Efficacy of an Intervention to Alter Skin Cancer Risk Behaviors in Young Adults

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Introduction: Skin cancer is the most common cancer, and its incidence is increasing. Young adults expose themselves to large amounts of ultraviolet radiation (UV) and engage in minimal skin protection, which increases their risk. Internet interventions are effective in modifying health behaviors and are highly disseminable. The current study's purpose was to test an Internet intervention to decrease UV exposure and increase skin protection behavior among young adults.

Study design: RCT conducted in 2014, with data analyzed in 2015.

Setting/participants: A national sample of adults aged 18–25 years at moderate to high risk of developing skin cancer by a self-report measure was recruited online.

Intervention: Participants were randomized to one of three intervention conditions: assessment only, the website of a skin cancer organization, or a tailored interactive multimedia Internet intervention program (UV4.me) based on the Integrative Model of Behavioral Prediction.

Main outcome measures: Self-reported overall UV exposure and skin protection assessed at 3 and 12 weeks after baseline. Secondary outcomes were self-reported intentional and incidental UV exposure, sunburns, sunscreen use, and skin cancer screening.

Results: For the intervention arm, there were significant decreases in UV exposure and increases in skin protection at both follow-up time points compared with the assessment-only condition ($p < 0.001$). The effect sizes (Cohen's d) comparing the experimental and assessment-only arm for exposure behaviors were 0.41 at 3-week follow-up and 0.43 at 12-week follow-up. The effect sizes for protection behaviors were 0.41 at 3-week follow-up and 0.53 at 12-week follow-up. The control condition was not significantly different from the assessment only condition. All three conditions exhibited decreased exposure and increased protection at both follow-ups ($p < 0.01$), but the effect was much stronger in the intervention group. Secondary outcomes were generally also significantly improved in the intervention condition compared with the other conditions.

Conclusions: This is the first published report describing the results of an RCT of an Internet intervention to modify skin cancer risk behaviors among young adults. The UV4.me intervention significantly improved self-reported skin cancer prevention behaviors. Future research will investigate mechanisms of change and approaches for dissemination.

Trial registration: This study is registered at www.clinicaltrials.gov NCT02147080.

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Introduction

Skin cancer is the most common cancer, with nearly five million diagnoses annually in the U.S., and its incidence has been increasing in recent years.[1–5] Invasive melanoma is the second most diagnosed cancer among young adults.[6] Contributing to increased skin cancer risk among young adults is the fact that U.S. adolescents have had the lowest skin protection rates

of all age groups[7] and also engage in increased exposure to ultraviolet radiation (UV) as they move into adulthood.[8]

For these reasons, it is important to have available interventions that are effective in addressing skin cancer risk behaviors among young adults. Although a few such interventions exist,[9] most of these intervention studies have been conducted locally often with college (more often female) students only, have required an in-person component, and the length of follow-up has been short. Additionally, no reports on Internet interventions for skin cancer prevention among this population have been published previously. However, with approximately 97% of U.S. young adults using the Internet,[10] and the evidence for the efficacy of Internet interventions,[11] the Internet is an ideal mechanism with which to reach young adults and explore the efficacy of a skin cancer prevention intervention for this population.

The web-based intervention that was designed to modify skin cancer risk and protective behaviors among young adults was informed by the Integrative Model for Behavioral Prediction (IM).[12] Constructs from the IM are associated with skin cancer risk and protective behaviors and include demographics, past UV-related behavior, attitudes such as appearance consciousness,[13,14] other individual difference variables (e.g., knowledge and risk perception), UV-related beliefs,[15–22] norms and compliance,[13,23] self-efficacy and control,[24–29] and intentions,[28] though the authors' group is the only one that has applied the overall model to the skin cancer domain. Individually tailored and interactive messages and material focusing on IM constructs such as norms and self-efficacy were featured in the web-based intervention. The tailored intervention emphasized appearance concerns, which are known to be the primary motivation for UV exposure and lack of skin protection among young adults. This was accomplished in part through the use of facial images showing UV damage as well as computerized age progression demonstrations.[30–33]

The purpose of the study was to test the efficacy of the web-based intervention to decrease UV exposure and increase skin protection behaviors among young adults at moderate to high risk of developing skin cancer in an RCT. It was hypothesized that participants randomized to the experimental intervention would report significantly less exposure and more protection than participants in other conditions at follow-up. Unlike prior research, this study was conducted with a large national sample.

Methods

Participants were recruited online by Survey Sampling International using their U.S. consumer opinion panel and partnerships with other panels and online communities. Survey Sampling International panelists were exposed to brief web banner ads about the study from which they could click to link to the study website. Once at the study website, interested candidates were asked to complete the Brief Skin Cancer Risk Assessment Tool (BRAT),[34] which was scored automatically. Skin cancer risk items include sun sensitivity, sunburn history, number of moles/freckles, and climate of childhood residence. Items are weighted, resulting in a 0–78 score. The BRAT authors recommend a cut off of $\geq$27 to denote moderate to high skin cancer risk. Internal and test–retest reliability compare favorably to those reported in the literature for similar items/scales (BRAT).[34] Eligible participants were adults aged 18–25 years, had never had skin cancer, and were at moderate to high risk of developing skin cancer based on the BRAT. Approximately 47% of the 5,015 individuals who submitted a screening form met these eligibility criteria. Figure 1 shows the CONSORT study flow diagram.

This project was approved and monitored by Fox Chase Cancer Center's IRB, and informed consent was obtained from research participants. Eligible participants were directed to the online informed consent form, which participants signed using a computer mouse. Participants were then directed to the baseline survey. Participants were subsequently randomized to one of three treatment conditions in blocks of nine or 12: assessment only, a control website, and the intervention website (described below).

In order to intervene with participants prior to summer, participants completed assessments at baseline in the spring (March to June 2014); 3 weeks after baseline (April to July 2014); and 12 weeks after baseline (June to October 2014). Of the participants who completed baseline assessments, approximately 71% completed the first follow-up survey, and approximately 72% completed the second follow-up. Participants received an Amazon e-giftcard after each questionnaire: $10 for baseline, $20 for 3-week follow-up, $50 for 12-week follow-up, plus $20 for completing all three assessments.

Intervention Conditions

This trial was registered with ClinicalTrials.gov (identifier, NCT02147080). The experimental website (UV4.me) was targeted to young adults, personally tailored, and included interactive, multimedia, and goal-setting components. The control website was the Skin Cancer Foundation (SCF) website (www.skincancer.org). According to the SCF website, the SCF "is the only international organization devoted solely to education, prevention, early detection, and prompt treatment of" skin cancer. The SCF website was chosen because it is a high-quality multimedia website on the topic of skin cancer; however, no prior study has reported on its potential impact on behavior. Major topics include skin cancer information; prevention; true stories; healthy lifestyle (e.g., sports, anti-aging, vitamin D); news; and getting involved, among others. Participants were sent automated e-mail reminders to enter the control website and to begin and engage with UV4.me (e.g., set and work on goals).

The UV4.me Intervention

Based on a synthesis of prior formative individual interviews and focus groups with the target population, the authors' expertise, and the literature,[35–37] a multidisciplinary team collaborated to create