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The Influence of Parents and Peers on Adolescent Indoor Tanning Behavior: Findings from a Multi-City Sample

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Abstract

Background—Indoor tanning is common among adolescents.

Objective—This study examined the influence of parents and peers on adolescent indoor tanning.

Methods—Telephone interviews were conducted with 5274 teen-parent pairs in the 100 largest US cities. Random coefficient regression analyses were conducted to examine the relationship between parental and peer factors and adolescent indoor tanning.

Results—Teens' report of whether their parents allow them to tan indoors was the strongest predictor (aOR: 5.6), while parents' modeling (aOR: 1.2), attitudes (aOR: 1.1), and concern about teen tanning (aOR: 1.9) were significantly but less strongly associated. Teens thinking most of their peers like to be tan (aOR: 1.7) and perceived percent of peers who tan indoors (aOR: 1.0) also were significantly associated. Limitations: The cross-sectional design was a limitation of this study.

Conclusion—Interventions targeting adolescent indoor tanning should address both family- and peer-related factors.

Non-melanoma skin cancers (NMSCs) were diagnosed more than 1 million times in 2006 in the United States,¹ and that year there were an estimated 64,190 cases of melanoma.¹ The primary risk factor for both types of skin cancer is a modifiable one—exposure to ultraviolet radiation (UVR).^{2–5} Along with a large body of research showing an association between solar UVR exposure and both NMSC and melanoma, mounting evidence indicates that UVR emitted by the lamps used in indoor tanning booths is also a significant risk factor.^{6–9} Indoor tanning also has acute health consequences, including eye and skin burns, other ocular disorders, and suppression of immune functioning.^{10, 11} The American Academy of Dermatology has recommended banning the non-medical use of indoor tanning booths, and as an interim measure, prohibiting use of tanning booths by minors.¹² Despite this and other recommendations against the use of indoor tanning by adolescents, several researchers have found that there is a high prevalence of use within this age group.^{13–17}

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Correlates of indoor tanning among adolescents have included being female,^{13–17} being older,^{13–17} and, for persons of White race, having darker skin tone and lower sun sensitivity.^{13, 15} In one study, non-White individuals (both teens and parents, with a statistically significant difference for parents only) tanned less often than did Whites.¹³ However, most studies on indoor tanning have not included many (if any) people of color.

Factors related to the teen's parents and peers also have been shown to predict teen's indoor tanning use.^{13–17} For example, in a survey conducted in Boston, MA and Minneapolis, MN, Stryker and colleagues found that modeling (i.e., maternal indoor tanning behavior), gatekeeping cognitions (i.e., maternal concern about their adolescent tanning indoors) and gatekeeping behaviors (i.e., teen reporting that their parent would allow them to tan indoors) were more significantly associated with adolescent indoor tanning behavior than were maternal cognitive variables (e.g., knowledge about tanning consequences).¹⁶ Although in one study having friends who tan was significantly associated with indoor tanning behavior,¹⁵ little research has been done on the influence of peers in adolescent indoor tanning behavior. This represents a gap in the literature, given that peers play a significant role in other risky behaviors of adolescents (e.g., smoking behavior).¹⁸

The current study was conducted to gain further understanding of the influence parents and caregivers have on adolescent indoor tanning behavior. We performed a partial replication of the study conducted by Stryker and colleagues¹⁶ but in a geographically and ethnically diverse sample. Additionally, we examined the influence peers have on adolescent indoor tanning. We hypothesized that the findings from Stryker's study would be replicated, with parental gatekeeping and modeling emerging as the strongest predictors of adolescent indoor tanning behavior, and parents' attitudes toward being tan and knowledge about skin cancer risk of indoor tanning as less influential. Additionally, perceived peer tanning behavior and attitudes were expected to have a moderate influence on adolescent indoor tanning behavior.

Methods

Survey Procedures

As one component of a multi-level study (CITY100—Correlates of Indoor Tanning in Youth), telephone interviews were conducted from January through December of 2005. Interviews were conducted in each of the 100 largest US cities as determined by year 2000 census data.¹⁹ These cities represent 33 states plus the District of Columbia. A survey was administered to 1) a parent or legal guardian and 2) an adolescent aged 14–17 in each household, with the objective of contacting an average of 60 teen-parent pairs per city.

When a household was contacted, the mother or female caregiver was requested for the parent interview. However, when a woman was not available to take the phone call, the father or other male caregiver was interviewed. Throughout the remainder of this manuscript, parent or caregiver will be used to refer to both parents and guardians.

Survey Sampling, Inc. (SSI) provided lists of targeted age samples for each of the 100 cities. The samples were drawn from the company's database of households, compiled from white-page phone directories cross-referenced with secondary sources (e.g., school registration lists) to identify households with the desired age range. Using the list generated by SSI, households were contacted via telephone by trained interviewers employed by Luth Research, located in San Diego, California. Although initially we considered mailing an introductory letter to each prospective household in advance of the phone call, results from a pilot study with teen-parent pairs in two non-CITY100 cities suggested that this strategy would not be cost-effective in improving the response rate in the larger study.²⁰ Ten attempts were made to a household before it was deemed unreachable.

When a household was contacted, the interviewer first ascertained from the parent the household's eligibility to participate. He or she then obtained oral informed consent from the parent for the parent and teen interviews, interviewed the parent, obtained oral assent from the teen, and interviewed the teen. If more than one adolescent was at the home at the time of the interview, one was randomly selected.

Interviewer performance was monitored throughout the interviewing interval to ensure high quality data. The interviews were conducted throughout a calendar year, with attempts to balance season of interview within each city, in order to minimize potential city by seasonal confounds. Adolescent and parent pairs who could not speak English were excluded. No compensation for participation was provided. This study was approved by the Institutional Review Boards of San Diego State University and University of California, San Diego.

The Survey Instrument

The survey used in the current study was one that had been used previously by Stryker and colleagues,¹⁶ with some modifications by our research group. It covered a wide variety of domains relevant to indoor tanning behavior including, but not limited to, parent and adolescent attitudes toward and knowledge about risks associated with tanning; adolescent, parent, and peer indoor tanning behavior; and demographic variables. Prior to our main study, we conducted a small pilot test with 32 female college students to evaluate the test-retest reliability of key adolescent items; a trained interviewer administered the survey with each pilot subject twice, with a one-week interval between phone calls. Individual items are described in detail below.

Adolescent Indoor Tanning Behavior—The primary outcome variable was whether the adolescents had tanned indoors using UV lamps at a business in the last 12 months. The item read “In the past 12 months did you go to a tanning salon or other business and use the tanning lamps?”. In our pilot study, test-retest reliability of a version of this item that did not specify where the tanning occurred was excellent (Kappa=1.00, $p < .001$).

Demographic and Socioeconomic Characteristics—Data on age and sex were collected for all study participants. We also assessed parent education level (high school or less; some college; college graduate; advanced degree) and income (\leq \$40,000; \$40,001–\$60,000; \geq \$60,001), and teen race/ethnicity (approximately 15 categories that were collapsed into: Non-Hispanic White; Non-Hispanic Black; Hispanic White; Other).

Parent Influence—Parent tanning behavior—whether or not they had ever tanned indoors using UV lamps at a business—was examined to assess modeling of this behavior. As a cognitive measure of gatekeeping, parents were asked to report how concerned they would be for their teens' health if they tanned indoors occasionally. Those parents who answered “a lot” were compared to those who answered “not a lot”; response options “a little” and “not at all” were combined to create the “not a lot” category. As a behavioral measure of gatekeeping, the adolescents were asked whether they agreed or disagreed with the statement, “My parents would allow me to tan indoors.” Reproducibility of this item during the pilot study was good ($r = .88$, $p < .001$). Two additional parental cognitive variables were assessed; parents were asked whether they agreed or disagreed with the statements, “People with a tan look more attractive” and “Indoor tanning using indoor tanning lamps could cause skin cancer”.

Peer Influence—To assess the influence that peers had on adolescent indoor tanning behavior, the adolescents were asked what percentage of their friends had ever tanned indoors using tanning lamps. Reproducibility of this item during the pilot study was excellent ($r = .95$, $p < .001$). The adolescents also were asked to report whether they agreed or disagreed with the

statement, “Most of my friends like to be tan.” Reproducibility of this item during the pilot study was good ($r = .76, p < .001$).

Adolescent Skin Type—A standard measure with good psychometric properties based on questions about skin’s likelihood of burning and tanning was used to assess skin type.²¹ This scale is used to categorize individuals into one of four categories (i.e., Skin Type I: always burn, never tan; II: usually burn, then can tan if work at it; III: sometimes get a mild burn, then tan; IV: rarely burn, tan easily). Reproducibility of the skin type assessment during the pilot study was good ($r = .70, p < .001$).

Statistical Analysis

Initially, descriptive statistics were computed using the Statistical Package for the Social Sciences (SPSS). Univariate tests, including chi-square analyses, were conducted to assess associations between adolescent indoor tanning (i.e., did or did not tan indoors using UV lamps at a business in the last 12 months) and the demographic/skin type, parental, and peer variables. Then, to assess the combined influence of demographics, parents, and peers on adolescent indoor tanning behavior, random coefficient regression was used. This method was selected because random coefficient regression accounts for the dependence built into the nested data structure. For this two-level model, variables assessed for the adolescent and parent pairs were lower-level variables and they were nested within city (level two). Demographic/skin type variables, except income, were treated as covariates in analyses of the relationship between parental and peer predictors and adolescent indoor tanning behavior. Income was not included as a covariate because it was not considered a covariate by Stryker and colleagues. Moreover, there was a large amount of missing data for this variable and due to restrictions imposed by Hierarchical Linear Modeling, this would have omitted a considerable number of cases from our dataset. Hierarchical linear models were estimated with HLM software, version 6.01.²² Due to the nonlinear nature of the model, the Bernoulli function was selected.

Results

Cooperation Rate and Exclusion Information

Of the 8,176 households that met the initial eligibility criteria, 6,125 (74.9%) agreed to participate. Of the 6,125 interviews conducted, only 6,054 were conducted with *both* a parent and a teen. Only those interviews conducted with both a parent and a teen are included in the current study. An additional four cases were deleted from the dataset due to lack of clarity on the nature of relationship between the parent and adolescent. Additionally, all individuals for whom there were missing data on any of the fourteen predictor variables assessed were excluded from the current study due to restrictions imposed by Hierarchical Linear Modeling. Thus, the results reported herein are based on 5,274 adolescents and their parents. A total of 591 adolescents (11.2%) reported having tanned indoors using UV lamps at a business in the last 12 months.

Demographic and Skin Type Influence

Basic demographic data can be found in Table 1. As shown, the adolescent sample was well-balanced with respect to sex and the four age categories. Approximately 70% of the adolescents reported having skin types III or IV. Over three-fourths of the caregivers were women, including 4035 mothers, 7 stepmothers, and 53 female guardians, which included aunts, grandmothers, sisters, and guardians. A substantial number of male caregivers participated in the interview as well (1160 fathers, 8 stepfathers, and 11 male guardians, which included grandfathers, guardians, cousins, and brothers). The majority of the caregivers were between the ages of 35 and 55, had at least some college education, and had an income of 60,001 or greater.

Table 1 also presents data from the Chi-square and random coefficient regression analyses. For all but two of the demographic/skin type variables (i.e., parent education, age of parent), findings for the Chi-square and random coefficient regression analyses were concordant. Older teens were significantly more likely to have tanned indoors in the last 12 months. Girls were significantly more likely than boys to have tanned indoors in the last 12 months. Parent's sex, on the other hand, was not significantly associated with adolescent indoor tanning behavior. Adolescent's skin type also was significantly associated with indoor tanning behavior, with adolescents whose skin does not easily tan (and likely burns) tanning less often. Non-Hispanic White adolescents were significantly more likely to have tanned indoors in the last 12 months, and Non-Hispanic Black individuals tanned indoors significantly less than the other ethnoracial groups. Finally, the results from the Chi-square analysis indicated that there was a significant relationship between parent education and adolescent indoor tanning behavior, but this was not found in the multilevel analysis. The results from the Chi-square analysis indicated that there was not a significant relationship between age of parent and adolescent indoor tanning but the random coefficient regression analysis indicated that there was a significant relationship, with teens of young parents significantly less likely to have tanned indoors in the last 12 months.

Influence of Parents and Peers

Table 2 presents data from the Chi-square and random coefficient regression analyses relating the five parental predictors (i.e., tanning behavior, thinking that having a tan makes one more attractive, not thinking that tanning indoors poses skin cancer risk, lack of concern about adolescent tanning, and adolescent report of whether their parents would allow them to tan indoors) to whether or not the adolescent had tanned indoors using UV lamps at a business in the last 12 months. It also presents descriptive data for these variables. Findings from both bivariate and multivariate analyses indicated that all five variables of parental influence were significantly and independently associated with adolescent indoor tanning. The general pattern of results was found to be similar for boys and girls when analyzed separately. Adolescents whose parents had ever tanned indoors at a business were significantly more likely to have tanned indoors at a business in the last 12 months. Similarly, those adolescents with parents who believe that people with a tan look more attractive were significantly more likely to have tanned indoors. Adolescents whose parents reported that they would not be concerned "a lot" if their child tanned indoors occasionally, as well as adolescents who believed that their parents would allow them to tan indoors, were significantly more likely to have tanned indoors in the last 12 months. Interestingly, adolescents whose parents agreed with the statement "indoor tanning using indoor tanning lamps could cause skin cancer" were significantly more likely to have tanned indoors in the last 12 months relative to those with parents who did not agree.

Findings from both Chi-square and random coefficient regression analyses showed that those adolescents who believed that most of their friends like to be tan were significantly more likely to have tanned indoors in the last 12 months. Adolescents also were asked to report the percentage of their peers who tan indoors, and the mean was 28.22% (SD = 30.13). Adolescents who had tanned indoors in the last 12 months reported a significantly higher mean percentage of peers who had tanned indoors (M = 64.37%, SD = 28.63%) than adolescents who had not tanned indoors in the last 12 months (M = 23.67%, SD = 28.63%), $t = -34.21$, $p < .001$. Findings from the random coefficient regression analysis indicated that perceiving a higher percentage of peers as having tanned indoors was associated with higher levels of adolescent indoor tanning behavior in the last 12 months.

Discussion

The results of the current study indicated that a significant number of adolescents from a multi-city sample had recently tanned indoors at a business. The prevalence of indoor tanning in the last year among our adolescent sample of 11.2% was similar to the rates of 10% found in two national studies.^{13, 15} Female teens, older teens, and teens who are less likely to burn and more likely to tan were significantly more likely to have tanned indoors, supporting data from previous studies.^{13–17} A dramatic sex difference was found, with female adolescents 5.3 times more likely than males to have tanned indoors in the last year.

Several parental factors were significantly associated with adolescent indoor tanning behavior, suggesting that previous recommendations to target parents in intervention activities, in addition to the adolescent, may be warranted.^{13, 16} As suggested by Cokkinides et al.¹³ and Stryker et al.,¹⁶ there are multiple ways that parents may be influencing the tanning behavior of their children. In this and previous studies,^{13, 16} parental tanning behavior proved to be a significant predictor, possibly due to modeling.²³ In our study, teens with parents who had ever tanned indoors tanned indoors in the last 12 months far more often than did teens of parents who had never tanned indoors (21.8% vs. 7.9%). Parental modeling has been found to be important in predicting health behaviors in other domains, such as obesity.²⁴ Thus, decreasing the frequency with which parents tan indoors may subsequently decrease the frequency of that behavior in adolescents.

The other primary way that parents may influence adolescent tanning behavior is the extent to which they are gatekeepers, monitoring and attempting to prevent indoor tanning behavior in their adolescent. Mirroring results obtained by Stryker and colleagues,¹⁶ in our study adolescents' perceptions of whether they would be allowed to tan indoors was significantly associated with their indoor tanning behavior. In fact, adolescents who said that their parents would allow them to tan indoors were 5.6 times more likely to have tanned indoors, making this the strongest association in the multivariate model. Also, teens of parents who reported that they would not be concerned "a lot" for their teens' health if they tanned indoors occasionally were nearly twice as likely to have tanned indoors, a finding that was similar to that found by Stryker and colleagues (aOR = 1.7).¹⁶ Thus, encouraging parents to increase their gatekeeping behavior and changing their gatekeeping cognitions may help prevent adolescents from tanning indoors. Parental monitoring has been found to be important in the prevention of other risky behaviors such as substance use and antisocial behavior.²⁵

Although Stryker and colleagues found that parental cognitive variables did not predict adolescent indoor tanning behavior when controlling for other factors in their multivariate model,¹⁶ the non-gatekeeping cognitive variables assessed in the current study were in fact significant predictors. Approximately 13.5% (compared with 6.7%) of adolescents with parents who reported that people with a tan look more attractive had tanned indoors in the last 12 months, suggesting that interventions to reduce adolescent indoor tanning behavior should target parental attitudes, in addition to parental tanning behavior and gatekeeping-related cognition and behavior. One finding contradicted our hypotheses. Adolescents of parents who reported that they thought indoor tanning posed a risk for skin cancer were significantly more likely to have tanned indoors. Although seemingly counterintuitive, these findings may simply reflect that parents whose adolescents are tanning have thought more about the health risks than parents whose adolescents had not tanned recently. These findings also may suggest that people's UVR protective behaviors may be modified more effectively by focusing on the appearance-based, rather than the skin cancer effects, of UVR exposure. In fact, Mahler and colleagues found that an intervention using UV photographs and photoaging information was successful in improving sun protective behaviors among college students.²⁶

A large proportion of our adolescent sample (79.6%) reported that most of their friends like to be tan, and our findings indicated that adolescents who held this belief were 1.7 times more likely to have tanned indoors. Perception of a higher percentage of peers who have tanned indoors also was associated with higher rates of indoor tanning. Likewise, Geller and colleagues found that adolescents who reported that they had friends who tanned were significantly more likely to have engaged in indoor tanning behavior.¹⁵ Along similar lines, among a group of college students, having friends, family, and partners who thought that they should tan indoors was positively and significantly associated with indoor tanning bed use.²⁷ Thus, it appears to be the case that peer behavior and attitudes, as well as perceptions of peer behavior and attitudes, may be additional target areas for intervention. One recent sun safety intervention successfully increased sun protective behaviors in part by capitalizing on the potential impact that peers can have with one another's health behaviors, using "sun teams" made up of 8th through 12th grade students to lead peer-education activities regarding sun protection.²⁸

There are several limitations to the current study that should be addressed. First, our use of a cross-sectional design means that directionality and causality cannot be assumed. Although constructs from Social Cognitive Theory²³ support our inferences, the findings are merely correlational; prospective data are needed to confirm our interpretations. Second, adolescent respondents may have been less forthright on the telephone when answering questions about indoor tanning than they would have been with an anonymous paper-and-pencil survey. For example, we had no way to ensure their privacy during the interview and/or they may have underreported their tanning behavior in order to please the interviewer. Also, one of our key variables assessing gatekeeping—adolescents' report of whether or not their parents would allow them to tan indoors—is merely a proxy for parental gatekeeping behavior since adolescents, not parents, reported on parental behavior. Thus, it is possible that adolescent report of parental behavior does not accurately reflect true parental gatekeeping behavior.

Because our diverse sample was selected from the 100 largest U.S. cities and we had a respectable cooperation rate, the findings likely will generalize to U.S. urban adolescents. On the other hand, they may not generalize to those living in suburban and rural areas. Little research has examined whether there are differences in indoor tanning prevalence between individuals living in urban versus suburban or rural areas. However, Demko and colleagues did find that attending a rural high school was significantly associated with indoor tanning behavior.¹⁴ Future research should look into such potential differences. The relatively high proportion of individuals in our sample who reported a low likelihood of burning and high likelihood of tanning compared with other samples¹⁵ may reflect the ethnoracial diversity of our sample.

In summary, these data serve to support previous assertions that parents may play an important role in adolescent indoor tanning behavior. Our study also highlighted the possible influence of peers. Adolescents' perceptions of whether or not their parents would allow them to tan indoors emerged as the strongest predictor of teen tanning in the multivariate model, with modeling, parental cognitions (both gatekeeping and non-gatekeeping), and peer factors also associated but to a lesser degree. These findings underscore the need to address both family- and peer-related factors when designing individual- and policy-level interventions to decrease indoor tanning among adolescents.

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Demographic and Skin Type Variables

Table 1

	N	% of Sample	% Teens Tanned in Past Year	Chi-Square	Odds Ratio for HLM (N = 5274) (95% Confidence Intervals)
Age of Teen (years)					
14	1252	23.7%	6.2%	91.51***	1.31 (1.18, 1.45)***
15	1456	27.6%	8.8%		
16	1406	26.7%	13.0%		
17	1160	22.0%	17.5%	285.21***	5.27 (4.02, 6.87)***
Sex of Teen					
Female	2783	52.8%	18.1%		
Male	2491	47.2%	3.5%	69.70***	1.13 (1.02, 1.25)*
Teen Race/Ethnicity					
Non-Hispanic White	3740	70.9%	13.3%		
Non-Hispanic Black	345	6.5%	0.9%		
Hispanic White	231	4.4%	6.9%		
Other	958	18.2%	7.7%	15.24**	1.19 (1.06, 1.34)**
Skin Type of Teen					
I: always burn, never tan	584	11.1%	6.5%		
II: usually burn, can tan if work at it	992	18.8%	12.5%		
III: sometimes burn, then tan	1744	33.1%	11.7%		
IV: rarely burn, tan easily	1954	37.0%	11.5%	.014	1.22 (.94, 1.60)
Sex of Parent					
Female	4095	77.6%	11.2%		
Male	1179	22.4%	11.1%	7.04	1.24 (1.04, 1.49)*
Age of Parent (years)					
<35	97	1.8%	3.1%		
5-44	1790	33.9%	11.2%		
45-54	2966	56.2%	11.6%		
>55	421	8.0%	10.5%	17.46**	.912 (.812, 1.02)
Parent Education					
High school or less	879	16.7%	13.4%		
Some college	1529	29.0%	12.9%		
College degree	1909	36.2%	10.2%		
Advanced degree	957	18.1%	8.6%		

* p ≤ .05

** p < .01

*** p < .001

Findings for the Parental and Peer Predictors

Table II

	N	% of Sample	% Teens Tanned Past Year	Chi-Square	Odds Ratio for HLM (N=5274)(95% CI)
Parent or Guardian Modeling					
Yes, ever tanned indoors at a business	1263	23.9%	21.8%	186.39***	1.20 (1.13, 1.27)***
No, never tanned indoors at a business	4011	76.1%	7.9%		
Parental Cognitive Variables					
People with a tan look more attractive					
Agree	3486	66.1%	13.5%	56.30***	1.10 (1.04, 1.18)**
Disagree	1788	33.9%	6.7%		
Indoor tanning can cause skin cancer					
Disagree or Don't Know	829	15.7%	9.2%	4.11*	.908 (.850, .966)**
Agree	4445	84.3%	11.6%		
Gate-keeping Variables					
How concerned would you be for teen's health if he/she tanned occasionally?					
Not a lot	2263	42.9%	17.7%	166.75***	1.93 (1.54, 2.43)***
A lot	3011	57.1%	6.3%		
My parents would allow me to tan indoors					
Agree	2173	41.2%	22.6%	485.72***	5.60 (4.35, 7.19)***
Disagree	3101	58.8%	3.2%		
Peer Variables					
Most of my friends like to be tan					
Agree	4199	79.6%	13.5%	109.27***	1.73 (1.11, 2.70)**
Disagree	1075	20.4%	2.2%		
Perceived % of peers who tan indoors^d					
	—	—	—	—	1.03 (1.02, 1.04)***

*

p ≤ .05

**

p < .01

p < .001

^d Descriptive data for this continuous variable are presented in the text