



## How East Asian colorism influences the use of skin-whitening products: The case of Chinese adolescents

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East Asian colorism refers to the favoring of lighter skin tones due to historical roots related to manual labor and social classes. This may influence the skincare behavior of people in modern society, particularly adolescents, who are vulnerable to social pressure. By conducting a Bayesian analysis aided by Markov chain Monte Carlo algorithms on data from 11,926 middle-school students in China, we found that the use of skin-whitening products was positively associated with self-perception of lighter skin, being a girl, feeling that one's skin tone was not attractive enough, constantly being evaluated about one's skin tone, and observations of unfair treatment due to skin tone (including both negative bias toward darker skin and positive bias toward lighter skin). These findings provide practical guidance for policy making and educational and marketing approaches regarding adolescent health and skincare.

### Keywords

East Asian colorism, skin tone, adolescents, skincare, skin-whitening product

### Article Highlights

- This study explored how East Asian colorism influences the use of skin-whitening products among Chinese adolescents.
- We applied social cognitive theory, social comparison theory, and the theory of planned behavior to explain the motivations behind the use of skin-whitening products.
- The use of skin-whitening products was found to be positively associated with adolescents' self-perception of having lighter skin, feeling that their skin tone was not attractive enough, and frequently hearing others comment about their skin tone.
- Girls were more likely to use skin-whitening products than were boys.

### East Asian Colorism and Chinese Society

In East Asian culture there is a traditional belief that associates aesthetic values with individuals who have lighter skin tones. These aesthetic values are a departure from colorism issues in Western countries, which are often linked to Eurocentrism and racism (Branigan et al., 2017; Daftary et al., 2023; Hunter, 2016; Pinkston, 2015). While the preference for lighter skin is widespread across all of Asia (Bettache, 2020), bias on skin tones has been suggested to be strongest in East Asia (Chen & Francis-Tan, 2022).

Colorism issues have historical origins in East Asia, where the preference for lighter skin tones was associated with higher socioeconomic status and social hierarchy in earlier feudal societies (Ashikari, 2003, 2005; Yip et al., 2019). In ancient East Asian societies, prolonged exposure to sunlight during outdoor manual labor led to increased pigmentation in the skin as an adaptation to ultraviolet radiation. Since upper-class elites normally did not engage in frequent outdoor labor, lighter skin tones came to symbolize higher social classes and subsequently became a social preference (Mak, 2007; Zhang, 2012). When preferences exist collectively in the form of norms, they can easily be adopted by members of society and lead to conformity (Helbing et al., 2014). Patterns of social conformity have deep roots in evolutionary sociobiological features dating back to the early age of ancient human societies and even further, as seen in behaviors in nonhuman/animal societies (Boyd & Richerson, 1982; Raihani, 2021). Thus, some researchers have suggested that social selection rather than natural selection has led to variations in skin pigmentation in the human race (Jablonski, 2004) and the perception of women as having lighter skin than men do (Carrito & Semin, 2019).

Preferences for lighter skin tones also have cultural origins in East Asia. In ancient Chinese literature, aesthetic appreciations of women frequently featured comparisons equating their complexion to the qualities of snow, ice, or jade (Yeung, 2015), which demonstrate the qualities of transparency, delicacy, smoothness, and whiteness (Zhang, 2012). Traditional Chinese proverbs further reinforce the connection between whiteness and perfection, including the famous phrase “*yi bai zhe bai chou*” (“*a white complexion can hide several flaws*”). These historical and cultural contexts, combined with the impact of racial colorism from the West during the era of colonization, have contributed to the development of East Asian colorism as observed in present-day China, Korea, and Japan (Craig, 2006; Hua, 2013). Many people in modern China experience high societal and interpersonal pressure to achieve beauty ideals, fueling a robust beauty economy worth billions of dollars (Hua, 2013). Although East Asian men are not fully exempt from colorism and can be victimized by such value prioritizations (Wang & Bao, 2023), beauty norms and advertising emphasizing lighter skin predominantly target women (Leong, 2006; Li et al., 2008).

Adolescents are in the process of developing their identity and thus are particularly susceptible to peer influences regarding attractiveness norms (Brown & Larson, 2009). When living in a social infosphere predominated by East Asian colorism (Mak, 2007; Yeung, 2015; Yip et al., 2019; Zhang, 2012), girls may absorb such biased perceptions. Hence, those with darker skin tones may perceive themselves as less attractive and subsequently develop low self-esteem, as physical attractiveness is a major concern during this developmental stage (Harter, 2001). Several studies have highlighted the susceptibility of adolescents to social appearance anxiety (Alfano & Beidel, 2011; Papapanou et al., 2023). This susceptibility manifests in their heightened propensity to develop social anxiety disorders, encounter appearance-related anxiety, and endure the adverse consequences associated with an excessive preoccupation with their physical appearance and self-perception (American Academy of Child and Adolescent Psychiatry, 2023). However, to date, little research has examined the influence of East Asian colorism on skincare practices in the modern Chinese adolescent population.

## Using Skin-Whitening Products to Change One's Skin Tone

Although the daily practice of using skin-whitening products has remained popular over time among Chinese women (Li et al., 2008), products have changed. The historical origins of whitening products can be attributed to the Tang Dynasty, during which women utilized ground pearl powders for the purpose of skin whitening (Yu et al., 2017). Nowadays, the use of other natural ingredients has been proven to be effective in skin whitening, such as edible bird's nest extract (Sandi & Susiani, 2021), *Glycyrrhiza glabra* root extract, *Solanum tuberosum* juice (Shete et al., 2020), and *Etilingera elatior* flower and leaf extracts (Whangsomnuek et al., 2019). At present, Chinese skin beauty standards are set through celebrities' and social media influencers' promotion (Hua, 2013) as well as traditional advertising, with around 75% of advertisements depicting lighter skin tones as a desirable attribute for women (Banerjee et al., 2013). Using skin-whitening products is now normalized in China, especially for women (Yeung, 2015). A survey of a college student population of Chinese women found that over 70% were dissatisfied with their skin tone and wanted to be lighter, and 60% had used skin-whitening products (Li et al., 2008).



However, not all skin-whitening product ingredients are safe. Some contain toxic ingredients such as mercury, corticosteroids, and hydroquinone (Peregrino et al., 2011; Wallander et al., 2015). Others can cause health problems including skin rashes, acne triggered by steroids, scarring, thinning of the skin, and the occurrence of skin ulcers (American Academy of Dermatology Association, 2021). Overall, while ingredients vary and research on the financial costs is limited, there is consensus that the regular use of high-quality skin-whitening products can be expensive and lead to significant health risks.

## **Theoretical Background of Psychological Research Related to Skin-Whitening Product Usage in East Asian Societies**

The continued utilization of skin-whitening products following widespread beauty standards favoring fair skin can be attributed to modern social expectations as well as historical precedent. In this regard several sociopsychological theories are useful for investigating decision making regarding skin-whitening product usage among East Asian adolescents. Social cognitive theory posits that behaviors are shaped by a combination of contextual variables, personal experiences, and individual traits (Bandura, 1986). According to social comparison theory, individuals engage in the evaluation of their own social and personal worth by comparing themselves to others (Festinger, 1954). In the current digitalized world, people may easily compare their physical attractiveness to that of celebrities, idols, and peers (Hua, 2013), and modern social media platforms increase the degree of such engagement by using specific algorithms to predict and show users content based on their past behavior (Aljunid & Dh, 2020; Breese et al., 1998). Thus, additional content related to colorism values may be fed to those who have already engaged with such content, potentially exacerbating and sustaining their unhealthy perceptions and anxieties related to skin tone (Karim et al., 2020; O'Day & Heimberg, 2021; Shensa et al., 2018). The concept of fear of negative evaluation provides another useful perspective, which suggests that people are motivated to gain positive judgments and avoid disapproval from others (Watson & Friend, 1969). It is likely that people use skin-whitening products to achieve paler skin that complies with cultural beauty standards, thereby earning praise and acceptance, and avoiding disapproval.

Motivations for using skin-whitening products also align with the theory of planned behavior. According to this framework, attitudes, perceived social norms, and behavioral control play a significant role in shaping individuals' intentions, which, in turn, guide their conduct (Ajzen, 1991). Due to the above-mentioned sociohistorical factors, people in East Asia might form a favorable attitude toward whiter skin (Mak, 2007; Yu et al., 2017; Zhang, 2012). Further, Chinese social norms for women include the use of skin-whitening products to achieve whiter skin as a daily practice (Hua, 2013; Li et al., 2008; Yeung, 2015). The marketing of skin-whitening products highlighting their availability and effectiveness also increases the sense of behavioral control in consumers (Li et al., 2008). Therefore, the combination of these factors may generate the intention and subsequently the behavior of using such products.

Considering the background theories and cultural context, this study examined how expressions of East Asian colorism affect the likelihood of skin-whitening product usage. We focused on adolescents, who are susceptible to social influences and expectations in the process of forming their own assessments and behaviors. Expressions of colorism in the context of this study included skin-tone-based self-evaluation of attractiveness, perceived emphasis during social interactions, and perceived biased social treatment. As this was an exploratory study, we did not form hypotheses.

## **Method**

### **Participants and Procedure**

This research project received ethics approval from the Institutional Review Board at China University of Political Science and Law. Using convenience sampling, we collected survey data from 11,926 students ( $M_{\text{age}} = 15.50$  years,  $SD = 1.44$ , range = 13–18) from 11 middle schools in Jiangsu Province, China. Among this population, 4,349 self-identified as biologically boys (36.47%) and 7,577 self-identified as biologically girls (63.53%). Data collection was approved by the Institutional Review Board of the China University of Political Science and Law, which ensured that the rights and well-being of all participants were respected and protected. One of the authors selected several public and international schools and contacted the principals of these schools to explain the purpose of the research and

request their cooperation. Due to certain difficulties in official social activity arrangement in China and the degree of the author’s involvement, we used convenience sampling instead of random sampling. Apart from this shortcoming, the authors ensured the sampling was not affected by other issues of subjectivity (Andrade, 2021; Farrokhi & Mahmoudi-Hamidabad, 2012). We used school–parent WeChat Groups to send informed consent forms and obtain agreement from the parents or guardians of the voluntary participants (see Appendix). Next, we conducted online pilot interviews with 48 participants from April 8–25, 2023 to examine the scope of students’ common skin-tone-based perceptions. These interviews were open ended, as we asked for students’ East Asian colorism-related life experiences, such as colorism encounters, student reactions, feelings, and behaviors. Each session lasted approximately 15–30 minutes.

## Measures

Although several racial-based colorism scales have been developed to measure colorism experience and the attitudes of racial minority groups (Bond & Cash, 1992; Harvey et al., 2005; Hill, 2002), the original items in these scales were not directly relevant to our focus on East Asia colorism. However, we took the content of these scales into consideration when developing our adapted questionnaire, as well as perceptions from the pilot interviews to better measure colorism in the modern East Asian context. Selected variables from the dataset to be used in our statistical analysis are presented and described in Table 1.

**Table 1. Variable Descriptions**

Variable name	Meaning	Variable type	Value
Light skin	Self-evaluation of one’s skin tone	Ordinal	1. Very dark 2. Somewhat dark 3. Somewhat light 4. Very light
Unattractive	Feeling that one’s skin tone is not attractive enough	Ordinal	1. Totally disagree 2. Somewhat disagree 3. Somewhat agree 4. Totally agree
Evaluated	Constantly hearing others commenting about one’s skin tone	Ordinal	1. Totally disagree 2. Somewhat disagree 3. Somewhat agree 4. Totally agree
Bullied	Having seen others with similar or darker skin tone being discussed/made fun of/teased	Ordinal	1. Totally disagree 2. Somewhat disagree 3. Somewhat agree 4. Totally agree
Favoritism	Having seen people with lighter skin tone being admired/receiving special care in social situations	Ordinal	1. Totally disagree 2. Somewhat disagree 3. Somewhat agree 4. Totally agree
Woman	Being a woman	Binary	0. No 1. Yes
Whitening	Currently using skin-whitening product(s)	Binary	0. No 1. Yes

The outcome variable *whitening* represents the status of whether the participants were currently using skin-whitening products, which was measured by a yes/no question. The variable *woman* describes the participants’ biological sex. The variable *light skin* represents the self-assessed degree of one’s own skin tone on a 4-point Likert scale ranging from 1 (*very dark*) to 4 (*very light*). The variables *unattractive*, *evaluated*, *bullied*, and *favoritism* were measured on a 4-point Likert scale ranging from 1 (*totally disagree*) to 4 (*totally agree*), representing participants’ attitude regarding their own skin tone as well as their perception of social attitudes toward their skin tone.



## Data Analysis

We used the following multiregression formula for the analysis. The probability around mean value  $\mu$  of the outcome variable is in the form of normal distribution with standard deviation  $\sigma$ .  $\mu_i$  represents the mean value of skin-whitening product usage likelihood of participant  $i$ . Regarding the coefficients, the mean value ( $M$ ) is in the form of a normal distribution, with standard deviations ( $SD$ ) reported.

$$whitening \sim normal(\mu, \sigma) \quad (1)$$

$$\mu_i = \beta_0 + \beta_{lightskin} \times lightskin_i + \beta_{unattractive} \times unattractive_i + \beta_{evaluated} \times evaluated_i + \beta_{bullied} \times bullied_i + \beta_{favoritism} \times favoritism_i + \beta_{woman} \times woman_i \quad (2)$$

$$\beta \sim normal(M, SD) \quad (3)$$

The analytical model has an intercept  $\beta_0$  and coefficients  $\beta_{lightskin}$ ,  $\beta_{unattractive}$ ,  $\beta_{evaluated}$ ,  $\beta_{bullied}$ ,  $\beta_{favoritism}$ , and  $\beta_{woman}$ . Because the outcome variable *whitening* indicates a binary state of behavior, we can calculate the probability of skin-whitening product usage (ranging from 0 to 1) of participant  $i$  ( $\pi_{whitening}$ ) based on the coefficients and values of participant  $i$ 's parameters using the following formula:

$$\pi_{whitening} = \frac{e^{\mu_i}}{1 + e^{\mu_i}} \quad (4)$$

We used Bayesian analysis with aided Markov chain Monte Carlo (MCMC) algorithms to conduct the regression, following standardized protocols (Nguyen et al., 2022). All properties are treated probabilistically in the Bayesian approach, and the highest occurrence probabilities of parameters are used for result interpretation, which can aid assessment accuracy in psychological and behavioral research (Csilléry et al., 2010; Dunson, 2001; Gill, 2014; Wagenmakers et al., 2018). We used credible intervals (i.e., the mean values and ranges of the coefficients' posterior distribution) to determine the factors' effect and reliability.

Simulated data through the MCMC processes were checked for goodness of fit, which was compared to the original data to ensure that there were no problematic influential observations affecting the inference. For this purpose, we employed Pareto-smoothed importance sampling leave-one-out (LOO) diagnostics (Vehtari & Gabry, 2019; Vehtari et al., 2017). The LOO value was calculated using the following formula, where  $p_{post(-i)}(\theta)$  is the posterior distribution based on the data minus data point  $i$ .

$$LOO = -2 \sum_{i=1}^n \log \int p(y_i | \theta) p_{post(-i)}(\theta) d\theta \quad (5)$$

Here, if all  $k$  values of the analytical model are below 0.5, the simulated data for the model are deemed to fit well with real data. Convergence of the Markov chains in MCMC processes was checked using the effective sample size ( $n_{eff}$ ) and the Gelman–Rubin shrink factor ( $Rhat$ ).  $N_{eff}$  over 1,000 has been deemed sufficient for reliable inference (McElreath, 2020), and  $Rhat$  equaling 1 indicates good chain convergence (Brooks & Gelman, 1998; Gelman & Rubin, 1992). We conducted our analysis using the *bayesvl* package in R version 4.2.0 (La & Vuong, 2019) with uninformative priors, 5,000 iterations (including 2,000 warm-up iterations), and four chains.

## Results

The results of Pareto-smoothed importance sampling LOO diagnosis showed that all  $k$  values were below the threshold of .50, indicating acceptable goodness of fit of the analytical model (see Figure 1).

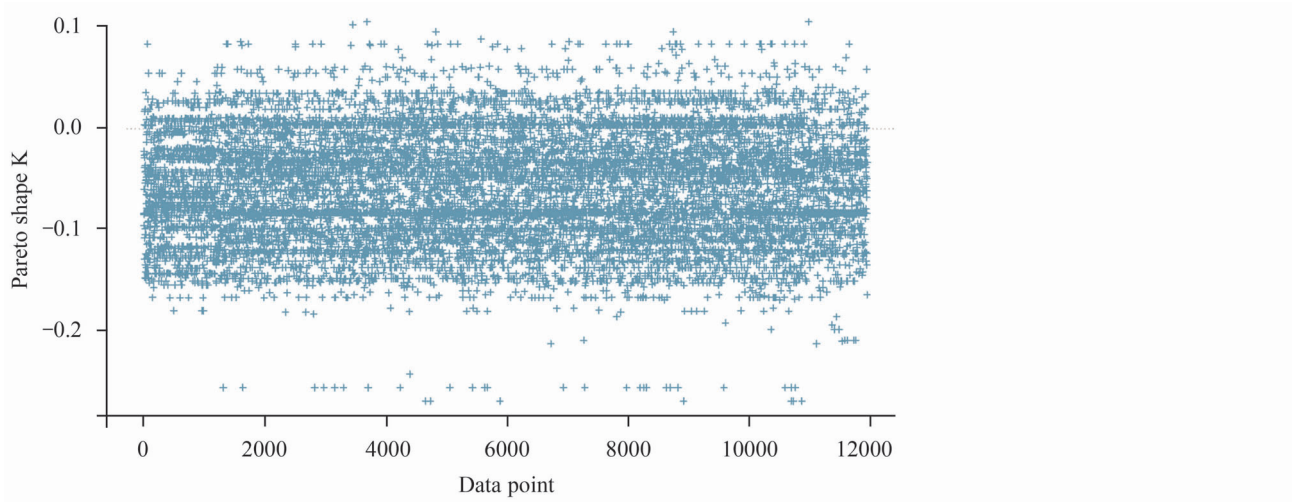


Figure 1. *Pareto-Smoothed Importance Sampling Leave-One-Out Diagnostic Plot*

Table 2 shows the statistical results of the analysis. The  $n_{eff}$  values were well over 1,000, and the  $Rhat$  values equaled 1 for all parameters, indicating the good convergence of the Markov chain and thus good reliability of the found effects. The Markov chains' convergence was also visually checked through the trace plots (see Figure 2), where all chains were shown to fluctuate around equilibriums after the warm-up period.

Table 2. *Simulated Posteriors of Model 1*

Parameters	$M$	$SD$	$n_{eff}$	$Rhat$
Constant	-1.88	0.06	11345	1
Light skin	0.16	0.03	9903	1
Unattractive	0.25	0.04	10151	1
Evaluated	0.14	0.03	10465	1
Bullied	0.03	0.03	10678	1
Favoritism	0.13	0.03	11878	1
Woman	0.56	0.04	11214	1

Note.  $n_{eff}$  = effective sample size;  $Rhat$  = Gelman–Rubin shrink factor.

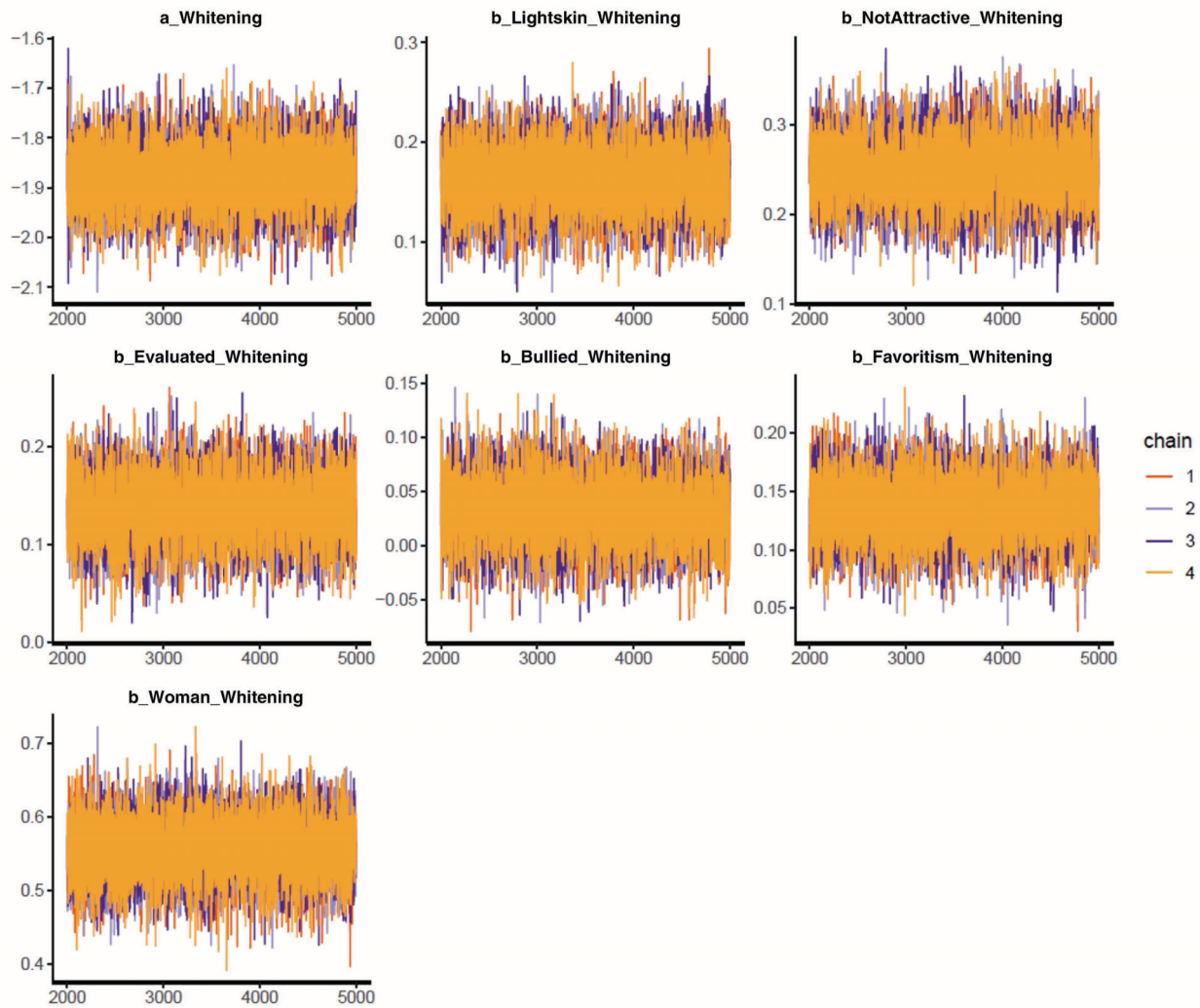


Figure 2. Trace Plots for the Analytical Models

As shown in Table 2, the mean values of the posterior coefficients indicated the highest probabilities of occurrence for those coefficients, whereas the standard deviation helped determine if the effects indicated by the mean values were reliable (negative, positive, or no effect). Lighter skin tone was found to be positively associated with *Whitening*, while *negative* personal perceptions of one's own skin tone were positively associated with whitening. Being evaluated about one's skin tone was also found to have a positive association with whitening. Experiences of negative treatment toward dark skin tone showed a slight positive association, but the effect was relatively weaker than the other examined factors—there was a relatively low mean value of  $\beta_{bullied}$  in relation to the values of  $bullied_i$ . However, experiences of positive treatment toward light skin tone showed a clearer positive association with whitening. Being a *woman* was also positively associated with the likelihood of using skin-whitening products. All the effects besides that of *bullied* were very clear. The posterior distributions of coefficients within the 90% highest posterior density intervals are shown in Figure 3. Apart from *bullied*, which has a small portion of distributions lying on the negative side, all other coefficients' distributions lay completely on the positive side, indicating their effects' reliability.

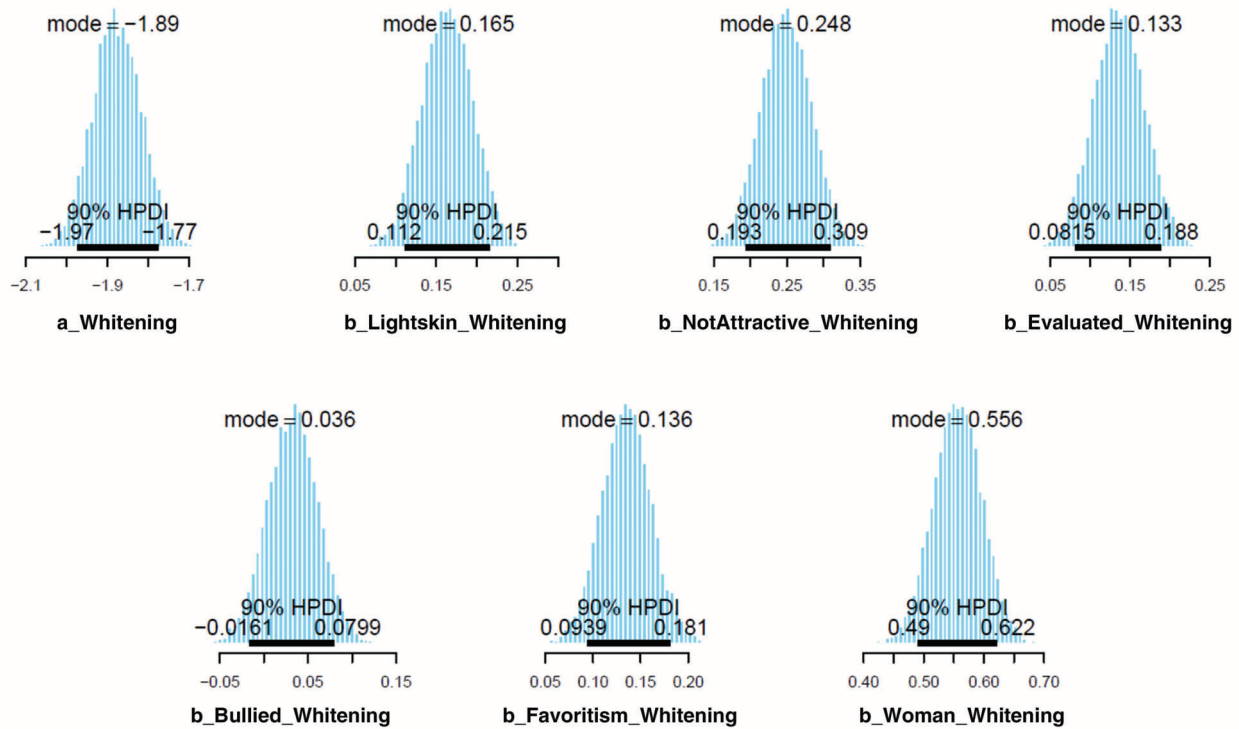


Figure 3. Posterior Distributions Within 90% Highest Posterior Density Intervals

## Discussion

This study examined how expressions of East Asian colorism affect the likelihood of skin-whitening product usage. Our results show that using skin-whitening products was positively associated with self-perceptions of having lighter skin. This was not an expected finding, since those with darker skin would have more visible results from using such products. A possible explanation is that the decision to use skin-whitening products is associated with being more self-conscious about skin tones, leading to a more biased self-perception that is aligned with social norms (i.e., a perception–reality gap). In addition, the temporary whitening effect of such products may also contribute to this counterintuitive result.

We also found that skin-whitening product usage was positively associated with several negative perceptions of darker skin tone in relation to social expectations. These included feeling that one’s skin tone was not attractive enough, constantly hearing others commenting about one’s skin tone, having seen others with similar or darker skin tone being discussed/made fun of/teased, and having seen people with lighter skin tone being admired/receiving special care in social situations. From a sociopsychological perspective, behaviors are influenced by social norms and interactions (Bandura, 1986) as well as social comparison (Festinger, 1954). Driven by fears of negative evaluation (Watson & Friend, 1969), adolescents who observe negative social evaluations of darker skin are more likely to use skin-whitening products to conform to cultural beauty standards and avoid negative external feedback (Li et al., 2008; Zhang, 2012).

This study provides insights into skincare practice related to the notion that Chinese people’s appearance perceptions are influenced by East Asian colorism (Leong, 2006; Li et al., 2008; Yeung, 2015). From a decision-making perspective, researchers have suggested that attitudes, social norms, and behavioral control influence individuals’ intentions and behavior (Ajzen, 1991). East Asians’ positive attitudes toward skin-whitening products might be due to sociohistorical



factors (Mak, 2007; Yu et al., 2017; Zhang, 2012), reinforced by social norms of women using skin-whitening products as a daily practice (Li et al., 2008; Yeung, 2015; Zhang, 2012), with behavior control promoted by advertisements about the availability and effectiveness of skin-whitening products (Leong, 2006; Li et al., 2008). In addition to personal experiences of receiving compliments for lighter skin or witnessing negative feedback toward darker skin, East Asian colorism values are reinforced through the social comparison of one's physical attractiveness to that of celebrities, idols, and peers on social media (Hua, 2013; Leong, 2006).

Regarding the impact of observations of skin-tone-based unfair treatment, our findings show that negative biases related to dark skin had a weaker influence on skin-whitening product usage compared to positive biases related to light skin. This may be due to collective moral expectations in East Asian society, which make negative attitudes less apparent and explicit in public interactions. Overall, the influence of skin-tone-related information on skin-whitening product usage can also be viewed from three dimensions of information: direction, intensity, and compatibility (Le, 2023). Direction refers to the binary directionality of whether the received information favors or is against the use of skin-whitening products. The factors in our findings all show a direction of reinforcing such behaviors. Intensity refers to the magnitude of the information's influence. Here, participants' responses of "strongly agree" regarding the factors represented a higher intensity of perceived influence. Compatibility refers to the sensitivity (including susceptibility and reactivity) of a person toward certain information. Here, Chinese girls can be considered a sensitive group regarding information about skin tone and skin-whitening products, which is in line with our finding that girls were more likely than boys were to use skin-whitening products.

## **Practical Implications**

Our findings have implications for policy making and marketing approaches related to skincare. While it is likely that colorism-based attitudes strengthen the intention of using skin-whitening products, the moral value of utilizing such an association should be taken into consideration. People should be free to embrace their personal ideas of beauty; however, adolescents need support to develop healthy and open perceptions of skin tone and physical attractiveness. Thus, we recommend that marketing practices of skincare products in East Asian societies aim to emphasize other qualities of skin beauty that represent good health instead of focusing on the light/dark tone of skin. It is also important for policymakers to closely monitor such marketing practices to ensure that they do not attempt to psychologically manipulate the viewer through suggestions of skin-tone-based discrimination, especially in advertisements that target adolescents. Furthermore, we recommend that teachers in East Asian cultures incorporate proper knowledge of science-based skincare practices into health/biology educational programs at schools, which will help prevent the development of distorted views regarding skin tone among students, especially girls, who are susceptible to prejudicial perceptions of skin tone.

## **Limitations and Future Research Directions**

This study has limitations. First, we used convenience sampling; representativeness could be improved in future research through incorporating other techniques, such as random sampling. Second, our sample comprised adolescents, who might focus more on skin tone than do older adults, who experience less social pressure related to physical appearance. In addition, our participants were from Jiangsu Province, a relatively affluent region that may not accurately represent Chinese or East Asian adolescents in regions with significantly lower economic status. Furthermore, we used data related to biological sex and did not include self-identified gender as a factor. Future studies could update the found effects by incorporating nonbinary/other gender groups, which may have different psychological patterns related to physical appearance.

## **Acknowledgments**

Ruining Jin led the research and data collection. Tam-Tri Le analyzed the data. Both authors refined the research objectives and methods; and drafted, reviewed, and approved the final manuscript.

The authors declare no conflicts of interest.

All data and code snippets of this study are available at the Open Science Framework repository (<https://osf.io/76p4t/>).

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