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An integrated model of skin cancer risk in sexual minority males

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Abstract Sexual minority males are an at-risk group for developing skin cancer. Elevated rates of skin cancer among this population are thought to be driven by excess indoor tanning; however, motivations to indoor tan among this population are unknown. Theoretically, appearance-based and affect regulation motives may be proximal predictors of increased indoor tanning in this population. The current study tests an integrated biopsychosocial model of indoor tanning behaviors and future intentions among a sample of sexual minority males. Participants were 231 sexual minority males, between the age of 14 and 35 years, residing in San Diego County, California, who completed a battery of self-report questionnaires online. Constructs assessed included skin tone, perceived susceptibility to skin cancer, sociocultural pressures to tan, appearance-based motives to tan, affect regulation in regard to indoor tanning, indoor tanning behaviors over the previous 3 months, and future intentions to indoor tan. The three proposed proximal predictors of indoor tanning all displayed significant pathways; however, results varied depending upon the specific outcome measure modeled. Affect regulation was significantly associated with increased odds of indoor tanning, and future intentions to indoor tan. Increased appearance reasons to tan were significantly associated with future intentions to indoor tan, while increased appearance reasons not to tan were significantly associated with fewer number of indoor tanning sessions. Results underscore the unique pathways of affect regulation and appearance-based motives in indoor tanning behaviors. Skin cancer prevention programs focusing on sexual minority males may wish to address affect and appearance concerns.

Keywords Skin cancer · Indoor tanning · Sexual minority · Males · Appearance · Affect

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Introduction

Skin cancer (e.g., melanoma, basal cell and squamous cell carcinomas) is the most prevalent form of cancer in the United States (American Cancer Society, 2013; Rogers et al., 2010), and the incidence has increased steadily over the past several years (Linos et al., 2009). While studies of the most common forms of skin cancer are rarely conducted because of lack of tracking by cancer registries, a 2012 study indicated that approximately 5.4 million cases of basal cell and squamous cell skin cancer were diagnosed in 2012 among 3.3 million people (Linos et al., 2009). It is estimated that in 2016 more than 76,000 people in the United States will be diagnosed with melanoma, the most deadly form of skin cancer (Linos et al., 2009). Consequently, the U.S. Surgeon General recently highlighted skin cancer as a major public health issue, and strongly recommended prevention efforts aimed at identifying at-risk populations and risk behaviors (U.S. Department of Health and Human Services [HHS], 2014).

In the U.S., men, compared to women, are at a 40% increased risk of being diagnosed with, and roughly a 100% increased risk of dying of skin cancer (American Cancer Society, 2013). Furthermore, there is emerging data

indicating important subgroups of men who are at an even greater risk of developing skin cancer. One such group is sexual minority (e.g., gay and bisexual) men. Recent nationally representative epidemiological data have revealed that sexual minority men have an estimated lifetime prevalence of skin cancer between 4.3 and 6.6%, compared to heterosexual men (2.7–3.1%), an increased odds of 1.5–2.0 (Mansh et al., 2015).

Ultraviolet (UV) radiation exposure is one of the strongest risk factors for developing skin cancer (Narayanan et al., 2010; Lazovich et al., 2010). In a comprehensive review of studies, the International Agency for Cancer Research concluded that individuals who have ever used a tanning bed had a 1.15 relative risk for developing melanoma compared to the general population (Green et al., 2007). Even greater risk was revealed for individuals who had used a tanning bed before the age of 35 years, with a relative risk of 1.75. This trend is also evident when examining other forms of skin cancer (e.g., squamous cell carcinoma), with a relative risk of 2.25 reported (Green et al., 2007). Additionally, a large case–control study found that those who engage in indoor tanning had an increased odds of 1.74 of developing melanoma, and increased odds of up to 4.4 depending on the type of tanning bed used (Lazovich et al., 2010). Subsequently, the International Agency for Cancer Research reclassified UV radiation from "probably carcinogenic to humans" to "carcinogenic to humans" (El Ghissassi et al., 2009). Two independent studies recently found sexual minority males to have between 3.1 and 5.8 increased odds of indoor tanning compared to heterosexual males (Mansh et al., 2015; Blashill & Safren, 2014). These rates of indoor tanning among sexual minority men mirror those found among heterosexual females.

A number of health behavior theories have been applied to tanning behaviors, including the Theory of Reasoned Action (Ajzen & Fishbein, 1980), which highlights the role that attitudes toward a behavior and subjective norms have in predicting subsequent behaviors, through the mechanism of intentions to engage in the behavior. The Tripartite Theory of Body Image posits that sociocultural factors (i.e., media, peers, family, significant others) predict elevated body dissatisfaction through internalization of cultural appearance ideals (Thompson & Heinberg, 1999). Other investigators have also used the construct of perceived susceptibility (i.e., an individual's belief regarding the chances of developing a disease) of skin cancer from the Health Belief Model (Janz et al., 2008) to explain tanning behaviors.

Selected constructs from these models (Theory of Reasoned Action, the Tripartite Theory, and Health Belief Model) have previously been combined into an integrated model of tanning behaviors. This Integrated Health Behavior Model of Tanning has been empirically assessed within a prospective design among a sample of females (Cafri et al., 2009). Findings from this research among females (Cafri et al., 2009) indicate that intentions to tan significantly predicted tanning behaviors, and that intentions to tan were predicted by appearance reasons to tan and appearance reasons not to tan. Importantly, sociocultural influences (i.e., internalization of appearance-based messages to tan, from the media, family, friends, and significant others) predicted appearance reasons to tan. Conversely, skin cancer risk (e.g., lighter Fitzpatrick skin type) predicted perceived threat of skin cancer, which in turn predicted appearance reasons not to tan. The strongest pathways to tanning behaviors were those that included sociocultural influences and appearance reasons to tan. Although this integrated model, which was developed based on females, adds much to the literature on skin cancer prevention, it may not fully explain tanning behaviors for all populations, including sexual minority males, a group who is at high risk of being diagnosed with skin cancer.

To date, limited research has explored the motivations of intentional tanning among sexual minority males, even though males also engage in tanning behaviors (O'Riordan et al., 2006; Blashill, 2013; Demko et al., 2003). Thus, it is not clear if the constructs in the Integrated Health Behavior Model of Tanning are fully relevant to sexual minority males. Some constructs from the Integrated Health Behavior Model of Tanning, such as appearance concerns, have been linked to tanning behavior in men (Miyamoto et al., 2012; Blashill & Traeger, 2013). Indeed, recent systematic reviews have consistently noted appearance-based motives display some of the strongest associations with tanning behaviors (e.g., Coups & Phillips, 2011; Holman & Watson, 2013). Additionally, sexual minority men report elevated body dissatisfaction compared to heterosexual men (Morrison et al., 2004; Peplau et al., 2009), with levels of body image concerns similar to those of heterosexual women. In tandem, these findings suggest that theoretical models of tanning behaviors that incorporate appearance-related variables may be particularly relevant to sexual minority males.

Similarly, there may be constructs specifically salient to sexual minority males, which are not included in the Integrated Health Behavior Model of Tanning. For example, affect regulation has also been identified as a reason individuals tan (Poorsattar & Hornung, 2007). One study found that 42% of emerging adults reported intentional tanning to influence their mood (Knight et al., 2002); whereas, other studies have found relaxation to be the most prominent motivation for tanning (Feldman et al., 2004). Further, experimental data indicate that individuals report greater relaxation after tanning with exposure to UV versus

non-UV exposure (Feldman et al., 2004). This construct may be critically important to evaluate as a contributor to tanning for sexual minority males, who report elevated negative affect (i.e., symptoms of depression and anxiety) compared to heterosexual males (Fergusson et al., 1999; Jorm et al., 2002; King et al., 2008). This increased negative affect among sexual minority males can be attributed in part to the excess sexual minority stress (i.e., negative attitudes toward homosexuality, structural stigma, discrimination, prejudice, victimization) that sexual minority individuals face in the current sociocultural climate (Hatzenbuehler, 2009; Meyer, 1995, 2003). The resulting experiences and expectation of rejection contribute to the increased risk for negative affect. Because there is a significant lack of research in tanning behaviors in sexual minority males, it has not been possible to develop interventions to reduce tanning behaviors or increase sun protection behaviors among this population.

The aim of the current study was to test a modified version of the Integrated Health Behavior Model of Tanning, by integrating affect regulation motivations to tan into the model. Based upon the empirical and theoretical data reviewed above, it is hypothesized that this adapted model will fit the data well, and both appearance-based and affect regulation motives will significantly predict indoor tanning behaviors and intention to engage in future tanning.

Methods

Participants

This study used convenience sampling to recruit participants from a population of adolescent and young adult sexual minority males. The study focused on adolescent and young adult minority males because exposure to UV radiation prior to age 35 is associated with a high risk of skin cancer, and recent data have revealed high levels of indoor tanning among sexual minority males between 14 and 18 years of age (Blashill, 2017). Participants analyzed in the current study were 231 sexual minority males recruited online via Facebook advertisements (see below for more details). The full sample included 291 participants, with 60 failing one or more of the three validity check items embedded within the survey (see measures below), resulting in an analytic sample of 231 (79.3% of original sample). The mean age of the sample was 24.5 years ($SD = 5.4$; range: 15–35). The sample was majority White (60.1%), but also included racial and ethnic diversity: 29.4% Hispanic, 12.2% Asian/Pacific Islander, 5.9% Black/African American, 2.9% Native American/American Indian, and 16.4% "Other." Sexual minority status was defined by responses to two items (a common approach in the field; Mustanski et al., 2014): sexual orientation identity and sexual attraction. All participants reported either a non-heterosexual identity or same sex attraction: 84% gay, 11.3% bisexual, 0.4% asexual, 0.4% heterosexual, 3.8% "Other", 73.9% only male attraction, 18.5% mostly male attraction, 5% equal male/female attraction, and 2.5% mostly female attraction.

Procedure

For 5 weeks in the summer of 2016, advertisements were shown to potential participants in San Diego, California via the social media platform Facebook, and Instagram, a photo sharing mobile application/website. Advertisements included a call for sexual minority males between the ages of 14–35 years to participate in an online survey in exchange for a $15 gift card to a large Internet-based retailer. Potential participants were directed to an online data collection page where they were instructed to login via their Facebook username and password; data collected in this process included participants' profile name, email linked to their account, and current city of residence. These data were utilized to deter fraudulent responders from attempting to access the survey. Following Facebook login, potential participants answered a series of questions in order to determine their study eligibility.

Inclusion criteria for the study were: (1) 14–35 years of age; (2) male gender identity; (3) sexual minority status; (4) current residence in San Diego County, California; and (5) English speaking. The sole exclusion criterion was history of a skin cancer diagnosis. Potential participants who met inclusion criteria were subsequently presented with an online consent form. Potential participants under the age of 18 were presented with a separate online assent form (parental consent was waived in this low-risk study). Study completion time generally ranged between 20 and 25 min. Upon survey completion, participants were redirected to a separate online survey where they were presented with the option to provide their name and email for purpose of sending the study incentive (a $15 online gift card). Their name and email were not linked to their survey responses. The San Diego State University IRB approved all study procedures prior to its initiation.

Measures

Demographics

Participants completed a demographic section that assessed age, gender, race, ethnicity, sexual identity, sexual attraction, zip code of current residence, and history of skin cancer.

Skin tone

Biological skin cancer risk was measured using the Fitzpatrick Skin Type Scale (Fitzpatrick, 1988). Participants were presented with both a table and a scale of images of human faces representing six skin types and were asked to identify which skin type best matches their untanned skin color. The table presented to participants includes a descriptive skin color and characteristics of that skin type (e.g., Skin Type 4; Brown-typical Mediterranean Caucasian skin; Rarely burns, tans with ease), with "1" representing the lightest skin tone, and "6" representing the darkest. Fitzpatrick Skin Type demonstrates strong 1-year test–retest reliability (Magin et al., 2012) and displays predictive validity with diagnosis of melanoma (Ródenas et al., 1996).

Perceived skin cancer susceptibility

Participants responded to three items assessing perceived susceptibility of developing skin cancer, adopted from items previously used in the skin cancer literature (Cafri et al., 2009; Jackson & Aiken, 2000). Items were scored along a six-point Likert scale from "1" (strongly disagree) to "6" (strongly agree). Items were: "If you don't use sun protection, you feel susceptible to skin cancer (S_1);" "The possibility of skin cancer worries me (S_2);" and "Whenever I hear of friends or relatives (or public figure) getting skin cancer, it makes me realize that I could get it too (S_3)." Internal consistency for the current sample was $\alpha = .83$.

Pressures/reasons to tan

Participants completed the Physical Appearance Reasons for Tanning Scale (PARTS; Cafri et al., 2006, 2008). The PARTS is a 44-item self-report instrument that assesses appearance-based motivation and sociocultural pressures to engage in tanning behaviors. Items were scored on a five-point Likert scale that ranges from "1" (definitely disagree) to "5" (definitely agree). The PARTS consists of nine lower-order subscales: General Attractiveness (9 items), Acne (4 items), Body Shape (6 items), Skin Damage (6 items), Skin Aging (3 items), Media (7 items), Family (3 items), Friends (4 items), and Significant Others (2 items). These nine lower-order subscales comprise three higher-order factors: Appearance Reasons to Tan; Appearance Reasons Not to Tan; and Sociocultural Pressures to Tan. The PARTS has previously demonstrated structural validity and gender invariance (Cafri et al., 2008). Internal consistency estimates in the current sample ranged between $\alpha = .85$ to .97.

Tanning to regulate affect

Participants completed the Indoor Tanning Relaxation Scale (ITRS; Hillhouse et al., 2008). The ITRS assesses participants' attitudes toward indoor tanning as a strategy to reduce stress, and includes five items responded to via a five-point Likert Scale, ranging from "1" (strongly disagree) to "5" (strongly agree). Items are: "Indoor tanning is a stress-free way to relax ($ITRS_1$);" "I feel favorable about indoor tanning because I think it is a good way to unwind ($ITRS_2$);" "It feels physically good to lie under a sunlamp ($ITRS_3$);" "In this hectic world, indoor tanning is a nice way to feel good ($ITRS_4$);" and "I am in a better mood after I tan ($ITRS_5$)." Internal consistency in the current sample was $\alpha = .93$.

Indoor tanning behavior and intention to indoor tan

Participants reported via free-response, the number of times they indoor tanned in the past 3 months: "Please give me your best estimate on how many times you have indoor tanned in the past 3 months." Open-ended frequency items have been identified as the "gold standard" for assessing indoor tanning behaviors (Lazovich et al., 2008). The correlation between indoor tanning frequency self-report and daily diaries of indoor tanning behaviors is estimated at $r = .87$ (Hillhouse et al., 2008, 2012). Future indoor tanning intention was assessed with the following item: "I plan to indoor tan in the next 3 months", with response options that ranged from "1" (definitely do not intend) to "7" (definitely intend; Cafri et al., 2009; Hillhouse & Turrisi, 2002). Past research has found that indoor tanning intention longitudinally predicts future indoor tanning behaviors (Cafri et al., 2009).

Validity check items

Based on recommendations for conducting online studies (Huang et al., 2012), three validity check items were embedded within the battery of questionnaires to ensure that participants were closely reading and appropriately responding to each survey item (e.g., "For this question, please select "Slightly Unconcerned" as your answer"). For example, if a participant responded to the above item with "Slightly Unconcerned" the item would be scored as "correct" given that they correctly followed the instruction to answer that given item. A sum score was calculated with a possible range of "0" (all items incorrect) to "3" (all items correct). Only participants who correctly responded to all three validity check items were included in subsequent analyses.

Statistical analyses

Structural equation modeling (SEM) within Mplus (v7.31) was employed to test the various pathways of the proposed integrated model. Latent variables were created for many of the constructs tested in the model. Sociocultural pressures consisted of four manifest subscales from the PARTS (Media, Friends, Family, and Significant Others). Skin cancer susceptibility consisted of responses from the three manifest items of susceptibility. Appearance reasons to tan consisted of three manifest subscales from the PARTS (General, Acne, and Shape). Appearance reasons not to tan consisted of two manifest subscales from the PARTS (Aging and Skin Damage). Tanning to regulate affect consisted of responses from the five manifest items from the Indoor Tanning Relaxation Scale ($ITRS_1$-$ITRS_5$). Skin tone was measured via the single manifest item from the Fitzpatrick Skin Type Scale. Mplus allows for maximum flexibility in modeling non-normally distributed dependent variables. Maximum likelihood estimation with robust standard errors was utilized to estimate the population covariance matrix and uses all available data. Further, select fit indices were calculated to assess the goodness-of-fit of the model being tested: the χ^2/df test, the comparative fit index (CFI), the Tucker–Lewis index (TLI), and the root-mean square error of approximation (RMSEA). The χ^2/df is a well-recognized fit index, while the CFI and TLI indices are relatively independent of the sample size (Floyd & Widaman, 1995), and the RMSEA provides an index of residual variance. The model provides an acceptable fit to the data if the following criteria are met: CFI and TLI above 0.90, RMSEA less than 0.08, and a χ^2/df ratio below 3.0 (Hu & Bentler, 1999). For the count variable of indoor tanning sessions over the past 3 months, a zero-inflated negative binomial regression (ZNIB) was used. When modeling with ZNIB, two dependent variables are analyzed: a count variable and an inflation variable (Múthen & Múthen, 2001). The count variable represents values of zero and above, while the inflation variable is modeled as a binary latent variable, with a value of one representing a participant whose score cannot be any other value but zero. Additionally, when modeling count dependent variables, Mplus does not produce traditional fit indices, thus; only individual pathways of the model can be tested with ZNIB.

Results

Preliminary results

Twenty-two participants (9.5%) reported indoor tanning in the previous 3 months. The average number of indoor tanning sessions in the previous 3 months in the total sample was 0.57 ($SD = 2.41$; range 0–24) and among those who indoor tanned at least once was 6.05 ($SD = 5.39$). Future intentions to tan in the next 3 months were high among those who tanned at least once ($M = 5.82$; $SD = 1.50$), compared to the total sample ($M = 2.36$; $SD = 2.01$).

Previous indoor tanning behavior

Lighter skin tone significantly predicted increased skin cancer susceptibility ($\beta = -0.18$, $SE = 0.08$, $t = -2.32$, $p = .02$; Fig. 1). In turn, elevated skin cancer susceptibility significantly predicted increased appearance reasons not to tan ($\beta = 0.46$, $SE = 0.08$, $t = 6.07$, $p < .001$). Elevated sociocultural pressures significantly predicted increased appearance reasons to tan ($\beta = 0.85$, $SE = 0.04$, $t = 21.40$, $p < .001$). Of the three proximal predictors of previous indoor tanning behavior, elevated appearance reasons not to tan significantly predicted lower number of indoor tanning sessions in the past 3 months ($\beta = -0.93$, $SE = 0.10$, $t = -9.08$, $p < .001$), and more positive attitudes toward tanning to regulate affect significantly predicted lower odds of not tanning ($\beta = -.65$, OR 0.52, $SE = 0.13$, $t = -4.98$, $p < .001$). The model accounted for 43.6% of the variance in indoor tanning over the past 3 months ($SE = 0.14$, $t = 3.11$, $p = .002$).

Indoor tanning intention

The model fit the data well (TLI = .94, CFI = .95, RMSEA = .06, $\chi^2/df = 1.87$). Lighter skin tone significantly predicted increased skin cancer susceptibility ($\beta = -0.16$, $SE = 0.07$, $t = -2.34$, $p = .02$; Fig. 2). In turn, elevated skin cancer susceptibility significantly predicted increased appearance reasons not to tan ($\beta = 0.45$, $SE = 0.07$, $t = 6.71$, $p < .001$). Elevated sociocultural pressures significantly predicted increased appearance reasons to tan ($\beta = 0.85$, $SE = 0.03$, $t = 29.60$, $p < .001$). Of the three proximal predictors of intention to indoor tan in the next 3 months, elevated appearance reasons to tan ($\beta = 0.36$, $SE = 0.07$, $t = 5.47$, $p < .001$), and more positive attitudes toward tanning to regulate affect ($\beta = 0.21$, $SE = 0.07$, $t = 3.24$, $p = .001$) significantly predicted increased intention to indoor tan in the next 3 months. The model accounted for 23.9% of the variance in future indoor tanning intention ($SE = 0.05$, $t = 4.57$, $p < .001$).

Discussion

The current study is the first known attempt to assess motivations to indoor tan among sexual minority males. Sexual minority males are disproportionally impacted by

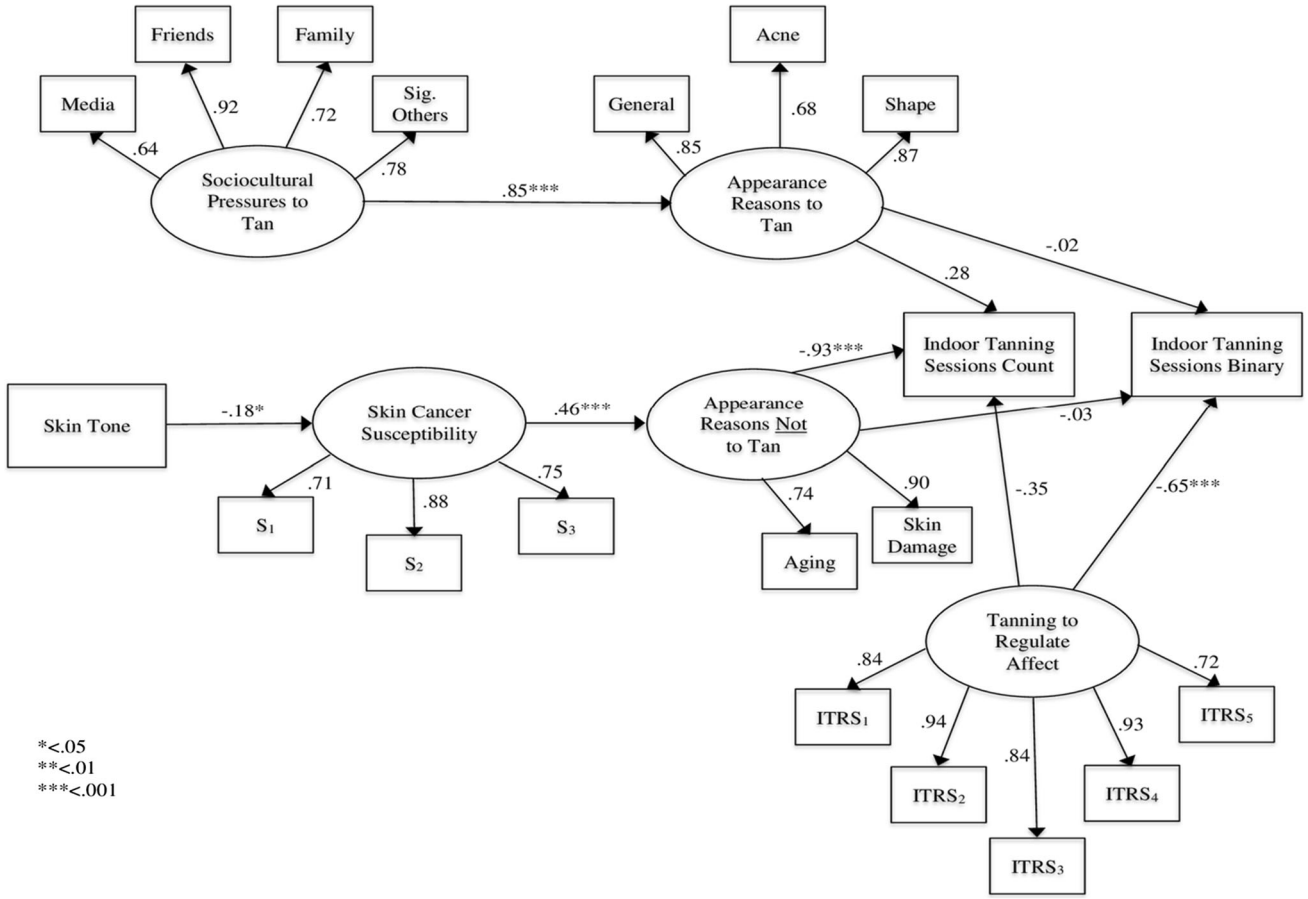

Fig. 1 Structural equation model for indoor tanning behaviors

skin cancer (Mansh et al., 2015), and engage in elevated levels of indoor tanning (Mansh et al., 2015; Blashill & Safren, 2014). To date, however, limited empirical data have focused on biopsychosocial correlates of indoor tanning in this vulnerable population.

Results from the current study highlight the role biopsychosocial variables play in indoor tanning intention and behavior. Consistent with previous research (Cafri et al., 2009), individuals with fairer skin were more likely to report increased skin cancer susceptibility, indicating general awareness of the risk of skin cancer among individuals with fair skin. In turn, this susceptibility was associated with increased appearance reasons not to tan. Participants who reported elevated sociocultural pressures to tan also were more likely to report appearance reasons to tan. In sum, the distal factors associated with indoor tanning found in previous research with adolescent girls and young adult women were also noted in the current study among sexual minority males.

The association between proximal predictors (i.e., appearance reasons to tan, appearance reasons not to tan, and tanning to regulate affect) and indoor tanning varied as a function of the specific dependent variable modeled. Positive attitudes toward tanning to regulate affect significantly predicted the odds of having indoor tanned at least once in the past 3 months; however, it did not produce a significant association with the number of indoor tanning sessions. Conversely, appearance reasons not to tan significantly predicted fewer number of indoor tanning sessions, but was not significantly associated with the odds of tanning at least once in the past 3 months. Appearance reasons to tan significantly predicted intention to tan in the next 3 months, as did positive attitudes toward tanning to regulate affect. Collectively, these results highlight that each of the three proximal variables is significantly associated with some aspect of indoor tanning behavior and intention. It is possible that appearance reasons not to tan is a stronger barrier to frequent indoor tanning behavior as opposed to ever indoor tanning, given its differential association with the count verus binary indoor tanning behavior outcomes.

The current study, based significantly in health behavior theory, may lend some insights to designing future skin cancer prevention program for sexual minority males. For instance, given that three unique pathways predicted varied

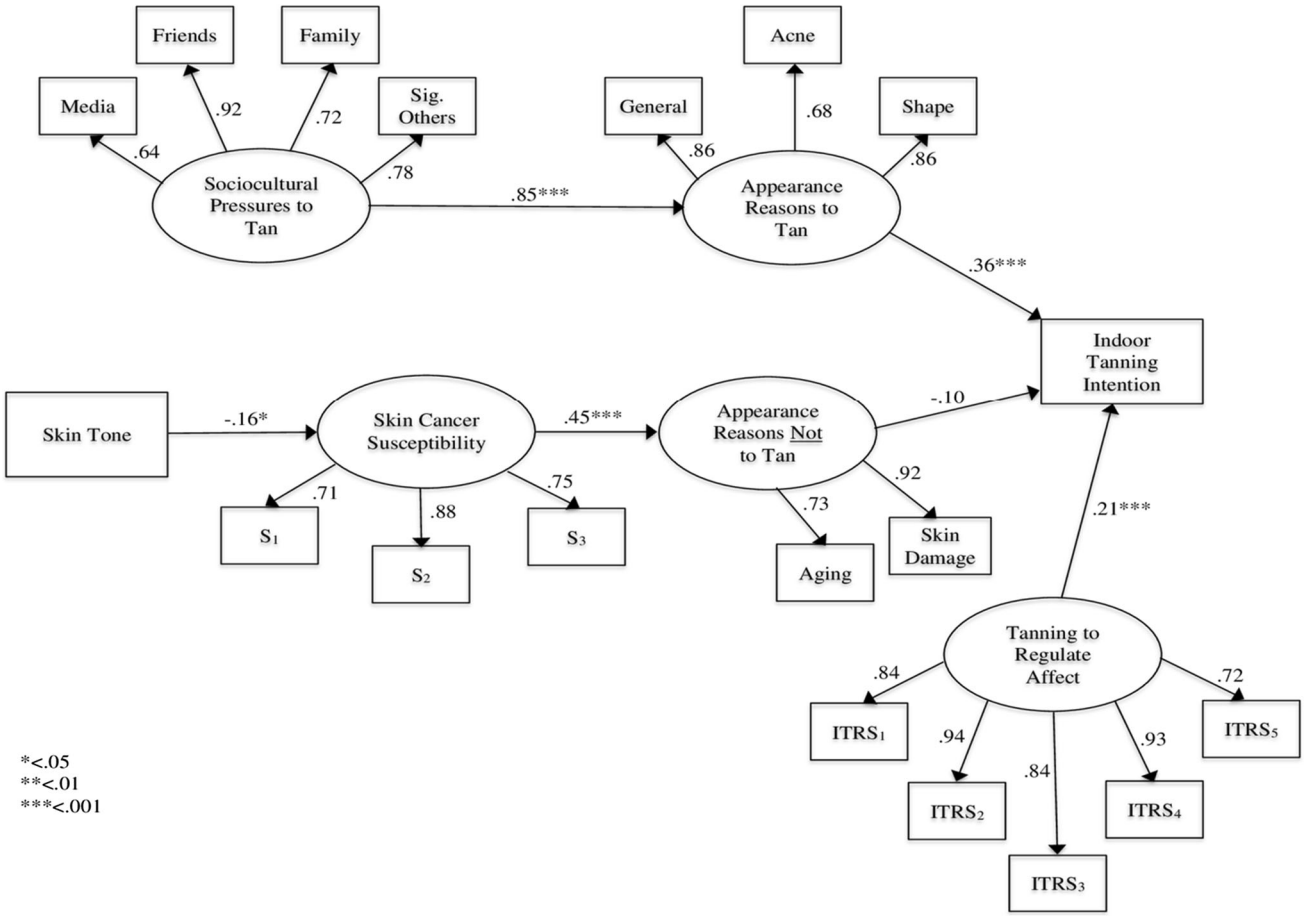

Fig. 2 Structural equation model for future intention to indoor tan

indoor tanning behaviors and intention, prevention programs may wish to consider integrated programing that addresses the negative appearance related impact of UV exposure, combined with strategies to reduce body image concerns, along with more adaptive affect regulation skills (Blashill & Pagoto, 2015). One approach that aims to harness appearance reasons not to tan is programs that utilize facial morphing technology (Williams et al., 2013). These programs often utilize software that digitally ages participants' faces, showing the potential impact of continued indoor tanning on appearance. Perhaps facial morphing technology could be combined with strategies to reduce appearance motivations to tan, such as actively challenging appearance ideals that underscore tanned skin as the "ideal" (Chait et al., 2015; Stapleton et al., 2015). Lastly, given that engagement in tanning to regulate affect may be a salient pathway to indoor tanning intention and engaging in indoor tanning behavior, providing participants with alternative, adaptive strategies to regulate their emotions, such as through brief mindfulness-based training, may be a fruitful multidimensional approach to address skin cancer risk among sexual minority males.

The current study is not without limitations. Of note, the study was cross-sectional in design, and thus, causality and temporality could not be established. Future indoor tanning intentions were assessed however, and past research has found intention to experimentally predict behaviors (Webb & Sheeran, 2006). The current study also assessed trait level variables, whereas an ecological momentary assessment design may provide more nuanced state level relationships, particularly in regard to associations between affect, appearance motives, and tanning behaviors. Such designs, which should be utilized in future research, could assess affect and body image before and immediately after an indoor tanning session, allowing for potentially more granular assessment of the variables noted above. Future research should also consider including the assessment of sexual minority stress variables (e.g., victimization, discrimination, prejudice, internalized homophobia, and concealment of sexual orientation) within the broader Integrated Model. The study's findings may not be generalizability to sexual minority males who reside outside of Southern California, or those who are less overtly "out" in their sexual orien-

tation. Given that the assessment period spanned from May through October, there may be concerns about failure to capture the "seasonality" of indoor tanning, which tends to be higher in the Winter and Spring; however, the average high temperature in San Diego is 70 °F, with modest variations in temperature across the year, suggesting that "seasonality" of indoor tanning may be less of a concern in this region of the United States. Additionally, the recruitment strategy exclusively focused on participants who identified as a male interested in other males on their Facebook profiles. Although we are not aware of any empirical data that suggests there are meaningful differences between sexual minority males who disclose their sexual orientation on social media versus those who do not, it is highly unlikely our sample included any "closeted" sexual minority males, who may experience elevated negative affect from concealing their identities from others (Pachankis, 2007). Alternatively, recent research has noted that greater "outness" regarding one's sexual minority status is associated with elevated negative affect, perhaps through experiencing more sexual orientation-based discrimination (Riggle et al., 2017). Thus, future research with sexual minority males may wish to employ varied recruitment strategies, which may also include participants who are less out about their sexual orientation, and/or inclusion of heterosexual males, for purposes of testing sexual orientation as a moderator variable within the Integrated Model. Other moderator variables, such as participant age, may also be important to explore, as some pathways may be more or less relevant for adolescent versus young adult sexual minority males. Finally, this study focused on adolescent and young adult males, a population at high risk for engaging in tanning behaviors that are associated with skin cancer. However, the findings may not be generalizable to other age groups.

In conclusion, the results from the current study support previous integrated models of skin cancer risk that incorporate components of the Tripartite Theory of Body Image, the Health Belief Model, and the Theory of Reasoned Action. Importantly , the added component of attitudes toward tanning to regulate affect revealed significant pathways to past indoor tanning behavior and future intentions. Sexual minority males are an at-risk group for developing skin cancer, likely through elevated rates of indoor tanning. Skin cancer prevention programs targeting this population may benefit from employing a multidimensional approach, including appearance-based motives and affect regulation skills.

Compliance with ethical standards

Conflict of interest Aaron J. Blashill, Benjamin M. Rooney, and Kristen J. Wells declare that they have no conflicts of interest.

Human and animal rights and Informed consent All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

References

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*. Englewood Cliffs: Prentice-Hall.

American Cancer Society (2013). *Cancer facts and figures.* http://www.cancer.org/research/cancerfactsfigures/cancerfactsfigures/cancer-facts-figures-2013

American Cancer Society (2016). *Cancer Facts and Figures.* http://www.cancer.org/acs/groups/content/@research/documents/document/acspc-047079.pdf

Blashill, A. J. (2013). Psychosocial correlates of frequent indoor tanning among adolescent boys. *Body Image, 10,* 259–262. doi:10.1016/j.bodyim.2012.11.005

Blashill, A. J. (2017). Indoor tanning and skin cancer risk among diverse US youth: Results from a national sample. *JAMA Dermatology, 153,* 344–345.

Blashill, A. J., & Pagoto, S. (2015). Skin cancer risk in gay and bisexual men: A call to action. *JAMA Dermatology, 151,* 1293–1294. doi:10.1001/jamadermatol.2015.3125

Blashill, A. J., & Safren, S. A. (2014). Skin cancer risk behaviors among US men: The role of sexual orientation. *American Journal of Public Health, 104,* 1640–1641. doi:10.2105/AJPH.2014.301993

Blashill, A. J., & Traeger, L. (2013). Indoor tanning use among adolescent males: The role of perceived weight and bullying. *Annals of Behavioral Medicine, 46,* 232–236. doi:10.1007/s12160-013-9491-9

Cafri, G., Thompson, J. K., Jacobsen, P. B., & Hillhouse, J. (2009). Investigating the role of appearance-based factors in predicting sunbathing and tanning salon use. *Journal of Behavioral Medicine, 32,* 532–544. doi:10.1007/s10865-009-9224-5

Cafri, G., Thompson, J. K., Roehrig, M., Rojas, A., Sperry, S., Jacobsen, P. B., et al. (2008). Appearance motives to tan and not tan: Evidence for validity and reliability of a new scale. *Annals of Behavioral Medicine, 35,* 209–220. doi:10.1007/s12160-008-9022-2

Cafri, G., Thompson, J. K., Roehrig, M., van den Berg, P., Jacobsen, P. B., & Stark, S. (2006). An investigation of appearance motives for tanning: The development and evaluation of the Physical Appearance Reasons For Tanning Scale (PARTS) and its relation to sunbathing and indoor tanning intentions. *Body Image, 3,* 199–209. doi:10.1016/j.bodyim.2006.05.002

Chait, S. R., Thompson, J. K., & Jacobsen, P. B. (2015). Preliminary development and evaluation of an appearance-based dissonance induction intervention for reducing UV exposure. *Body Image, 12,* 68–72. doi:10.1016/j.bodyim.2014.09.004

Coups, E. J., & Phillips, L. A. (2011). A more systematic review of correlates of indoor tanning. *Journal of the European Academy of Dermatology and Venereology, 25,* 610–616. doi:10.1111/j.1468-3083.2011.03996.x

Demko, C. A., Borawski, E. A., Debanne, S. M., Cooper, K. D., & Stange, K. C. (2003). Use of indoor tanning facilities by white adolescents in the United States. *Archives of Pediatrics and Adolescent Medicine, 157,* 854–860. doi:10.1001/archpedi.157.9.854

El Ghissassi, F., Baan, R., Straif, K., Grosse, Y., Secretan, B., Bouvard, V., et al. (2009). A review of human carcinogens—Part

D: Radiation. *The lancet Oncology, 10,* 751–752. doi:10.1016/S1470-2045(09)70213-X

Feldman, S. R., Liguori, A., Kucenic, M., Rapp, S. R., Fleischer, A. B., Lang, W., et al. (2004). Ultraviolet exposure is a reinforcing stimulus in frequent indoor tanners. *Journal of the American Academy of Dermatology, 51,* 45–51. doi:10.1016/j.jaad.2004.01.053

Fergusson, D. M., Horwood, L. J., & Beautrais, A. L. (1999). Is sexual orientation related to mental health problems and suicidality in young people? *Archives of General Psychiatry, 56,* 876–880. doi:10.1001/archpsyc.56.10.876

Fitzpatrick, T. B. (1988). The validity and practicality of sun-reactive skin types I through VI. *Archives of Dermatology, 124,* 869–871. doi:10.1001/archderm.1988.01670060015008

Floyd, F. J., & Widaman, K. F. (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment, 7,* 286–299. doi:10.1037/1040-3590.7.3.286

Green, A., Autier, P., Boniol, M., Boyle, P., Doré, J. F., Gandini, S., et al. (2007). The association of use of sunbeds with cutaneous malignant melanoma and other skin cancers: A systematic review. *International Journal of Cancer, 120,* 1116–1122. doi:10.1002/ijc.22453

Hatzenbuehler, M. L. (2009). How does sexual minority stigma "get under the skin"? A psychological mediation framework. *Psychological Bulletin, 135,* 707–730. doi:10.1037/a0016441

Hillhouse, J. J., & Turrisi, R. (2002). Examination of the efficacy of an appearance-focused intervention to reduce UV exposure. *Journal of Behavioral Medicine, 25,* 395–409. doi:10.1023/A:1015870516460

Hillhouse, J., Turrisi, R., Jaccard, J., & Robinson, J. (2012). Accuracy of self-reported sun exposure and sun protection behavior. *Prevention Science, 13,* 519–531. doi:10.1007/s11121-012-0278-1

Hillhouse, J., Turrisi, R., Stapleton, J., & Robinson, J. (2008). A randomized controlled trial of an appearance-focused intervention to prevent skin cancer. *Cancer, 113,* 3257–3266. doi:10.1002/cncr.23922

Holman, D. M., & Watson, M. (2013). Correlates of intentional tanning among adolescents in the United States: A systematic review of the literature. *Journal of Adolescent Health, 52,* S52–S59. doi:10.1016/j.jadohealth.2012.09.021

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6,* 1–55. doi:10.1080/10705519909540118

Huang, J. L., Curran, P. G., Keeney, J., Poposki, E. M., & DeShon, R. P. (2012). Detecting and deterring insufficient effort responding to surveys. *Journal of Business and Psychology, 27,* 99–114. doi:10.1007/s10869-011-9231-8

Jackson, K. M., & Aiken, L. S. (2000). A psychosocial model of sun protection and sunbathing in young women: The impact of health beliefs, attitudes, norms, and self-efficacy for sun protection. *Health Psychology, 19,* 469–478. doi:10.1037/0278-6133.19.5.469

Janz, N. K., Champion, V. L., & Strecher, V. J. (2008). The health belief model. In K. Glanz, B. K. Rimer, & F. M. Lewis (Eds.), *Health behavior and health education: Theory, research and practice* (3rd ed., pp. 45–66). San Francisco: Jossey-Bass.

Jorm, A. F., Korten, A. E., Rodgers, B., Jacomb, P. A., & Christensen, H. (2002). Sexual orientation and mental health: Results from a community survey of young and middle-aged adults. *The British Journal of Psychiatry, 180,* 423–427. doi:10.1192/bjp.180.5.423

King, M., Semlyen, J., Tai, S. S., Killaspy, H., Osborn, D., Popelyuk, D., et al. (2008). A systematic review of mental disorder, suicide, and deliberate self harm in lesbian, gay and bisexual people. *BMC Psychiatry, 8,* 70–87. doi:10.1186/1471-244X-8-70

Knight, J. M., Kirincich, A. N., Farmer, E. R., & Hood, A. F. (2002). Awareness of the risks of tanning lamps does not influence behavior among college students. *Archives of Dermatology, 138,* 1311–1315. doi:10.1001/archderm.138.10.1311

Lazovich, D., Stryker, J. E., Mayer, J. A., Hillhouse, J., Dennis, L. K., Pichon, L., et al. (2008). Measuring nonsolar tanning behavior: Indoor and sunless tanning. *Archives of Dermatology, 144,* 225–230. doi:10.1001/archdermatol.2007.45

Lazovich, D., Vogel, R. I., Berwick, M., Weinstock, M. A., Anderson, K. E., & Warshaw, E. M. (2010). Indoor tanning and risk of melanoma: A case-control study in a highly exposed population. *Cancer Epidemiology and Prevention Biomarkers*. doi:10.1158/1055-9965.EPI-09-1249

Linos, E., Swetter, S. M., Cockburn, M. G., Colditz, G. A., & Clarke, C. A. (2009). Increasing burden of melanoma in the United States. *Journal of Investigative Dermatology, 129,* 1666–1674. doi:10.1038/jid.2008.423

Magin, P., Pond, D., Smith, W., Goode, S., & Paterson, N. (2012). Reliability of skin-type self-assessment: Agreement of adolescents' repeated Fitzpatrick skin phototype classification ratings during a cohort study. *Journal of the European Academy of Dermatology and Venereology, 26,* 1396–1399. doi:10.1111/j.1468-3083.2011.04298.x

Mansh, M., Katz, K. A., Linos, E., Chren, M. M., & Arron, S. (2015). Association of skin cancer and indoor tanning in sexual minority men and women. *JAMA Dermatology, 151,* 1308–1316. doi:10.1001/jamadermatol.2015.3126

Meyer, I. H. (1995). Minority stress and mental health in gay men. *Journal of Health and Social Behavior, 36,* 38–56. doi:10.2307/2137286

Meyer, I. H. (2003). Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychological Bulletin, 129,* 674–697. doi:10.1037/0033-2909.129.5.674

Miyamoto, J., Berkowitz, Z., Jones, S. E., & Saraiya, M. (2012). Indoor tanning device use among male high school students in the United States. *Journal of Adolescent Health, 50,* 308–310. doi:10.1016/j.jadohealth.2011.08.007

Morrison, M. A., Morrison, T. G., & Sager, C. L. (2004). Does body satisfaction differ between gay men and lesbian women and heterosexual men and women?: A meta-analytic review. *Body Image, 1,* 127–138. doi:10.1016/j.bodyim.2004.01.002

Mustanski, B., Van Wagenen, A., Birkett, M., Eyster, S., & Corliss, H. L. (2014). Identifying sexual orientation health disparities in adolescents: Analysis of pooled data from the Youth Risk Behavior Survey, 2005 and 2007. *American Journal of Public Health, 104,* 211–217. doi:10.2105/APJH.2013.301748

Muthén, L. K., & Muthén, B. O. (2001). *Mplus: Statistical analysis with latent variables [computer software]*. Los Angeles: Author.

Narayanan, D. L., Saladi, R. N., & Fox, J. L. (2010). Review: Ultraviolet radiation and skin cancer. *International Journal of Dermatology, 49,* 978–986. doi:10.1111/j.1365-4632.2010.04474.x

O'Riordan, D. L., Field, A. E., Geller, A. C., Brooks, D. R., Aweh, G., Colditz, G. A., et al. (2006). Frequent tanning bed use, weight concerns, and other health risk behaviors in adolescent females (United States). *Cancer Causes and Control, 17,* 679–686. doi:10.1007/s10552-005-0453-9

Pachankis, J. E. (2007). The psychological implications of concealing a stigma: A cognitive-affective-behavioral model. *Psychological Bulletin, 133,* 328–345. doi:10.1037/0033-2909.133.2.328

Peplau, L. A., Frederick, D. A., Yee, C., Maisel, N., Lever, J., & Ghavami, N. (2009). Body image satisfaction in heterosexual,

gay, and lesbian adults. *Archives of Sexual Behavior, 38,* 713–725. doi:10.1007/s10508-008-9378-1

Poorsattar, S. P., & Hornung, R. L. (2007). UV light abuse and high-risk tanning behavior among undergraduate college students. *Journal of the American Academy of Dermatology, 56,* 375–379. doi:10.1016/j.jaad.2006.08.064

Riggle, E. D., Rostosky, S. S., Black, W. W., & Rosenkrantz, D. E. (2017). Outness, concealment, and authenticity: Associations with LGB individuals' psychological distress and well-being. *Psychology of Sexual Orientation and Gender Diversity, 4,* 54–62. doi:10.1037/sgd0000202

Ródenas, J. M., Delgado-Rodríguez, M., Herranz, M. T., Tercedor, J., & Serrano, S. (1996). Sun exposure, pigmentary traits, and risk of cutaneous malignant melanoma: A case-control study in a Mediterranean population. *Cancer Causes and Control, 7,* 275–283. doi:10.1007/BF00051303

Rogers, H. W., Weinstock, M. A., Harris, A. R., Hinckley, M. R., Feldman, S. R., Fleischer, A. B., et al. (2010). Incidence estimate of nonmelanoma skin cancer in the United States, 2006. *Archives of Dermatology, 146,* 283–287. doi:10.1001/archdermatol.2010.19

Stapleton, J. L., Manne, S. L., Darabos, K., Greene, K., Ray, A. E., Turner, A. L., et al. (2015). Randomized controlled trial of a web-based indoor tanning intervention: Acceptability and preliminary outcomes. *Health Psychology, 34,* 1278–1285. doi:10.1037/hea0000254

Thompson, J. K., & Heinberg, L. J. (1999). The media's influence on body image disturbance and eating disorders: We've reviled them, now can we rehabilitate them? *Journal of Social Issues, 55,* 339–353. doi:10.1111/0022-4537.00119

U.S. Department of Health and Human Services (2014). *The surgeon general's call to action to prevent skin cancer*. http://www.surgeongeneral.gov/library/calls/prevent-skin-cancer

Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological Bulletin, 132,* 249–268. doi:10.1037/0033-2909.132.2.249

Williams, A. L., Grogan, S., Clark-Carter, D., & Buckley, E. (2013). Appearance-based interventions to reduce ultraviolet exposure and/or increase sun protection intentions and behaviours: A systematic review and meta-analyses. *British Journal of Health Psychology, 18,* 182–217. doi:10.1111/j.2044-8287.2012.02089.x