Patterns of Indoor Tanning Use

Implications for Clinical Interventions

Joel Hillhouse, PhD; Rob Turrisi, PhD; Alan L. Shields, PhD

Objective: To identify indoor tanning patterns with relevance for health screening and prevention efforts.

Design: We collected data on indoor tanning patterns from January 17, 2006, through April 14, 2006. By cluster analysis, 4 patterns of indoor tanning were identified: special event, spontaneous or mood, mixed, and regular year-round tanning. These 4 types of indoor tanning were compared by demographic, behavioral, and psychosocial variables for clinically significant differences.

Setting: Midsized (ie, approximately 12,000 students) southeastern university.

Participants: A total of 168 women who tanned indoors.

Main Outcome Measures: Self-reported attitudes, intentions and tanning behaviors, and tanning dependence.

Results: Event tanners tanned the least, started tanning the latest, and scored lowest on measures of attitudes, social norms, and tanning dependence measures. Regular year-round tanners started the earliest, tanned at the highest levels, and scored the highest on the attitude, social norms, and tanning dependence measures. Spontaneous or mood tanners were similar to event tanners but with a mood component to their tanning. Mixed tanners, as the name implies, exhibited behavior that appeared to be a mixture of the regular and event tanning types.

Conclusions: The results of this study emphasize the fact that “one size fits all” does not apply when it comes to indoor tanning. Tanning behavioral types, which can be clinically assessed, can serve as a guide to physicians so that they can tailor their skin cancer prevention messages to be more effective.

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Evidence that indoor tanning (IT) poses a serious public health risk is increasing. Numerous case-controlled studies1-7 report positive relationships between IT and melanoma morbidity. A recent meta-analysis8 indicated a significantly increased melanoma risk associated with sunlamp or sun bed exposure. Cohort studies9-11 have confirmed this relationship for both melanoma and nonmelanoma skin cancers. A recent report12 from the International Agency for Research on Cancer concluded that exposure to sun beds before the age of 35 years significantly increases the risk of melanoma and squamous cell carcinoma.

The IT industry is experiencing explosive growth and attracting unprecedented numbers of young people to its tanning bed salons. Nearly 2 million Americans tan indoors each day, with the number of individual users in the United States having doubled to nearly 30 million in the past decade.13 Our investigations of IT have suggested that there may be subtypes of tanning behavior that have clinical significance in terms of health risk and clinical prevention messages.14

In focus group studies and interviews conducted in our laboratory, indoor tanners have reported 2 general patterns and 2 subpatterns of IT behavior. One general pattern involves IT on a regular weekly or biweekly basis (eg, 3 times per week). In the other, indoor tanners tan numerous times during a short period associated with a special event, followed by extended periods of no tanning. However, some of these nonregular tanners also describe a more spontaneous pattern. Other tanners report both regular tanning periods and shorter periods of tanning associated with particular special events. Finally, we noted a group of tanners who report being strongly influenced by mood factors in their tanning, and these individuals seem to be spread across the 2 main groups described herein.15

The purpose of the present study was to explore IT patterns empirically using cluster analysis and then explore each identified cluster in terms of potential health risk and motivations. We developed simple items designed to assess IT behavioral patterns that were used for the cluster analysis. Behavioral profiles were then compared by relevant demographic, behavioral,
Indoor tanning was assessed by asking respondents to estimate their IT frequencies during 12, 6, and 3 months using open-ended responses. These items were then weighted to account for different time frames, summed, and averaged as an estimate of IT behavior during the past year (Cronbach α=0.91).1

**IT Intentions**

Study participants were asked to indicate how strongly they intended to engage in IT-related behaviors in the next year. Individuals responded to each item on 7-point scales anchored by an intend or do-not-intend response format (Cronbach α=0.93).

**Attitudes and Perceptions About IT**

Individuals were asked to indicate whether they agreed or disagreed with a set of statements that described the potential advantages and disadvantages of IT behavior on 5-point Likert-type scales (Cronbach α=0.89).

**Descriptive IT Norms**

The Indoor Tanning Norms Rating Form21 is a measure that evaluates descriptive norms of IT use for “all college students,” “popular college students,” “attractive college students,” “close friends,” and “media stars” (Cronbach α=0.88).

**Perceived Subjective Norms**

We used the methods suggested by Ajzen and Madden22 to assess perceived subjective or injunctive norms, including perceived approval of friends, typical college students, popular college students, family members, and partners (if they had one). This scale evidenced good internal consistency (Cronbach α=0.89). In addition, we asked individuals with current romantic partners how dark a tan their partner preferred (Partner Tan Preference Rating).

**IT Attitude Predictors**

Respondents indicated the degree to which they believe tanning improves attractiveness with 5 items (Cronbach α=0.93).
Table 1. Indoor Tanning Patterns by Cluster

<table>
<thead>
<tr>
<th>Tanning Pattern</th>
<th>Event (n=90 [53.6%])</th>
<th>Spontaneous or Mood (n=10 [6.0%])</th>
<th>Mixed (n=48 [28.6%])</th>
<th>Regular (n=20 [11.9%])</th>
<th>Total (N=168)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event, mean (SD)</td>
<td>1.26 (0.96)</td>
<td>1.20 (0.42)</td>
<td>1.52 (1.07)</td>
<td>-0.15 (1.57)</td>
<td>1.16 (1.10)</td>
</tr>
<tr>
<td>Spontaneous, mean (SD)</td>
<td>0.17 (1.30)</td>
<td>1.10 (0.60)</td>
<td>0.98 (1.08)</td>
<td>-0.25 (1.52)</td>
<td>0.40 (1.33)</td>
</tr>
<tr>
<td>Regular seasonal, mean (SD)</td>
<td>-1.66 (0.60)</td>
<td>0.00 (0.00)</td>
<td>1.08 (0.40)</td>
<td>1.35 (1.27)</td>
<td>-0.42 (1.51)</td>
</tr>
<tr>
<td>Regular year round, mean (SD)</td>
<td>-1.70 (0.76)</td>
<td>-0.60 (0.84)</td>
<td>-0.54 (1.13)</td>
<td>0.45 (1.61)</td>
<td>-1.05 (1.26)</td>
</tr>
<tr>
<td>Regular (dichotomous), No./total No. (%)</td>
<td>4/78 (5.1)</td>
<td>1/8 (12.5)</td>
<td>10/45 (22.2)</td>
<td>11/18 (61.1)</td>
<td>26/149 (17.4)</td>
</tr>
<tr>
<td>Mood (dichotomous), No./total No. (%)</td>
<td>14/77 (18.2)</td>
<td>4/8 (50.0)</td>
<td>16/45 (35.6)</td>
<td>10/17 (58.8)</td>
<td>44/147 (29.9)</td>
</tr>
</tbody>
</table>

a Measured on 5-point Likert scales (−2, strongly disagree, to +2, strongly agree). See the Figure for the actual items.
b Measured on dichotomous yes or no scales. See the Figure for the actual items.

Expectancies related to IT were assessed with 8 items (Cronbach α=0.99). The perception that IT is a good way to relax and relieve stress was assessed with 6 items (Cronbach α=0.97).

Tanning Dependence

We have been exploring the idea that some tanners exhibit dependence-like behaviors, such as tanning obsessions, physical and psychological tolerance, loss of control, tanning consequences that parallel the effects of endogenous opioids, and cognitions that reflect dissatisfaction with their skin color.23 Euphoria and other opioid-like tanning effects were measured with a 5-item scale (eg, “I feel euphoric after an indoor tanning session”. Cronbach α=0.88). Belief that tanning is out of control was measured with a 5-item scale (Cronbach α=0.77). Tolerance to tanning effects was measured with 3 items (eg, “I think the amount 1 indoor tan leaves me less attractive”; Cronbach α=0.69). Obsession with tanning was measured with 4 items (Cronbach α=0.73). Dissatisfaction with skin color was measured with 4 items (Cronbach α=0.78).

DATA ANALYSIS

Initially, we performed cluster analysis for the purpose of establishing IT behavioral types. Once categorized into types, we examined the behavioral and psychological patterns among the types to explore potential clinical implications. Cluster analysis was performed using the squared euclidean distance metric and the Ward minimum variance clustering algorithm24 according to procedures described by Milligan and Hirtle.25 A 4-cluster solution generated 4 distinct pattern profiles. Table 1 presents the means and standard deviations for the Likert-type assessments and the percentages that agree with the dichotomous assessments.

CLUSTER 1: EVENT TANNERS (TYPE 1)

This cluster demonstrated a spike on the event tanning scale and had relatively low scores on the spontaneous, mood, regular seasonal, and regular year-round scales. This cluster made up 53.6% of the total sample.

CLUSTER 2: SPONTANEOUS OR MOOD TANNERS (TYPE 2)

This cluster had spikes on the event, spontaneous, and mood tanning scales. It had low scores for both regular tanning scales. This cluster seemed to be a subcategory of event tanners who also reported tanning spontaneously and for mood reasons. This cluster composed 6.0% of the total sample.

CLUSTER 3: MIXED TANNERS (TYPE 3)

This cluster showed spikes for the event, spontaneous, and regular seasonal tanning scales. It had low scores on the regular year-round scale and moderate scores on the mood scale. It appears to include tanners who not only tan regularly in certain seasons but also will event tan during their off-season. The mixed tanner cluster consisted of 28.6% of the sample.

CLUSTER 4: REGULAR TANNERS (TYPE 4)

This cluster had a spike on the regular seasonal and mood tanning scales and a spike on the regular year-round scale. It demonstrated low scores on the event and spontaneous tanning scales. This cluster made up 11.9% of the total sample.

Next we used analysis of variance to test for differences in demographic, psychosocial, and behavioral domains.

DEMOGRAPHIC AND BEHAVIORAL VARIABLES

Statistically significant differences were found among clusters for age, age at first IT session, IT frequency in the past year, and IT intentions for the coming year (Table 2). Mixed and regular tanners were statistically significantly younger than the spontaneous or mood tanners (F=2.88; P=.04). Regular tanners reported their first IT session at a statistically significantly younger age than event tanners (F=2.83; P=.04). Event tanners reported tanning less than either mixed or regular tanners (eg, event tanners reported tanning 60 times less per year than regular tanners), and regular tanners tanned indoors at statistically significantly higher levels than spontaneous or mood or mixed tanners in the past year (F=36.69; P<.001).

PSYCHOSOCIAL VARIABLES

Statistically significant differences were found for IT attitudes, IT descriptive and subjective norms, tanning attitudes, belief that IT is stress relieving, partner preference, and 4 of the tanning dependence scales (ie, euphoria, obsession, out of control, and skin color dissatisfaction but not tolerance) (Table 3).
Table 2. Demographic and Behavioral Variables by Cluster

<table>
<thead>
<tr>
<th>Variable</th>
<th>Event (n=90 [53.6%])</th>
<th>Spontaneous or Mood (n=10 [6.0%])</th>
<th>Mixed (n=48 [28.6%])</th>
<th>Regular (n=20 [11.9%])</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD), y</td>
<td>20.6 (5.4)</td>
<td>23.7 (10.2)</td>
<td>19.5 (2.8)</td>
<td>18.6 (0.9)</td>
<td>.04</td>
</tr>
<tr>
<td>Age at first indoor tanning session, mean (SD), y</td>
<td>16.2 (2.4)</td>
<td>16.4 (3.8)</td>
<td>15.3 (3.2)</td>
<td>14.6 (1.3)</td>
<td>.04</td>
</tr>
<tr>
<td>IT intentions, mean (SD)</td>
<td>4.5 (1.7)</td>
<td>5.2 (1.8)</td>
<td>6.3 (0.9)</td>
<td>7.0 (0.1)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>IT use, mean (SD)</td>
<td>11.8 (16.5)</td>
<td>17.6 (16.1)</td>
<td>27.3 (20.1)</td>
<td>72.3 (48.8)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Abbreviation: IT, indoor tanning.

*Measured on 7-point Likert scales (1=definitely do not intend; 7=definitely intend).

Regular tanners reported significantly more positive attitudes toward IT than other clusters, and event tanners had significantly less positive attitudes than either mixed or regular tanners (F(3,156)=17.45; P<.001). Event tanners were less likely to believe that their peers and media stars were indoor tanners than either mixed or regular tanners (F(3,156)=8.92; P<.001). Similarly, event tanners reported significantly lower subjective norms than any other cluster of tanners (F(1,157)=7.28; P<.001). Event tanners also reported that their partners preferred the lightest tans when compared with either mixed or regular tanners (F(3,156)=4.17; P=.008). Regular tanners reported more positive attitudes toward tans than event tanners (F(3,156)=3.03; P=.03). Event tanners reported less positive expectancies associated with tanning than either mixed or regular tanners (F(3,157)=5.21; P=.002). Event tanners were also the least likely to believe that IT was stress relieving compared with the other clusters (F(3,157)=9.28; P<.001).

Next we examined differences in IT clusters using the tanning dependence scales. Event tanners were least likely to report euphoria or other endogenous opioid-like effects from IT than the other clusters (F(3,158)=9.11; P<.001). Mixed and regular tanners were more likely to report obsessions with IT than were event tanners (F(3,158)=5.91; P=.001). Event tanners were the least likely of the clusters to report that they believed their tanning was out of control (F(3,158)=5.36; P<.002). Finally, mixed and regular tanners were more likely to express dissatisfaction with the color of their skin than were event tanners (F(3,158)=3.67; P=.01).

Table 3. Mean (SD) Psychosocial and Pathologic Scores by Cluster

<table>
<thead>
<tr>
<th>Variable</th>
<th>Event (n=90 [53.6%])</th>
<th>Spontaneous or Mood (n=10 [6.0%])</th>
<th>Mixed (n=48 [28.6%])</th>
<th>Regular (n=20 [11.9%])</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT attitudes a</td>
<td>14.6 (5.0)</td>
<td>17.1 (4.2)</td>
<td>19.0 (4.0)</td>
<td>21.4 (2.6)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>IT descriptive norms a</td>
<td>17.5 (3.6)</td>
<td>19.3 (3.7)</td>
<td>20.0 (3.5)</td>
<td>18.7 (3.7)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>IT injunctive norms b</td>
<td>0.8 (5.0)</td>
<td>5.1 (5.5)</td>
<td>3.7 (4.4)</td>
<td>4.9 (4.0)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Partner preference b</td>
<td>3.0 (1.1)</td>
<td>3.3 (1.5)</td>
<td>3.7 (1.3)</td>
<td>4.1 (1.4)</td>
<td>.008</td>
</tr>
<tr>
<td>Tanning attitudes a</td>
<td>30.5 (5.6)</td>
<td>32.8 (4.5)</td>
<td>32.2 (4.3)</td>
<td>32.8 (4.0)</td>
<td>.03</td>
</tr>
<tr>
<td>Tanning expectations d</td>
<td>27.6 (6.5)</td>
<td>30.3 (5.0)</td>
<td>30.5 (4.9)</td>
<td>30.5 (4.2)</td>
<td>.002</td>
</tr>
<tr>
<td>Belief IT relieves stress g</td>
<td>18.0 (6.1)</td>
<td>22.7 (5.8)</td>
<td>21.9 (4.9)</td>
<td>23.9 (3.5)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>IT euphoria a</td>
<td>10.3 (5.2)</td>
<td>14.8 (4.4)</td>
<td>13.9 (5.0)</td>
<td>15.6 (5.3)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>IT obsession f</td>
<td>5.3 (2.2)</td>
<td>5.8 (2.4)</td>
<td>7.2 (3.6)</td>
<td>7.5 (3.1)</td>
<td>.001</td>
</tr>
<tr>
<td>IT out of control a</td>
<td>6.9 (2.8)</td>
<td>9.6 (2.6)</td>
<td>8.6 (4.0)</td>
<td>9.5 (3.6)</td>
<td>.002</td>
</tr>
<tr>
<td>IT tolerance g</td>
<td>4.8 (2.1)</td>
<td>3.9 (2.1)</td>
<td>5.4 (2.4)</td>
<td>4.8 (2.6)</td>
<td>.29</td>
</tr>
<tr>
<td>Dissatisfaction with skin color f</td>
<td>11.1 (4.3)</td>
<td>13.1 (3.3)</td>
<td>12.7 (3.9)</td>
<td>14.1 (3.1)</td>
<td>.01</td>
</tr>
</tbody>
</table>

Abbreviation: IT, indoor tanning.

*Scores range from 5 to 25; represents neutral attitude.

This study identified 4 tanning subtypes that appear to differ in demographic, psychosocial, and behavioral dimensions. Table 4 represents a hypothesized framework for matching IT type to clinical intervention methods based on the psychosocial and behavioral differences found in this study. Of course, controlled studies would be needed to confirm the efficacy of each behavioral intervention for the various types of IT. However, we thought it would be useful to propose this initial framework as a starting place.

The event tanning (type 1) cluster composed more than 50% of this sample. These individuals tend to tan at moderate to low levels (ie, an average of 12 times per year).
and have relatively low intentions to tan indoors in the future relative to other tanners. They report the least positive attitudes toward IT, the lowest normative ratings related to IT, and the weakest tanning expectancies and are the least likely to report that IT is relaxing or stress relieving. They also scored lowest on all of the tanning pathologic measures. These individuals appear to be casual tanners who may view tanning as a fashion accessory for special events. These are the individuals we hypothesize that dermatologists or other health care professionals are most likely to affect with appearance-related messages during the brief discussions that may occur in clinical settings. In our previous research, we demonstrated that even relatively short brochures based on behavioral principles can have significant effects on skin cancer risk behavior in these casual tanners.19,26

The spontaneous or mood (type 2) tanners, who made up approximately 6% of the sample, appear to be a special subcategory of the event tanners. They are the oldest tanners (mean age, 23.7 years) and tan at levels intermediate between the event tanners and the mixed and regular tanners. They demonstrate weak intentions to continue their tanning and intermediate attitudes and beliefs related to tanning. It has been our experience that many of our event tanners tend to reduce their tanning as they get older and particularly as they leave college and enter a world with different social and financial contexts. Spontaneous or mood tanners appear to be event tanners who do not follow this common progression but instead sustain their tanning behaviors. It is possible that this persistence may be partly due to mood influences on their tanning. For this reason, we hypothesize that it may be useful to include a brief screening for seasonal affective disorder (SAD) symptoms and depression for patients who tan indoors. Patients who show evidence of depression and SAD symptoms could be referred to mental health care professionals for diagnosis and treatment.27,28

The mixed tanners (type 3) constitute close to 30% of the sample and, as the name implies, represent a group that reports mixed patterns of tanning behavior. They resemble the regular tanners most in their intentions, attitudes, beliefs, and scores on tanning dependence scales. However, they tan significantly less than the regular tanners, although still at high rates (mean of >25 times per year), and have weaker attitudes toward IT. Perhaps most important, they seem much less influenced by mood issues than do regular tanners. Tanning is likely an important part of lifestyle and social group interaction in these tanners. We hypothesize that this group would probably benefit from a harm reduction approach, since it may be difficult to get them to eliminate tanning from their lives altogether because of the likely importance of tanning to their current social image. For example, a clinical discussion that provided information on alternative safe tanning choices, such as sunless tanning, might prove reasonably effective. However, we also hypothesize that this group may need additional booster interventions to see sustained behavioral change.

The regular tanners (type 4) make up approximately 12% of the sample and are the most at-risk group. They tan at high levels (mean of >70 times per year). They start tanning at the youngest age, have high intentions of continuing tanning, have positive attitudes toward tans and IT, and have a strong mood component to their tanning. This group of tanners is similar to the mixed tanners in terms of their tanning being an integral part of their lifestyle and social group. However, we believe that the mood component seen in regular tanners may help to account for the much greater tanning levels seen. We hypothesize that this group could benefit from depression and SAD screening and referral for those demonstrating significant depression and SAD symptoms. Of course, the fact that many of these individuals tan indoors throughout the year suggests multiple tanning motives and the likely need to incorporate interventions that address more than depression and SAD issues, such as the body dysmorphic disorder or substance-related disorder issues hinted at in the tanning pathologic assessment results. However, we believe that initial treatment of SAD symptoms may be needed before addressing other motives. We hypothesize that this group has the least chance for change in response to the brief clinical discussions that occur in physicians’ offices and may in fact experience reactance2 to some messages presented.28 We believe that this hard-core group of tanners may benefit the most from intensive interventions that address the social, appearance, health, and mood aspects of tanning in an integrated package. Such promising intervention techniques as motivational interviewing may be appropriate for this group of tanners at high risk.

This study is limited by its restricted college sample. However, the university from which this sample was drawn has a primarily nonresidential, nontraditional population of students (eg, older, many married and with children, and most employed full time). Thus, this sample is probably more reflective of typical indoor tanners than many traditional college populations. The study did not assess SAD, although an earlier study26 has already demonstrated a strong relationship between tanning and SAD symptoms (ie, depression, sleep problems, lethargy, anxiety, and social problems that usually recur regularly each winter). This study did not address other potential comorbidities hinted at in the tanning pathologic assessment results. For example, several of the scales on that

Table 4. Hypothetical Indoor Tanning Subtype by Intervention Framework

<table>
<thead>
<tr>
<th>Type</th>
<th>Hypothetical Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event tanner</td>
<td>Appearance-related discussion or brochure based on behavioral change models with emphasis on alternatives.</td>
</tr>
<tr>
<td>Spontaneous or mood tanner</td>
<td>Screening and referrals of patients with seasonal affective disorder.</td>
</tr>
<tr>
<td>Mixed tanner</td>
<td>Harm reduction approach focusing on reducing to &lt;10 times per year or sunless tanning products. Motivational interviewing-type information regarding peers' tanning preference or behavior.</td>
</tr>
<tr>
<td>Regular year-round tanner</td>
<td>Seasonal affective disorder screening and referral. In-depth discussion using motivational interviewing techniques.</td>
</tr>
</tbody>
</table>
measure may reflect forms of body dysmorphic disorder or substance-related disorders. Currently, we have only empirical data on the relationship of SAD to tanning, although promising work is attempting to link these other conditions to UV-risk behaviors. Future work should explore the association of other pathologic conditions with tanning so that physicians can consider the need to extend screening beyond SAD. This is a cross-sectional study, which makes it difficult to establish cause and effect (eg, we do not know if attitudes precede IT or vice versa). Finally, the relatively small number of regular users included in this study means that the results must be replicated in a larger sample before we can be certain that the clear behavioral differences between event and regular tanners are generalizable.

In conclusion, we hypothesize that physicians who tailor their approach to the various tanning subtypes will experience better results in terms of reductions in IT intentions and behavior. This study represents preliminary results in a restricted sample; therefore, these results need to be replicated in larger, more representative samples using more sophisticated analytic techniques such as latent class analysis. It would also be interesting to explore the potential fluidity of these tanning types and whether individuals transition from one type to another (eg, from event tanners to regular tanners) in a predictable way. By labeling tanners by behavioral type and adjusting our interactions based on those types, we will have a more accurate picture of our patients and be more effective in our health care messages.

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REFERENCES