

Tradename: AC Skinmuni-Tea

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Lot #: N231002C

Sponsor: *Active Concepts, LLC; 107 Technology Drive Lincolnton, NC 28092*

Study Director: *Daniel Shill*

Principal Investigator: *Kayla Goodson*

Test Performed:

EEG (electroencephalography) Brainwave Study

Introduction

The physical experience of applying cosmetics is multifaceted and influences how consumers perceive products, demonstrating the importance of quantifying the complex effects of product application. Cosmetic products are designed to provide the traditional physical beauty attributes and benefits in addition to various sensory effects and an overall feeling of well-being. The physiological and psychological effects of cosmetics are inextricably linked given the physical act of applying a product 1) elicits positive emotions as it is perceived to improve physical appearance and 2) enhances relaxation similar to a body massage. Considering the physiological and psychological implications of product application are interdependent, enhancing the emotional response to cosmetic products can augment the consumer experience.

Accordingly, an EEG brainwave study was conducted to evaluate the immediate relaxation and calming effects associated with the topical application of **AC Skinmuni-Tea**. Because the ingredient was designed to promote relaxation through enhanced Alpha brainwave activity, Gamma, Beta, Theta, and Delta frequencies were also measured to confirm that its effects remained specific to Alpha waves and did not unintentionally influence other neurological states.

Study Principle

A headband is placed on the forehead of participants and brainwaves are monitored as products are applied to the skin. The brainwaves associated with relaxation and calmness are isolated and analyzed to provide insight to the psychological state during product application.

Materials

- A. Equipment:** Muse 2 Headband and Application (IntraXon, Toronto, ON, Canada); Mind Monitor Application
- B. Products:** Base Lotion (Cetaphil® Moisturizing Cream for All Skin Types)
- C. Software:** Excel Analysis ToolPak (Microsoft)

Methods

20 volunteers between the ages of 22 and 40, who were known to be free of any skin pathologies with Fitzpatrick skin types I to IV, participated in this study (Table 1).

Table 1. The Fitzpatrick Classification of Skin Types Chart¹

Fitzpatrick Skin Type Descriptions*	
Skin Type	Description
I	Always burns, never tans
II	Burns easily, tans minimally
III	Burns moderately, tans to light brown
IV	Burns minimally, tans to moderate brown
V	Rarely burns, tans to dark
VI	Never burns, least sensitive to changes
*Adapted from The Surgeon General's Call to Action to Prevent Skin Cancer	

Prior to initiating the study protocol, participants were seated in a quiet room for 10 minutes with the Muse 2 Headband on to obtain Baseline brainwave activity. Two randomly assigned test sites were identified on the volar forearm of participants and the order of applying conditions was randomized for each participant. Following stable Baseline measurements, the principal investigator physically applied 0.2 g of one condition to the respective test site for 30 seconds. After applying the first condition, brainwaves were monitored for 60 seconds without physical contact from the principal investigator. Once stable recordings were achieved, the principal investigator applied 0.2 g of the second condition to the respective test site for 30 seconds. The skin test site conditions and treatments are described below (Table 2). The Base Lotion utilized in this study was Cetaphil® Moisturizing Cream for All Skin Types.

Table 2. Descriptions of the Conditions and Treatments for each Skin Test Site

Skin Test Site	Condition	Treatment / Test Article Application Description
1	Base Lotion	Base Lotion
2	5.0% AC Skinmuni-Tea	5.0% AC Skinmuni-Tea in Base Lotion

The Muse 2 Headband smart device has five EEG Brain Sensors detecting Gamma, Beta, Alpha, Theta, and Delta brainwave activity which indicate different psychological states (Table 3). The Muse 2 Application records these brainwaves and provides feedback regarding sensor placement and connectivity. Brainwave data was exported from the Muse 2 Application and uploaded to the Mind Monitor Application for individual brainwave analysis.

Table 3. Brainwave Activity Detected by the Muse 2 Headband

Brainwave	Psychological State
Gamma	Heightened perception, problem solving tasks
Beta	Awake, thinking, alert consciousness
Alpha	Physically and mentally relaxed
Theta	Light Sleep, dreams
Delta	Deep sleep, loss of bodily awareness

The absolute Alpha brainwave activity recorded during the 30-second application period was utilized for analysis, with an increase in Alpha brainwave activity indicating enhanced relaxation and calmness. Absolute Gamma, Beta, Theta, and Delta brainwave activity were also evaluated to determine whether the observed changes in Alpha activity occurred independently or were accompanied by alterations in other brainwave frequencies. This analysis helped confirm whether the relaxation response was specific to Alpha brainwave enhancement rather than part of a generalized change in overall brainwave activity. Data was analyzed using a one-way ANOVA with statistical significance accepted at $p \leq 0.05$. Data is displayed relative to Baseline brainwave activity according to the following equation:

$$\text{Brainwave Activity} = \frac{\text{Brainwaves}_{\text{Condition}}}{\text{Brainwaves}_{\text{Baseline}}}$$

Percent change in absolute brainwave activity calculated for each test site relative to Baseline values, using the following equation:

$$\text{Percent Change (\%)} = \frac{\text{Brainwave Activity}_{\text{Condition}} - \text{Brainwave Activity}_{\text{Baseline}}}{\text{Brainwave Activity}_{\text{Baseline}}} \times 100$$

Results

The data obtained from this study met criteria for a valid study as the Base Lotion performed as anticipated. Application of 5.0% **AC Skinmuni-Tea** demonstrated effective immediate relaxation properties by increasing Alpha brainwave activity compared to Base Lotion. Additionally, no other significant improvements in activity for the remainder of the brainwaves were observed.

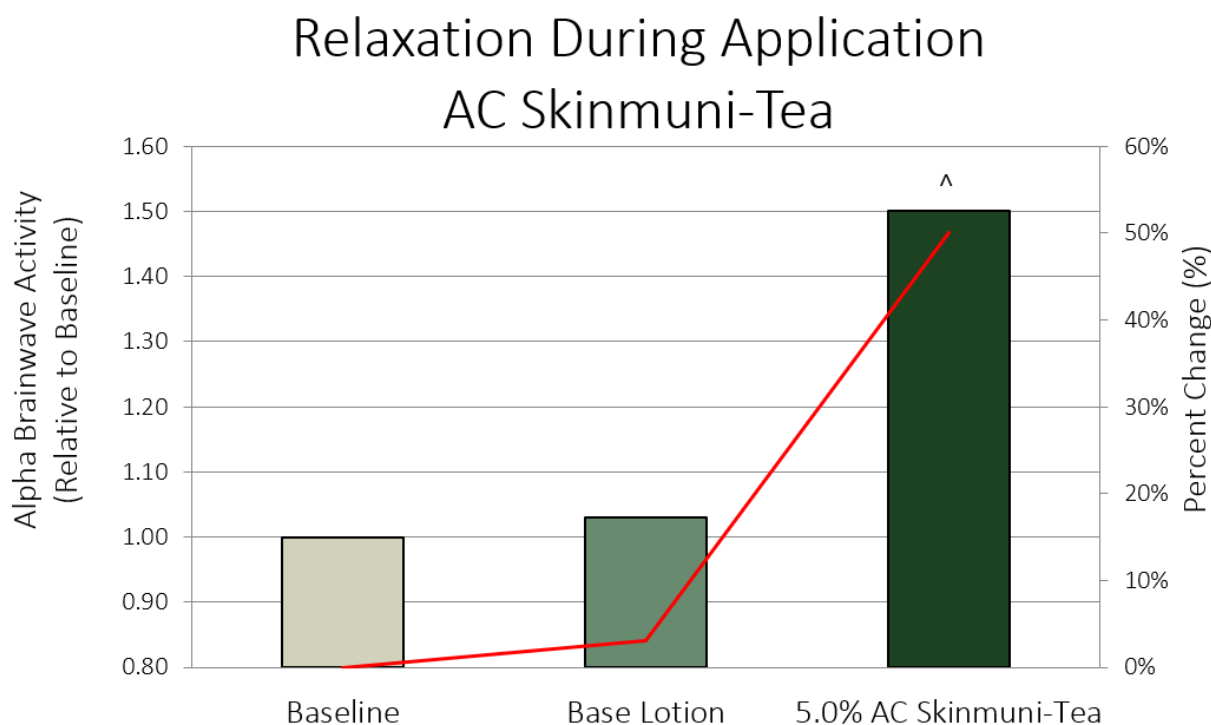


Figure 1. Alpha Brainwave Activity During Product Application Relative to Baseline. [^] indicates significance ($p \leq 0.05$) compared to Base Lotion.

Table 4. One-way ANOVA Results of Alpha Brainwave Activity During Application. ^ indicates significance ($p \leq 0.05$) compared to Base Lotion.

	Base Lotion vs 5.0% AC Skinmuni-Tea
P-value	0.042^

Heightened Perception During Application AC Skinmuni-Tea

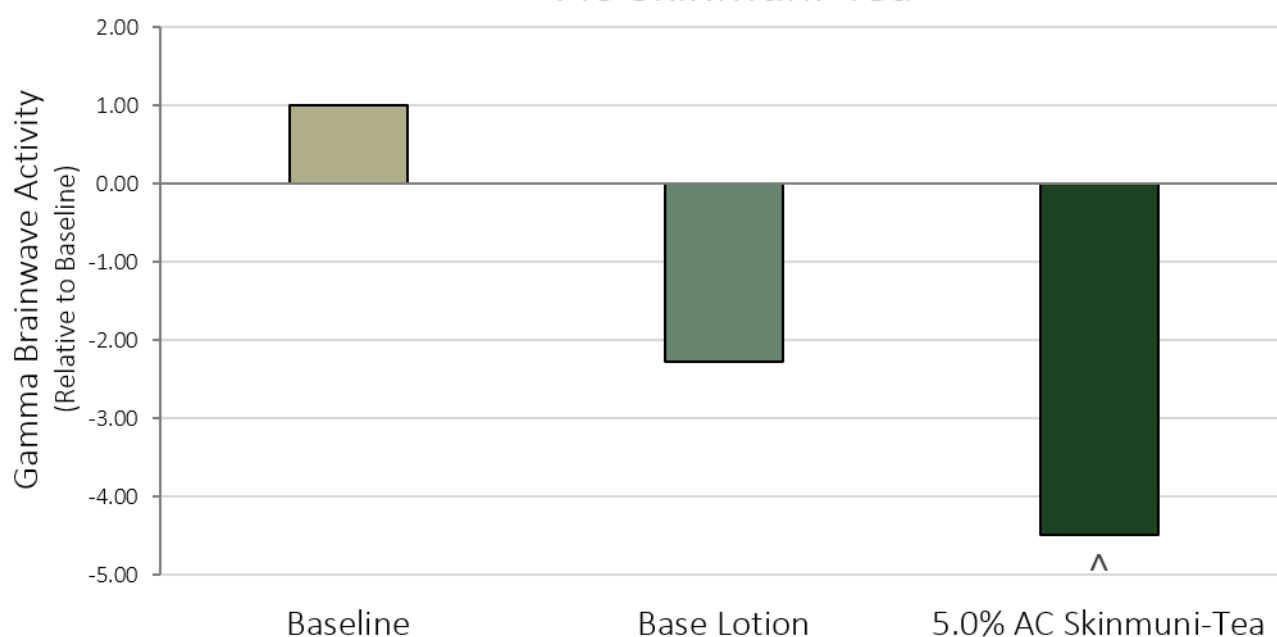


Figure 2. Gamma Brainwave Activity During Product Application Relative to Baseline ^ indicates significance ($p \leq 0.05$) compared to Base Lotion.

Table 5. One-way ANOVA Results of Gamma Brainwave Activity During Application^ indicates significance ($p \leq 0.05$) compared to Base Lotion.

	Base Lotion vs 5.0% AC Skinmuni-Tea
P-value	0.034^

Active Thinking During Application AC Skinmuni-Tea



Figure 3. Beta Brainwave Activity During Product Application Relative to Baseline.

Table 6. One-way ANOVA Results of Beta Brainwave Activity During Application.

	Base Lotion vs 5.0% AC Skinmuni-Tea
P-value	0.078

Introspection During Application AC Skinmuni-Tea

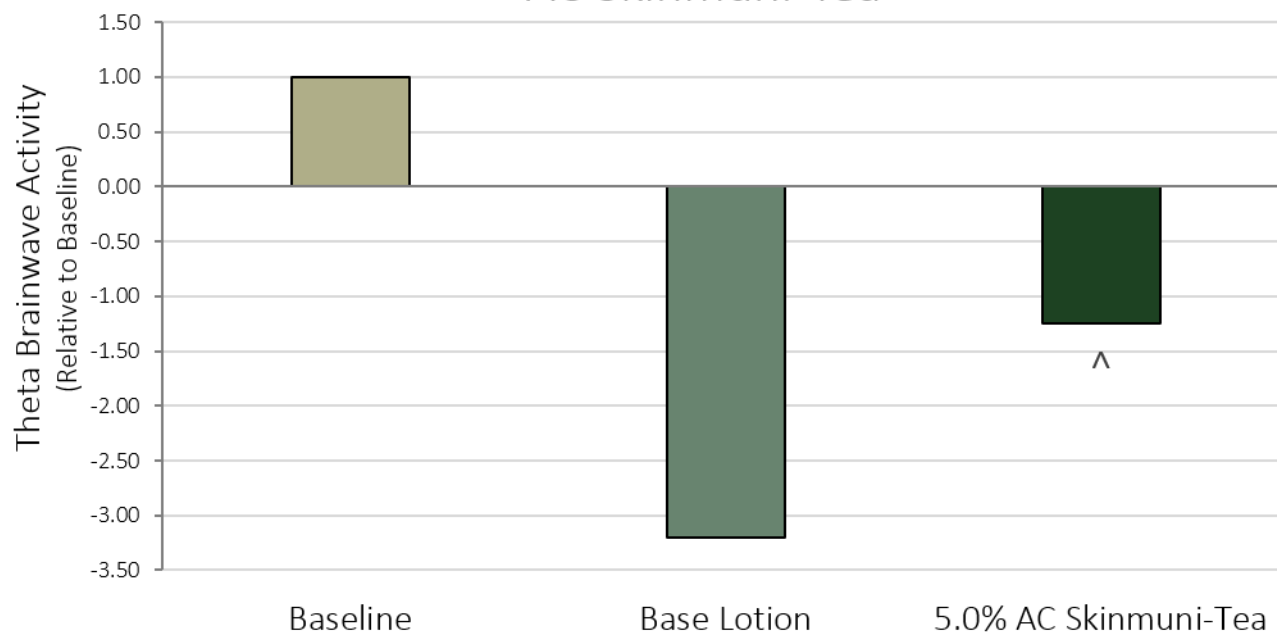


Figure 4. Theta Brainwave Activity During Product Application Relative to Baseline. [^] indicates significance ($p \leq 0.05$) compared to Base Lotion.

Table 7. One-way ANOVA Results of Theta Brainwave Activity During Application. [^] indicates significance ($p \leq 0.05$) compared to Base Lotion.

	Base Lotion vs 5.0% AC Skinmuni-Tea
P-value	0.028 [^]

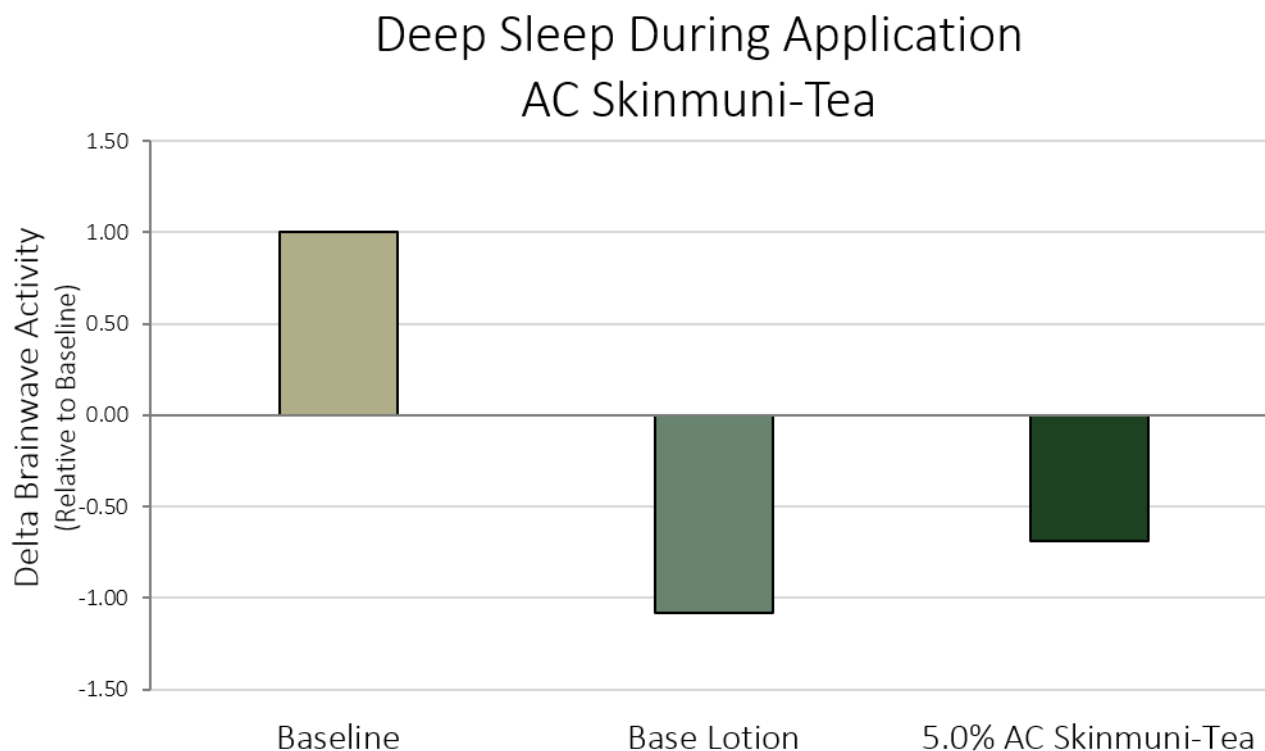


Figure 5. Delta Brainwave Activity During Product Application Relative to Baseline.

Table 8. One-way ANOVA Results of Delta Brainwave Activity During Application. ^ indicates significance ($p \leq 0.05$) compared to Base Lotion.

	Base Lotion vs 5.0% AC Skinmuni-Tea
P-value	0.061

Discussion

The ability of **AC Skinmuni-Tea** to elicit a relaxed state upon application was assessed via Alpha brainwave activity during 30 seconds of application. As shown in Figure 1, Alpha brainwave activity slightly increased by 3% during Base Lotion application, but was not significantly altered from Baseline measurements, indicating the Base Lotion does not exert significant relaxation properties (Figure 1; Table 4). Conversely, 5.0% **AC Skinmuni-Tea** significantly increased Alpha brainwave activity by 50% during the 30-second application compared to Baseline brainwave activity (Figure 1; Table 4). These results demonstrate **AC Skinmuni-Tea** has effective immediate and short-term relaxation and calming properties during application.

To determine whether the observed increase in Alpha brainwave activity was a true, isolated response rather than part of a generalized chain in brain activity, Gamma, Beta, Theta, and Delta brainwave activity were also evaluated. No significant increases were observed for any of the remaining brainwave frequencies following application of Base Lotion and 5.0% **AC Skinmuni-Tea** (Figures 2, 3, 4, 5). Furthermore, both Base Lotion and 5.0% **AC Skinmuni-Tea** significantly reduced Gamma brainwave activity compared to Baseline, indicating topical application did not elicit heightened perception (Figure 2; Table 5). Similarly, Beta brainwave activity was significantly reduced following application of both test materials, suggesting neither treatment stimulates active thinking (Figure 3; Table 6). Theta brainwave activity, which is associated with introspection, was also significantly reduced compared to Baseline during Base Lotion and 5.0% **AC Skinmuni-Tea** application (Figure 4; Table 7). No significant differences in Delta brainwave activity were observed for both test materials, demonstrating application did not induce deep sleep associated brainwave activity with application (Figure 5; Table 8). Collectively, these findings demonstrate that 5.0% **AC Skinmuni-Tea** increased Alpha brainwave activity without significantly eliciting other brainwave frequencies, supporting the observed response is specific to relaxation and calming rather than an increase in overall brainwave activity.

In conclusion, these results indicate **AC Skinmuni-Tea** increases Alpha brainwave immediately during application when added to personal care products at recommended use levels. Collectively, **AC Skinmuni-Tea** enhances the psychological response when applying a cosmetic product, by increasing relaxation and calmness, which can augment the consumer experience. These results support the intended design of **AC Skinmuni-Tea** as a relaxation-promoting ingredient, demonstrating a selective enhancement of Alpha brainwave activity without meaningful changes to the other major brainwave frequencies.

References

1. Sharma AN, Patel BC. Laser Fitzpatrick Skin Type Recommendations. [Updated 2022 Mar 9]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK557626/>