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Understanding Skin Sensitivity Across the Body and in Response to Products Using Ecological Momentary Assessment

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Abstract

Sensitive skin is comprised of a spectrum of symptoms with triggers woven into people's day-to-day lives, making it difficult to fully capture in the lab or with questionnaires relying on people's memory. In the studies described here, we applied an Ecological Momentary Assessment (EMA) approach to capture skin sensitivity as it happens in-life to evaluate: 1) how sensitive skin is distributed across the body, and 2) how sensitive skin responds to product intervention over multiple weeks. We found that women in the US who self-reported sensitive skin experienced a range of skin sensitivity symptoms, most commonly itch, dryness, and redness, but each with a different distribution across body locations. Using EMA, we also found that 2 weeks of regular usage of Dove Sensitive Body Wash (Unilever) in the shower significantly reduced in-life reports of dryness and increased the number of days when women did not report sensitivity compared with usage of a standard sulfate-based cleanser. These studies highlight a novel approach for understanding sensitive skin and assessing treatment efficacy while already demonstrating the importance of a moisturizing skin cleanser as part of such treatment.

Figure 1. Current Dove Sensitive Body Wash.



The Science and Significance of Skin Sensitivity

Sensitive skin is one of those experiences that most people recognize instantly, but few can define precisely. It might reveal itself as dry and flaking skin, a flush of redness after stepping out into the cold, or a general feeling of tightness and discomfort that doesn't neatly correspond to anything visible on the surface. Dermatologically, it is best understood not as a single condition but as a spectrum of reactions rooted in how the skin protects itself and how it communicates with our brain to form our sensory experiences.[1,2]

At the heart of this experience is the skin barrier, the outermost layer of the skin, made up of tightly packed cells embedded in a matrix of lipids that acts rather like mortar between bricks.[3,4] When this barrier is intact, it holds moisture in and keeps irritants out. When it is compromised, whether through genetics, environmental exposure, overuse of harsh cleansing, or age-related changes, water escapes more easily, and external triggers can penetrate more readily.[5] The result is skin that reacts more quickly and more intensely to things that others might not notice at all. Sitting just beneath this barrier is a dense network of sensory nerve endings. In individuals with sensitive skin, these nerves can become more easily activated, translating everyday stimuli into signals of discomfort, itch, or burning.[6,7]

The triggers themselves are often unremarkable. Temperature swings, hard water, certain fragrances and preservatives, tight or particular fabrics, shaving, and even psychological stress can all provoke a reaction.[8,9] Because these triggers are woven into the fabric of daily life, sensitive skin rarely stays quiet for long, and its expression can shift from day to day and from one part of the body to another. It is also a deeply subjective experience: for example, unusual cold may lead to a bit of dryness in one person, but stinging and irritation in another; and the same person's skin may feel calm one week and reactive the next.[10] Despite this variability, sensitive skin is strikingly common. Across large consumer surveys conducted around the world, roughly half to two-thirds of adults describe their skin as sensitive to some degree, with women reporting it slightly more often than men.[1]

Because the barrier plays such a pivotal role in this story, supporting it is one of the most direct routes to easing sensitivity. Products that support the skin barrier, both moisturizers and gentle cleansers, aim to do exactly that: minimizing disruption to barrier lipids and proteins, replenishing the outer lipid layers of the skin, reinforcing the lipid matrix that holds it together, thereby maintaining the natural retention of moisture.[11] Such product regimens can provide the skin a more resilient surface from which to face its everyday insults, but determining which ones are effective for sensitive skin is a challenge given its subjective and ephemeral nature. That is where our research comes into play.

Ecological Momentary Assessment for Tracking Skin Sensitivity in Life

Sensitive skin doesn't play by the rules of a lab – a tight, uncomfortable feeling, a hot shower, a persistent itch that appears mid-afternoon, a patch of redness that fades before the day is out. These everyday experiences are fleeting and notoriously difficult to capture with traditional research methods that either rely on often imperfect memory of past sensitivity, or on provoking skin reactions in a lab that do not relate well to people's daily experiences with skin sensitivity.

Instead, we have moved to a different approach: Ecological Momentary Assessment (EMA), a method that captures skin sensitivity as it happens in life.[12] Instead of asking people to look back and recall the degree to which their skin felt itchy, irritated, or uncomfortable,[13,14] we invite them to check in with their skin issues at the moment using a simple survey accessible on their mobile devices. The result is a far richer, more accurate picture of skin sensitivity, capturing contextual information such as when symptoms strike, where on the body, and what in daily life seems to set them off. We have run 2 recent studies applying this EMA methodology to the detection and evaluation of intervention on sensitive skin across the body. Participants in both studies reported their skin sensitivity symptoms as they occurred, using a questionnaire available on demand from the home screen on their mobile phones like an app.

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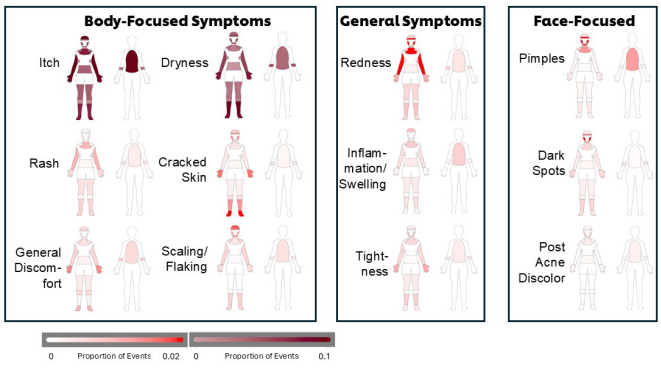
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In EMA studies, it is critical to maintain engagement with participants. Ideally, we would like the reporting of experienced skin issues to become habitual, but habits take prompting and repetition to develop. We always begin EMA with frequent prompts regarding reporting skin issues during the first few days. Although participants for these studies were recruited because they were experiencing skin sensitivity at study onset, we understood that sensitivity symptoms can come and go, but we nevertheless needed to keep participants not currently experiencing symptoms engaged. Thus, we provided an option for participants to report during the evening hours that they did not experience any skin issues on that day, so they would sustain engagement with the EMA even if their symptoms waned. Anecdotally, we have observed several participants in each of our EMA studies to continue reporting skin issues even after their scheduled participation had ended, an indication of the power of this approach if executed properly.

Distribution of Skin Sensitivity by Symptoms Across the Body

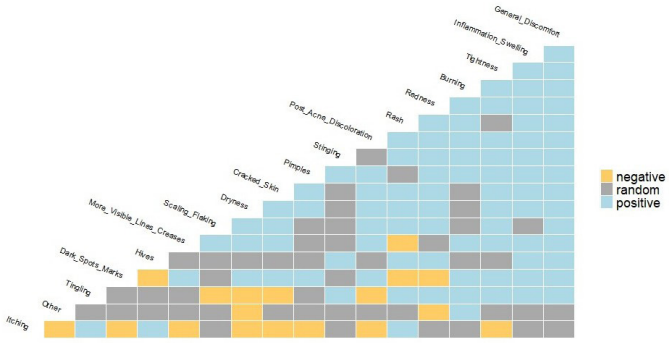
Based on the responses of 117 American women aged 18 to 55 who self-reported skin sensitivity, we found that symptoms associated with sensitive skin manifest across multiple body locations and show substantial variation. We found that the top symptoms reported by the EMA participants were itch and dryness, both occurring with more than twice the frequency of the remaining symptoms. Both symptoms were documented more frequently on locations on the body, particularly hands, arms, feet, and lower legs, than on the face. In fact, we found that most of the top eleven most frequent symptoms in our EMA study, as shown in Figure 2, were more commonly reported on bodily locations other than the face, suggesting key roles for products that are applied all over the body in the management of skin sensitivity.

Figure 2. Prevalence of each issue by body location from EMA reports by women reporting sensitive skin. Issues were grouped as "body-focused" if the top 3 locations by prevalence are on the body, as "face-focused" if the top 3 locations by prevalence are on the face, and as "general" otherwise.



The top 5 symptoms reported during the most intense sensitivity events by participants were general discomfort, rash, stinging, burning, and dryness. Although stinging and burning were not among the top 11 most prevalent symptoms, with each occurring in less than 10% of all reported sensitivity events, their intensity suggests that they are still important symptoms to resolve. We initially found it surprising to see dryness associated with high severity, but we noted that dryness showed high and statistically significant levels of co-occurrence with other sensitivity symptoms such as general discomfort, rash, redness, and inflammation/swelling (see Figure 3). This suggests that, as an indicator of a compromised skin barrier, the occurrence of dry skin may be the precursor to the development of other sensitive skin issues, and moisturizing products should be a part of skin sensitivity prevention and alleviation.

Figure 3. Degree of co-occurrence of sensitive skin symptoms within EMA reports for women reporting sensitive skin. Blue boxes indicate pairs of symptoms that tend to co-occur within the same report, whereas yellow boxes indicate pairs of symptoms where the occurrence of one implies the occurrence of the other is less likely.



Incorporating Dove Sensitive Skin Body Wash to Mitigate Body Skin Sensitivity

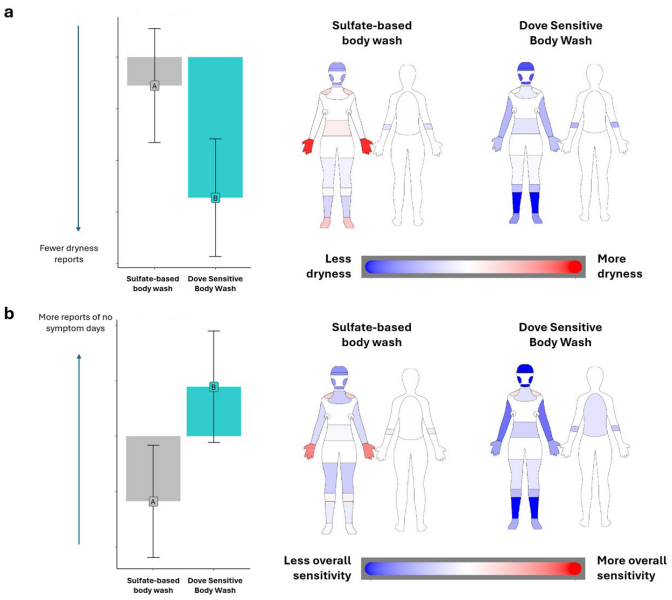
Dove Sensitive Body Wash is a hypoallergenic and gentle everyday cleanser designed specifically for people with sensitive skin. Formulated with a sulfate-free, mild cleansing blend with 24 hr renewing Micromoisture, Dove Sensitive Body Wash cleanses while protecting the skin barrier.

Our second EMA study evaluated the effectiveness of Dove Sensitive Body Wash for reducing sensitive skin symptoms in everyday life. Following a 2-week baseline period using a standard sulfate-based body wash (control), one group of women was provided with Dove Sensitive Body Wash while another group continued to use the control product, and both groups completed another 2-week test phase while continuing real-time symptom reporting.

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Figure 4. (A) Bar chart displaying change in frequency of dryness reports from baseline for each body wash, with error bars indicating 95% confidence intervals. Body heatmaps displaying change in the number of dryness symptoms reported from the baseline phase by each body location and body wash. (B) Bar chart displaying change in the number of "no symptom day" reports from baseline for each body wash, with error bars indicating 95% confidence intervals. Body heatmap displaying change in all skin sensitivity symptoms from the baseline phase for each body location and body wash.



As shown in Figure 4, Dove Sensitive Body Wash led to a significant reduction in the number of dryness events compared with the control cleanser during the test phase, indicating a measurable improvement in that aforementioned "precursor" sensitive skin symptom. Importantly, these reductions were most evident on body locations that our first study identified as being particularly prone to dryness and skin sensitivity in general, including the lower legs, feet, arms, hand, and face, demonstrating that Dove Sensitive Body Wash can support whole-body skin comfort. Beyond symptom-specific improvements, we found a significant increase in reports of "symptom-free" days for the users of Dove Sensitive Body Wash compared with users of the control cleanser.

Taken together, these findings suggest that Dove Sensitive Body Wash minimizes the occurrence of dryness relative to standard cleansers and can actively promote periods of symptom-free skin in real-life conditions. Overall, the application of EMA provided robust real-world evidence that daily cleansing with Dove Sensitive Body Wash contributes to improved skin comfort for individuals with sensitive skin, supporting its role as an effective component of sensitive skin management in everyday life.

Conclusion

Sensitive skin is common, variable, and personal, but our research using EMA has shown that it can be quantified with contextual detail beyond traditional approaches. In-life reports from women show that skin sensitivity is not confined to the face, but is frequently experienced across the body, with varying distributions of distinct but often interconnected symptoms such as dryness, rash, inflammation, and general discomfort. Our second EMA study extended this understanding by demonstrating that Dove Sensitive Body Wash reduced dryness events and increased symptom-free days under real-life conditions. By helping us understand skin sensitivity with this new level of granularity, we believe EMA can help tailor future approaches for treating sensitive skin for broader populations.

Disclosure

The work was funded by Unilever Global IP. Unilever provided the commercial products used in the study. JS, MR and BD work for Unilever. Unilever was involved in the collection and analysis of the data.

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