingly Large Role in Adolescents’ Lives.** More than 90% of teens have Internet access, most report daily use, and more than half use social networking Web sites (SNSs). MySpace, the most popular SNS, regularly ranks among the world’s 10 most popular Web sites and includes more than 200 million Web profile accounts, of which 25% belong to minors. Members of an SNS create a personal Web profile that may contain images, text, and audio. The SNSs play an important role in adolescents’ social lives as a place for identity exploration and peer group interaction. The SNSs are also a venue in which teenagers publicly display references to behaviors that are both personal and associated with health risks, such as sexual behaviors. Approximately half of 18-year-olds display information about worrisome health risk behaviors, including sex and substance use, on their public SNS profiles. Although these behaviors are often considered normative in the adolescent age group, there are hazards associated with displaying the behaviors on SNSs, including attracting unwanted attention from cyberbullies or sexual predators. These types of online harassment are more common among adolescents who communicate about sex online and among users of SNSs. Other hazards of displaying risk behaviors online include negatively affecting future opportunities and increasing interest in and peer acceptance of the risk behavior. Adolescents may not understand or take seriously the accessibility of displayed SNS information. Absence of an online adult moderator, as on SNSs, is also associated with risky online behaviors.

Given the popularity of SNSs among adolescents, the adverse effects associated with displaying risk behaviors online, and the lack of adult monitoring and guidance on SNSs, it is clear that mecha-
METHODS

SETTING

This intervention study was conducted between April 2 and July 31, 2007, using the Web site www.MySpace.com. Web profiles on MySpace may be “public,” in which content may be viewed by any Web site visitor, or “private,” meaning that with-out the profile owner’s permission to view the site only limited information is available. The University of Washington institutional review board approved this study. The approval included a waiver of informed consent because data were collected via observation of public behavior and the intervention represented minimal to no risk.

One of us (M.A.M.) became a MySpace member and constructed a profile with the user name “Dr Meg.” This publicly available profile displayed information about M.A.M.’s professional credentials and research interests.

SUBJECTS

Inclusion criteria were having a publicly available individual MySpace profile at baseline and having a reported age between 18 and 20 years. To ensure that the participant still maintained the profile, we only included profiles in which the owner had logged in within the previous 30 days.

Our goal was to assess the intervention’s ability to affect an at-risk population with diminished access to clinical care owing to lack of resources or confidentiality concerns. Therefore, our sample population was from a single zip code randomly selected from a list of the 10 US Census urban areas with the lowest mean income. Although subjects’ zip codes are not routinely displayed on SNS profiles, they are part of the member registration process and can be used as search terms on MySpace. Adolescents often cite confidentiality concerns as a reason they forgo clinical care, and engagement in risk behaviors such as risky sex or substance use is associated with confidentiality concerns. We selected subjects whose profiles displayed 3 or more references to sexual behaviors or substance use, including at least 1 reference to alcohol use and 1 reference to tobacco use.

SEARCH STRATEGY

MySpace features a search engine for locating Web profiles that meet criteria such as hometown, age, or hobbies. We set the search criteria to include our selected zip code, age range of 18 to 20 years, and indications in Web profile demographic information that the user “smoked” and “drank,” which met the inclusion criterion of at least 1 reference to alcohol use and 1 to tobacco use. All profiles from this search were evaluated, and all eligible profiles were included. Figure 1 details our search strategy.
INTERVENTION

After collecting data from all profiles that met inclusion criteria, a research assistant divided subjects into 2 groups using random number allocation. The intervention group received a single e-mail from the research assistant on behalf of an adolescent medicine physician using the Dr Meg Web profile. We hypothesized that a physician would be regarded as a trusted but nonthreatening authority figure. The e-mail was developed with consultation from a physician health communications expert and one of us (M.R.P.). All study-related e-mail messages were sent within the MySpace system from the Dr Meg profile to subjects’ profiles; no personal e-mail addresses were used. The e-mail message provided information regarding the risky nature of online personal disclosures (Figure 2). To provide subjects with clinical resources, the e-mail message also included a link to the Web site www.iwantthekit.org, which contains information about sexually transmitted infections and is provided with consultation from a physician health communications expert and one of us (M.R.P.). All study-related e-mail messages were sent within the MySpace system from the Dr Meg profile to subjects’ profiles; no personal e-mail addresses were used. The e-mail message provided information regarding the risky nature of online personal disclosures (Figure 2). To provide subjects with clinical resources, the e-mail message also included a link to the Web site www.iwantthekit.org, which contains information about sexually transmitted infections and free testing for chlamydia.30,33 The control group received no contact from the researchers.

DATA COLLECTION

One of us (M.A.M.) who was blinded to the subjects’ experimental condition evaluated all Web profiles at 2 points: before the intervention (baseline) and 3 months after the intervention (postintervention).

Data included sex and date of last login, which are standard inclusions on MySpace profiles. The subjects’ stated home-towns were checked to verify that they were within our target zip code. Data on the following variables were collected when available: ethnicity, “relationship status,” and sexual orientation; Table 1 describes the specific menu of categories provided by MySpace for these variables. We then evaluated each profile at baseline and postintervention to determine the number of references to sexual behavior and substance use using criteria described in Table 1. Postintervention, we also recorded whether the profile security settings were changed to “private.”

All publicly accessible elements of the MySpace profile were reviewed; no attempts were made to read personal e-mails or access information set as “private.” All profiles were printed and securely stored at baseline and postintervention so that the researchers could examine them in print form and verify counted references.

Two of us conducted content analyses (M.A.M. and M.R.P.). Sexual behavior and substance use were evaluated according to a codebook developed in our previous studies.4-10 Upon completion of the initial profile coding by M.A.M., M.R.P. recorded a random sample of 10% of profiles to assess interrater reliability. The Cohen κ statistic was used to evaluate the extent to which there was agreement in SNS profile coding; κ values were 0.75 for references to sex and 0.71 for references to substance use. References that included slang of uncertain meaning were investigated using the Web site www.urbandictionary.com, an up-to-date reference for adolescent slang.

The four outcomes of interest were measured 3 months after the intervention: (1) eliminated all references to sex, (2) eliminated all references to substance use, (3) changed profile security to “private,” and (4) completed any 1 of these protective actions.

STATISTICAL ANALYSIS

All statistical analyses were conducted using STATA statistical software, version 9.0 (StataCorp, College Station, Texas). Descriptive statistics were calculated; χ² and t tests were used to compare intervention and control groups on demographic characteristics and baseline display of risk behavior. The χ² test was used to compare proportions of profiles in the intervention and control groups that met our 4 outcome criteria.

Because the initial number of references to sex or substance use could influence the likelihood of eliminating all references postintervention, we created a variable for initial number of references to substance use or sexual behaviors and explored this variable as an effect modifier: “high reporters” had more than the median number of references to the given behavior, and “low reporters” were those who displayed the median number of references or fewer. These categories were applied to sex, substance use, and total number of references to either sex or substance use.

Finally, we used logistic regression to model associations between intervention group, demographic variables, and each of our 4 outcomes of interest to determine if any independent predictors influenced our outcomes. The following other variables were included: sex, age, relationship status, sexual orientation, and whether the subject was a high reporter at baseline. These variables were selected based on our a priori hypothesis that they could be associated with the display of risk behaviors postintervention and their common availability on MySpace profiles. Two variables, relationship status and sexual orientation, contained categories determined by MySpace. We collapsed these variables into binary categories described in Table 1. Sexual orientation data were missing for 3.7% of subjects, so we created a separate category for missing data.

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**Table 1. Variable Descriptions and Examples**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description and Examples</th>
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</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Self-reported in identification section of profile.</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td>Self-reported multiple choice in demographic section of profile; available categories on MySpace include Asian/Pacific Islander, Black/African, Latin/Hispanic, Native American, White/Caucasian, and other.</td>
</tr>
<tr>
<td>Relationship status</td>
<td>Self-reported multiple choice in demographic section of profile; available options on MySpace include single, in a relationship, married, divorced, and swinger. We collapsed this variable into 2 categories: “single” and “in a relationship.”</td>
</tr>
<tr>
<td>Sexual orientation</td>
<td>Self-reported multiple choice in demographic section of profile; available options on MySpace include: straight, gay/lesbian, bisexual, and unsure. We collapsed this variable into 2 categories: “straight” and “other.”</td>
</tr>
<tr>
<td>Sexual behavior references</td>
<td>All publicly available sections of the MySpace profile were evaluated (including pictures, blogs, lists of favorites, and downloaded icons) for display of sexually suggestive material. Examples of material considered sexually suggestive included display of a “sex survey” describing personal sexual preferences, text describing previous sexual experiences, pictures of profile owner in undergarments, and downloaded sexually suggestive icons and cartoons.</td>
</tr>
<tr>
<td>Substance use references</td>
<td>All publicly available sections of the MySpace profile were evaluated (including pictures, blogs, lists of favorites, and downloaded icons) for display of material suggesting alcohol use, tobacco use, or drug use. Examples included downloaded icons of beer brands, pictures of profile owner smoking, and downloaded pictures of marijuana leaves.</td>
</tr>
</tbody>
</table>
RESULTS

SAMPLE POPULATION

A total of 1340 profiles were analyzed; 190 (14.2%) met inclusion criteria. Most exclusions were because the last login occurred more than 30 days before baseline (342 profiles [25.5%]) or because fewer than 3 risk behaviors were displayed (591 profiles [44.1%]).

Our sample included slightly more males (58.4%) than females. More than 75% of subjects reported their ethnicity in their profile; of these, 51.6% were black/African. There were no significant differences between control and intervention groups on these demographic variables.

DISPLAY OF RISK BEHAVIOR

Baseline

The most frequently referenced risk behavior in our sample was substance use; 85.3% of profiles displayed substance use references (mean [SD], 5.2 [2.9]). Approximately half the profiles displayed sexual references (34.2%; mean [SD], 1.1 [1.7]). There were no significant differences between control and intervention groups regarding these variables at baseline (Table 2).

Postintervention

The proportion of profiles in which references decreased to 0 by 3 months after the intervention was 13.7% in the intervention group vs 5.3% in the control group for sexual references (unadjusted odds ratio [OR] [95% confidence interval (CI)], 3.8 [0.9-13.7]) and 26% vs 22% for substance abuse references (1.2 [0.6-2.3]). The proportion of profiles in which profile security was "private" postintervention was 10.5% in the intervention group vs 7.4% in the control group (unadjusted OR [95% CI], 1.5 [0.5-4.1]). The proportion of profiles in which any of the 3 protective measures was taken was 42.1% in the intervention group vs 29.5% in the control group (unadjusted OR [95% CI], 1.7 [0.9-3.2]).

Results of logistic regression showed that, when adjusted for demographic characteristics and baseline risk behaviors, the odds of removing all references to sex postintervention were 4.2 times higher in the intervention group than in the control group (95% CI, 1.3-14.2). The odds of undertaking any protective change postintervention were 1.9 times higher in the intervention group than in the control group (95% CI, 1.0-3.5). Subjects who were high reporters of substance use at baseline were less likely to eliminate all references to substance use postintervention (OR [95% CI], 0.2 [0.1-0.5]) (Table 3).

EXPLORATORY ANALYSES

As exploratory analyses, we performed adjusted logistic modeling stratified by sex. Among females, those in the intervention group were more likely to eliminate sexual references relative to those in the control group (OR [95% CI], 17.3 [1.3-235.1]), compared with males in the intervention group relative to males in the control group (2.9 [0.6-13.7]). An interaction term of sex and intervention group was not significant.

CONCLUSIONS

Our study shows that an e-mail intervention to reduce SNS display of risk behaviors is feasible and may be effective. The results illustrate that a single e-mail message from a physician can affect adolescents’ online display of references to risk behaviors, particularly the display of sexual risk behaviors among at-risk female adolescents. This finding is important because displaying sexual references on adolescents’ SNS profiles is associated with a number of adverse outcomes. First, the display of sexual references in a publicly accessible online venue increases the risks of online victimization, which is associated with distress, depressive symptoms, delinquent behavior, and substance use. Second, seeking online information about applicants has become more common among university and em...
employment recruiters. Therefore, displaying sexual references on an SNS profile may negatively affect an adolescent’s future opportunities. Third, although many consider sexual activity normative in this age group, displaying sexual behavior references on a popular adolescent Web site may increase pressure to become sexually active among virginal adolescents. Last, displaying sexual references online may affect how friends and potential sexual partners view and interact with an adolescent and may reinforce the behaviors associated with the display. The suggestion that the intervention may have effectiveness among female adolescents is encouraging given that females are more at risk for adverse outcomes, such as unwanted sexual solicitation or, even worse, sexual assault, associated with online displays of sexual information.

This study cannot determine the active ingredient of the intervention with certainty. There are several possible mechanisms through which our intervention may have had an effect on adolescents’ decisions to remove sexual references from their SNS profiles. One is that by reading our e-mail message, adolescents may have realized how publicly available their SNS profiles have become. Indeed, we received an unsolicited e-mail response from one respondent stating that she was previously unaware of the public accessibility of her Web profile. A second possible reason is that our warning about sexually transmitted infection and inclusion of information about obtaining testing may have reminded teenagers of the consequences of risky sexual behavior and led to the removal of online sexual references.

Although our small sample size and wide CI preclude us from making firm conclusions, our findings suggest that the intervention may be more effective among females. It is possible that females may have been more receptive to receiving a message from a female physician moderator, or they may have felt more threatened by the public disclosure of sexual references. Males may be more responsive to receiving a message from a male moderator or to repeated e-mail messages.

Our intervention was not successful in reducing online references to substance use. Because both intervention and control groups had similar reductions in their substance use references, it is possible that these online references are more transient. For example, a subject may have displayed several substance use references in the context of a recent social event and later replaced this section of the profile with newer updates. Furthermore, most of our sample population (85.3%) displayed substance use references, and these references may be more normative in our target population and therefore less amenable to change. Finally, our e-mail message regarding testing for sexually transmitted infections may have reinforced the message about sexual behavior. Had we provided similar referrals to substance use reduction efforts, we may have seen an effect on substance use references as well.

There are several limitations to our study that warrant mention. First, our profile search was conducted using the proprietary MySpace Web site search engine. However, we see no obvious way in which it may have biased our findings because there is no reason to believe it would systematically select certain profiles. Second, we evaluated Web profiles from a single SNS. The extent to which these findings could be generalized to other Web sites is not known. For consistency, and because of the ready availability of important data fields, we chose a single SNS that is the most popular among teenagers. Third, we sampled from a population of adolescents living in 1 high-risk geographical area; the extent to which our intervention could affect adolescents living in other areas is unknown. We targeted this intervention to a population that is often considered difficult to reach using traditional clinical means. Fourth, we conducted a brief single-message intervention from 1 source. Varying the message, author, or number of contacts may have produced different results. Fifth, our study was intended to reduce only the display of risk behavior references on a SNS. We did not assess the validity of SNS references or target real-life risk behaviors. Links between risk behavior references on SNS and actual risk behaviors remain uncertain. Display of references to a risk behavior may represent engagement in that behavior, consideration of engagement in the behavior, boastful claims, or nonsense. The validity of online risk behavior displays has not been adequately evaluated, but there are reasons to be concerned that such disclosures reflect either intent or actual behaviors. However, even if displayed behaviors are nonsense, they are associated with adverse effects.

Despite these limitations, our study findings have important implications. Our study illustrates that developing online interventions to reduce online risk behaviors...

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**Table 3. Logistic Modeling**

<table>
<thead>
<tr>
<th>Variable</th>
<th>All Sex References Removed</th>
<th>All Substance Use References Removed</th>
<th>Profile Security Changed to &quot;Private&quot;</th>
<th>Any Protective Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention group</td>
<td>4.2 (1.3-14.2)</td>
<td>1.1 (0.5-2.3)</td>
<td>1.6 (0.5-4.6)</td>
<td>1.9 (1-3.5)</td>
</tr>
<tr>
<td>Female sex</td>
<td>1.2 (0.4-3.5)</td>
<td>0.8 (0.4-1.7)</td>
<td>1.6 (0.6-4.6)</td>
<td>1.1 (0.6-2.1)</td>
</tr>
<tr>
<td>Age, y</td>
<td>0.6 (0.3-1.2)</td>
<td>0.8 (0.5-1.2)</td>
<td>0.9 (0.5-1.8)</td>
<td>0.8 (0.6-2.1)</td>
</tr>
<tr>
<td>Self-reported sexual orientation other than &quot;straight&quot;</td>
<td>0.5 (0.1-2.4)</td>
<td>0.3 (0.1-1)</td>
<td>2 (0.6-7.1)</td>
<td>0.5 (0.2-1.2)</td>
</tr>
<tr>
<td>Self-reported in a romantic relationship</td>
<td>0.9 (0.3-3)</td>
<td>1.1 (0.5-2.3)</td>
<td>0.8 (0.2-2.7)</td>
<td>0.9 (0.5-1.8)</td>
</tr>
<tr>
<td>High reporter at baseline</td>
<td>2.7 (0.9-8.2)</td>
<td>0.2 (0.1-0.5)</td>
<td>0.5 (0.2-1.7)</td>
<td>0.6 (0.3-1.1)</td>
</tr>
</tbody>
</table>

*The odds of undertaking protective behavior by 3 months after the intervention.

bHigh reporter indicates that the subject had more than the median number of references to a given risk behavior.
is feasible, low intensity, and low cost. Given the popularity of SNSs among adolescents, SNS interventions have potential to reach large target audiences. Our ability to set MySpace search criteria to target specific ages and geographic areas as well as adolescents who self-reported drinking and smoking underscores this point. Our findings suggest that some teenagers may be open to feedback regarding their Web profiles and subsequently alter online behaviors. Given the hazards associated with displaying risk behavior information, parents and health care providers should recognize the importance of SNSs in adolescents’ social lives, discuss SNS disclosures with both younger and older adolescents, and provide Internet safety resources.44-47 Further study is needed to better understand risk behavior displays on other SNSs, adolescents’ views regarding online safety, and online interventions in other populations.

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Author Contributions: Drs Moreno, Parks, Zimmerman, and Christakis had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Moreno, VanderStoep, Zimmerman, and Christakis. Acquisition of data: Moreno and Christakis. Analysis and interpretation of data: Moreno, VanderStoep, Parks, Zimmerman, Kurth, and Christakis. Drafting of the manuscript: Moreno and Parks. Critical revision of the manuscript for important intellectual content: Moreno, VanderStoep, Parks, Zimmerman, Kurth, and Christakis. Statistical analysis: Moreno, VanderStoep, Zimmerman, and Christakis. Obtained funding: Christakis. Administrative, technical, and material support: Moreno, Parks, and Kurth. Study supervision: Kurth and Christakis.

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REFERENCES


