

Why My Patient Will Not Stop Tanning

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UV radiation (UVR) is a known carcinogen, yet many people seek out additional exposure and even pay for it. An economic utility model breaks down the decision to tan as a cost-benefit argument whereby the guaranteed benefit of relaxing today and having the desired tan tomorrow can outweigh the distant possible cost of developing skin cancer and photoaging. Additionally, some individuals actually may develop a substance-related disorder (SRD) on UVR that drives their need to tan. Modification of the CAGE (cut down, annoyed, guilty, eye-opener) questionnaire and *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition, Text Revision)(*DSM-IV-TR*) criteria for substance abuse finds that a number of patients meet criteria for a possible UVR SRD. Although the dependency may primarily be psychological, it also is possible that a physiological dependency develops with chronic exposure to UVR. Administration of naltrexone to select frequent tanners blunted their preference for UVR versus non-UVR light beds and even induced withdrawal-like symptoms in some individuals. By looking deeper into the reasons that people tan, it may be possible to develop a more effective prevention campaign.

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Skin cancer is the most common type of cancer in the United States and rates are rising.¹ One of the main risk factors for skin cancer is exposure to UV radiation (UVR).² Not only does UVR exposure increase a person's chances of developing skin cancer, but it also has been linked to wrinkles and photoaging.³ Considering this evidence, it seems the only reasonable course of action is to minimize UVR exposure as much as possible and accept the risks that come along with a certain degree of unavoidable exposure.

Despite the risks, exposure to UVR is sought out by sunbathers and even paid for by indoor tanners. In the United States alone, it is estimated that 30 million people utilize indoor tanning services each year, and the numbers are growing. The rate of use among adolescent females in the United States is between 16% and 51%; adolescent males are 2 to 3 times less likely to tan indoors.⁴ Additionally, use of indoor tanning facilities among young adults has increased from 1% in 1988 to 27% in 2007.⁵ With all the known risks, the tanning industry somehow remains a \$5 billion business.⁶

REASONS FOR TANNING

There must be an explanation for the number of people who engage in indoor tanning. Perhaps it is because they are uninformed and have never been told of all the possible side effects that can result from UVR exposure; however, frequent tanners actually are more informed about the dangers of UVR than their nontanning counterparts.⁷ When tanners are asked about their behavior, some of the most commonly cited reasons for tanning include the

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desire for appearance enhancement, relaxation, improved mood, and socialization.⁸ It seems these benefits are enough to outweigh the negative effects that are publicized by public health prevention campaigns.

Feldman et al⁹ considered the pros and cons of tanning using an economic utility model. The authors' premise assumed that all rational individuals make decisions on consumption and exposure based on their best interests; however, the model showed that when evaluating pros and cons, more weight was given to immediate gains and losses, while future gains and losses were discounted, which means that the potential risk for skin cancer is not enough to stop a patient from tanning because he/she views it as a consequence that will happen many years from now. For tanners, looking and feeling good today is deemed more important than the distant risk for skin cancer. Focusing on the benefits of a decision versus the costs also plays a factor. When positives are highlighted, people are more likely to choose the guaranteed lesser gain than to opt for the uncertain chance of a greater gain. Conversely, when negatives are highlighted, people prefer to take a greater possible risk rather than accept a guaranteed lesser risk.⁹ The implications of this utility model present a rational explanation for tanning; more importantly, this model offers insight on the failure of some skin cancer prevention strategies. For many patients, the guaranteed risk of attending a reunion in 2 weeks with pale skin is worse than the possible risk of dying from skin cancer 30 years from now.

In considering why our patients tan, it is important to note the multiple reported health benefits of UVR exposure. A prevacation tan often is thought to be beneficial, and tanning is commonly cited as a treatment of various dermatologic disorders and a method for increasing vitamin D levels. Although it is a common practice, tanning in the sun before a vacation provides little protection (the equivalent of sun protection factor 3) against further sun damage⁶; indoor tanning beds provide even less protection than a natural suntan. Both methods falsely lead patients to believe it is acceptable to use less sun protection while on vacation, thereby leading to an overall increase in UVR exposure both before and during their trip.⁶ UV phototherapy has been shown to be an effective treatment of a variety of inflammatory dermatoses such as psoriasis¹⁰; however, because unaffected skin often is exposed along with affected areas, the dose of UVR that can be administered is limited. Research is ongoing to identify and deliver specific UVR wavelengths to diseased skin while sparing unaffected skin. Perhaps the most controversial therapeutic claim associated with UVR exposure is its benefit of increasing vitamin D levels. The optimal level of vitamin D is one

of the main points of contention regarding this claim. Although exposure to UVB radiation incites vitamin D production, there is no indication that the intense levels of UVB generated by tanning beds are required. It has been shown that the exposed hands and face of an infant receiving 30 to 120 minutes of sun exposure per week provide adequate vitamin D.⁶ Similarly, current recommendations maintain that just 5 to 20 minutes of sun exposure to the hands, face, and arms every other day in a light-skinned individual (Fitzpatrick skin types I–III) provides enough vitamin D¹¹; however, some organizations are attempting to raise current standards on adequate vitamin D levels. If successful, these changes could provide some support for claims of medical tanning, as UV Foundation studies have found that regular use of tanning beds did result in a higher level of vitamin D.¹² The final point, however, is that even if the recommended minimum levels of vitamin D are raised, there still is more support for oral supplementation rather than for increased exposure to UVR.⁶

SUBSTANCE-RELATED DISORDER

Another consideration is that some individuals tan excessively, despite the risks, due to a UVR substance-related disorder (SRD), which recently has become an area of interest with numerous studies comparing tanning to addictive substances such as alcohol. Because the CAGE¹³ (cut down, annoyed, guilty, eye-opener) questionnaire has proven to be effective in assessing alcohol dependence, a modified CAGE (mCAGE) created by Warthan et al¹⁴ frequently has been used to assess UVR SRDs. Similarly, just as criteria in the *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition, Text Revision) (*DSM-IV-TR*)¹⁵ are used to diagnose substance abuse, a modified *DSM-IV-TR* (*mDSM-IV-TR*) also created by Warthan et al¹⁴ is frequently used to diagnose UVR SRDs.

Applying these questionnaire criteria to various study populations, different groups have found a wide range of individuals who screen positive or meet the criteria for a UVR SRD. The Table provides a brief synopsis of 5 studies and the number of participants who met criteria for a UVR SRD according to 1 of 2 tools. It is notable that the 2 studies that reported the lowest percentages of SRDs included a broad population of tanners and nontanners.^{17,19} The other studies, however, restricted their study populations only to tanners.^{14,16,18}

In addition to determining the percentage of participants who met the criteria for UVR SRD, all 5 studies also considered demographic data to see if any subset of their study populations were more likely to have a UVR SRD.

Mosher and Danoff-Burg¹⁶ found a positive association between UVR SRDs and frequency of tanning

Summary of 5 Studies Utilizing mCAGE and/or mDSM-IV-TR

Study (Year)	Study Population	Participants Positive for UVR SRD by mCAGE, ^a n (%)	Participants Positive for UVR SRD by mDSM-IV-TR, ^b n (%)
Mosher and Danoff-Burg ¹⁶ (2010)	229 participants with a history of indoor tanning (from an initial group of 421 college students); a large university in the northeastern United States	70 (30.6)	90 (39.3)
Heckman et al ¹⁷ (2008)	400 students and other college-aged participants from a southeastern metropolitan university community with no selection based on tanning history	44 (11)	93 (23)
Harrington et al ¹⁸ (2011)	100 frequent tanners from 2 salons in Dallas, Texas	Not reported	41 (41)
Poorsattar and Hornung ¹⁹ (2007)	375 students attending a sampling of undergraduate classes in all colleges of the University of Washington in Seattle with no selection based on tanning history	45 (12)	N/A
Warthan et al ¹⁴ (2005)	145 beachgoers on Galveston Island, Texas	38 (26)	77 (53)

Abbreviations: mCAGE, modified CAGE (cut down, annoyed, guilty, eye-opener)¹⁴; mDSM-IV-TR, modified DSM-IV-TR (*Diagnostic and Statistical Manual of Mental Disorders* [Fourth Edition, Text Revision])¹⁴; UVR, UV radiation; SRD, substance-related disorder; N/A, not available.

^aTwo affirmative responses.

^bThree affirmative responses.

(odds ratio [OR]=1.05; 95% confidence interval [CI], 1.03-1.07; $P<.001$), alcohol use (OR=1.40; 95% CI, 1.07-1.84; $P<.05$), and marijuana use (OR=1.33; 95% CI, 1.02-1.74; $P<.05$) when comparing the group that scored positive according to both screening tools to the group that scored negative on both.

Heckman et al¹⁷ found a positive association between UVR SRDs and current smokers (OR=1.81; 95% CI, 1.10-2.98; $P=.02$) when comparing participants who scored positive on either the mCAGE or mDSM-IV-TR to those who scored negative on both.

Harrington et al¹⁸ (N=100) found that the age at which an individual started tanning was strongly associated with a positive screening on the mDSM-IV-TR. Sixty percent of participants who started using a tanning bed between the ages of 13 and 17 years met the test criteria, while only 28.3% of those who started after the age of 17 years met the criteria ($P=.002$).¹⁸

Numerous studies have shown that women develop UVR SRDs at a higher rate than men. Harrington et al¹⁸ showed that 50% of women met mDSM-IV-TR criteria compared to 25% of men ($P=.02$). Poorsattar and Hornung¹⁹ (N=375) showed that 22% of female tanners met mCAGE criteria compared to 8% of male tanners ($P=.007$). Although not statistically significant, Warthan et al¹⁴ (N=145) showed that women scored positive on the mCAGE more often than men at a rate of almost 2 to 1 (31% vs 17%; $P=.08$).

PHYSIOLOGICAL ADDICTION

In addition to the physical rituals and perceived outward benefits of tanning, there also seems to be a physiological reaction to tanning that may lead to UVR dependency in frequent tanners. In a blinded study, a group of frequent tanners who were exposed to 2 identical tanning beds, one with UVR and one without,

demonstrated an overwhelming preference for the UVR bed.⁸ When offered a choice between the beds, participants chose the UVR bed over the non-UVR bed 95% of the time. Furthermore, a small double-blind, placebo-controlled trial by Kaur et al²⁰ actually found that administration of 15 mg of naltrexone induced withdrawal symptoms in 4 of 8 frequent tanners (8–15 times per month), while none of their 8 controls had withdrawal symptoms, even with doses up to 25 mg. The study also found that administration of either 15 or 25 mg of naltrexone to frequent tanners removed their preference for UVR beds versus non-UVR beds, which was present with placebo or with 5 mg of naltrexone. This study certainly was limited by its small size (8 frequent tanners, 8 controls), but the effects of naltrexone on the frequent tanners certainly warrants further study and may even lead to the discovery of the biochemical mechanism behind UVR addiction.²⁰

COMMENT

Tanning is unlikely to go away anytime soon. Unless the cultural perception of tanned skin as glamorous and healthy is changed, we likely will see the long-term side effects of excessive UVR exposure for years to come. Future prevention efforts should focus on more than skin cancer and also address the more immediate effects. In concert, larger studies delineating individuals most susceptible to developing UVR SRDs may narrow down the target audience for prevention efforts. As with other SRDs, further investigation needs to look at the physiological process of UVR addiction, perhaps even offering treatment in the form of a patch or pill.

The American Academy of Dermatology opposes indoor tanning and supports a ban on the production and sale of indoor tanning equipment for nonmedical purposes.²¹ Patients with frequent sunburns, abnormally dark tans, or other signs of excessive UVR exposure may benefit from counseling regarding prevention and one day even treatment for an addiction to tanning.

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