Life Quality (Indexes) related to Cosmetic Products Use: A sociological perspective

Patrícia Costa[1], Manuela Dias[2], **Pedro Contreiras Pinto[3]**

[1] Quality manager, PhD Trials, Lisboa, Portugal, [2] R&D department, PhD Trials, Lisboa Portugal
[3]Scientific director, PhD Trials, Lisboa Portugal

PhD Trials, Av. Maria Helena Vieira da Silva, Lisboa, Portugal, +351216034267, geral@phdtrials.com

Abstract

Background: Quality-of-Life Indexes (QOL) related to dermatological disturbances are a standard procedure evaluation in drugs clinical trials. However, true metrics specifically designed for the evaluation of the influence of cosmetic products on the QOL of subjects are much are. The main objective of this study was to assess the influence of cosmetic products use on improving the QOL of individuals with newly designed questionnaires.

Methods: 569 QOL questionnaires were evaluated. All subjects gave their informed written consent. Two protocols were used: Group I – Protocols using Cardiff Acne Disability Index and Group II – Protocols using Infants Dermatitis Quality of Life Index (IDQOL). A new Sociological Quality of Life Questionnaire – SQOLQ was developed, based on the results obtained from the prospective part of the study.

Statistical and factorial analysis was specifically applied to numeric data resulting from questionnaires responses. A 95% level of significance. Statistical analysis was performed with Software SPSS23

Results: On Group I, mean QOL of subjects at D0 was 3.8, and at Dend was 2.2. Regarding the initial values there is a statistically significant improvement in the QOL of 41.6% at the end of the study. On Group II: Subjects present a statistically significant result at the end. Group III presented three main components related with QoL.

Conclusion: All the QOL Indexes can correctly describe the influence of the cosmetic products on the Quality of Life of subjects who use cosmetic the products.

Keywords: Life Quality Index, SQOLQ, Sociological study, IDLQI, CADI

Introduction

Quality of life (QoL) is a broad multidimensional concept that emerged as an attempt to perceive and "rate" the human behavior regarding specific life events and conditions. Usually is based on subjective evaluations including psychological, social and physical aspects of the individual's life. According to The World Health Organization, QoL can be defined as "the individuals' perception of their position in life, in the context of the cultural and value system in which they live and in relation to their goals, expectations, standards and concerns"[1-2]. The concept of health related

QoL (HRQoL), on an individual level encompasses psychological, social and physical aspects of the overall QoL and correlates this with specific determinants such as health risks and conditions, functional status, social support, and socioeconomic status. In a simpler way, HRQoL can be defined as an assessment of how the individual´s QoL may be affected over time by a disease, disability or disorder[5].

It is important for cosmetic companies to keep up with the expectations from consumers, as a crescent amount of people are slowly shifting mindsets, seeking high quality and effective and long-lasting results through their purchases. Before launching new cosmetic products on the market, the cosmetic companies need to invest in clinical trials because it is essential to assess the safety and effectiveness/performance of the products. In this sense, an HRQoL assessment can be seen as an interesting and fundamental complement to the traditional data[6].

In terms of available strategies to track and assess the HRQoL of each patient, there are multiple indexes and self-report questionnaires validated and translated in the most diverse languages for measure this parameter according to the disease under study and the age groups to which they belong – children, teenagers and adults[7].

Regarding skin conditions, some of the major focus of HRQol relies on the effects of two skin conditions, namely atopic dermatitis and acne vulgaris on the patient's QoL. Atopic dermatitis is a chronic itchy skin disease that is common in infants. Approximately 60% of cases of atopic dermatitis develop in the first year of life, normally between the 3 and 6 months of life; and, 90% develops by 5 years of age. Being the rate of atopic dermatitis highest in children under 5 years of age. Considering the symptoms associated with this skin disease, the QoL of children who manifest this condition and their caregivers, including parents and schoolteachers, are affected in the most diverse ways. It is then essential to evaluate whether the application of a particular cosmetic product helps to improve the quality of life of the same, thus demonstrating the effectiveness of the product according to the consumers. The atopic dermatitis-specific usual HRQoL instrument was the Infant's Dermatitis Quality of Life Index (IDQOL) due to the features of this type of questionnaires (e.g. designed specifically for apply in infants with atopic dermatitis; complete in 2-3 minutes; refers to the last week; the parameters addressed include feelings and symptoms, daily activities (sleep time, mealtimes, bath time, dressing and undressing), leisure (playing or swimming), personal relationships and treatment)[3-4].

Regarding acne vulgaris, one of the most common skin conditions affecting 85% of adolescents and young adults. Normally the affected areas include the face and trunk, which can be considered exposed areas of the body. The acne lesions in addition to directly provoking an aesthetic nuisance, indirectly affect fundamental aspects in social, professional and academic life. Some studies indicate that despite the high incidence of acne, its negative effects on psychosocial functioning are profound and can be associated with a broad spectrum of psychosocial abnormalities, which can range from depression, suicidality, anxiety, psychosomatic symptoms, embarrassment to social inhibition. It should also be noted that the data in the literature indicate that women have a higher rate of low self-esteem compared to men under the same conditions. Considering all the features mentioned above and the fact that it has been recognized that objective clinical measures may sometimes be inadequate in assessing the overall impact of acne on the QoL of patients has led to considerable investment in the development of disease-specific psychometric instruments. The acne specific HRQoL instrument used was the Cardiff Acne Disability Index (CADI) due to the features of this type of questionnaires (e.g. is not restrictive for facial acne; short completion time; high acceptability

by the volunteers; each question refers to the last month; includes patient perception of acne severity and addresses depressive feelings)[1].

As shown, plenty has been studied about Quality-of-Life Indexes (QOL) related to dermatological disturbances, accessed by Health sciences professionals. However, true metrics specifically designed for the evaluation of the influence of cosmetic products on the QOL of subjects are much rare and lack the social perspective that could be one of the main justifications for the use of such products. The main objective of this study was, by using the information that was obtained from the more frequent QoL questionnaires, to select the more influential questions using a mathematical approach and define a new QOL standard that can be used to all general type of cosmetic products.

Material and Methods

Study design

569 QOL questionnaires and 152 subjective self-assessment questionnaires were evaluated and distributed in 3 groups: 330 QOL questionnaires in Group I – Protocols using Cardiff Acne Disability Index (CADI); 239 QOL questionnaires in Group II – Protocols using Infants Dermatitis Quality of Life Index (IDQOL) and 152 subjective evaluation questionnaires in Group III – New Sociological Quality of Life Questionnaire – SQOLQ

Subjects

All protocols were submitted to an Independent Ethical Commission and all subjects gave their informed written consent including for the prospective part of the study.

In Group I, three hundred and thirty patients (330) were considered, including 92 teenagers between the ages of 12 and 17 years old, and 238 young adults over 17 years old. The mean age was 21.9 years (min. 12 years, max. 39 years).

In Group II, two hundred and thirty-nine (239) patients were considered, including 68 children up to 12 months and 171 children over 12 months, (min. 3 months, max. 6 years).

In Group III, one hundred and fifty-two (152) female subjects were considered, including: 20 women from 35 to 44 years old, 108 from 45 to 54 years old and 24 women from 55 to 65 years old.

Methodologies

Data was aggregated, in order to obtain robust samples. All the inclusion and exclusion criteria were consistent in the groups in order to enter the study pool. The questionnaires were performed in 2 study phases, at the beginning and at the end. CADI questionnaire was designed for use in teenagers and young adults prone to acne, therefore two age groups were defined (below and after 17 years old). Regarding IDQOL, two age groups were also defined (children below and after 12 months).

A third Group was developed based on subjective evaluations (self-assessment questionnaires), including psychological and physical aspects of the individual's self-perception, before and after

using a cosmetic product. A new Sociological Quality of Life Questionnaire – SQOLQ was developed, based on the results obtained from the prospective part of the study.

Group I – Protocols using Cardiff Acne Disability Index (CADI)

The acne-specific Quality of Life instrument selected for this study was the Cardiff Acne Disability Index (CADI) due to the features of this type of questionnaires.

The Cardiff Acne Disability Index (CADI) is a condensed version of Acne Disability Index (ADI) – 5 item questionnaires. Each question refers to the last month, is not restrictive for facial acne, includes patient perception of acne severity and addresses depressive feelings. It is self-explanatory and can be simply handed to the patient who is asked to complete it without the need for detailed explanation. This short version has the advantage of being short fill time (1 minute to complete). The CADI score is calculated by summing the score of each question resulting in a possible maximum of 15 and a minimum of 0. The higher the score, the more the QoL is impaired. To note that if one item is not answered, the item should be scored zero and the score for that completion would be the sum of the scores of the other four items (not adjusted). If more than one item is not scored, the questionnaire cannot be scored.

Group II – Protocols using Infants Dermatitis Quality of Life Index (IDQOL)

The atopic dermatitis-specific instrument selected for this study was the Infant's Dermatitis Quality of Life Index (IDQOL) due to the features of this type of questionnaires (e.g. designed specifically for apply in infants with atopic dermatitis; complete in 2-3 minutes; refers to the last week; the parameters addressed include feelings and symptoms, daily activities (sleep time, mealtimes, bath time, dressing and undressing), leisure (playing or swimming), personal relationships and treatment). It is self-explanatory and should be completed by the child's parent (s) or regular carer. The IDQOL score was calculated by summing the score of each question resulting in a maximum of 30 and a minimum of 0; the higher the score the more QoL is impaired.

Group III – New Sociological Quality of Life Questionnaire – SQOLQ

Subjective evaluation questionnaires, applied to women aged between 35 and 65 years, were collected. 15 questions were initially selected, including issues related to different dimensions, such as "physical" aspects (occurrence of spots and wrinkles on the skin, skin elasticity, oiliness, hydration, skin sensitivity) and issues related to psychological factors, such as self-esteem, beauty, youth and health perception. Also, an overall satisfaction question was considered. All questions were evaluated on 11 terms scales (0-10), before and after a cosmetic product application. The main objective was to select the most relevant questions that allowed to develop a new Sociological Quality of Life Questionnaire – SQOLQ.

Statistical analysis was specifically applied to numeric data resulting from questionnaires responses, Descriptive statistics include the calculation of mean values, standard deviation, percentage of variation related to the changes after the application of the product and between groups of participants. For the Group I and Group II the analysis was performed using the Wilcoxon test for paired data to compare the evolution of the cosmetics use in time and the Mann-Whitney U test for compare independent (non-parametric) data. The magnitude of the differences between groups was performed by Cohen's D effect size. A 95% level of significance was considered. Regarding Group III the analysis was performed using Factorial Analysis and Multiple Linear Regression analysis.

Factor analysis is a statistical technique that allowed to organize the way subjects perceived the questions. It indicates the questions that are related to each other and the ones that are not, identifying the questions that have the same concept (factor) underlying[8-10].

When we perform factor analysis, we're looking to understand how the different underlying factors influence the variance among the variables. Every factor will have an influence, but some will explain more variance than others, meaning that the factor more accurately represents the variables it's comprised of.

Another important metric is factor score. This is a numerical measure that describes how strongly a variable from the original research data is related to a given factor.

To identify in our data the factors that most impact the overall satisfaction, a Multiple Linear Regression was performed using factor scores (resulting from Factor Analysis) as independent variables.

Statistical analysis was performed with Software SPSS23 (IBM, USA).

Results

Group I – Protocols using Cardiff Acne Disability Index (CADI)

On Group I, as shown on figure 1a and 1b, the mean QOL of subjects at the D0 was 3.8 and at Dend was 2.2. Regarding the initial values there is a statistically significant improvement in the QOL of 41.6% at the end of the study.

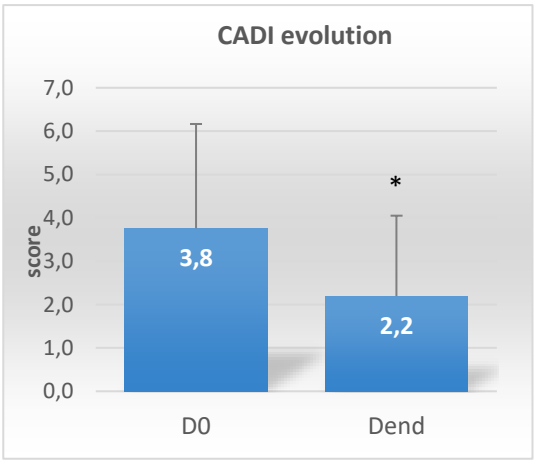

Figure 1a – CADI evolution- Mean + sd considering the overall sampling. Values of all the subjects (n=330). Also shown is the statistical comparison against D0 (*: p<0,05; N.S.: Non-significant)

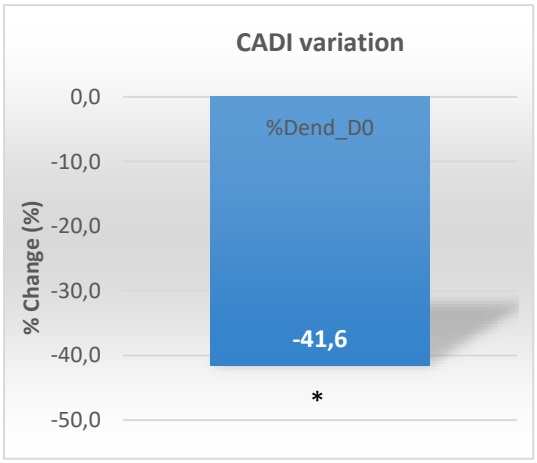

Figure 1b – CADI % change considering the overall sampling. Values of all the subjects (n=330). Also shown is the statistical comparison against D0 (*: p<0,05; N.S.: Non-significant)

An analysis per age (figure 2a and 2b) was also performed in order to confirm whether teenagers behave differently from young adults. Considering the two age groups, the teenagers show an initial score of 3.0 and a final statistically significant score of 2.2. The young adults show an initial score of 4 and a final statistically significant score of 2.2. The % change regarding D0 (26.8% and 45.9%) was also statistically significant. The % of improvement was significantly higher in young adults in relation to the teenager's group. However, despite being statistically significant, the differences are between age groups were small (Effect size Cohen's D: 0.39).

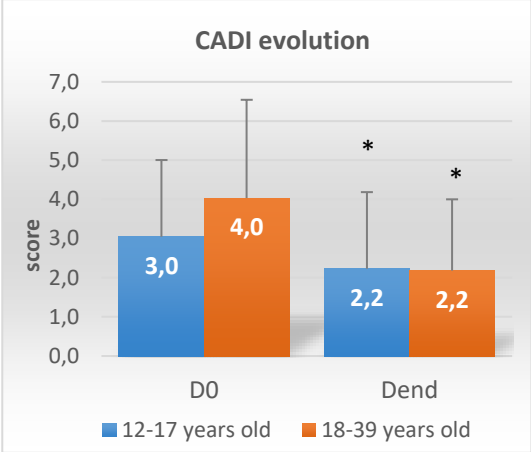

Figure 2a - CADI evolution - Mean + sd considering two age groups. Values of all the subjects per group (12 to 17 YO: n=92; Over 17 YO: n= 238). Also shown is the statistical comparison against D0 (*: p<0,05; N.S.: Non-significant)

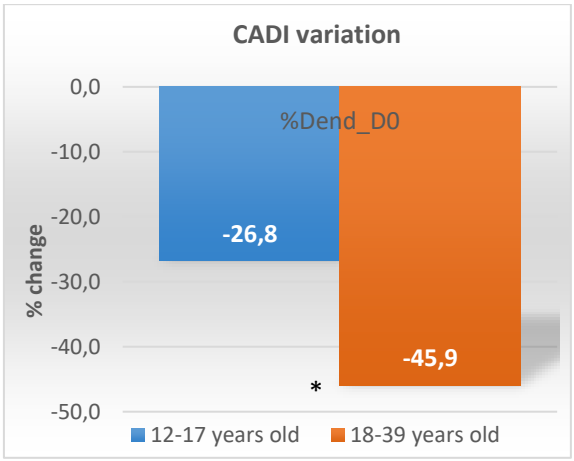

Figure 2b - CADI % change considering two age groups. Values of all the subjects per group (12 to 17 YO: n=92; Over 17 YO: n= 238). Also shown is the statistical comparison between groups (*: p<0,05; N.S.: Non-significant)

Knowing that literature data indicate that women have a higher rate of low self-esteem compared to men under the same acne skin conditions, it was decided to rearrange the results, creating the male sub-group and the female sub-group, independent of age (figure 3a and 3b).

The female group show an initial score of 4.1 and a final statistically significant score of 2.3 The male group show an initial score of 2.8 and a final statistically significant score of 2.0. The % change regarding D0 (45.0% and 29.3%) was also statistically significant. The % of improvement was significantly higher in female group when compared to the male group. However, despite being statistically significant, the differences between gender are small (Effect size Cohen's D: 0.32).

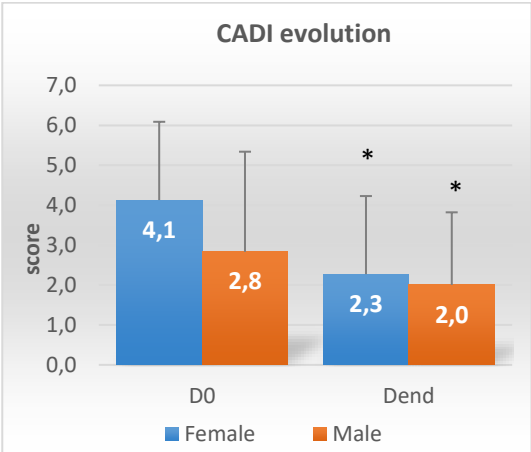

Figure 3a - CADI evolution - Mean + sd considering gender. Values of all the subjects per group (female: n=236; male: n= 94). Also shown is the statistical comparison against D0 (*: p<0,05; N.S.: Non-significant)

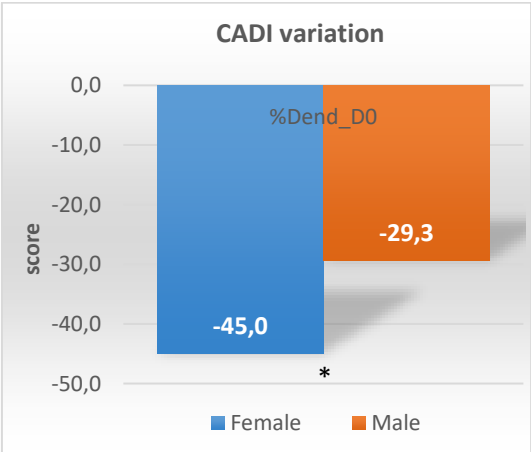

Figure 3b - CADI % change considering gender. Values of all the subjects per group (female: n=236; male: n= 94). Also shown is the statistical comparison between groups (*: p<0,05; N.S.: Non-significant)

Group II – Protocols using Infants Dermatitis Quality of Life Index (IDQOL)

On Group II, as shown on figure 4a and 4b, the mean QOL of subjects at the D0 was 3.5 and at Dend was 2.5. Regarding the initial values there is a statistically significant improvement in the QOL of 27.3% at the end of the study.

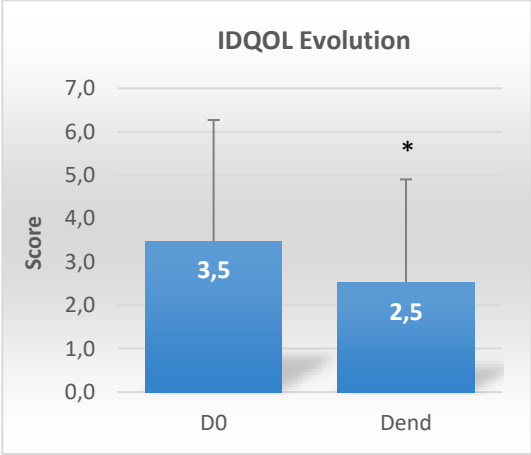

Figure 4a – IDQOL evolution – Mean + sd (A) considering the overall sampling. Values of all the subjects (n=239). Also shown is the statistical comparison against D0 (*: p<0,05; N.S.: Non-significant)

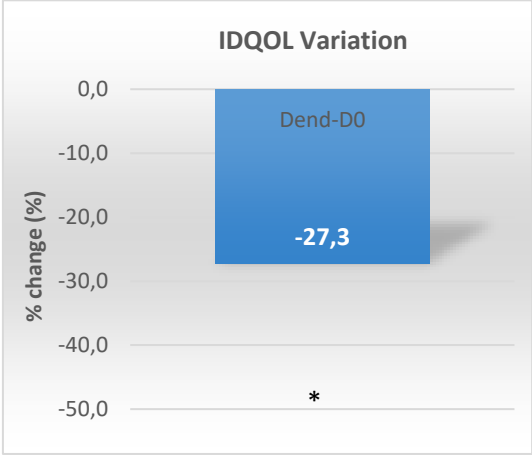

Figure 4b –IDQOL % change considering the overall sampling. Values of all the subjects (n=239). Also shown is the statistical comparison against D0 (*: p<0,05; N.S.: Non-significant)

Despite a higher QOL in the sub-group of children over 12 months, both groups present a statistically significant result at the end. Regarding the % of change, although the sub-group of children over 12 months presents a higher improvement (-28.7%) over the younger one (-23.1%), the differences between the two were not statistically significant and are very small (effect size Cohen's D: 0.06).

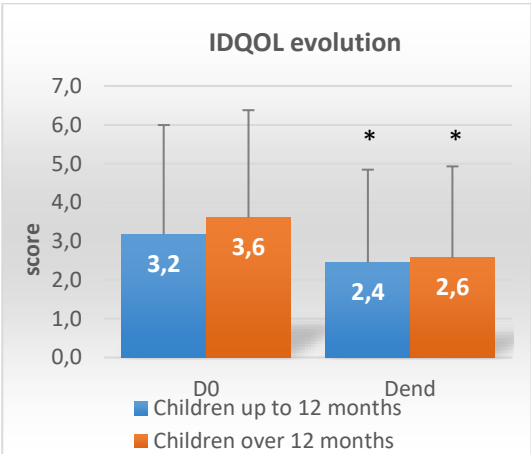

Figure 5a - IDQOL evolution - Mean + sd considering two age groups. Values of all the subjects per group (Children up to 12 months: n=68; Children over 12 months: n= 171). Also shown is the statistical comparison against D0 (*: p<0,05; N.S.: Non-significant)

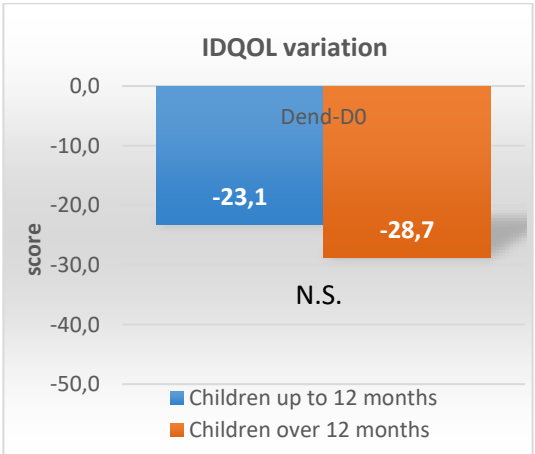

Figure 5b - IDQOL % change considering two age groups. Values of all the subjects per group (Children up to 12 months: n=68; Children over 12 months: n= 171). Also shown is the statistical comparison between groups (*: p<0,05; N.S.: Non-significant)

Group III – New Sociological Quality of Life Questionnaire – SQOLQ

Regarding Group III, a factorial analysis was performed on a set of 15 questions. After validation of the assumptions, 4 questions were eliminated due to non compliance with the required assumptions. The final model included 11 components and extracted 3 main factors (whose Eigenvalues are higher than 1). These 3 factors explain 76.7% of the total variance of the results.

The varimax rotation, was used. It tries to redistribute the factor loadings such that each variable measures precisely one factor.

The following matrix indicates, after rotating the factors, which variables belong to each factor.

Each row represents a variable and each of the columns is one of the factors. The values displayed in the matrix represent the factor loadings, that is, the correlation of each variable with each factor.

We identify the variables that belong to each factor by observing the values of the loads, the loads with the highest absolute value in one factor will belong to it.

Rotative componente matrix

	Component		
	1	2	3
Q8. Visible health of your skin	,899	,069	,117
Q6 Skin smoothness	,876	,068	,206
Q13. Skin suppleness	,835	,103	,359
Q10. Skin's visible youthfulness	,783	,399	,230
Q9. Overall beauty	,780	,315	,257
Q2. Skin sensitivity / irritability	,006	,900	,067
Q12. Occurrence of wrinkles on your skin	,204	,880	,111
Q15. Skin elasticity	,429	,722	,196
Q4. Skin hydration	,361	-,132	,815
Q11.Occurrence of spots on your skin	,248	,164	,696
Q1. Skin radiance / luminosity	,090	,368	,670

Figure 6: Rotative componente matrix

Our rotated component matrix identified 3 components:

- **Component 1**: includes Q8. Visible health of your skin; Q6 Skin smoothness; Q13. Skin suppleness, Q10. Skin's visible youthfulness; Q9. Overall beauty. We called this component "beauty and health improvement perception";

- **Component 2**: includes Q2. Skin sensitivity / irritability; Q12. Occurrence of wrinkles on your skin; Q15. Skin elasticity We called this component “aging signs improvement perception”;
- **Component 3**: includes Q4. Skin hydration Q11.Occurrence of spots on your skin, Q1. Skin radiance / luminosity. We called this component “hydrated and radiant skin improvement perception”.

To verify the internal consistency of the variables that comprise the factors, the coefficient of reliability (or consistency) Cronbach’s alpha was used. Thus, we verify in our data that **component 1** has an high Cronbach’s alpha: 0.934, **component 2** has a moderate Cronbach’s alpha: 0.851 and **component 3** has an acceptable Cronbach’s alpha: 0.672.

	Component 1	Component 2	Component 3
Cronbach’s alpha	0.934	0.851	0.672

Figure 7: Cronbach’s alpha internal consistency measure

In order to understand the 3 components by age, the variables that comprise each factor were used and the respective % was calculated.

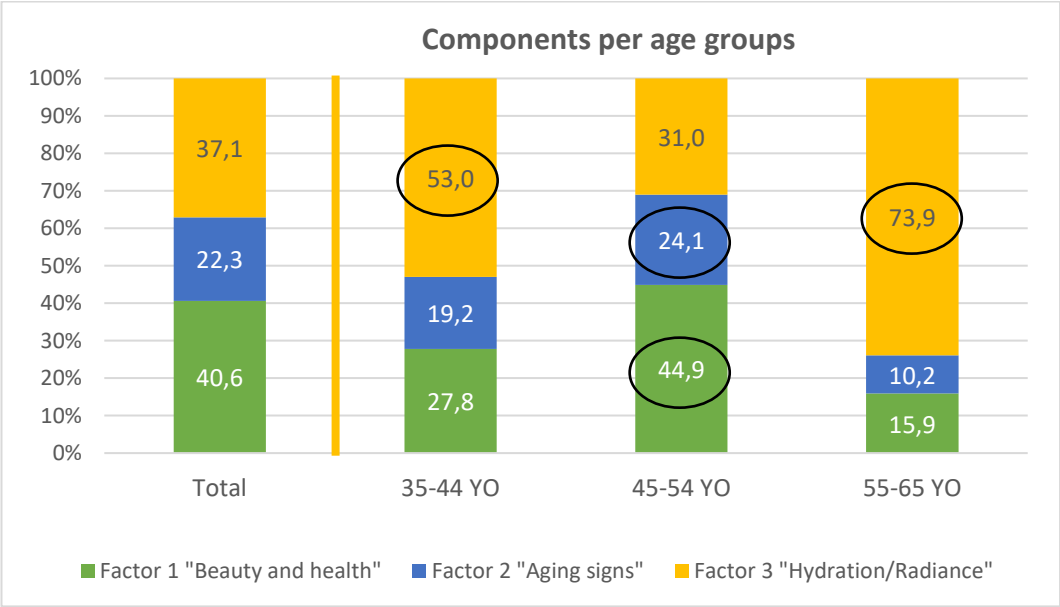

Figure 8: % of each factor per age groups

This allowed to conclude that women aged between 35-44 years old and women over 55 years old perceive having improved *hydration and radiance* while women aged between 45 and 54 years old perceive having improved on skin *beauty and health* and *aging signs*.

To verify the factors that most impact the overall satisfaction, the Multilinear Linear Regression test (Stepwise method) was applied, using factor scores as independent variables. The test was carried out after verifying the assumptions underlying the test, independence of the residuals (Durbin Watson: 2.033), multicollinearity through the value of VIF (< 2) and tolerance (> 0.1),

and normality of the residuals. After all assumptions were fulfilled, we eliminated 5 subjects and the final analysis had 147 cases.

	Beta (β)	Significance
Component 1	0.744	<0.001
Component 3	0.645	<0.001
Component 2	0.580	<0.001

Figure 9: Standardized Beta (β) coefficients (final model). Dependent variable: Overall evaluation

The analysis revealed that all the 3 components have a significant impact in the overall satisfaction. “Beauty and Health” is the most important component, followed by “Hydration / Radiance” factor and finally the “Aging signs” component.

Discussion: Although the self-reported QOL may depend on several factors, the results suggest that repeated applications of a cosmetic product significantly improve the perception that subjects have on their quality of life. Regarding the IDQOL, the results suggest that the subjects belonging to the sub-group of children over 12 months present a higher QOL impartment than the sub-group of children up to 12 months.

Regarding Group III, the analysis allowed to identify logical combinations of the several variables, perceive the relationships between them and classify these variables. The analysis synthesized 11 variables in 3 main components and revealed that these components, “Beauty and Health”, “Hydration / Radiance” and “Aging signs”, have a significant impact on women’s overall satisfaction, being “Beauty and Health” the first one.

Conclusion

This analysis was mainly focused on the effects of the use of cosmetic products on subjects. However, both the standard questionnaires and the newly designed QOL Index can correctly describe the influence of the cosmetic products on the Quality of Life of subjects who use the products, validating the sociological relevance of cosmetics application. The procedure allowed to create a new questionnaire to be applied in prospective studies and confirm the analysis among a larger sample of subjects.

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None

Conflict of Interest Statement

None

References

1) Chamlin, S. L., Cella, D., Frieden, I. J., Williams, M. L., Mancini, A. J., Lai, J.-S., & Chrenzz, M.-M. (2005). Development of the Childhood Atopic Dermatitis Impact Scale: Initial Validation of a Quality-of-Life Measure for Young Children with Atopic Dermatitis and their Families. In *J Invest Dermatol* (Vol. 125).
2) Finlay, A. Y. (1997). Quality of life measurement in dermatology: A practical guide. *British Journal of Dermatology*, *136*(3), 305–314. https://doi.org/10.1111/j.1365-2133.1997.tb14934.x
3) Finlay, A. Y. (2001). Quality of life in atopic dermatitis. *Journal of the American Academy of Dermatology*, *45*(1), S64–S66. https://doi.org/10.1067/mjd.2001.117010
4) Finlay, A. Y., & Khan, G. K. (1994). Dermatology Life Quality Index (DLQI)-a simple practical measure for routine clinical use. In *Clinical and Experimental Dermatology* (Vol. 19).
5) Brown, M. M., Chamlin, S. L., & Smidt, A. C. (2013). Quality of Life in Pediatric Dermatology. *Dermatologic Clinics*, *31*(2), 211–221. https://doi.org/10.1016/j.det.2012.12.010
6) Chen, S. C. (2012). Health-Related Quality of Life in Dermatology: Introduction and Overview. Dermatologic Clinics, 30(2), 205–208. https://doi.org/10.1016/j.det.2011.12.001
7) Fabbrocini, G., Panariello, L., de Vita, V., Vincenzi, C., Lauro, C., Nappo, D., Ayala, F., & Tosti, A. (2013). Quality of life in alopecia areata: A disease-specific questionnaire. Journal of the European Academy of Dermatology and Venereology, 27(3). https://doi.org/10.1111/j.1468-3083.2012.04629.x
8) Pestana Maria Helena, Gageiro João Nunes, Análise de dados para ciências sociais - A complementaridade do SPSS, 2ª edição revista e aumentada, 2000, PP 389-426; pp 447-511
9) Viana Adriana Backx Noronha, Tutorial SPSS – Módulo 17 – Análise Fatorial
10) https://www.qualtrics.com/experience-management/research/factor-analysis/
11) Brown, M. M., Chamlin, S. L., & Smidt, A. C. (2013). Quality of Life in Pediatric Dermatology. Dermatologic Clinics, 31(2), 211–221. https://doi.org/10.1016/j.det.2012.12.010