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A review of smartphone applications for promoting sun protection practices



To the Editor: Primary prevention of skin cancer is best achieved by protecting the skin from exposure to ultraviolet (UV) radiation; exposure to UV radiation increases the risk for both melanoma and nonmelanoma skin cancers.¹ The US Preventive Task Force recommends that children and adults be counseled on using sun protection practices to minimize UV exposure and suggests that mobile smartphone applications might be useful to facilitate these behaviors.² The effectiveness of smartphone applications to promote a variety of health behaviors targeting exercise performance, weight loss, diet, smoking cessation, alcohol consumption, and sun protection has been examined in the published literature.³ Skin cancer prevention is particularly amenable to intervention from smartphone applications by helping individuals monitor UV exposure and provide tailored recommendations and reminders for protecting their skin. Dozens of applications of varying quality are currently available, making it difficult for interested users to find applications with useful, intuitive, and effective features.

The purpose of this study was to provide a comprehensive list of currently available sun protection smartphone applications and their features. In August 2018, we searched the Apple (Cupertino, CA) and Android (Google, Menlo Park, CA) App stores for applications that promote sun protection practices. Search terms included “skin

cancer,” “sun,” “UV protection,” and “melanoma.” Results were screened according to predefined inclusion and exclusion criteria. Smartphone apps were included if they provided specific, personalized advice regarding sun protection using local UV indices and the user's personal skin characteristics. We excluded apps that only provided weather, UV information, or general recommendations and those that were not in English, were country specific, or not for patient use. We also excluded apps that were incompatible with the latest smartphone operating systems and that required purchase of a wearable UV dosimeter. Last, we compared apps on the basis of features that have been shown to improve the effectiveness of apps targeting behavior change, such as having a user-friendly design, providing real-time feedback, and offering tailored advice supplemented by additional information.⁴

Our search revealed 1060 results across both app stores (including duplicates), from which we identified 9 eligible apps (Table 1). Most apps were user friendly, intuitive, and provided personalized sun protection recommendations tailored to user skin type and color. Recommendations included avoiding being outdoors during periods of high UV light, a minimum sunscreen sun protection factor and time until reapplication, and types of physical protection (ie, clothing, hats, and sunglasses). However, we found limited published evidence regarding the effectiveness of these apps for facilitating sun protection behaviors. In fact, only SunZapp developers (Klein Buendel Inc, Golden, CO) provided citations to 3 published studies showing limited improvement in sun protection.⁵ We found most apps included in this review to be easy to use while providing instant feedback and tailored recommendations to users, but only SunSense (Raymio, Copenhagen, Denmark) satisfied all criteria by offering additional information about sun protection. Although we have identified several apps with the potential to promote sun safety, further investigation is required to establish whether their use results in sustained behavior change and reductions in UV exposure. Future research should also consider comparing apps that utilize wearable technology for real-time UV tracking and those that rely on regional UV indices.

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Table I. Smartphone applications meeting criteria, providing personalized sun protection recommendations to minimize UV exposure

No.	Name	Developer	Platform	Cost, USD	Last updated	Features
1	Dermosil Care Guide	Dermoshop Oy	iOS only	Free	January 2016	Personalized sun protection recommendations based on UV index, skin color, and landscape surface reflection; UV forecast (hourly and weekly)
2	Healthy Sun	Pavel Chekhau	iOS only	Free	August 2018	Personalized exposure time based on UV index, skin color, SPF of sunscreen, and landscape surface reflection; skin scanner to evaluate and track skin lesions
3	QSun	Comfable Inc	iOS and Android	Free; pro version \$3.99/month or \$23.99/year; wearable technology for real-time UV data collection \$149	August 2018	Skin type assessment; personalized sun protection recommendations based on UV, skin type, and landscape; notifications for high UV and reminders to reapply sunscreen; sunscreen scanner identifies effective sunscreen properties; sunscreen calculator estimates amount of sunscreen to apply based on height and weight; skin scanner estimates skin health and age; UV forecast (daily and weekly); sun-safe activity tracker (pro version only); vitamin D intake tracker (pro version only)
4	SunSense	Raymio	iOS and Android	Free; wearable technology for real-time UV data collection \$59.99	July 2018	Personalized sun protection recommendations based on UV index, skin color, landscape surface reflection, and cloud cover; "Plan your day" function; UV forecast (daily notification); reminders and alerts to reapply sunscreen or seek additional protection; general sun protection advice and information; multiple user profiles
5	SunZapp	Klein Buendel Inc	iOS and Android	Free; pro version \$1.99 (iOS only)	April 2018	Skin type assessment; personalized sun protection recommendations based on UV index, skin type, and SPF of sunscreen; UV forecast (daily); "Plan your day" function (up to 5 days in advance; pro version only); multiple user profiles (pro version only)
6	UVI Mate	Alexander Ershov	iOS and Android	Free; pro version \$6.49 /year	August 2018	Personalized sun protection recommendations based on UV index, skin color, and cloud cover; vitamin D intake tracker; UV forecast (next 2 hours, next 6 hours in pro version); reminder to reapply sunscreen; UV index adjusted according to landscape (pro version only); multiple user profiles (pro version only)
7	UVLens	Spark 64	iOS and Android	Free	May 2018	Skin type assessment; personalized sun protection recommendations based on UV index and skin type; reminder to reapply sunscreen based on SPF and time to burn estimation; UV forecast (2 days)
8	UV Notifier	Bella Saadllah (Z-team)	iOS and Android	Free	August 2017	Skin type assessment; personalized sun protection recommendations based on UV index and skin type; UV danger and time to burn alerts
9	UV SunTan Timer	Richard Acherki	iOS only	\$2.99	October 2014	Personalized sun protection recommendations based on UV index, skin color, and SPF of sunscreen; reminder to get out of the sun

SPF, Sun protection factor; UV, ultraviolet.

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Patient comfort and expectations for total body skin examinations: A cross-sectional study



To the Editor: Total body skin examinations (TBSEs) are cost-effective and reduce skin cancer-related mortality.¹ Patient discomfort with TBSEs is a barrier to care,^{2,3} but few studies explore the factors contributing to patient comfort during TBSEs. We aimed to clarify patient expectations regarding TBSE preparation, the areas to be examined, and the presence of a chaperone.

Adults presenting for TBSEs at an academic dermatology clinic between May 2017 and December 2017 were eligible to participate in a 19-question, institutional review board-approved survey. The target number was 500 surveys, and collection was stopped once this goal was reached. Data analysis used summary statistics, *t* test, chi-square, analysis of variance, and logistic regression.

Table I compares responses between respondents who had or had not previously undergone a TBSE (n = 493). Of all respondents, 3% to 6% preferred a same-gender physician for examination of the head, limbs, nails, and trunk, while more preferred a same-gender physician for sensitive areas, including the buttocks/thighs (16%), breasts (20%), penis (21%), and vulva (32%). Compared with patients with a previous TBSE, those new to TBSE more often preferred a same-gender physician for examination

of the buttocks/thighs (13% vs 25%, *P* < .01) and breasts (17% vs 30%, *P* = .04), but not for other areas.

Notably, 84% of respondents expected examination of the genital and breast skin in a TBSE, though this varied significantly by age, gender, ethnicity, previous TBSE, and family history of skin cancer. Of those who did not expect a dermatologist to examine genital and breast skin, 47% expected this examination to be performed by an obstetrician/gynecologist, 23% by a primary care physician, 4% by a urologist, and 26% by another type of physician.

When examined by a same-gender physician, both women and men were more comfortable without a chaperone than with a chaperone (*P* = .01); there was no difference in comfort between men and women when TBSE was performed by an opposite-gender physician with or without a chaperone (*P* = .33). Patients with a previous TBSE were more comfortable when examined by opposite-gender physicians, whether or not a chaperone was present (*P* < .01). Qualitative responses indicated that respondents prefer fewer people in the room during a TBSE.

This survey raises several important considerations. First, patients who have never undergone a TBSE report greater discomfort with an opposite-gender physician, especially for the examination of sensitive areas. Patients become more comfortable and exhibit reduced gender preferences after an initial TBSE. A discussion of patient expectations and education about the examination steps before the first TBSE may improve comfort. Second, many patients prefer not to have a chaperone in the room; balancing patient comfort with the legal necessity of providing a chaperone requires further consideration. Lastly, 1 in 6 patients did not expect a genital and breast skin examination by a dermatologist. It is important to know whether other specialists are routinely performing thorough skin examinations of these areas and whether they are comfortable diagnosing dermatologic conditions. Dermatologists should work closely with other specialists to ensure that important diagnoses of the genital and breast skin are not missed.

Limitations include an inability to assess demographic or clinical differences between participants and nonparticipants, and limited generalizability given that the study was conducted in a single academic institution.

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