Dissatisfaction with cutaneous body image is directly correlated with insomnia severity: A prospective study in a non-clinical sample

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Abstract

Objectives: Sleep deprivation can physically affect skin appearance, e.g. increase the cutaneous signs of aging. There are no studies of sleep disorders and subjective ratings of skin appearance or cutaneous body image (CBI). CBI is an important consideration in the treatment of cosmetically disfiguring dermatologic disorders. We examined the association of insomnia and CBI. Methods: As part of a larger study, community-based non-clinical participants completed ratings of insomnia and CBI (also measured 4-weeks post-baseline) using the Cutaneous Body Image Scale (CBIS). Results: 301/311 adults (238 women; mean ± SD age 38.6 ± 14.7 years; 54.5% married; 94.2% “white”) completed insomnia and CBI ratings at baseline; 243/301 completed CBI ratings 4-weeks post-baseline. A low CBIS score denotes greater dissatisfaction with CBI. Multiple regression analysis using CBI at baseline as dependent variable and insomnia, age and sex as independent variables revealed that insomnia ($\beta = -0.24, p < 0.001$) and female gender ($\beta = -0.25, p < 0.001$) but not age ($\beta = -0.097, p = 0.07$) were predictors of CBI dissatisfaction (adjusted $R^2 = 0.15, p < 0.001$). A similar relationship was observed for CBI ratings 4-weeks post-baseline. Conclusions: CBI dissatisfaction was positively related to insomnia severity, especially among women. Underlying insomnia may confound an individual’s self-assessment of their CBI, a finding that has important treatment implications in dermatology.

Keywords

Dermatology, self-image, skin, sleep

Introduction

The skin is the largest organ of the human body and plays a central role in both how our appearance is perceived by others and how we perceive our own appearance. Cutaneous body image (CBI) is defined as the mental perception of the appearance of the skin, hair and nails (1). Recent studies have shown that sleep deprivation can have an impact on objective ratings of skin appearance (2–4). In one study, 40 observers rated 20 facial photographs of 10 healthy individuals after a normal night’s sleep and after undergoing 31 h of sleep deprivation following a night with 5 h of sleep, without being informed about the purpose of the study. A higher frequency of dermatologic changes typically associated with a “fatigued look” were noted by the blinded observers in the sleep deprived photographs, including dark circles under the eyes, pale skin, more wrinkles/lines around the eyes, and droopy corners of the mouth (2). The authors (2) discuss the psychosocial implications of appearing fatigued, for example, in relation to perceived attractiveness and partner interactions, interactions in the workplace and with health-care providers. The desire to look less fatigued and have more youthful appearing skin, is also reported to be one of the primary motivators for undergoing plastic surgery (2,5). In another study, 20 adults with obstructive sleep apnea had 3-dimensional digital photogrammetry before and ≥2 months after treatment with positive airway pressure (PAP) (4). Twenty-two blinded raters assessed the pre- and post-PAP facial images, and identified the post-PAP photos as more alert, more youthful and more attractive (4). The investigators’ own inspections of the pre- and post-PAP images suggested a reduction in prominence of the forehead skin wrinkles (4).

Subjective ratings of satisfaction with the appearance of the skin is a very important dimension of CBI evaluation. For example, in dermatologic disorders (6) subjective patient ratings of dissatisfaction with CBI are an important consideration in assessing the severity of cosmetically disfiguring conditions such as psoriasis and acne. Clinical treatment guidelines for dermatologic disease highlight the importance of assessing psychosocial constructs, including aspects of cutaneous body image, in order to provide optimal treatment. Current treatment guidelines for acne almost universally address the importance of such psychosocial issues in the management and treatment of this disease, including guidelines from the Global Alliance to Improve Outcomes in Acne (7), and from the United States (8), Europe (9), and the United Kingdom (10). Similarly, treatment guidelines for psoriasis from a number of different countries including the United States (11), Britain (12), Canada (13), Europe (14), and the United Kingdom (15, 16) have highlighted the important impact that psoriasis can have on quality of life and psychological well-being. The Scottish Intercollegiate Guidelines Network recommends that
in the treatment of psoriasis, clinicians should discuss important psychosocial issues including body image and self-esteem with each patient (16), and Canadian guidelines recommend that quality of life issues like body image should be central in the long-term management of psoriasis (13). These guidelines have also highlighted the fact that the psychological effects of acne (7.8) and psoriasis (11.14–16) do not always correlate with the clinicians’ assessment of severity, stressing the importance of subjective ratings of well-being and appearance. Even in relatively mild cases of skin disease, psychosocial factors, such as CBI should be considered. CBI dissatisfaction is also a core feature of body dysmorphic disorder and is encountered in other body image disorders such as eating disorders (17), and such patients also typically seek treatments from a dermatologist (6).

Sleep disturbance has been known to confound the subjective evaluation of overall body image, and body image related to body weight. Studies of pregnant women (18,19), cancer patients (20,21), and a variety of student populations (22–25), have consistently found an association between body image and sleep problems. In pregnant women, positive correlations were found between both pre-pregnancy and current body image dissatisfaction and sleep disturbances as measured by the Pittsburgh Sleep Quality Index (PSQI) (18). In another pregnant sample, PSQI scores were positively associated with the “Feeling Fat” and “Salience of Body Weight” subscales of the Body Attitudes Questionnaire (BAQ), and negatively correlated with the “Attractiveness” and “Strength/Fitness” subscales of the BAQ (19). In cancer patients, having more problematic hot flashes and night sweats (20), fatigue, drowsiness or sleep disorders (21) were associated with poor body image. The occurrence of sleep difficulties in patients with eating disorders, for which body image is a core symptom for many patients (26), has also been widely established (27,28).

While these studies all show an association between sleep and body image, they have either addressed body image as a general construct (18–21) or examined weight-related body image concerns (24,25). The question remains: Does sleep also have an impact on an individual’s own subjective perceptions of their skin appearance? To our knowledge, there are no studies of the relation between sleep and subjective ratings of CBI. In the present study, we examined the association of insomnia and CBI in a non-clinical community-based sample of adults.

Methods
Participants
The data for this study were obtained from a large community-based survey of psychiatric and medical complaints, carried out in London, Ontario, Canada. The study was approved by the University of Western Ontario Office of Research Ethics. Details of the study and previous publications from the study database have been described elsewhere (29). A total of 301 out of 311 non-clinical community-based consecutively consenting participants (Table 1), all age ≥18 years, completed ratings of insomnia and CBI at baseline, and 243 completed a second rating of their CBI 4 weeks after the baseline ratings. Exclusion criteria were current or past history of any physician-diagnosed self-reported major dermatologic, psychiatric or other medical disorder. Individuals who reported a “major” chronic or acute physician diagnosed health concern were excluded from the study.

<table>
<thead>
<tr>
<th>Clinical feature</th>
<th>Baseline ratings (N = 311)</th>
</tr>
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<tbody>
<tr>
<td>Sex</td>
<td>73 men, 238 women</td>
</tr>
<tr>
<td>Age range</td>
<td>18–79 years</td>
</tr>
<tr>
<td>Mean ± SD age</td>
<td>38.6 ± 14.7 years</td>
</tr>
<tr>
<td>Marital status</td>
<td>54.5% married</td>
</tr>
<tr>
<td>Race</td>
<td>94.2% “white”, 2.9% “black”</td>
</tr>
<tr>
<td>Insomnia severity*</td>
<td>47.3% “No Insomnia” (n = 147)</td>
</tr>
<tr>
<td></td>
<td>17.0% “Mild Insomnia” (n = 53)</td>
</tr>
<tr>
<td></td>
<td>13.2% “Moderate Insomnia” (n = 41)</td>
</tr>
<tr>
<td></td>
<td>22.5% “Severe Insomnia” (n = 70)</td>
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*Insomnia severity ratings. “No Insomnia” denotes low sleep onset/continuity complaints + no complaints of non-restorative sleep. “Mild Insomnia” denotes low sleep onset/continuity complaints + some complaints of non-restorative sleep. “Moderate Insomnia” denotes high sleep onset/continuity complaints + no complaints of non-restorative sleep. “Severe Insomnia” denotes high sleep onset/continuity complaints + some complaints of non-restorative sleep.

Cutaneous body image
CBI was assessed using the Cutaneous Body Image Scale (CBIS), a psychometrically validated scale which has been used in both Canadian (1) and Japanese (30) samples of dermatology patients and non-clinical participants. The CBIS is comprised of 7 items which are responded to using a 10-point scale with ratings of ‘0’ denoting ‘not at all’; a rating of ‘1’, ‘2’ or ‘3’ denoting ‘mildly’, a rating of ‘4’, ‘5’, or ‘6’ denoting ‘moderately’, and a rating of ‘7’, ‘8’ or ‘9’ denoting ‘a great deal’. The seven items are as follows: ‘I like the overall appearance of my skin’, ‘I like my complexion or overall color of my skin’, ‘I like the appearance of the skin of my face’, ‘I like the complexion or the overall color of the skin of my face’, ‘I am very satisfied with my hair’, ‘I am satisfied with the appearance of my fingernails’, ‘I am satisfied with the appearance of my toenails’. A composite CBI score is derived by calculating an average score of the 7 ratings, with a possible range of 0 to 9. A lower score on the CBIS denotes greater dissatisfaction with CBI, while higher scores indicate greater CBI satisfaction. Scores on the CBIS have been shown to be significantly lower (p = 0.004) in clinical dermatology patients (mean ± SD: 4.44 ± 1.56) versus a non-clinical sample (4.96 ± 1.73) in Canada (1). Similarly, scores on the CBIS have been found to discriminate (p < 0.001) between dermatology patients (3.18 ± 1.69) and healthy adults (4.11 ± 1.80) in a Japanese sample (30).

Insomnia
Insomnia severity was assessed at baseline with the following six items in the survey questionnaire, where participants endorsed how their sleep is “usually”: the basic constructs for the four items about usual sleep onset latency, frequency of awakenings from sleep, and frequency of use of sleep medications were adapted from the Pittsburgh Sleep Quality Index (PSQI) (31) and two items addressing experience of non-restorative sleep upon awakening were included in the survey from earlier studies of sleep in dermatology patients (32). Participants rated their response to the following items: Item 1: “How long do you generally take to fall asleep at night?” with a 5-point response option of “immediately”, “less than 10 minutes”, “less than half an hour”, “less than one hour”, or “more than one hour”; Item 2: “How frequently do you experience awakenings from sleep?” with a 4-point response option of “never”, “sometimes”, “often”, or “always”; Item 3: “On average, how many times...
do you usually awaken during the night?’’ with a 4-point response option of ‘‘none’, ‘‘1 to 2 times’, ‘‘3 to 4 times’, ‘‘5 or more times’’; Item 4: ‘‘How often do you take sleeping medications in order to fall asleep?’’ with a 6-point response option of ‘‘never’, ‘‘approximately once every six months’, ‘‘approximately once every month’, ‘‘approximately once every week’, ‘‘2–4 times per week’’ or ‘‘every day’’; Items 5 and 6: Participants rated the restorativeness of their sleep, by endorsing a ‘‘Yes’’ or ‘‘No’’ to ‘‘Physically exhausted, no energy’’ (Item 5) and ‘‘Feeling that you had not slept at all’’ (Item 6) in response to the question ‘‘How do you usually feel when you awaken from sleep?’’. In order to create the Insomnia variable, the responses to Items 1 to 4 were added (possible range 4 to 19); the composite score was dichotomized at a cut off of 9, which was close to the mean (±SD) score of 9.2(±3.2). The final Insomnia variable had four categories and was created as follows: (i) ‘‘No insomnia’’ if composite score of Items 1 to 4 was ≤9 and both Items 5 and 6 were rated as a ‘‘No’’; (ii) ‘‘Mild insomnia’’ if the composite score of Items 1 to 4 was 9 and at least one of Items 5 and 6 were rated as a ‘‘Yes’’; (iii) ‘‘Moderate insomnia’’ if the composite score of Items 1 to 4 was >9 and both Items 5 and 6 were rated as a ‘‘No’’; (iv) ‘‘Severe insomnia’’ if the composite score of Items 1 to 4 was >9 and at least one of Items 5 and 6 were rated as a ‘‘Yes’’.

**Statistical analysis**

Analysis of variance (ANOVA) using CBI scores as the dependent measure was used to evaluate whether CBI concerns were significantly different between the four categories (‘‘None’’, ‘‘Mild’’, ‘‘Moderate’’ and ‘‘Severe’’) of Insomnia severity (Figures 1 and 2). Tukey’s post-hoc comparisons were used to evaluate differences in CBI ratings between the four Insomnia categories. The possible confounding effect of demographic factors such as age and sex, that are known to affect body image, was examined using multiple regression analysis, using the CBI measure as the dependent variable, and age, sex and Insomnia severity as independent variables. Pearson correlation was used to evaluate the correlation between baseline and 4-weeks post-baseline CBI measures. All analyses were carried out using SPSS version 20.0 (SPSS Inc., Chicago, IL) (33).

**Results**

Among the 311 participants, 301 completed the insomnia and CBI ratings at baseline. The demographic features of the study sample and baseline insomnia severity scores are summarized in Table 1.

![Figure 1](https://example.com/figure1.png)

**Figure 1.** Increase in Insomnia severity is associated with greater CBI dissatisfaction [F(3, 298) = 10.89, p < 0.001 by ANOVA]. A low CBI Scale score denotes greater CBI dissatisfaction (1).

Multiple regression analysis using the ‘‘Insomnia’’ variable, age and sex as independent variables and CBI measure at baseline as the dependent variable revealed that ‘‘Insomnia’’ (standardized regression coefficient or β = −0.24, p < 0.001) and female gender (β = −0.25, p < 0.001) but not age (β = −0.097, p = 0.07) were significant predictors of CBI (adjusted R² = 0.15, p < 0.001).

Using a prospective design, 243 of the 301 patients rated their CBI for a second time 4 weeks after the baseline ratings. A second multiple regression analysis using ‘‘Insomnia’’, age and sex as independent variables and CBI at 4 weeks revealed that Insomnia (β = −0.29, p < 0.001) and female gender (β = −0.19, p = 0.003) but not age (β = 0.021, p = 0.7) were once again significant predictors of CBI at 4 weeks (adjusted R² = 0.13, p < 0.001). CBI measures at baseline and 4 weeks later were significantly correlated (Pearson’s r = 0.81, p < 0.001).

A one-way ANOVA was used to test differences in CBI ratings between the four Insomnia severity groups at baseline (Figure 1) and 4 weeks later (Figure 2). At baseline (Figure 1) CBI ratings differed significantly across the four Insomnia severity categories, F(3, 298) = 10.89, p < 0.001. Tukey’s post-hoc comparisons indicated that the CBI score in the ‘‘No Insomnia’’ group (Mean = 5.45, 95% CI [5.15, 5.75]) was significantly greater than both the ‘‘Mild Insomnia’’ (Mean = 4.64, 95% CI [4.19, 5.08]), p = 0.03 and ‘‘Severe Insomnia’’ (Mean = 4.13, 95% CI [3.77, 4.49]), p < 0.001 groups. A high CBI score indicated greater satisfaction with CBI. Comparison of CBI scores between the ‘‘Mild Insomnia’’ (Mean = 5.21, 95% CI [4.77, 5.65]) and ‘‘Severe Insomnia’’ groups was also statistically significant (p = 0.003).

Differences in CBI ratings 4 weeks post-baseline among the four Insomnia groups were further examined using an one-way ANOVA (Figure 2). The CBI scores at 4 weeks differed significantly across the four Insomnia severity categories, F(3, 248) = 9.55, p < 0.001. Tukey’s post-hoc comparisons indicated that the 4-week post-baseline CBI score in the ‘‘No Insomnia’’ group (Mean = 5.50, 95% CI [5.17, 5.82]) was significantly greater than the ‘‘Severe Insomnia’’ group (Mean = 3.87, 95% CI [3.35–4.39], p < 0.001). Comparison of CBI scores between the ‘‘Mild Insomnia’’ (Mean = 5.05, 95% CI [4.56, 5.54]) and ‘‘Severe Insomnia’’ groups also revealed a statistically significant (p = 0.01) difference.

**Discussion**

We examined the relation between insomnia severity and the individual’s subjective perception of their cutaneous body image...
Our findings indicate a direct relation between insomnia severity and degree of CBI dissatisfaction (Figure 1) (a high CBI score (1) denotes greater satisfaction with CBI), a finding that has not been previously reported. This relation is significantly stronger among women than men, and not confounded by chronological age. These findings complement the recent reports of observer-rated objective changes in appearance associated with aging-related skin changes after sleep deprivation (2,3) and improvement after treatment of obstructive sleep apnea (4).

In our study we asked the participants to report their ‘usual’ sleep pattern, and the sleep-related symptoms endorsed were therefore likely an indication of a more enduring feature of their sleep. Follow-up CBI ratings 4 weeks after the baseline ratings indicated that the relationship of baseline insomnia severity with CBI dissatisfaction at 4-weeks post-baseline was essentially maintained, supporting the robustness of our finding.

Our findings further support the literature (18–25) on the association between sleep disturbance and general ratings of body image and weight-related body image in non-clinical samples. The greater CBI dissatisfaction ratings among participants reporting more severe insomnia may have other far-reaching clinical implications as the use of minimally invasive cosmetic procedures on the skin such as botulinum toxin A injections, that are primarily based upon the patient’s subjective dissatisfaction with their CBI, have increased eight-fold since 1992 (34). For example, data from the American Society of Plastic Surgeons (34) report more than 9.1 million minimally invasive cosmetic procedures in 2006. It is also noteworthy that the mean (95% CI) CBI scores among the ‘Severe Insomnia’ group of 4.13 (3.77–4.49) at baseline and 3.87 (3.35–4.39) at 4-weeks post-baseline, respectively, overlap with the CBI scores noted among clinical dermatologic patients (1,30) even though they are from a non-clinical sample. This suggests that the possible moderating effect of insomnia in the patient’s self-assessment of their CBI in clinical dermatologic populations can be an important factor, and has potentially clinically relevant implications for treatment guidelines of cosmetically disfiguring dermatologic disorders where the patient’s rating of dissatisfaction with their CBI is an important consideration in implementing the treatment (6,8,13,16).

CBI dissatisfaction is also a core feature of body dysmorphic disorder (35) and the possible confounding role of insomnia in primary body image pathologies involving the skin remains to be studied. Insomnia is also recognized as a cross-cutting feature of a wide range of psychiatric disorders (35) and it therefore could play a moderating role in the impact of psychiatric disorders such as depressive disease on different dimensions of body image including CBI. Sleep disturbances can have an impact on self-esteem and optimism (36) and this can in turn have an impact on self-evaluation of CBI.

Several study limitations should be noted. First, self-report questionnaires were used to assess insomnia. The constructs used to measure insomnia in our study have been extracted from the PSQI (31) and an earlier study of sleep symptoms in psoriasis patients (32). The full psychometric properties of the six items in our insomnia survey are not known. American Academy of Sleep Medicine (AASM) guidelines (37) for insomnia evaluation do recommend the use of self-administered questionnaires to assess insomnia and also state that polysomnography is not indicated for the routine evaluation of insomnia. Methods used to evaluate insomnia in our study do follow AASM guidelines; however, the participants were not clinically evaluated and were classified as having insomnia entirely based upon self-reports. Secondly, there are a number of potentially confounding factors that may impact the relationship between insomnia and CBI, including the role of psychiatric comorbidities, e.g. depressive illness, that are also associated with insomnia and can negatively impact self-evaluation of body image. We have studied non-clinical participants without a psychiatric history and only controlled for the possible confounding effect of age and gender. Future studies in clinical samples should examine the potential role that psychiatric disorders may play in this association.

Conclusions

Our findings among a non-clinical sample suggest that insomnia is associated with a greater tendency for negative self-evaluation of CBI especially in women. The dermatologist should enquire about insomnia and recent sleep deprivation when dealing with a patient complaining of CBI dissatisfaction. The possible moderating effects of insomnia in clinical situations involving cosmetic procedures of the skin and in cosmetically disfiguring dermatologic disorders also merit further investigation.

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Declaration of interest
The authors report no conflicts of interest.

References