Prysm iO™ Validation: Correlations Between Skin Carotenoid Score and Diet, Lifestyle, and Skin Attributes

OBJECTIVE

The primary objective of this clinical study was to assess the correlation between skin carotenoid scores as measured by Prysm iO and diet, lifestyle, and skin attributes.

BACKGROUND

Prysm iO is a nutritional wellness device that measures a class of antioxidants called carotenoids. Carotenoids are powerful antioxidants that protect the body from oxidative stress caused by poor diet, excessive stress, smoking, lack of sleep, and other unhealthy lifestyle habits.

Prysm iO uses distinct wavelengths of light to assess skin carotenoid levels. This light technology applies an algorithm from machine learning and references our Raman Technology from the BioPhotonic Scanner to generate a skin carotenoid score (or Prysm Score). This Prysm Score is based on a scale that was created with numbers and colors to help consumers easily interpret their Prysm Score (as shown in the appendix).

Millions of individuals all around the globe have been scanned using the BioPhotonic Scanner for over 20 years. From these scans, with over 21 million, Nu Skin has one of the world's largest, longest running antioxidant databases of its kind. This database correlates skin carotenoid scores to many different dietary, lifestyle, and supplementation habits. The objective of this study was to assess if these correlations are also seen with Prysm iO and to assess new potential correlations.

STUDY DESIGN

This large-scale study explored the associations between skin carotenoid scores and other dietary, lifestyle, health, and skin attributes. The principal investigator of the study was Professor Cai from Jiao Tong University, China. 589 total healthy individuals (male: n=293; female: n=296) with no active medical treatment were scanned with both the Prysm iO and BioPhotonic Scanner S3 to measure skin carotenoid scores.

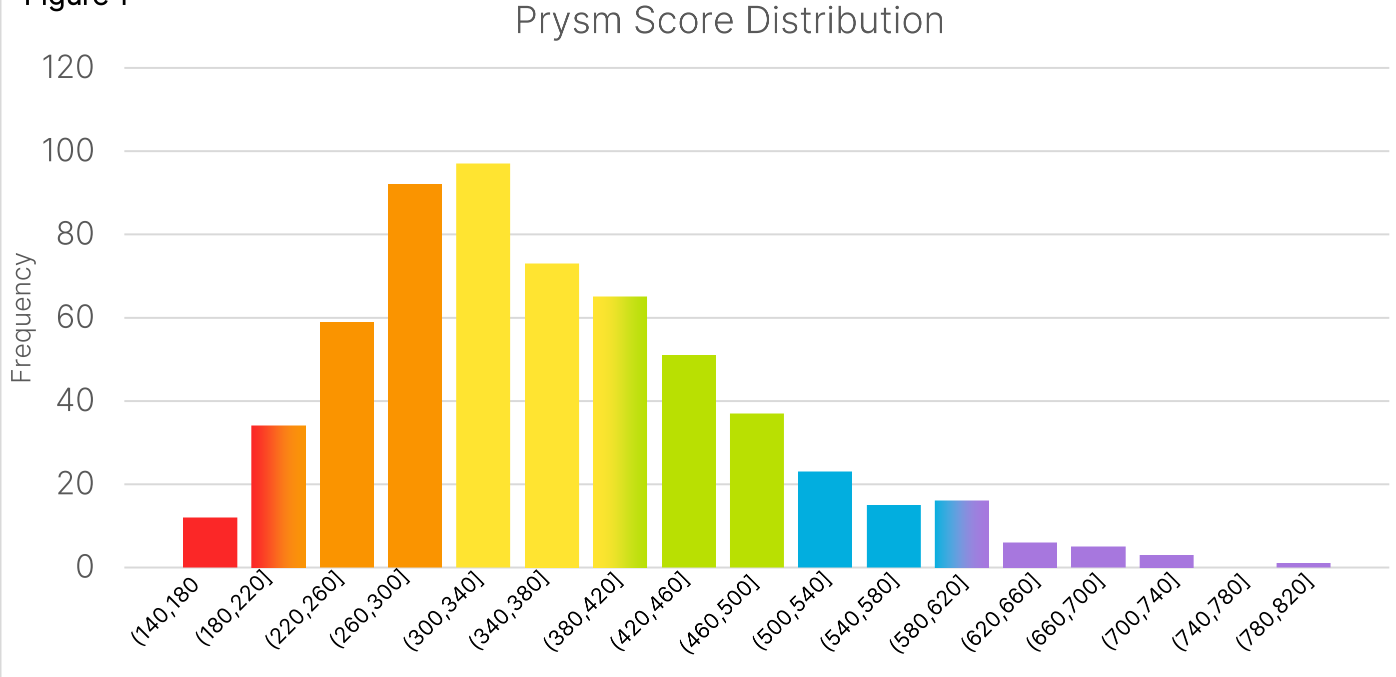
Each participant was scanned one time on each device, and data on diet, lifestyle, health, and skin attributes were collected. These scores were then correlated with other variables, including sex, age (18-50, >50), lifestyle habits (UV exposure, exercise habits, sleep), dietary habits as assessed from a food frequency questionnaire, and skin attributes.

RESULTS

PRYSM IO DISTRIBUTION OF SKIN CAROTENOID SCORES

The average (mean) skin carotenoid score in this study as measured by Prysm iO was 365. The lowest score was 140, and the highest score was 800. The frequency on the vertical axis represents the number of individuals, while the horizontal axis represents the skin carotenoid score (Figure 1). Most subjects scored in the yellow or moderate zone (300s), followed by orange (200s) and green (400s) respectively, with fewer people in the red (100s), blue (500s), and purple (600+). Please see appendix for more details on meaning of SCS.

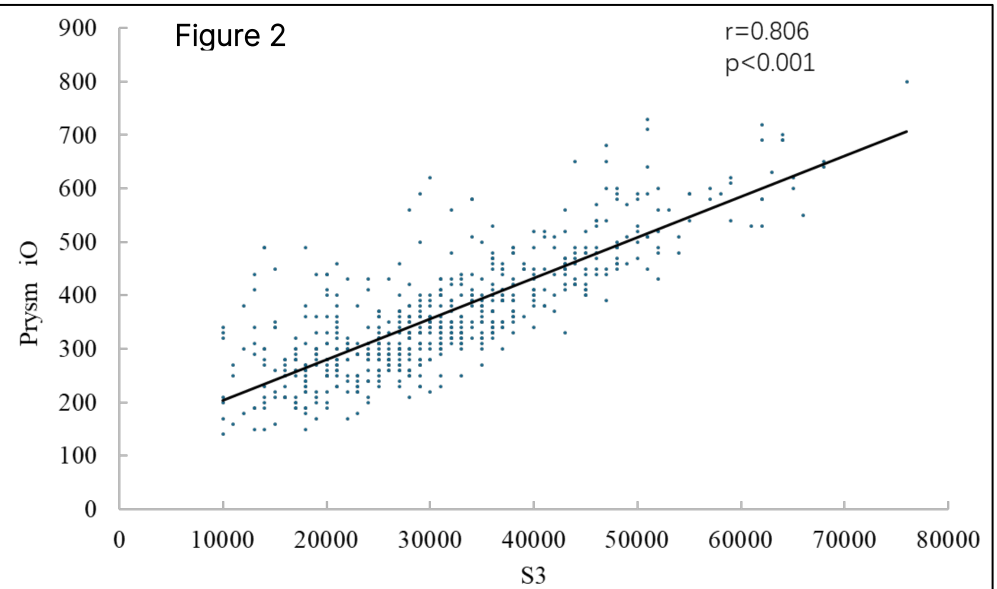
Figure 1



CORRELATION BETWEEN PRYSM SCORES AND BIOPHOTONIC SCANNER SCORES

Results show a strong positive correlation between Prysm Scores and BioPhotonic Scanner S3 scores. This was statistically significant ($p<0.001$) with a correlation coefficient of 0.806 (Figure 2). This indicates that if an individual has a high score on the BioPhotonic Scanner they will likely also have a similarly high Prysm Score, and if they have a low score on the BioPhotonic Scanner, they will likely also have a similarly low Prysm Score.

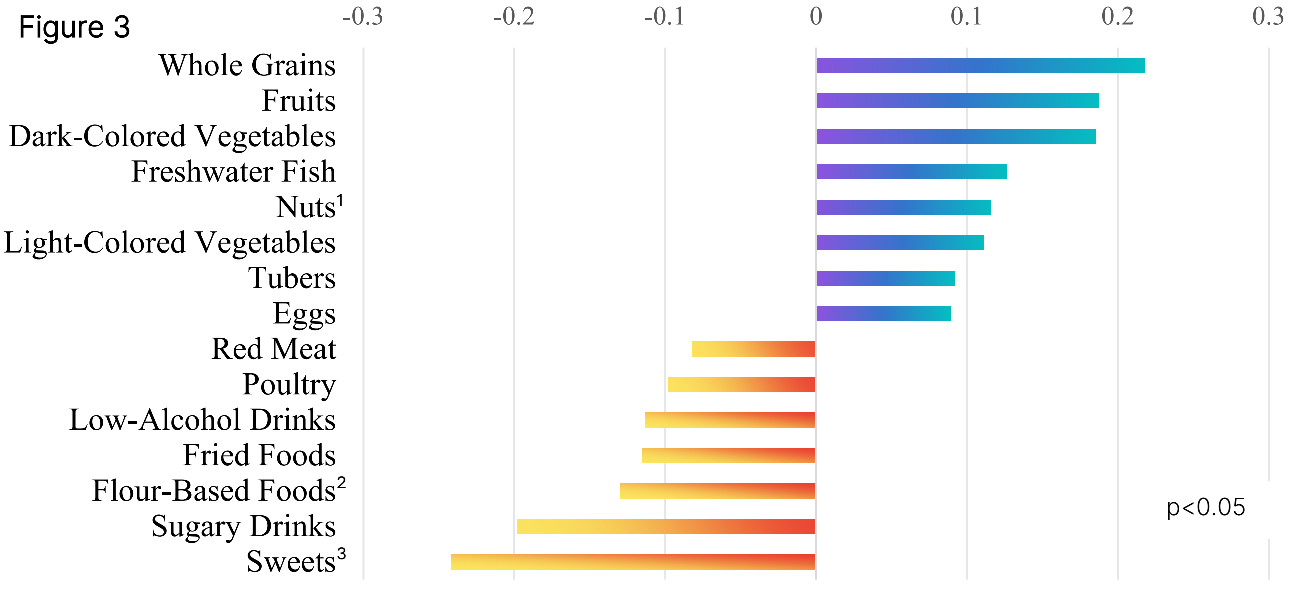
Figure 2



CORRELATION BETWEEN PRYSM SCORE AND DIETARY PATTERNS

A food frequency questionnaire showed that eating certain food groups was significantly associated with changes in Prysm Score ($p<0.05$). Consumption of whole grains, fruits, dark colored vegetables, freshwater fish, light colored vegetables, tubers, and eggs all had positive associations, meaning that eating these foods is associated with higher scores. Consumption of red meat, poultry, low-alcohol drinks, fried foods, and sugary drinks all had negative associations, meaning that intake of these food groups is associated with lower scores. There were also some significant findings within subgroups of gender and age: positive for nuts[1] (significant in females), negative for flour based foods[2] (significant in age 18-50), and negative for sweets[3] (significant in age 30-39) (Figure 3).

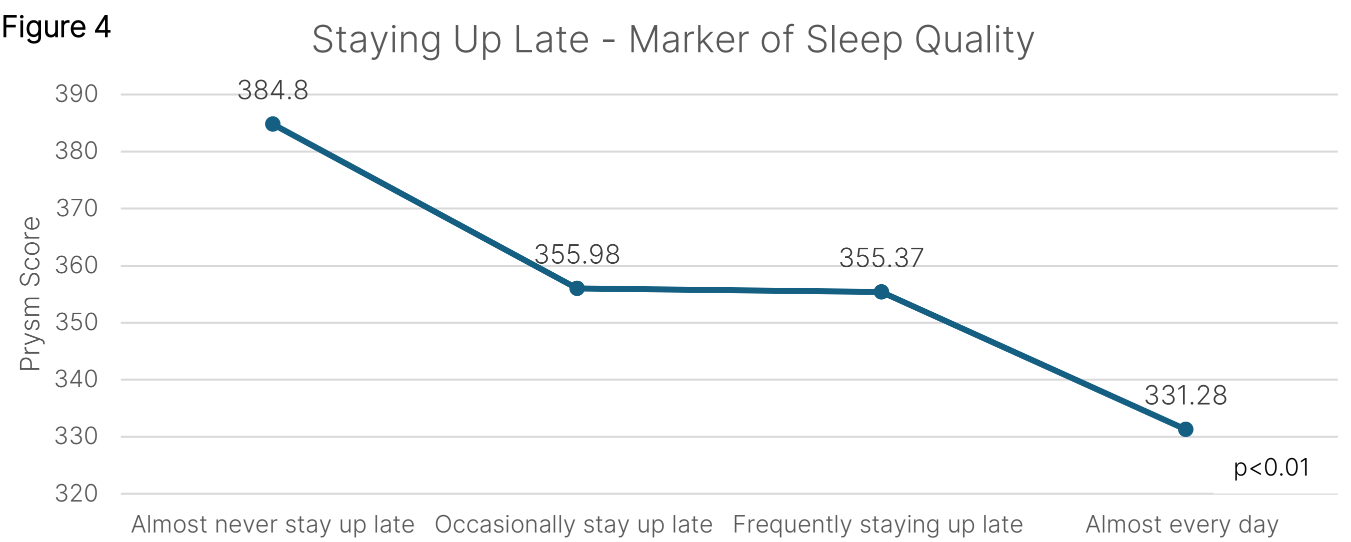
Figure 3



CORRELATION BETWEEN PRYSM SCORE AND LIFESTYLE FACTORS (SLEEP, UV EXPOSURE, EXERCISE)

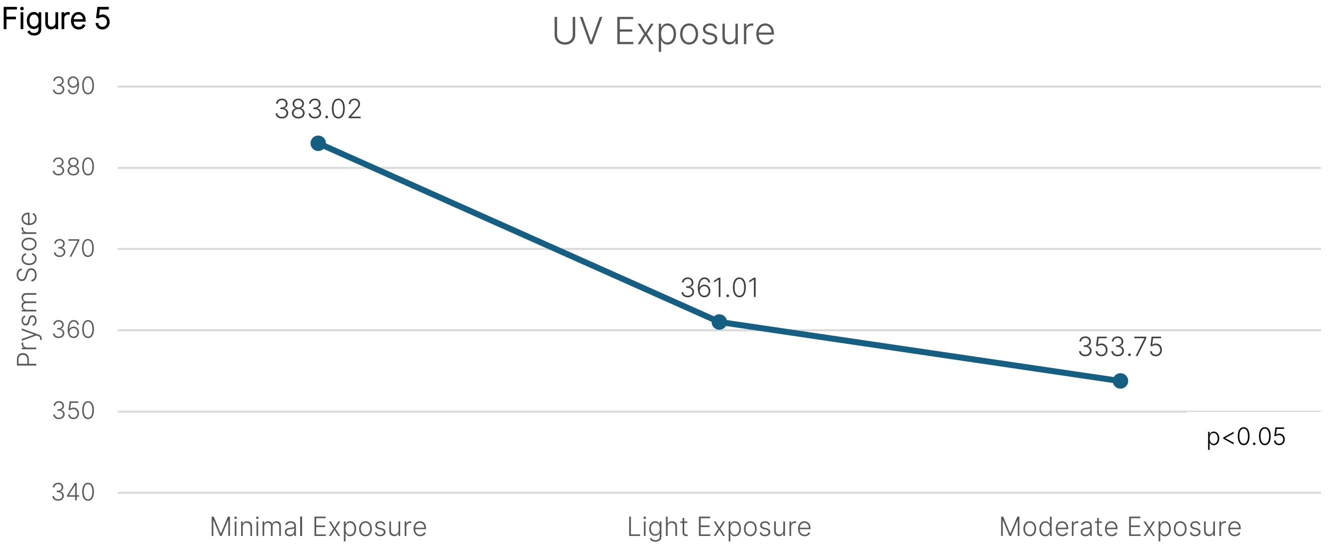
Prysm Scores were significantly negatively correlated with staying up late (past midnight) as a marker of sleep quality ($p<0.01$). Please note this correlation is based on self-reported estimates where those who reported almost never staying up late had higher scores on average compared to those who occasionally stay up late (1-2 times per week), frequently stay up late (3-4 times per week), or stay up late almost every day (≥5 times per week). This demonstrates a correlation between skin carotenoid scores and going to bed before midnight as a marker of sleep quality (Figure 4).

Figure 4



Prysm Scores were significantly negatively correlated with UV exposure or sun exposure, meaning that increased UV exposure was associated with lower scores, and lower UV exposure was associated with higher scores ($p<0.05$). Please note this correlation is based on self-reported estimates where minimal exposure was defined as less than 30 minutes per day of outdoor activity, light exposure as 30-60 minutes per day, and moderate exposure as 1-3 hours per day of outdoor activity (Figure 5).

Figure 5

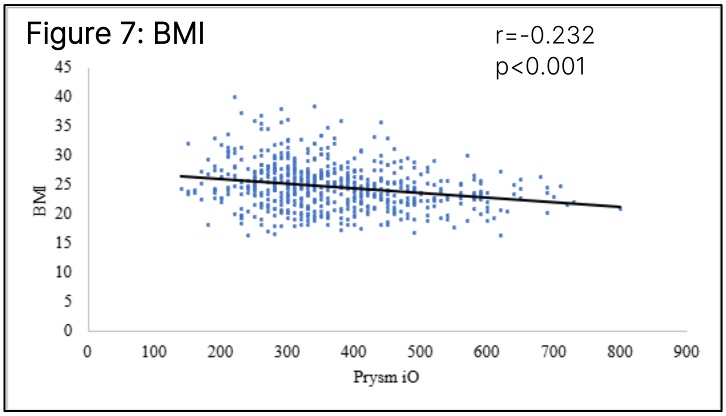


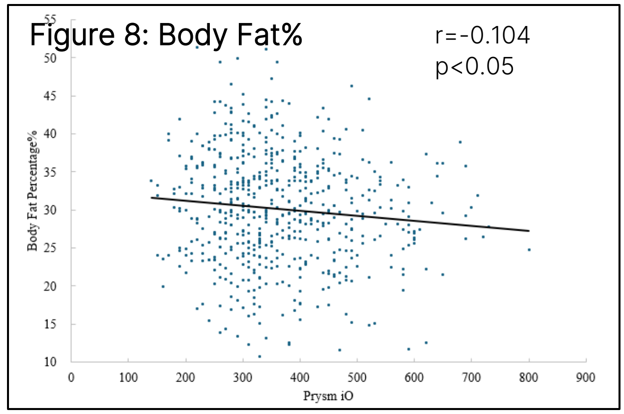
Prysm scores were significantly positively correlated with exercise habits ($p<0.05$). Please note this correlation is based on self-reported estimates. This means that more exercise was associated with higher scores compared with less exercise. Almost no exercise was defined as less than 60 minutes of medium to high intensity exercise per week, low intensity exercise was defined as 1-2 times per week with each session lasting ≥30 minutes, moderate-intensity exercise was defined as 3-4 times per week with each session lasting ≥30 minutes, and high intensity exercise was defined as ≥5 times/week and each session lasting ≥30 minutes (see figure 6).

Figure 6

CORRELATION BETWEEN PRYSM SCORE, BMI, AND BODY FAT

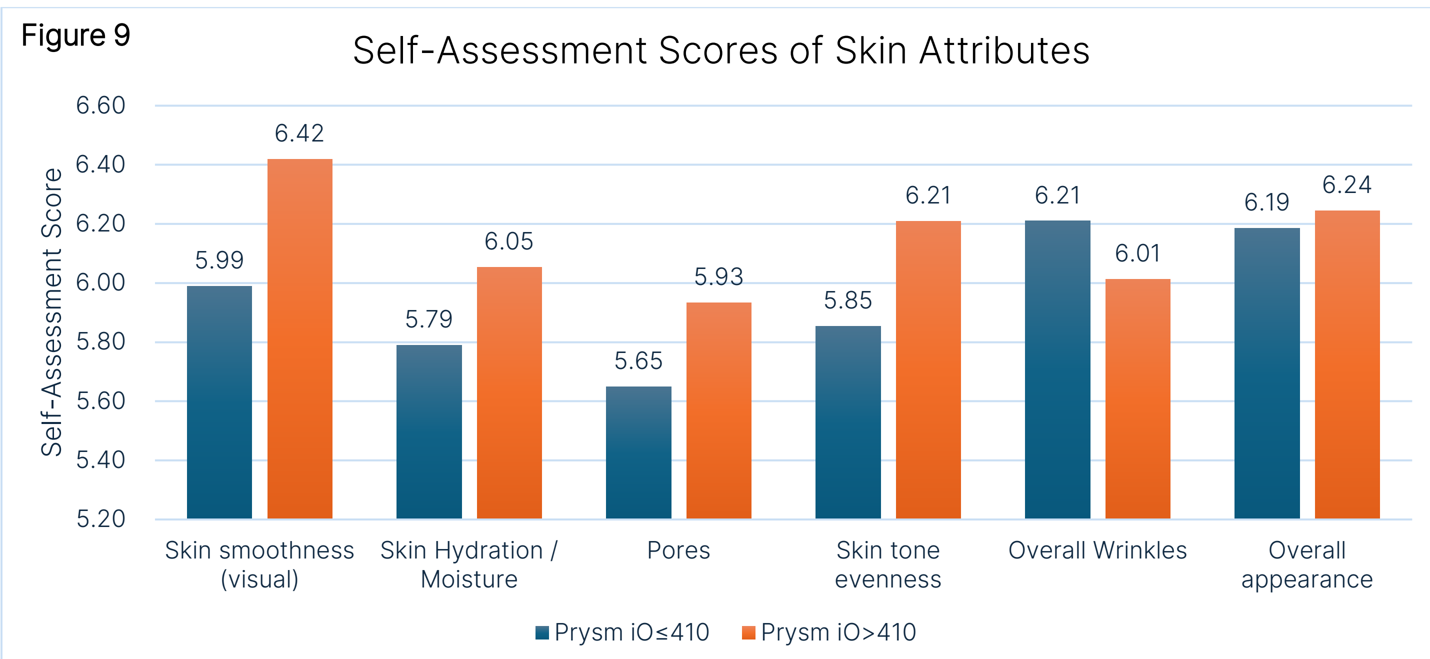
A statistically significant negative correlation between BMI and Prysm Score was noted ($p<0.001$). This means that a higher BMI is associated with a lower score, and a lower BMI is associated with a higher score. The correlation for BMI was -0.232 (Figure 7). Similarly, a statistically significant negative correlation between body fat percentage and Prysm Scores was noted ($p<0.05$). This means that a higher body fat percentage is correlated with a lower score, and a lower body fat percentage is correlated with a higher score. The correlation for body fat was -0.104 (Figure 8).





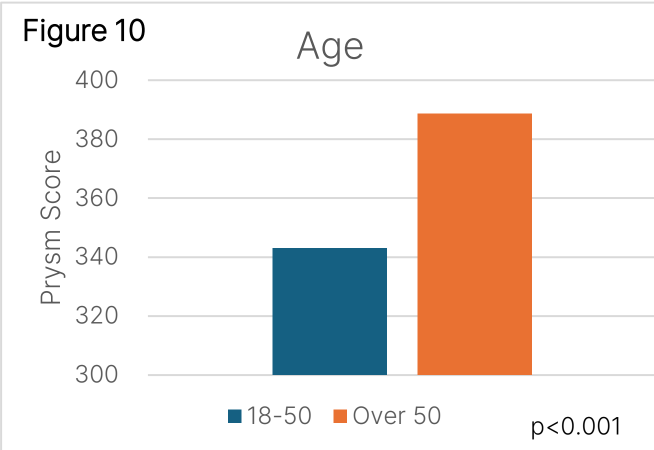
CORRELATION BETWEEN PRYSM SCORE AND SKIN ATTRIBUTES

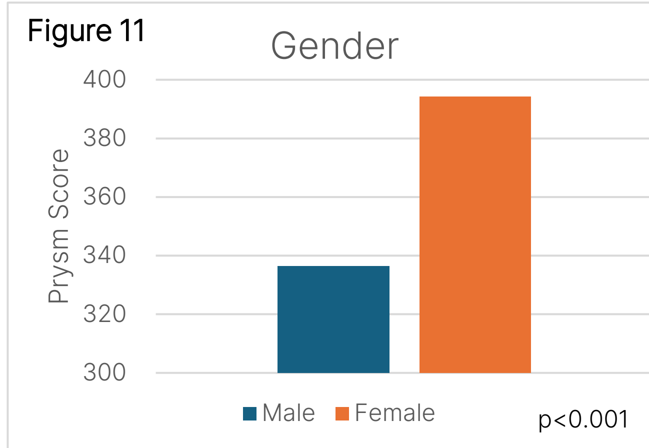
Prysm Scores were associated with differences in skin attributes (Figure 9). Prysm Scores ≤410 were associated with lower self-assessment scores for skin smoothness, skin hydration, pore size, skin tone evenness, and overall appearance, and higher scores for the appearance of lines and wrinkles. Prysm Scores that were >410 were associated with higher scores for skin smoothness, skin hydration, pore size, skin tone evenness, and overall appearance, and lower scores for lines and wrinkles.



CORRELATION BETWEEN PRYSM SCORE AND OTHER VARIABLES (AGE AND GENDER)

Overall, as noted in figure 10, those over 50 years of age showed higher scores than those 18-50 (p<0.001). Those over 50 report eating more fruits and vegetables than the younger group. Additionally, as noted in figure 11, females scored higher on average than males (p<0.001). Females also reported eating more fruits and vegetables than males.





CORRELATION BETWEEN PRYSM SCORE AND OTHER HEALTH VARIABLES

Questionnaires were provided where participants were asked about several different health issues, and then correlation analysis was conducted to determine if there was any association. Please note that no medical tests or assessments were made on health parameters; these are questionnaire-based, so results are self-reported. Immune health was assessed by asking about the frequency of cold and flu-like symptoms over the last year which had a significant correlation to scores ($p < 0.01$). This means that more frequent cold and flu symptoms were linked with lower scores, and less frequent cold and flu symptoms were linked with higher scores. Gut health was assessed by asking about gut health issues including abdominal pain, bloating, stool conditions, or gastrointestinal discomfort over the last month which had a significant correlation ($p<0.05$). This means that more gut health issues were linked with lower scores, and less gut health issues were linked with higher scores. And liver health was assessed by asking consumers about their liver health status, ranging from normal to unhealthy over the last year which had a significant correlation to scores ($p=.003$). This means that from the self-reported data, unhealthy liver is linked with lower scores, and better liver health is linked with higher scores.

DISCUSSION

The findings of this large-scale, cross-sectional study demonstrate correlations between Prysm Scores and a variety of dietary, lifestyle, health, and skin-related factors. The strong positive correlation between Prysm Scores and the established BioPhotonic Scanner supports the validity of Prysm iO as an accurate tool for assessing skin carotenoid concentrations. The BioPhotonic Scanner has been validated in previous research with examples of such research demonstrating a strong correlation between skin and serum levels of carotenoids[1], skin carotenoid score correlations with other antioxidants including vitamin C and E, and inverse associations with markers of oxidative stress[2], and how certain dietary supplements can increase skin carotenoid scores[3-5]. The present study helps to confirm Prysm iO's ability to reflect meaningful scores by demonstrating that it performs comparably to the BioPhotonic Scanner.

Diet-related correlations aligned closely with established scientific evidence about carotenoid & antioxidant levels of different food groups. Higher scores in individuals consuming more fruits, dark-and light-colored vegetables, eggs, freshwater fish, and whole grains reflect dietary patterns typically associated with higher carotenoid intake or improved antioxidant status. Conversely, negative associations observed with dietary choices such as fried foods, sugary drinks, and red meat are associated with increased oxidative stress and lower antioxidant intake and hence lower antioxidant defenses and lower scores. This helps confirm previous research linking increased fruit and vegetable intake with higher skin carotenoid scores[6] but adds new correlations of other foods that may also have a link.

Lifestyle factors such as later bedtimes, UV exposure, and exercise were also correlated with Prysm Scores. Previous work has established a correlation between UV exposure and skin carotenoids[6], but this research adds new insights into sleep and exercise. Later bedtimes—used as a marker for poor sleep quality—were strongly associated with lower Prysm Scores, consistent with evidence that inadequate sleep increases oxidative stress[7]. UV exposure was also negatively associated with Prysm Scores, which may reflect carotenoids being used up to combat oxidative stress from sun exposure. Similarly, higher levels of exercise were associated with higher Prysm Scores, which is intriguing because exercise may help increase intrinsic antioxidant defenses[8], which may spare carotenoids from being used up so quickly, supporting higher levels.

Higher BMI and body fat percentage were associated with lower scores. This was consistent with previous research findings with the BioPhotonic Scanner[9]. This may reflect carotenoid saturation in adipose tissue or lifestyle or dietary factors associated with weight gain that also reduce antioxidant intake. From a comparative standpoint, while the correlation with body fat was slightly weaker than that with BMI, both trends were statistically significant, reinforcing patterns of how these factors can impact antioxidant defenses.

The relationship between Prysm Scores and skin attributes is new insight from this research and is a topic that had not previously been explored. Individuals with scores above 415 consistently reported better measures of skin smoothness, hydration, pore size, and tone evenness, along with fewer visible lines and wrinkles. These findings align with existing literature linking oxidative stress and antioxidant depletion with impaired skin barrier function and accelerated appearance of aging[10].

The correlation between some self-reported health issues and Prysm scores is also enlightening and provides new observations. Immune health issues, gut health issues, and liver health issues all had significant correlations to Prysm scores.

Together, these results demonstrate that Prysm iO effectively measures carotenoid status and correlates with a wide variety of diet, lifestyle, health, and skin-quality factors. Some of the novel findings from this study include correlations with exercise, skin attributes, and sleep which were not well-established in previous studies or our database with the BioPhotonic Scanner.

CONCLUSION

This clinical study provides strong validation for Prysm iO as a reliable tool for assessing skin carotenoid status and identifying patterns or associations related to diet, lifestyle, and skin appearance. The device demonstrated excellent agreement with the BioPhotonic Scanner, reinforcing its accuracy and confirming it as a meaningful method of measuring a biomarker of antioxidant status.

Significant correlations between Prysm Scores and dietary habits, sleep quality, UV exposure, exercise levels, BMI, body fat percentage, and skin attributes highlight the device’s relevance and importance in considering a wider range of lifestyle factors. Individuals with healthier diets, earlier bedtimes, lower UV exposure, and more frequent exercise consistently had higher Prysm Scores. Furthermore, higher scores were associated with more favorable skin-quality attributes, suggesting potential applications for integrated beauty and wellness solutions.

One of the primary goals of Prysm iO is to help individuals understand the impact their daily choices make on a biomarker of antioxidant status and motivate them to make positive decisions in their diet, lifestyle, and supplementation habits. It is important to take a holistic approach to support long-term health and wellness, and this can begin by knowing your score, and making changes to improve it.

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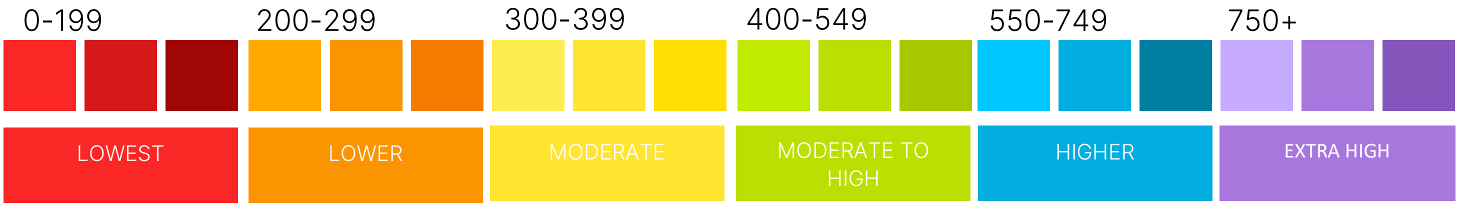
APPENDIX

WHAT DOES MY SKIN CAROTENOID (SCS) MEAN?

Based on a distribution of skin carotenoid scores, a reference scale was created to capture an individual's response. This scale provides a number and color for ease of tracking and comparing scores over time. The lower an individual scores on the scale, the lower the antioxidant defense, while a higher score represents increased antioxidant defense. Red (0-199) represents low scores, orange (200-290) is lower, yellow (300-399) is moderate, green (400-549) is moderate to high, blue (550-749) is higher, and purple (750+) is highest.



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