

Determinants of Indoor Tanning Behavior Among Adolescent Females: A Systematic Review of the Literature

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Abstract

Indoor tanning continues to grow in popularity even though empirical investigations denounce the behavior. Various reports have illustrated the detrimental health effects of ultraviolet (UV) exposure including increased risk for skin cancer. According to some physicians, the risk may be especially high for adolescents whose skin cells are dividing and changing rapidly. Persistent use of tanning facilities has become especially apparent within adolescent female populations. The purpose of this systematic literature review was to assess pertinent, empirical studies to answer the question, "What are the determinants of indoor tanning behavior among adolescent females?" Assessment of the methodological quality of each study is also presented. Consistent results from all studies demonstrated that girls were 2-3 times more likely to tan indoors than boys. Age, skin type, attitudes, beliefs, demographics, and social factors were among the determinants identified throughout the literature. Suggestions for future research and intervention are also included.

Persistent use of tanning facilities has become especially apparent within adolescent female populations (Lazovich & Forster, 2005). The incidence of adolescent female indoor tanning has grown significantly in recent years. In 1992, Banks, Silverman, Schwartz, & Tunnessen conducted a study which revealed that 33% of adolescent females had tanned once in their entire lifetime. In comparison, state and community-based, cross-sectional studies have indicated that as many as 70% of high school females engage in indoor tanning behaviors at some point during the year (Lim, Cyr, & DeFabo, 2004).

Extensive research has examined which factors are root determinants of adolescent indoor tanning behavior (Boldeman, Jansson, Nilsson, & Ullen, 1997; Lazovich et al., 2004; Wichstrom, 1994). By understanding which particular factors motivate indoor tanning behavior among pubescent females, health professionals will be able to develop interventions designed to curb the use of tanning beds. The purpose of this systematic literature review is to assess pertinent, empirical research studies in order to answer the question, "What are the determinants of indoor tanning behavior among adolescent females?" The decision to address all potential determinants was made to account for the bevy of variables which have the potential to stimulate and/or sustain indoor tanning behavior.

The function of this systematic literature review was to augment findings published by Lazovich and Forster (2005). Lazovich and Forster broadly examined the prevalence, practices and policies influencing indoor tanning among adolescent populations. The present systematic review of the literature assesses more manuscripts (n = 17) which discuss the particular determinants of indoor tanning behavior among adolescent females. Each study's methodological quality is also evaluated, thus providing a more comprehensive analysis of the adolescent female indoor tanning behavior. A more narrow research focus is warranted given the vast extent to which females engage in indoor tanning. Evaluation criteria are presented which focuses solely on studies and findings related to indoor tanning behavior among the female gender. Lastly, the present review includes practical recommendations on how future interventions should be developed to specifically educate female youth about the risks of indoor tanning.

Introduction

The indoor tanning industry continues to grow even though empirical reports denounce the use of tanning beds. Various investigations have illustrated the detrimental health effects of ultraviolet (UV) ray exposure (Rivers et al., 1989; Spencer & Amonette, 1995; Walters & Kelly, 1987). Artificial sunbathing using ultraviolet rays has demonstrated increased risk of all categories of skin cancer (Geller et al., 2002). The risk may be especially high for adolescents whose skin cells are dividing and changing more rapidly than those of adults (Cokkinides, O'Connell, Thun, & Weinstock, 2002). The World Health Organization (2005) has issued a caution for all youth under the age of 18, advising teenagers to limit their exposure to indoor tanning UV rays because of increased risk for melanoma later in life.

Methods

This review defines a determinant as any factor that has a statistically significant impact on the initiation, development, or termination of the indoor tanning behavior.

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All articles that evaluated, reported, or described determinants of indoor tanning behavior among adolescent females were analyzed. Articles which provided actual data related to tanning habits among adolescent females were also included.

For the purposes of this review, analysis of the factors contributing to the indoor tanning behavior was limited to adolescent females between the ages of 11 and 19. This age limitation was put into effect so that analysis would be strictly on adolescent populations. The scope of the review included adolescent girls residing in various countries around the world. The primary focus of this analysis was indoor tanning behaviors only. Studies that discussed the adoption of tanning behavior were included as well, provided that assessment of the indoor tanning behavior was also included.

In order to generate a sample of empirical studies evaluating the factors which influence female adolescents' indoor tanning behavior, an exhaustive search of electronic databases was conducted. These databases included EBSCO, ERIC, PsychINFO, Health Source, MEDLINE, Cambridge, and CSA. The key terms that were used to conduct the literature search were: *indoor tanning, tanning salon, tanning, tanning bed, tanning booth, factor, adolescent, teenager, attitude, influence, young people, female and literature review*. All articles gathered through this search were evaluated for inclusion. The reference section of each identified article was scanned to further enhance the breadth of the search. No time restriction was placed on the search so all pertinent articles on the topic could be retrieved.

Twenty-five studies discussed young people and their engagement in indoor tanning behavior. Studies that only discussed scientific and regulatory issues related to indoor tanning and results of the opinions of tanning operators regarding youth's access to tanning beds were excluded. Interventions designed to reduce UV exposure were also not reviewed because most of the interventions limited tanning to solely the outdoor environment.

After accounting for conditions outlined by the exclusion criteria, 8 articles were left out of the review, leaving 17 articles that were empirical studies assessing a multitude of factors that impact on indoor tanning behavior of female adolescents. All articles were published in peer reviewed journals between the years of 1992 and 2005. The independent variables used in all studies were unique and directly related to the study purpose. Ten studies were carried out in the United States, five studies took place in Sweden, one took place in Canada, and another took place in Norway.

To evaluate the statistical quality of each study, a modified version of criteria established by Bernstein and Freeman (1975) was used to develop a Statistical Quality Score (SQS). If a study used multivariate procedures such as discriminant analysis, factor analysis, cluster analysis, logistic regression, or MANOVA, then it received a score of 4. Studies reporting only descriptive statistics or non-parametric tests such as chi-square, mean, range, and

standard deviation, received a 3, while those that reported solely qualitative statistics received a 2. Qualitative statistics were characterized as measurements expressed not in terms of numbers, but rather, as data derived from analyzing language. Survey methods used to obtain qualitative data included one-on-one/group interviews, focus groups, content analyses, and case studies. If data analysis was described through narrative description, such as oral or written observations, then the study received a 1. When studies failed to report any statistical procedures, then no points were awarded.

Results

Studies' Characteristics

Characteristics such as knowledge of skin cancer risk, attitudes, beliefs, parental/peer influence, social norms, past experiences, skin types, self image, and age were all explored. Environmental barriers and their effect on tanning behavior were also studied. Studies analyzing indoor tanning rates of adolescents were published throughout the 1990s (n = 7), yet proportionately more have been in print since the turn of the century (n = 10). Twelve different journals encompassing a variety of health related fields have published articles about adolescent indoor tanning. Only five of the articles were published in three journals specifically concerned with adolescent and school-aged health (*Pediatrics, Archives of Pediatric Adolescent Medicine, and Journal of Adolescent Health*). The remaining articles were published in a wide variety of journals, both domestic and overseas. Four of the reviewed articles were published in journals outside of North America (*British Journal of Dermatology, European Journal of Cancer Prevention, European Journal of Cancer, and Scandinavian Journal of Public Health*).

In all but two of the reviewed studies, the sole dependent variable was frequency of tanning bed use. Among the 15 studies where frequency of tanning bed use was the dependent variable, 12 had both gender and age as independent variables. The remaining independent variables varied greatly within each study. Other than gender and age, skin type (Boldeman, Beitner, Jansson, Nilsson, & Ullen, 1996; Boldeman et al., 1997; Brandberg, Ullen, Sjoberg, & Holm, 1998; Geller et al., 2002; Lazovich et al., 2004; Robinson, Rademaker, Sylvester, & Cook, 1997), knowledge of risk (Boldeman et al., 1996; Boldeman et al., 1997; Lazovich et al., 2004; Mermelstein & Riesenber, 1992. Wichstrom, 1994), attitude towards a tan (Boldeman et al., 1996; Boldeman et al., 1997; Geller et al., 2002; Lazovich et al., 2004), and self-concept (Brandberg et al., 1998; Demko, Borawski, Debanne, Cooper & Stange, 2003; Lazovich et al., 2004; Shovellar, Lovato, Young, & Moffat, 2003) were the most common variables. Swedish studies examined correlations between smoking behaviors and indoor tanning (Boldeman et al., 1996; Boldeman et al., 1997; Boldeman et al., 2001; Boldeman, Jansson, Dal, & Ullen, 2003; Brandberg et al., 1998). Three studies explored the effects of parental modeling and

monitoring on the indoor tanning behavior in adolescents (Boldeman et al., 1997; Cokkinides et al., 2002; Stryker et al., 2004). Social factors such as peer influence and peer involvement in indoor tanning were also assessed in three of the studies (Gellar et al., 2002; Lazovich et al., 2004; Shovellar et al., 2003).

Almost all of the studies used a quantitative paradigm to determine correlations between independent and dependent variables. These studies investigated how certain internal and external factors impacted the indoor tanning behavior. Only one study used grounded theory and personal interviews (Shovellar et al., 2003) to understand the decision-making process an adolescent goes through before deciding to become a 'tanner'.

Studies' Methodological Quality

Each study was assigned a statistical quality score (SQS). Values for the SQS ranged from 0 to 4 (maximum possible score = 4). The median and mode scores for the distribution of the SQSs were equal to one another (median = 4, mode = 4). The mean value for the SQSs was 3.53 with a standard deviation of 0.62 among the scores. The final SQSs are reported in Table 1.

The most common method for collecting data was via questionnaires that were either mailed or distributed in person (eight studies collected data in the latter manner). Another popular method for collecting data was through a telephone interview which was conducted in six of the inquiries (Cokkinides et al., 2002; Demko et al., 2003; Gellar et al., 2002; Lazovich et al., 2004; Robinson et al., 1997; Stryker et al., 2004). Validity and reliability of the data obtained were reported in 10 (58.8%) of the reviewed studies. The majority of these studies (n = 8) used data from national samples. Of those studies which did not report validity and reliability measures, five used questionnaires which were not reviewed by professionals in the health field or tested in focus groups (Banks et al., 1992; Boldeman et al., 1996; Lucci, Citro, & Wilson, 2001; Oliphant, Forster, & McBride, 1994; Robinson et al., 1997).

Researchers in 11 of the reviewed articles (64.7%) used multiple or logistic regression techniques to analyze their data. Almost one-third of the studies (n = 5) used descriptive analysis to report statistical measures (Boldeman et al., 1996; Boldeman et al., 2001; Lucci et al., 2001; Oliphant et al., 1994; Robinson et al., 1997). One study failed to report any statistical analyses due to its qualitative nature (Shovellar et al., 2003).

Studies' Findings

The 17 studies contained a total of 98 findings (average = 5.76 / study; range = 2 to 101). Of these 98 findings, 35 specifically discussed the indoor tanning behavior solely among the female gender. The most common way to test female participation in indoor tanning was to report frequency

of tanning salon visits as the dependent variable. The majority of this information was gathered using either correlation analysis or multiple/logistic regression.

Age.

Nine studies revealed that indoor tanning behavior became more prevalent as females became older. Six studies revealed that indoor tanning behavior increased between the ages of 15 and 19 (Boldeman et al., 2003; Brandberg et al., 1998; Demko et al., 2003; Gellar et al., 2002; Mermelstein & Riesenber, 1992). Lazovich et al. (2004) indicated that 30-40% of 16 through 18-year-old white female adolescents used tanning beds. Brandberg et al. (1998) noted that use of sun beds was more frequent in older age groups (13 years old = 0%; 15 years old = 6%; 17 years old = 14%). Gellar et al. (2002) and Demko et al. (2003) indicated that girls between the ages of 15 and 18 were much more likely than younger girls (11-14) to use tanning beds ([24.6% vs. 4.7%; $p < .001$] and [25.5% vs. 7%; no p value reported]). Five studies also demonstrated that increase in age was also associated with an increase in the frequency of tanning visits throughout the year. Among girls 17 to 19 years old, Robinson et al. (1997) noted that 12.5% used indoor tanning beds six or more times per year. Multivariate analysis by Cokkinides et al. (2002) demonstrated that ages 17-18 were strong predictors of frequent indoor tanning behaviors among girls. Mermelstein and Reisenberg (1992) and Boldeman et al. (1997) explained that indoor tanning increased significantly with age especially among those female adolescents who reported tanning more than 20 times per year. Demko et al. (2003) reported that the percentage of females using tanning beds 3 times or more per year increased with age as well (13-14: 11.2%; 17-18: 47%).

Demographic Variables.

Various demographic characteristics were found to play a part in determining whether adolescent females chose to use tanning beds. Two national studies conducted in the United States demonstrated that there was a higher prevalence of females in rural locations than urban or suburban locations choosing to tan indoors. These studies also indicated that indoor tanning behavior was seen more in the Midwestern and Southern parts of the United States (Lazovich & Forster, 2005). Four studies in the United States (Cokkinides et al., 2002; Demko et al., 2003; Robinson et al., 1997; Stryker et al., 2004) reported decreased odds of indoor tanning in female youth who have a college educated mother, personal income or allowance, or possess higher levels of socioeconomic status (50% of high SES females engaging in behavior). One study conducted in Sweden, however, described no association between indoor tanning and any geographical or socioeconomic factors (Boldeman et al., 1997).

Table 1
Statistical Quality Scores (SQS)

Authors	SQS	Data Collection Method	Population Studied	Age Range	Statistical Methods
Mermelstien & Reisenberg, 1992	4	Questionnaire	Chicago HS students	9 th and 10 th grade	MANOVA, Reg.
Banks et al., 2001	4	Questionnaire	VA clinic patients	16-19	Freq., Reg.
Oliphant et al., 1994	3	5 min questionnaire	MN HS students	13-19	Freq., Chi-Square
Wichstrom, 1994	4	Questionnaire	Norwegian HS students	15-19	ANOVA, Fact. Analysis
Boldeman et al., 1996	3	Questionnaire	Swedish students	14-19	Freq., Chi-Square
Boldeman et al., 1997	4	26-item questionnaire	Swedish students	14-19	Chi-Square, Reg.
Robinson et al., 1997	3	Telephone interview	IL teenagers	11-19	Freq., Chi-Square
Brandberg et al., 1998	3	Mailed questionnaire	Swedish adolescents	13-19	Freq., Chi-Square
Boldeman et al., 2001	3	Mailed questionnaire	Swedish adolescents	13-17	Freq., Chi-Square
Lucci et al., 2001	3	2 Questionnaires	TX Jr/Sr High Students	12-18	Freq., Chi-Square
Geller et al., 2002	4	GUT Study	US students	12-18	Chi-Square, Reg.
Cokkinides et al., 2002	4	Telephone survey	US youth	11-18	Mult. Log. Reg.
Demko et al., 2003	4	AHS Wave II data set	Non-hispanic white youth	13-19	Mult. Log. Reg.
Shovellar et al., 2003	2	Personal Interview	Canadian adolescents	12-16	Qualitative
Boldeman et al., 2003	4	2 CS studies	Swedish adolescents	15-19	Chi-Square, Log. Reg.
Lazovich et al., 2004	4	Telephone interview	MA/MN adolescents	14-17	Mult. Log. Reg.
Stryker et al., 2004	4	Telephone interview	MA/MN adolescents	14-17	Mult. Log. Reg.

Skin Type.

The role of skin type as a determinant of indoor tanning has changed with time. Lazovich and Forester (2005) reported that studies conducted in the early 1990s found that adolescent females with skin types more prone to burn easily were more likely to tan indoors than were individuals with skin types less susceptible to burn. These individuals most often had skin types I and II (high risk) which burned easily when exposed to UVA rays. More recent studies in the United States (Cokkinides et al., 2002; Demko et al., 2003; Geller et al., 2002), however, reported that female adolescents with skin types at lower risk for burning are more likely to engage in indoor tanning. Boldeman et al. (2003) also indicated that female adolescent sun bed use was positively related to moderately sensitive skin type. Multivariate analysis by Cokkinides et al. (2002) demonstrated that low sun sensitivity index was a predictor of indoor tanning behavior in girls. Another study found that one out of six respondents reported burning after sun bed use (Boldeman et al., 2001). Wichstrom (1994) reported that adolescent females did not regard

adverse skin conditions (rash, dermatitis, skin lesions, etc.) as deterrents from engaging in indoor tanning behavior.

Attitudes and Beliefs.

Three studies reported that positive attitudes toward a tan are associated with indoor tanning among females (Cokkinides et al., 2002; Geller et al., 2002; Lazovich et al., 2004). Geller and colleagues (2002) explained that adolescent females who professed that it was worth getting burned to have a tan were almost twice as likely to tan indoors as those who did not hold this belief (22.3% vs. 11.3%; OR: 2.25; 95% CI: 1.94-2.60). Additionally, Geller and collaborators reported that most adolescent girls preferred the looks of tanned skin (OR: 4.45; 95% CI: 3.38-5.85). Multivariate analysis by Cokkinides et al. (2002) revealed that high attitudinal appeal for a tanned look was a strong predictor of indoor tanning among females. Lazovich and colleagues (2004) reported that females who agreed with the positive aspects of indoor tanning were more likely to continue the indoor tanning behavior, while those who viewed the behavior negatively

were less likely to continue. Lazovich and colleagues also noted that current (as opposed to past) adolescent female tanning bed users believed that tanning beds were safe to use.

Social Factors.

Geller et al. (2002) found that girls were more likely to view indoor tanning positively (89.2 vs. 77.8%) if their friends tanned (OR: 3.57; 95% CI: 2.47-5.16). Cokkinides et al. (2002) reported that girls felt visiting the tanning booth was an appropriate precursor to a special social activity (vacation, prom, etc.). Another study by Stryker and colleagues (2004) assessed the influence of parental gate-keeping and modeling on indoor tanning. Parental gate-keeping refers to whether or not the child's indoor tanning behavior was being monitored. Parents were also surveyed as to whether or not they participated in indoor tanning themselves (modeled the behavior). These two factors were assessed and combined to represent a child's overall risk factor for parental mimicry. Among adolescents, of which the majority examined were females who had none of the risk factors, the prevalence of indoor tanning was just 8.7%. When both risk factors were present, 77.8% engaged in the indoor tanning behavior (Lazovich & Forster, 2005).

Discussion

Contributions and Limitations

This review contributes to the literature on adolescent indoor tanning practices in two ways. First, it provides a comprehensive review of the methodological quality of all studies done on adolescent indoor tanning behavior. While Lazovich and Forster (2005) provide an overview of studies conducted examining adolescent indoor tanning behavior, their article does not examine the methodological quality of studies on adolescent indoor tanning. Second, this review specifically examines all findings applicable to the female gender. None of the reviewed studies examines adolescent females' indoor tanning behaviors exclusively. This is surprising, given that all studies report females as being the predominant users of indoor tanning facilities. With the addition of this systematic literature review, which analyzes the determinants causing females to engage in indoor tanning, it is hoped that there will be a greater impetus for future research focusing on females. The review suffers from one central limitation. Although a comprehensive literature search was conducted on numerous databases using a variety of pertinent search terms, certain studies may have been overlooked due to lack of indexing in searched databases.

Assessment of Methodological Quality

There was clearly allocation bias present within almost all of the studies that were reviewed (n = 17). Virtually no

studies used control/experimental groups, primarily because none of the studies tested intervention strategies to reduce indoor tanning among youth populations. While the methods (participant selection, data collection, accounting for confounders, statistical analyses, etc.) used to carry out the reviewed studies were generally efficacious, the designs of the reviewed studies failed to represent empirical frameworks. Only a minority of the studies (n = 5), however, failed to at least field test their instruments among a panel of experts in the health profession. The SQS scores of the studies that were reviewed were also very high with the majority of them earning a score of 4 (58.8%).

Recommendations for Research

Studies must not only examine the prevalence of indoor tanning among adolescent girls but also take into account the frequency of the behavior. For young people, cumulative exposure to ultraviolet rays may be as important a predictor of skin cancer as the number of sunburns occurring during adolescence. The amount of time actually spent in tanning beds should also be assessed when evaluating frequency. Knowledge of these two variables is crucial to the understanding of the behavior. It would also be beneficial to understand what factors play a role in stimulating the intention to tan indoors among female adolescents. The literature would be greatly augmented by a reliable, valid survey instrument that could adequately assess and predict the indoor tanning behavior among adolescents, especially females. A study by Hillhouse, Alder, Drinnon, and Turrisi (1997) examined psychological determinants of high-risk UV radiation exposure-related behaviors (sunbathing, tanning salon use, and sunscreen use) among college students. The results generally supported the utility of the Theory of Planned Behavior (Ajzen, 1991) as an explanatory model describing intention to tan. It would possibly be beneficial to utilize this psychosocial model to develop an explanatory and predictive survey instrument for youth indoor tanning.

Another suggestion for future research would be to add onto the qualitative research of Shoveller et al. (2003). By developing a greater understanding of the factors impacting the decision making process of adolescent females, health educators can be better prepared to develop interventions aimed at assessing intention and motivation. In employing the grounded theory (presented by Shovellar and colleagues) within future research projects, researchers can more readily delineate between types of indoor tanners and levels of indoor tanning. This identification process may be crucial to the understanding of the behavior. Lazovich et al. (2004) noted that identifying young teenagers, who tan only once or twice per year, as "experimental tanners," may be inaccurate. Even one or two tanning visits at the age of 14 or 15 may actually be directly indicative of additional tanning visits as time progresses. For this reason, the characterization of "experimental tanner" for an individual exhibiting this level of indoor tanning behavior may be false. To greater facilitate further research efforts, a definition of "indoor tanner" or

“indoor tanning” may be necessary for female adolescents at different ages.

Further research examining the effect of public policy on indoor tanning is also essential. By examining factors such as government regulations, marketing campaigns, price, and anti-indoor tanning initiatives, a greater understanding of the milieu surrounding adolescent female indoor tanning could be derived.

Recommendations for Intervention

While the research conducted on adolescent indoor tanning has provided a baseline level of knowledge for the behavior, there is still extensive work that must be done. One question that researchers must address is: “Why are there no empirical research studies evaluating interventions designed to curb the indoor tanning behavior among adolescent females?” With the anticipated advent of new studies evaluating interventions, it is hoped that future researchers will engage in more pragmatic design paradigms. Given that all published studies indicate that primarily females are engaging in the behavior, there must be interventions designed to target this specific at-risk group. It is recommended that interventions be designed specifically to target female adolescents who are between 14 and 15 years of age. It is important to intervene among girls at these ages, because, as they progress through adolescence, they will be the ones who will become the principal users of tanning beds.

A recent intervention designed to reduce indoor tanning among college-aged females provides researchers with a basis for which to develop programs specifically for adolescent females (Hillhouse & Turisi, 2002). The program’s intent was to make participants become cognizant of the negative long-term impact indoor tanning has on appearance. To do this, an 11-page workbook which addressed the adverse effects of indoor tanning on appearance was distributed to program participants. Those participants who received the workbook reported indoor tanning one-half as much as those who did not receive the workbook. Utilizing appearance-based intervention strategies, such as this, may prove to also be useful in targeting adolescent females.

Future Directions

As Lazovich and Forester (2005) noted, the academic community is just beginning to understand the basis for adoption of indoor tanning behavior by adolescents. More research is needed to confirm risk factors for adoption and maintenance of indoor tanning behavior. It is also important that concentration be placed on developing interventions for adolescent females that can help reduce the prevalence of unsafe indoor tanning bed exposure. Studies that develop and test intervention strategies to reduce indoor tanning by youth are non-existent and desperately needed. Creative public education approaches are essential to promoting sound UV-protection strategies for both adolescent females

and their parents (Shovellar et al., 2003). Simple preventative messages, however, may be of little value (Brandberg et al., 1998). As Wichstrom noted in 1994, “many girls already know that they are engaging in risky behavior, and therefore primary prevention programs devoted to enhancing knowledge about risk for skin cancer may not be very effective...” (p. 419). Alternative approaches, such as interventions focused on appearance motivation and self-perception, may prove to be more valuable.

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