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Evaluation of skin firmness by the DynaSKIN, a novel non-contact compression device, and its use in revealing the efficacy of a skincare regimen featuring a novel anti-ageing ingredient, acetyl aspartic acid

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Background: One of the key strategies for anti-ageing in the cosmetics industry today is to target the structural changes responsible for ptosis of the skin, given its impact on age perception. Several objective and non-invasive methods are available to characterise the biomechanical properties of the skin, which are operator-dependent, involving skin contact and providing single-dimensional numerical descriptions of skin behaviour. The research introduces the DynaSKIN, a device using non-contact mechanical pressure in combination with fringe projection to quantify and visualise the skin response in 3-dimensions. We examine the age correlation of the measurements, how they compare with the Cutometer®, and measure skin dynamics following application of a skincare regimen containing established anti-ageing ingredients.
Methods: DynaSKIN and Cutometer® measurements were made on the cheek of 80 Caucasian women (18–64 years). DynaSKIN volume, mean depth and maximum depth parameters were correlated with age and 15 Cutometer® parameters. Subsequently, the firming efficacy of a skincare regimen featuring acetyl aspartic acid (AAA) and a peptide complex was examined in a cohort of 41 volunteers.
Results: DynaSKIN volume, mean depth and maximum depth parameters correlate with age and the Cutometer® parameters that are associated with the skin relaxation phase (R1, R2, R4, R5, R7 and F3). Furthermore, the DynaSKIN captured significant improvements in skin firmness delivered by the skincare regimen.
Conclusion: The DynaSKIN is a novel device capable of capturing skin biomechanics at a high level of specificity and successfully detected the firming properties of a skincare regimen. Its independent measuring principle, consumer relevance and skin firmness 3D visualisation capabilities bring objectivity and novelty to product efficacy substantiation evaluation.

Key words: DynaSKIN – skin biomechanics – age correlation – Cutometer® – skin ageing – acetyl aspartic acid

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Skin is a multilayered highly nonlinear, anisotropic, viscoelastic material consisting of the epidermis dermis and hypodermis, each with their own composition and thus mechanical properties (1, 2). There are multiple structures in the skin layers that contribute to the overall mechanical properties. Various cells of the epidermal layer differ in physical properties, and the contribution that they make to skin mechanobiology. Additionally, their distance from the skin surface is linked to their mechanical role in the epidermis. This is reflected by the cellular protein contribution of actin, keratin and profilaggrin. The basement membrane of the epidermis is structured to ensure continuity of mechanical force transmission at the epidermal–dermal junction (1). In the dermis, fibroblasts produce collagen and elastic fibres (elastin, fibrillin and microfibrillar proteins) and proteoglycans, and these dominate the structural contribution to the mechanical properties. The random arrangement of collagen fibres enables mechanical anisotropy in the skin. Small external mechanical forces such as compression applied to the skin are transmitted and distributed by the elastic and collagen fibril networks (3); therefore, the response of these components is an important aspect of skin mechanobiology. Upon the application of force, skin initiates mechanical creep and stress