

# Perceived Stress and Interest in Non-Invasive Aesthetic Procedures During the COVID-19 Pandemic

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**Purpose:** Multiple effects of the COVID-19 pandemic have been described, including an increase in concerns about one's facial appearance resulting in greater interest in cosmetic procedures. However, additional research is required to examine the impact of the pandemic on patients' overall stress levels and whether this reported stress is associated with an interest in facial aesthetic procedures. We aimed to describe perceived stress and to identify factors associated with increased stress among patients seeking aesthetic treatments during the pandemic.

**Patients and Methods:** Patients coming to a Singapore-based clinic and who completed a questionnaire over a one-month period were included. Stress was evaluated using the Perceived Stress Scale (PSS); additional questions sought to understand factors associated with perceived stress and future interest in aesthetic procedures.

**Results:** Two hundred and thirteen respondents participated in the study. Separation from family and inability to travel for leisure were major stressors in 54% and 55%; getting COVID-19 was less frequently a stressor (11%). Patients reported greater concern with appearance (increased worry in 32%, comparison to others in 41%). Ninety-one percent of patients continued aesthetic procedures despite the pandemic and 75% reported interest in proceeding with treatments not previously tried before. PSS scores were higher than published norms. Factors associated with increased scores included residency status, job insecurity and markers of increased concern about appearance. Finally, higher stress scores were observed in patients with greater likelihood of receiving future aesthetic treatments, although this was not statistically significant after applying the Bonferroni correction for multiple comparisons.

**Conclusion:** Significantly higher stress scores were seen in patients seeking aesthetic treatments. We identified factors associated with increased stress with a suggested association between increased likelihood of proceeding with any aesthetic procedure and higher levels of stress. These highlight the importance of caution in treating patients given their increased stress levels and potential vulnerability.

**Keywords:** stress, COVID-19, pandemic, aesthetic procedures



## Introduction

The COVID pandemic has affected everyone's lives in many ways with most countries having experienced periods of complete lockdown. This has countless downstream effects on all aspects of life, including work routine, social life, physical and mental well-being.<sup>1</sup> Indeed, the psychological effects of the pandemic have been reported in multiple contexts including the general population as well as among vulnerable groups such as healthcare workers and COVID-19 patients.<sup>2</sup>

In Singapore, strict enforcement of preventive measures to limit COVID spread and infection were in place since the onset of the pandemic in February 2020.<sup>3</sup> Singapore relies heavily on openness to travel for its success in attracting professional expatriates and their families.<sup>4</sup> Pandemic stressors are likely to affect everyone; however, these may have

a greater impact on non-residents in a country such as Singapore where professional expatriates and foreign workers routinely return home or travel elsewhere for leisure.

In the field of medical aesthetics, multiple effects of the pandemic have also been described. Although medical aesthetics is generally considered a non-essential service, a strong rebound was observed worldwide after full lockdown was relaxed.<sup>5,6</sup> Factors affecting interest in medical aesthetics during the pandemic include the “zoom effect”, increasing the focus on one’s appearance as well as an overall increased interest in well-being. In one study, new facial concerns were identified due to video conferencing, which was associated with an increased interest in aesthetic procedure.<sup>7</sup> In addition, an association between video calls and interest in aesthetic procedures was observed in another study.<sup>8</sup>

Although a small number of studies have recently been published examining the interest in cosmetic treatments during the pandemic, research on reported stress levels of patients seeking aesthetic procedures is needed. Furthermore, the degree of overall stress in relation to interest in treatments has not been examined. Understanding patients’ stress levels, whether or not these are associated with non-invasive facial aesthetic treatments, is critical to guiding a patient with their treatment plan as, for example, an overly anxious patient may not be in a position to make objective decisions regarding elective aesthetic procedures.

Within this novel context, this study aimed to describe perceived stress levels and factors associated with increased stress among patients who were receiving treatments during the pandemic. We further evaluated contributors to stress by residency status in Singapore. Finally, we sought to examine whether stress levels influenced the likelihood of proceeding with non-surgical facial aesthetic procedures. At the time of the conduct of this survey, travel outside and into Singapore remained restricted with requirement for strict facility-based quarantine for at least 7 days, depending on the country, representing a unique opportunity to evaluate levels of stress, factors associated with stress, and intention to receive aesthetic procedures.

## Methodology

### Study Population

Patients coming to a Singapore-based clinic and who completed a self-administered questionnaire over a one-month period were included in the study (June 15 to July 15, 2021). Participation was voluntary, and patients were invited to complete the questionnaire to help the clinic better understand their level of stress and their desire for aesthetic treatments. Patients 21 years and older, regardless of ethnicity, were included in the study.

### Data Collection

A questionnaire was designed to understand patients’ stress levels, factors associated with perceived stress, prior treatment and future interest in non-surgical facial aesthetic procedures. This was administered during a 4-week period when restrictions on social interactions were implemented as community cases were increasing.<sup>9</sup> The travel restrictions, mask wearing and social distancing introduced in the first quarter of 2020 persisted.

Patients in this clinic routinely complete forms as part of routine care, including consultation forms, post-treatment questionnaires and post-consultation surveys. These forms are stored in an electronic data system that is utilized for clinical care and is accessible only to clinicians responsible for care of the patients. As such, the addition of this form was consistent with standard clinical practice.

The questionnaire used in this analysis incorporated the Perceived Stress Scale (PSS); the most widely used, validated questionnaire that examines an individual’s global perception of stress, incorporating lack of predictability, control and degree of overload.<sup>10</sup> This is a 10-item questionnaire that has been found to have predictive validity for up to 8 weeks and has been used in numerous publications relating stress to various clinical conditions including inflammation and obesity,<sup>11</sup> and poor glycemic control in patients with diabetes,<sup>12</sup> among others.

Additional questionnaire items included aesthetic treatment history, including prior treatments and treatments that will be considered in the future.

## Inclusion and Exclusion Criteria

Both new and existing patients, aged 21 years or older, attending the clinic for aesthetic procedures or consultation were included in this study. Participants who took part in the study received a \$50 voucher towards a non-medical grade facial treatment.

## Ethics Consideration

This study was a work-based project, conducted by the physician who would normally have access to the clinical data for patient care. Only data collected during routine patient care were used in the analyses and patient consent was not required. However, it should be noted that patient consent is routinely obtained for treatment and general conduct of research in the clinic (only de-identified data were utilized in the analyses, and only the investigator and members of the clinical team had direct access to patient-level data). Formal exemption was given by the Institutional Review Board of the Nanyang Technological University (IRB#2021-624). This study complies with the Declaration of Helsinki.

## Data Analyses

Descriptive and statistical analyses were conducted using SPSS. Frequency distributions were calculated for the following: age; gender; race (Chinese versus Caucasians/Others), and current residency status in Singapore, as this has an impact on the ability and need to travel. Mean, median, range and quartiles of the Perceived Stress Scale (PSS) scores were also determined. Frequency of contributions of the following factors to levels of stress were also assessed: job insecurity, inability to travel leading to separation from family, inability to travel for leisure, getting ill from COVID-10, working from home, comparison to others and frequency of worrying about appearance. Treatment history of non-invasive aesthetic procedures and self-reported likelihood of proceeding with non-invasive aesthetic procedures were also evaluated. *t*-test and Chi-square analyses were conducted to examine binary associations between various clinical and demographic factors and perceived stress score. A *p*-value less than 0.05 was considered statistically significant. For the analysis comparing perceived stress score by multiple characteristics, we applied the Bonferroni correction, where a *p*-value of 0.05 was corrected by the number of multiple comparisons. With 11 multiple comparisons, applying the Bonferroni correction reduced the *p*-value for clinical significance to a *p*-value <0.0045.<sup>13</sup>

## Results

A total of 213 respondents completed the survey, of whom 93.4% were female (Table 1). The majority of patients were 36 years of age or older (81%), with an almost equal percentage of respondents between 36–45 years (42%) and 46 years or greater (39%). One third of study participants were citizens or permanent residents of Singapore, the remainder had a work permit, a dependent pass (typically family members of those on work permits), or a long-term visit pass.

The mean perceived stress score in our study population was  $18.93 \pm 6.09$ , with a median of 19. For reference, Table 2 is the normative table for the PSS 10 Item Survey in the United States. Notably, the perceived stress score in our study population is several points higher across all categories of comparison.

## Factors Associated with Stress

When asked about the degree to which factors contributed to their stress level, separation from family and inability to travel for leisure were reported as major stressors in 54% and 55% of respondents, respectively (Table 3).

Given that residency status may modify ability to travel, we further examined whether stressors differed by residency status. Separation from family was a more frequent stressor for non-citizens/non-permanent residents with 73% reporting separation from family as a significant stressor vs 29% for citizens/permanent residents ( $p < 0.0001$ ) (Table 4) Non-citizens/non-permanent residents were also significantly more likely to attribute stress to inability to travel for leisure (64% among non-citizens/non-permanent residents and 42% citizens/permanent residents,  $p = 0.004$ ) (Table 5) Notably getting COVID as a stressor was somewhat more common among citizens/permanent residents at 17.4% vs 8.3% among non-citizens/non-permanent residents, although this was of borderline statistical significance ( $p = 0.059$ ) (Table 6). No

**Table 1** Demographics

Characteristic	N (%)
Gender	
Female	199 (93.4)
Male	14 (6.6)
Age	
35 or less	40 (19)
36–45	90 (42)
Above 46	83 (39)
Race	
Chinese	46 (22)
Caucasian	128 (60)
Other	39 (18)
Current Residency Status in Singapore	
Singaporean/Permanent Resident (PR)	69 (37)
All Others (Dependent/Long-term Visit Pass/Work Permit)	117 (64)
Overall Perceived Stress Scale-10	
Mean/SD (Ref: F:13.7±6.6; M:12.1±5.9) <sup>17,18</sup>	18.93 (6.09)
Median	19
Range	2–32

**Table 2** Norm Table for the PSS 10-Item Inventory in the US (No Norms in Singapore)<sup>17,18</sup>

Category	N	Mean	SD
Gender			
Male	926	12.1	5.9
Female	1406	13.7	6.6
Age			
18–29	645	14.2	6.2
30–44	750	13.0	6.2
45–54	285	12.6	6.1
55–64	282	11.9	6.9
65 and older	296	12.0	6.3
Race			
White	1924	12.8	6.2
Hispanic	98	14.0	6.9
Black	176	14.7	7.2
Other Minority	50	14.1	5.0

significant differences in contribution to working from home and job insecurity were seen, when evaluated by residency status (data not shown).

## Concern About Appearance and Interest in Aesthetic Procedures

Forty-one% of patients reported a high frequency of comparing their appearance to others (Table 7). Patients were also asked to report the degree to which their concerns about appearance had changed. An increase in the degree of worry

**Table 3** Self-Reported Contributors to Stress

Extent to which the following contribute to current stress level	
Contributing Factors	N (%)
Job Insecurity 1,2,3 (Never to Neutral) 4,5 (Often, Very Often)	162 (76) 51 (24)
Separation from Family 1,2,3 (Never to Neutral) 4,5 (Often, Very Often)	98 (46) 115 (54)
Inability to travel for Leisure 1,2,3 (Never to Neutral) 4,5 (Often, Very Often)	95 (44) 118 (55)
Getting Ill from COVID 1,2,3 (Never to Neutral) 4,5 (Often, Very Often)	190 (90) 23 (11)
Working from Home 1,2,3 (Never to Neutral) 4,5 (Often, Very Often)	157 (73) 56 (26)

**Table 4** Contributors to Stress by Residency Status : Separation from Family

Current Status in SG, N (%)	Separation from Family (Never to Neutral), N (%)	Separation from Family (Often, Very Often), N (%)	Chi Square (p-value)
Singaporean/Permanent Resident (PR) (69, 36.3%)	49 (71.0)	20 (29.0)	34.27 (p<0.0001)
Others (Work permit, Dependent pass, Long-term visit pass) (121, 63.7%)	33 (27.3)	88 (72.7)	
Total	82 (43.2)	108 (56.8)	

**Table 5** Contributors to Stress by Residency Status: Travel for Leisure

Current Status in SG, N (%)	Inability to Travel for Leisure (Never to Neutral), N (%)	Inability to Travel for Leisure (Often, Very Often), N (%)	Chi Square (p-value)
Singaporean/Permanent Resident (PR) (69, 36.3%)	40 (58.0)	29 (42.0)	8.32 (p= 0.004)
Others (Work permit, Dependent pass, Long-term visit pass) (121, 63.7%)	44 (36.4)	77 (63.6)	
Total	84 (44.2)	106 (55.8)	

about appearance was reported by 32% of patients and 7% reported focusing on appearance rather than their surroundings (Table 7).

When asked about treatments they received in the preceding 6 months, 67% of patients reported having undergone botulinum toxin treatments, with the overwhelming majority (91%) having done some form of aesthetic treatment despite the ongoing pandemic (Table 8). In addition, 94% of patients reported an intention to proceed with aesthetic treatments in the next 6 months, with 75% reporting likelihood of undergoing treatments not previously done. Interestingly, 13.6% plan

**Table 6** Contributors to Stress by Residency Status: Getting Ill from COVID

Current Status in SG, N (%)	Getting Ill from COVID (Never to Neutral), N (%)	Getting Ill from COVID (Often, Very Often), N (%)	Chi Square (p-value)
Singaporean/Permanent Resident (PR) (69, 36.3%)	57 (82.6)	12 (17.4)	3.56 (p= 0.059)
Others-(Work permit, Dependent pass, Long-term visit pass) (121, 63.7%)	111 (91.7)	10 (8.3)	
	168 (88.4)	22 (11.6)	

**Table 7** Self-Reported Concern About Appearance

Self-reported Concern About Appearance	N (%)
I compare aspects of my appearance to others 1,2,3 (Never to Neutral) 4,5 (Often, Very Often)	124 (58) 89 (41)
I am focused on how I look rather than surroundings 1,2,3 (Not at all To Neutral) 4,5 (Often, Very Often)	198 (93) 15 (7)
Change in the extent I worry about my appearance 1,2,3 (Very much decreased To Neutral) 4,5 (Increased, Very much Increased)	144 (67) 68 (32)

to undergo botulinum toxin treatments even though they have not had this in the past, suggesting that 81% of patients have had or are planning to do botulinum treatments. Notably, 21% of patients reported an increase in likelihood of aesthetic treatments as a consequence of their current level of stress.

## Perceived Stress Scores by Clinical and Demographic Characteristics

Perceived stress score by demographic, clinical and other relevant characteristics are shown in Table 9. All across the categories, the perceived stress scores were markedly higher than that reported for the US normative values (Table 2). Mean perceived stress scores were not significantly different by age or race. Having a non-citizen/non-permanent residency status was a predictor of higher stress levels with a mean PSS-10 score 3 points higher among this group as compared to citizens and permanent residents, however, this was not statistically significant with the application of the Bonferroni correction. Significantly higher mean stress scores were observed among those reporting concerns about job insecurity, separation from family, and inability to travel for leisure. Stress associated with working from home was also associated with significantly higher stress scores. Interestingly, concerns about getting ill from COVID were not significantly associated with higher stress scores.

Patients who more frequently compared their appearance to others, as well as those who reported an increase in the extent of concern about appearance over the past 12 months, were significantly associated with higher stress scores when compared to patients who reported otherwise.

Finally, patients who reported a higher likelihood of proceeding with any aesthetic treatment were found to have higher stress scores when compared to patients who reported decreased or no change in likelihood of proceeding with aesthetic treatments; however, this was no longer statistically significant after applying the Bonferroni correction.

**Table 8** Treatment History and Future Treatments N (%)

Treatments done in past 6 months (patient can check more than one, total not 100%)	N (%)
Botox	144 (67)
Filler	35 (16)
Ultherapy	36 (17)
Laser light	57 (27)
Body Treatments	37 (17)
Other Treatments	47 (22)
None	19 (9)
Treatments done in past 6 months	
Any treatment	194 (91)
No Treatment	19 (9)
Treatments likely to do in next 6 months (patient can check more than one, total not 100%)	
Botox	144 (68)
Filler	65 (31)
Ultherapy	49 (23)
Laser light	74 (35)
Body Treatments	40 (19)
Other Treatments	48 (23)
None	12 (6)
Treatments likely to do in next 6 months	
Any treatment	201 (94)
No Treatment	12 (6)
Treatments NOT done before, likelihood to proceed in next 6 months	
Botox	29 (13.6)
Filler	43 (20.1)
Ultherapy	54 (25.2)
Laser light	39 (18.2)
Body Treatments	29 (13.6)
Other Treatments	38 (17.8)
None	54 (25.2)
Degree of Likelihood to proceed vs current Stress	
1,2,3 (Decreased to Neutral)	166 (80)
4,5 (Increased, Very much Increased)	43 (21)

## Discussion

The mental health consequences of the COVID pandemic have been described in various settings, including among the general public, COVID-19 patients and among health care workers.<sup>14,15</sup> Furthermore, a wide range of manifestations have been described in the literature, including depression, stress, anxiety, panic attack, among others.<sup>2</sup> This is the first study to explore the overall stress levels of patients seeking non-surgical facial aesthetic procedures during the pandemic. This is of particular interest given the increase in demand for non-invasive facial aesthetic procedures that have been documented worldwide.<sup>16</sup> Whether or not this increase in demand is associated with a change in stress levels has not been directly examined. If indeed high levels of stress increase the likelihood of proceeding with treatments, this should be taken into account in recommending a treatment plan as patients may face undue pressure to proceed with procedures.

Using the PSS-10, a validated measure of stress that has been used in various aspects of medicine, significantly higher stress levels in the population of patients seeking aesthetic procedures during the pandemic were observed when compared to previously published reference levels.<sup>17,18</sup> Furthermore, significantly higher stress levels exist among patients who reported higher degrees of focus on appearance, as evidenced by more frequent comparisons to others,

**Table 9** Perceived Stress Score (Mean) by Clinical, Demographic and Other Characteristics

Characteristic (N, %)	Mean	t-test (p-value)
Age		
45 or less (130, 61.0%)	19.2	t=0.67 (p=0.512)
45–55 (67, 31.5%)	18.7	
55 or older (16, 7.5%)	17.4	
Race		
Chinese (46, 21.6%)	18.6	t = 1.64 (p=0.196)
Caucasian (128, 60.1%)	19.5	
Other (39, 18.3%)	17.5	
Current Status in Singapore		
Singaporean/PR (69, 32.4%)	18.1	t=-2.064 (p=0.043)
All Others (121, 56.8%)	21.0	
Job Insecurity as a stressor		
1, 2 and 3 (162, 76.1%) (Never to Neutral)	18.2	t = -3.08 (p=0.002)
4,5 (51, 23.9%) (Often/Very Often)	21.2	
Separation from Family as a stressor		
1,2 and 3 (98, 46.0%) (Never to Neutral)	17.1	t= 4.33 (p<0.0001)
4 and 5 (115, 54.0%) (Often/Very Often)	20.5	
Inability to Travel for Leisure as a stressor		
1,2 and 3 (95, 44.6%) (Never to Neutral)	17.3	t=-3.67 (p<0.0001)
4 and 5 (118, 55.4%) (Often/Very Often)	20.3	
Getting ill from COVID as a stressor		
1,2, and 3 (190, 89.2%) (Never to Neutral)	18.9	t= 0.01 (p= 0.989)
4 and 5 (23, 10.8%) (Often/Very Often)	18.9	
Working from Home as a stressor		
1,2, and 3 (157, 73.7%) (Never to Neutral)	18.0	t=-3.51 (p <0.0001)
4 and 5 (56, 26.3%) (Often/Very Often)	21.5	
I compare aspects of my appearance to others		
1, 2 and 3 (124, 58.2%) (Never to Neutral)	17.8	t= -3.32 (p=0.001)
4 and 5 (89, 41.8%) (Often/Very Often)	20.5	
Extent of worry about appearance (change in past 12 months.)		
1, 2 and 3 (145, 68.1%) (decreased to neutral)	17.8	t=-4.10 (p<0.0001)
4 and 5 (very much increased) (68, 31.9%)	21.3	
Degree of likelihood to proceed vs current stress		
1, 2 and 3 (166, 77.9%) (decreased to neutral)	18.5	t =-2.24 (p=0.026)
4 and 5 (43, 20.2%) (increased/very much increased)	20.8	

or a greater worry about their appearance. We also identified an association between increased likelihood of proceeding with any aesthetic procedure and higher levels of stress, although this was not statistically significant. Altogether, our findings not only contribute to potential explanations for the increased demand for facial cosmetic treatments but also highlight the importance of caution in recommending procedures to our patients who have increased stress levels and vulnerability, and their increased likelihood of proceeding with any aesthetic procedure.

## Factors Associated with Stress Levels

This survey was completed with a high percentage of females (93.4%), consistent with a generally higher prevalence of women seeking care in an aesthetic clinic. Our clinic sees a slight majority of Caucasian rather than Chinese patients,<sup>19</sup> which



is similar to the ethnic distribution of survey respondents. Caucasian patients were slightly overrepresented in this study, providing 60% of responses compared to 51% previously reported. Consistent with the high percentage of Caucasians in our study population is the high proportion of non-citizens or non-permanent residents.

The conduct of this survey coincided with a resurgence of COVID-19 cases in Singapore and a partial lockdown, with limitations of social activities, including closures of dine-in restaurants and fitness clubs.<sup>9</sup> Social-distancing, quarantine, mask-wearing, work from home policies remained in place since the onset of the pandemic in 2020. Travel remained limited with a mandatory 14-day quarantine in a designated facility, and for non-permanent residents/citizens return to Singapore was not guaranteed if they travelled outside Singapore.<sup>20</sup> Travel limitations due to COVID restrictions were significant stressors for the survey respondents, with inability to see family or no leisure travel reported as the most relevant stressors in over half of the patients. This is consistent with the high percentage of non-residents who took part in this survey. The expatriate community is an important segment of the Singapore working population in Singapore and many count on the unrestricted ability to travel to return to their home countries to see family or for leisure.<sup>21</sup> In contrast, concerns about getting ill from COVID were more prevalent among citizens and permanent residents, although this was of marginal statistical significance. These differences in contributors to stress by residency status provide a relevant background in taking care of patients.

Of concern is our finding that almost a third of patients reported an increase in worrying about their appearance. This was associated with significantly higher self-reported stress levels, providing more direct evidence of dissatisfaction with oneself. These findings are consistent with a prior report that 83% of dermatologists believed that since the pandemic their patients are more unhappy about their facial appearance.<sup>22</sup> Frequent comparison of one's appearance with others was reported in 41% of patients, and more concerning, this practice was associated with higher stress levels. It is reassuring that in one prior study, patient's anxiety during the pandemic was not associated with a formal diagnosis of body dysmorphic disorder.<sup>23</sup> The etiology of the increased concern over one's facial appearance is unclear from our study; however, others have posited a potential effect of routine video-conferencing with constant self-observation and external comparison given that we visualize our own and others' faces next to each other.<sup>24</sup> Consistent with our findings is a survey of the general population that demonstrated an increase in interest in aesthetic procedures. In that survey, respondents attribute this increase to seeing themselves more often in the mirror and on social media.<sup>16</sup>

## Aesthetic Treatments and Stress Levels

The vast majority of patients still underwent aesthetic treatments despite the COVID pandemic, with 91% of respondents reported doing non-surgical aesthetic treatments. Use of botulinum toxin dominated, with 67% reported doing a treatment in the preceding 6 months. Higher stress scores were identified in patients who expressed an increased likelihood of proceeding with any aesthetic treatment, although this was not statistically significant after the Bonferroni correction. These findings suggest that despite not being considered essential treatments, patients may potentially regard aesthetic procedures as beneficial and/or important to their overall health and wellbeing. Botulinum toxin treatments, in particular, have been reported to improve symptoms of overall sense of well-being, including reduced sense of stress and depression.<sup>25</sup> In a crossover study of the impact of botulinum toxin on mood during the COVID pandemic, botulinum toxin treatment was associated with increased self-reported happiness and self-satisfaction.<sup>26</sup> Interesting to note that despite never having received any treatment, an additional 13.6% of patients intended to receive botulinum toxin, further supporting the perceived importance of this treatment. Potential explanations proposed in the literature include the "facial feedback hypothesis" where seeing a stressed or angry face in the mirror or during video conferencing may impart negative emotions, whereas a less stressed appearance with botulinum toxin treatment may lead to a greater sense of well-being.<sup>26</sup>

The impact of video-conferencing popularized during the pandemic may also contribute to the high percentage of patients who have either received or intend to receive botulinum toxin treatments. In our study, other treatments that patients continued to receive during the pandemic included dermal fillers (31%), laser/light (35%), as well as skin tightening (23%) treatments. Video-conferencing may potentially remind patient of their imperfections and expression lines, and this may increase the desire to continue with cosmetic procedures.<sup>27</sup> Indeed, in this era of "zoom" meetings, at least a fifth of study respondents responded with an increased likelihood to proceed with any aesthetic procedure. Given that video-conferencing is likely to continue to be standard business practice,<sup>28</sup> the potentially increased demand for aesthetic treatments may continue. Indeed,

94% of survey respondents reported an intention to receive aesthetic procedures in the next 6 months; and 21% reported an increase in their likelihood to receive treatments considering their current level of stress. This is consistent with prior analyses of public survey responses that demonstrated a 21% increase interest in searches for aesthetic interventions, most commonly for non-invasive procedures at 7.3%.<sup>16</sup> Furthermore, this agrees with findings in other countries including Australia<sup>7</sup> and the United States.<sup>8</sup> Interestingly, our findings demonstrated that there was no significant difference in reported stress levels among those who received treatment as compared to those who did not, however this may be attributed to the small sample size of patients who did not receive any treatment (N = 19).

## Potential Implications for Consultation and Treatment Planning

Altogether, our findings suggest an association between stress, in general, and an increased focus on facial appearance, in particular. We note an increased likelihood of proceeding with aesthetic treatments; however, this was no longer significant after the Bonferroni correction for multiple comparisons. Our findings strongly suggest that a patient's state of mind will need to be carefully considered in treatment planning as stress has been demonstrated to influence decision-making,<sup>29</sup> as for instance, stressed patients may be more vulnerable to proceeding with an aggressive treatment plan. Furthermore, with the radical increase in concern about one's appearance, patients are more likely to be self-critical,<sup>30</sup> with increased awareness of imperfections. These suggest a need for even greater caution in explaining and demonstrating clinical findings during the consultation process, and potentially building in more "cooling off" time for patients to consider the proposed treatment plan.

## Limitations

There are several limitations to this study, including its cross-sectional design and consequent inability to establish causality and temporality. For instance, patients who report an increased focus on their own appearance were also found to have higher stress levels; however, it is unclear if the self-focus resulted in increased stress or whether higher stress levels resulted in an increase in worry about their appearance. Given that this is a convenience sample, another potential limitation is response bias, as the patients who responded may potentially have had higher stress levels and were more motivated to complete the survey. However, the factors associated with stress, as well as the link between stress levels and interest in treatments are unlikely to have been influenced by responding to a survey. The study may also have limited generalizability in terms of contributors to stress since the severity and nature of travel restrictions imposed differed between countries. Finally, this study was conducted with COVID as a stressor, and whether or not other stressors, for example political unrest, result in a similar increased likelihood of seeking aesthetic procedures is not known. Further studies are needed to evaluate this association in other settings.

## Conclusions

Patients who presented to an aesthetic clinic in the setting of COVID were found to have higher stress levels when compared to population norms. In the traditionally open country of Singapore, limitations in travel, whether to see family or for leisure were associated with high levels of stress. An increased focus on personal appearance was also associated with high level of stress. Patients continued to undergo aesthetic procedures throughout the pandemic, suggesting the importance of these procedures to patients' overall well-being. The observation that patients with a high level of stress were more likely to proceed with aesthetic procedures, though not statistically significant, suggests the need for caution in managing these patients, as they may potentially be more vulnerable and therefore desire treatments that are more aggressive.

## Disclosure

The authors report no conflicts of interest in relation to this work and declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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