

Indoor tanning addiction tendencies: Role of positive tanning beliefs, perceived vulnerability, and tanning risk knowledge

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ABSTRACT

This study explored the utility of mCAGE in identifying individuals who display tanning addiction tendencies and examined correlates of indoor tanning addiction tendencies including (a) demographic variables, (b) use patterns and future intentions, and (c) attitudinal and knowledge constructs in a young adult college sample. Participants ($n = 587$ undergraduate students at a large university in the North-Eastern United States) completed paper-and-pencil surveys about indoor tanning and sunbathing behaviours, past use and future intentions, modified CAGE screener adapted for indoor tanning addiction, positive tanning beliefs, perceived vulnerability, and tanning knowledge. Higher indoor tanning addiction tendencies were indicated for (a) younger participants; (b) participants reporting higher frequency of past indoor tanning and higher indoor tanning intentions; and (c) participants reporting positive tanning beliefs. The findings indicate a need for clinical identification of indoor tanning addiction and a move towards establishing interventions for cessation, particularly on college campuses.

Keywords

Indoor tanning, mCAGE, skin cancer, tanning addiction.

History

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Introduction

Increased risk of melanoma and non-melanoma skin cancers from indoor tanning has been established in numerous studies (Clough-Gorr, Titus-Ernstoff, Perry, Spencer, & Ernstoff, 2008; Lazovich et al., 2010; Ting, Schultz, Cac, Peterson, & Walling, 2007; Westerdahl, Ingvar, Masback, Jonsson, & Olsson, 2000). Research has shown that even moderate exposure to artificial ultraviolet radiation in tanning beds can lead to the development of various health problems, including premature aging, immune suppression, eye damage, allergic reaction, and increased risk of skin cancers (squamous cell carcinoma, basal cell carcinoma, and melanoma) (Costagliola et al., 2008; Pierard, 1998; Quatresooz, Henry, Paquet, & Pierard, 2011; Walters & Kelley, 1987; Wehner et al., 2012). Despite severe health risks associated with indoor tanning, and recommendations by the U.S. Food and Drug Administration, National Cancer Institute, the American Academy of Dermatology, and other prominent health organizations to avoid indoor tanning entirely (FDA Consumer Health Information, 2010), it is a popular behaviour amongst college youth (Basch, Hillyer, Basch, & Neugut, 2012; Buller et al., 2011; Lostritto et al., 2012). Besides the desire for appearance enhancement (Bagdasarov, Banerjee, Greene, & Campo, 2008; Branstrom, Ullen, & Brandberg, 2004; Cafri et al., 2006; Cokkinides, Weinstock, O'Connell, &

Thun, 2002; Danoff-Burg & Mosher, 2006), indoor tanners report other motivations including relaxation (Branstrom et al., 2004; Cokkinides et al., 2002; Danoff-Burg & Mosher, 2006), experience of lifting up spirits or mood (Cokkinides et al., 2002), improving seasonal affective disorder (Hillhouse, Stapleton, & Turrisi, 2005), and socialization (indoor tanning with friends; Branstrom et al., 2004; Geller et al., 2002; O'Riordan et al., 2006).

Recent evidence suggests that excessive indoor tanning may be an affective disorder, similar to substance-use disorder (e.g. Harrington et al., 2011; Heckman, Egleston, Wilson, & Ingersoll, 2008; Hillhouse et al., 2012; Kourosh, Harrington, & Adinoff, 2010; Mosher & Danoff-Burg, 2010; Nolan, Taylor, Liguori, & Feldman, 2009; Warthan, Uchida, & Wagner, 2005). The release of endogenous opioids when the skin is exposed to UV radiation most likely accounts for the mechanism of tanning dependence (Nolan et al., 2009). Assessing an individual's dependence on tanning has been investigated using different assessment criteria: the modified CAGE (Cut down, Annoyed, Guilty, Eye-opener) Questionnaire, which consists of four questions used for alcoholism screening (and modified to indoor tanning contexts) (Mayfield, McLeod, & Hall, 1974), the American Psychiatric Association Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSMIV-TR) (American Psychiatric Association, 2003), which outlines seven diagnostic criteria for substance related disorder, and the Structured Interview for Tanning Abuse and Dependence (SITAD) tanning dependence assessment based on opioid use items adapted from the Structured Clinical

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Interview for DSM-IV Axis I Disorders (SCID; First, Spitzer, Gibbon, & Williams, 1995).

There is no current gold standard for measuring tanning dependence (Hillhouse et al., 2012), but the above mentioned diagnostic tools do identify individuals who may display a tanning addiction tendency or a high likelihood of tanning addiction. In a number of previous studies (Heckman et al., 2008; Mosher & Danoff-Burg, 2010; Warthan et al., 2005) both the modified CAGE questionnaire and the DSMIV-TR have been utilized to measure tanning dependence, and the results have consistently documented a significant association between the two instruments. The findings from these two instruments indicate high tanning dependence rates in the study populations, and have been criticized for possibly over-identifying tanning dependence in the population (Hillhouse et al., 2012). The more recent measure of tanning abuse and dependence using SITAD concluded that 10.8% of college-going, adult participants met the SITAD criteria for tanning abuse (defined as a maladaptive pattern of tanning and manifested by failure to fulfill role obligations, physically hazardous tanning, legal problems, or persistent social or interpersonal problems) and 5.4% met the criteria for tanning dependence (as defined by three or more of the following: loss of control, cut down, time, social problems, physical or psychological problems, tolerance, and withdrawal; Hillhouse et al., 2012).

Whereas the SITAD may be a more comprehensive measure of tanning abuse and dependence, it has been utilized and validated in one study only. As well, it was not available when we conducted this study. Our objective for the study was to explore the utility of mCAGE in identifying individuals who display tanning addiction tendencies, and to examine its multiple correlates. Examining multiple correlates of tanning addiction tendency is not only important to help identify individuals in need of a clinical intervention, but to also identify targets of intervention that could be amenable to change (such as knowledge or attitudes about tanning). The current study was exploratory in nature, and was designed to replicate and extend the works of Warthan et al. (2005) and Heckman et al. (2008) by further investigating possible predictors of tanning addiction tendencies such as demographic variables, use patterns and future intentions, and attitudinal and knowledge constructs in a college young adult sample. Demographic variables may help identify potential individuals at risk for indoor tanning addiction tendencies; indoor tanning and sunbathing use patterns and future intentions may help to establish construct validity of the indoor tanning addiction measure as well as shed light on indoor and outdoor tanning behaviours; finally, attitudinal and knowledge constructs may help clarify theoretically-supported targets of behaviour change interventions/campaigns.

Based on prior literature, we hypothesized that female participants with higher past indoor tanning behaviours, greater intentions to indoor tan, more positive tanning beliefs, and low knowledge will display higher indoor tanning addiction tendencies. We were unsure of the associations between indoor tanning addiction tendencies and other variables in the study (such as, age, skin type, past sunbathing frequency and intentions to sunbathe), but included the

variables because they have been investigated in prior studies as predictors of indoor tanning behaviours (Buller et al., 2011).

Methods

Participants and procedure

This study used a cross-sectional design to assess behaviours, attitudes, and intentions relevant to understanding indoor tanning addiction tendencies, a high risk factor for skin cancer. After receiving human subjects' approval from the Institutional Review Boards, 587 undergraduate students in introductory communication courses at a large North-Eastern University in the United States were surveyed in the winter of 2011. The participants completed the paper-and-pencil surveys voluntarily and anonymously in their classrooms. The survey was administered at the end of class, and the students who declined participation were allowed to leave the class.

Two versions of the questionnaires were completed by participants to control for order effects – one version was comprised of questions about behaviour and intention in the beginning followed by attitudinal questions, and the other version had attitudinal questions in the beginning followed by questions about behaviour and intention. We conducted independent sample t tests to examine order effects. Results confirmed that the order of questions did not have any effect on study variables such as indoor tanning dependence, $t(562) = -0.62$, $p = 0.54$; positive tanning beliefs, $t(577) = -1.37$, $p = 0.17$; perceived vulnerability, $t(579) = 0.67$, $p = 0.50$; and tanning risk knowledge, $t(564) = 0.24$, $p = 0.81$. Therefore, survey versions were not included as a covariate in any of the further analyses.

Of the original 587 participants, students older than 25 were removed ($n = 36$) to retain sample homogeneity. Among the remaining 551 participants, 39.6% had ever used an indoor tanning device. The mean age of participants was 19.98 years ($SD = 1.23$, $Range = 18-25$ years), 63.9% ($n = 352$) were females, and 61.3% participants identified themselves as Caucasian, 19.1% Asian, 9.3% Hispanic/Latino, and 8% Black/African American (other groups <2% each). We also assessed participants' skin type using the Fitzpatrick (1988) scale and 2.7% participants self-identified their skin as Type 1 (burns, never tans), 12.2% as Type 2 (burns easily, then develops light tan), 14.6% as Type 3 (burns moderately, then develops light tan), 37.2% as Type 4 (burns minimally, then develops moderate tan), 28.8% as Type 5 (does not burn, develops dark tan), and 4.4% as Type 6 (does not burn, shows no noticeable change in appearance). Additionally, we assessed participants' past year tanning bed use behaviour using Hillhouse et al. (2012) 12-month categorization. Among the participants, 194 (35.2%) were current tanners who had used a tanning bed in the last 12-months.

Measurement instruments

Indoor tanning addiction tendencies

Indoor tanning addiction tendencies were measured with Mosher and Danoff-Burg (2010) modified 4-item CAGE (Cut down, Annoyed, Guilty, Eye-opener) questionnaire (with yes/no response options) originally developed by

Mayfield et al. (1974), and used for alcohol screening purposes ($\alpha = 0.71$). As per Warthan et al.'s (2005) scoring recommendations, 2 or more affirmative responses to items on the modified CAGE (mCAGE) were classified as indicating a probable substance related disorder that involved tanning bed use or indoor tanning addiction tendencies. Participants with scores of 2 and higher (13.7%) were categorized as having indoor tanning addiction tendencies.

Indoor tanning use frequency

Indoor tanning use frequency was measured at the 12-month period using the measure by Hillhouse, Turrisi, Holwiski, and McVeigh (1999). Participants were asked to estimate the number of times they used an indoor tanning facility (tanning bed, sun-bed, tanning salon, or tanning booth) in the last 12-months, with an 11-point Likert scale with 0 (0 times), 1 (1–10 times), 2 (11–20 times) ... and 10 (more than 100 times) as response options ($M = 1.01$, $SD = 2.14$).

Indoor tanning use intention

Indoor tanning use intention was measured at the 3-month and 12-month periods using the measure by Hillhouse et al. (1999). Participants were asked to estimate the number of times they plan to use a tanning bed in the next three months with a 7-point Likert scale with 0 (0 times), 1 (1–5 times), 2 (6–10 times) ... and 6 (more than 25 times) as response options ($M = 0.49$, $SD = 1.16$). For indoor tanning use intention in the next 12-month period, participants were asked to estimate the number of times they plan to use a tanning bed in the next 12 months with an 11-point Likert scale with 0 (0 times), 1 (1–10 times), 2 (11–20 times) ... and 11 (more than 100 times) as response options ($M = 0.74$, $SD = 1.71$). As expected, the two measures of intention had a strong correlation ($r = 0.92$, $p < < 0.001$). Given that the two measures had a strong correlation, we utilized indoor tanning intention in the next 3-month period in all analyses.

Sunbathing frequency

Jackson and Aiken's (2000) measure of sun-tanning was used to measure sunbathing frequency. Participants were asked to estimate the number of hours they spent sunbathing last summer, with a 9-point Likert scale with 0 (0 hours/week), 1 (1–2 hours/week), 2 (3–4 hours/week) ... and 8 (more than 25 hours/week) as response options ($M = 2.43$, $SD = 2.10$).

Sunbathing intention

Sunbathing intention was measured at the 3-month and 12-month periods modeled after the indoor tanning use intention measure by Hillhouse et al. (1999). Participants were asked to estimate the number of times they plan to sunbathe in the next 3 months with a 7-point Likert scale with 0 (0 times), 1 (1–5 times), 2 (6–10 times) ... and 6 (more than 25 times) as response options ($M = 0.19$, $SD = .59$). For sunbathing intention in the next 12-month period, participants were asked to estimate the number of times they plan to sunbathe in the next 12 months with an 11-point Likert scale with 0 (0 times), 1 (1–10 times), 2 (11–20 times) ... and 11 (more than 100 times) as response options ($M = 2.34$, $SD = 2.47$). As

expected, the two measures of intention had a moderate correlation ($r = 0.27$, $p < 0.001$). Given that the two measures had a moderate correlation, we utilized both sunbathing intention in the next 3-month and 12-month periods in all analyses.

Positive tanning beliefs

Positive tanning beliefs were measured by adapting the advantages of sunbathing scale developed by Jackson and Aiken to indoor tanning contexts (e.g. I feel more attractive with a tan) (Jackson & Aiken, 2000). The scale consisted of a 7 Likert-type items with responses ranging from 1 (strongly disagree) to 5 (strongly agree). Responses were summed and averaged with a higher score indicating greater advantages of tanning bed use ($M = 3.35$; $SD = 0.99$; $\alpha = 0.94$).

Perceived vulnerability

We used the perceived vulnerability to photoaging scale developed by Gibbons, Gerrard, Lane, Mahler, and Kulik (2005) to assess the likelihood of wrinkling prematurely due to indoor tanning. This is a single-item scale, "If you were to get tanned on a regular basis from using indoor tanning beds, what are the chances that your skin would wrinkle prematurely?" followed by a 7-point scale, ranging from 1 (no chance) to 7 (definitely would happen). A higher score indicated greater perceived vulnerability to photoaging ($M = 5.68$, $SD = 1.4$).

Tanning knowledge

Tanning knowledge was a shortened version of the 13-question tanning IQ quiz, developed by the Texas AgriLife Extension Service, Texas 4-H, and the Cancer Prevention and Research Institute of Texas (AgriLife Extension: Texas A&M System, 2009). Using 8 of the 13-questions, we asked participants to rate true (1) or false (0) to statements about tanning risk (such as, there is no such thing as a safe tan, dermatologists say tanning causes melanoma, and indoor tanning is helping to reduce the incidence of sunburn). All answers marked correctly by participants were added together for their correct score ($M = 3.91$, $SD = 1.32$). A higher score indicated higher tanning knowledge.

Data analysis

Indoor tanning addiction tendencies was a binary dependent variable with 0 (no indoor tanning addiction tendencies) and 1 (indoor tanning addiction tendencies). One logistic regression model was built to examine the roles of (a) demographic variables (age, sex, and skin type), (b) sunbathing and indoor tanning use patterns and future intentions, and (c) attitudinal and knowledge variables on indoor tanning addiction tendencies. The results present the findings of the regression analysis for each type of variable (i.e. demographic, past behaviours and future intentions, and attitudinal and knowledge constructs).

Results

A zero-order correlation matrix is presented in Table 1.

Table 1. Zero order correlation matrix for all variables.

	1	2	3	4	5	6	7	8	9	10	11	12
1. IT addiction tendencies	1.00											
2. Past IT use	0.59**	1.00										
3. IT use intention (3-months)	0.59**	0.84**	1.00									
4. Summer sunbathing freq.	0.32**	0.38**	0.39**	1.00								
5. Sunbathing intent (3-months)	0.05	0.15**	0.16**	0.19**	1.00							
6. Sunbathing intention (12-months)	0.30**	0.42**	0.41**	0.73**	0.27**	1.00						
7. Positive tanning beliefs	0.32**	0.40**	0.35**	0.51**	0.15**	0.50**	10.00					
8. Perceived vulnerability	0.08	0.14*	0.07	0.14*	0.00	0.10	0.13*	1.00				
9. Tanning risk knowledge	-0.11*	-0.13*	-0.10	-0.13*	-0.07	-0.04	-0.09	-0.02	1.00			
10. Age	-0.07	0.04	0.02	-0.06	0.09	-0.06	-0.06	0.03	0.02	1.00		
11. Sex (Female)	0.24**	0.28**	0.24**	0.23**	0.02	0.23**	0.15*	0.37**	-0.04	-0.10	1.00	
12. Skin type	0.04	0.07	0.08	0.11*	0.07	0.06	-0.01	-0.14*	0.02	0.07	0.07	1.00

* $p < 0.01$; ** $p < 0.001$

Table 2. Logistic regression analyzing predictors of indoor tanning addiction tendencies.

Variables	OR (95% CI)	Wald
Demographic variables		
Age	0.68 (0.49, 0.94)*	5.41
Sex (Female)	2.79 (0.99, 7.84)	3.79
Skin Type I	Reference	
Skin Type II	0.22 (0.02, 2.45)	1.50
Skin Type III	0.27 (0.03, 2.82)	1.20
Skin Type IV	0.25 (0.03, 2.43)	1.44
Skin Type V	0.19 (0.02, 1.98)	1.92
Skin Type VI	0.82 (0.05, 12.63)	0.02
Sunbathing and indoor tanning use patterns and future intentions		
Frequency of indoor tanning	1.37 (1.10, 1.69)**	7.99
Indoor tanning use intention (3-months)	2.11 (1.42, 3.16)***	13.35
Frequency of sunbathing in summer	1.04 (0.83, 1.30)	0.12
Sunbathing intention (3-months)	0.52 (0.27, 0.99)*	3.95
Sunbathing intention (12-months)	1.00 (0.83, 1.21)	0.00
Attitudinal and tanning risk knowledge measures		
Positive tanning beliefs	2.15 (1.23, 3.75)**	7.30
Perceived vulnerability	0.97 (0.71, 1.33)	0.04
Tanning risk knowledge	0.85 (0.64, 1.14)	1.16

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ Cox & Snell $R^2 = 0.30$; Nagelkerke $R^2 = 0.54$.

Demographic variables

The results of the logistic regression (Table 2) indicated one significant demographic predictor: age (Wald = 5.41, OR = 0.68, $p < 0.05$). Participants lower in age had greater odds of displaying indoor tanning addiction tendencies.

Prior sunbathing and indoor tanning behaviours and future intentions

The results of the logistic regression (Table 2) indicated three significant predictors of indoor tanning addiction tendencies related to prior tanning and sunbathing behaviours and future intentions: frequency of past tanning bed use (Wald = 7.99, OR = 1.37, $p < 0.01$), indoor tanning intention in 3-months (Wald = 13.35, OR = 2.11, $p < 0.001$), and sunbathing intentions in 3-months (Wald = 3.95, OR = 0.52, $p < 0.05$). Higher frequency of past indoor tanning, higher intention to indoor tan in the next 3-months, and lower intention to sunbathe in the next 3-months predicted indoor tanning addiction tendencies. Others variables (frequency of sunbathing, and

sunbathing intentions in the next 12-months) were not significant predictors of indoor tanning addiction tendencies.

Attitudinal and knowledge constructs

The results of the logistic regression (Table 2) indicated one significant predictor of indoor tanning addiction tendencies related to attitudinal (i.e. positive tanning beliefs, perceived vulnerability) and knowledge constructs: positive tanning beliefs (Wald = 7.30, OR = 2.15, $p < 0.01$). Whereas positive tanning beliefs were associated with indoor tanning addiction tendencies, perceived vulnerability was not a significant predictor. As well, tanning risk knowledge did not predict indoor tanning addiction tendencies.

Overall, the effect size for the regression model was moderately strong, as is evident from the Nagelkerke $R^2 = 0.54$.

Discussion

The present study investigated possible predictors of tanning addiction tendencies such as demographic variables, use patterns and future intentions, and attitudinal and knowledge constructs in a college young adult sample. The results indicated higher indoor tanning addiction tendencies for (a) younger participants; (b) participants reporting higher frequency of past indoor tanning, greater intention of indoor tanning in the next 3-months, and lower sunbathing intention in the next 3-months; and (c) participants ascribing to positive tanning beliefs. These results are further discussed.

We found that 14% of our sample displayed indoor tanning addiction tendencies. Using mCAGE as a measure of tanning addiction, our results are slightly lower than previously reported national results. For instance, Warthan et al. (2005) reported that 26% of beachgoers in their study met the mCAGE criteria for sun tanning-related disorder, Poorsattar and Hornung (2007) reported that 28% of their indoor tanning undergraduates met the mCAGE criteria for indoor tanning addiction, and Mosher and Danoff-Burg (2010) reported that 30.6% of their undergraduates from a state university in the North-Eastern United States met the mCAGE criteria for possible indoor tanning addiction. Therefore, compared to other previous studies, we found much smaller percentage of our sample displaying indoor tanning addiction tendencies. However, when focusing only on participants who had ever

used indoor tanning facilities, we found that 33% of participants met the mCAGE criteria for indoor tanning addiction, consistent with previous studies. As well, results clearly demonstrated that younger participants were more likely to display these tendencies. These findings corroborate what we know from past studies regarding demographic profile of indoor tanning users.

We found that participants who reported higher frequency of past indoor tanning, greater intention of indoor tanning in the next 3-months, and lower sunbathing intention in the next 3-months displayed higher indoor tanning addiction tendencies. Given that we collected data in the winter of 2011, it is not surprising that participants with higher indoor tanning addiction tendencies reported less sunbathing intention in the next 3-months but higher indoor tanning intention in the same period. A recent study described the proportion of college students that spent approximately three hours or more outdoors, and reported that during summer months, 88% of college students reported being outdoors, followed by less than half (40%) during spring and fall, and less than one-tenth (7%) during winter months (Basch et al., 2012). This leads us to conclude that sunbathing is most prevalent during summer months and indoor tanning in fall, winter, and spring months. Whereas sunbathing and indoor tanning are not interchangeable behaviours, they are seasonal behaviours motivated by appearance-enhancement beliefs and preference for tanned skin. These attitudes and behaviours are driven, in part, by social norms and cultural ideals that place a high value on physical appearance, and present a major challenge to sun protection and skin cancer prevention efforts (Holman et al., 2013; Martin et al., 2009).

Confirming the desire for a tanned look, our results demonstrate that participants ascribing to positive tanning beliefs were at a greater risk for indoor tanning dependence. Changing positive attributes associated with indoor tanning is necessary to reduce the appeal and charm of indoor tanning among youth. Past research indicates that where people exhibit positive attitudes toward sun protection, they also report positive tan appeal and outdoor sun exposure attitudes (Bandi, Cokkinides, Weinstock, & Ward, 2010). Instead of focusing interventions on exclusively sun-protection or indoor tanning prevention, interventions to limit ultraviolet radiation exposure and melanoma prevention should include both avoidance of sun-tanning and indoor tanning. Given the increasing rates of melanoma detection in young adults, it is pertinent that melanoma prevention makes way into school and college curriculum.

Contrary to expectations, the present study did not find a significant association between tanning risk knowledge and indoor tanning addiction tendencies. However, the results do indicate a trend associating lower tanning risk knowledge with higher indoor tanning addiction tendencies. These results indicate that educating people about dangers of indoor tanning may not be an optimal strategy for interventions. In fact, research suggests that increasing threat perceptions alone are not sufficient. It is equally important to raise people's personal beliefs of susceptibility (Cody & Lee, 1990).

The findings of our study also indicate a need for clinical identification of indoor tanning addiction and a move towards

establishing counselling or behaviour change interventions for cessation, particularly on university campuses. Whereas some behavioural interventions have been successful in reducing indoor tanning behaviour among users (Gibbons et al., 2005; Hillhouse, Turrisi, Stapleton, & Robinson, 2008), no known behavioural interventions have been tested with people displaying indoor tanning addiction tendencies. As well, patient intake forms at dermatologist clinics should include questions about sun-tanning and indoor tanning behaviours and have provisions for referring patients for cessation services. Indoor tanning addiction literature is at a nascent stage, but the available evidence presents the need for clinical interventions for helping dependent indoor tanners quit. This is a ripe area for further research.

Finally, the findings of the present study have implications for a likely classification of indoor tanning addiction similar to substance-related and addictive disorders in DSM-5. Although it's a little preliminary, the findings of this paper suggest the need for a more comprehensive measure of indoor tanning dependence. A recent literature review summarized the clinical features, diagnosis, prevalence, aetiology, treatment, prevention, and psychopathology of indoor tanning addiction disorder, and reported that many excessive indoor tanners meet symptom criteria adapted from the DSM-IV-TR for substance abuse and dependence (Petit, Lejoyeux, Reynaud, & Karila, 2014). Without a clear consensus on a gold standard for measuring tanning dependence, the research signals a clear need for understanding indoor tanning addiction, particularly the wide spectrum of addiction (as some people may be more or less addicted), as well as studies in neurobiology and imaging to further our understanding of tanning dependence.

Limitations

There are limitations to our current work. The study was conducted at one university campus in a cold-weather state in northern United States on a convenience sample of young adults limiting the generalise-ability of our findings. We utilised the mCAGE measure for identifying participants with indoor tanning addiction tendencies. Asking participants to complete other measures such as DSMIV-TR or SITAD may indicate different results, and help assess the validity of mCAGE as the primary diagnostic tool for indoor tanning dependence identification. We utilized the conventional cutting score of 2 for mCAGE to indicate a probable substance related disorder that involved tanning bed use or indoor tanning addiction tendencies. Examining several different cutting scores to see which one maximizes sensitivity and specificity, and comparing it with other available measures such as the DSMIV-TR or SITAD will provide a more in-depth understanding of identifying individuals displaying indoor tanning addiction tendencies. Additionally, with the new Fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013), new measure based on the criteria for substance use disorder modified for tanning addiction could be developed and tested. Finally, we focused only demographic, use patterns and intentions, and attitudinal and knowledge constructs. Future research could

look at other normative, familial, and inter-generational constructs that influence indoor tanning behaviour and indicate a strong association with indoor tanning dependence.

Conclusions

In conclusion, this is one of the few studies to examine correlates of indoor tanning dependence and signals a need for greater research and practical steps for indoor tanning cessation interventions. The findings reported here will be useful in behavioural and possibly pharmacological intervention development to encourage cessation as well as public health campaigns to raise awareness of this prevalent yet preventable cancer risk behaviour.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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