ADHERENCE AND PSYCHOLOGICAL ATTRIBUTES IN DERMATOLOGY. THE ROLE OF REPRESENTATIONS AND ATTACHMENT STYLE IN TREATMENT AND THE EFFECT OF ELECTRONIC MESSAGES ON PROTECTIVE BEHAVIOUR

PhD Thesis

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List of publications providing the basis and related to the topic of the thesis

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Table of contents

1. Introduction

1.1. Adherence in dermatology

Adherence can be described as "the extent to which a person's behaviour - taking medication, following a diet and/or executing lifestyle changes -, corresponds with agreed recommendations from a health care provider" (1, p. 17). The medical sub-speciality of dermatology is one of the fields in clinical care where treatment adherence has been reported as relatively low (2-4). The importance of the doctor-patient relationship came into focus recently in dermatological adherence research (4-9). The quality of the doctor-patient relationship has been increasingly regarded as an essential factor in dermatological adherence (6, 10-13). There is relatively little qualitative research which connects patients' views about the management of their chronic illness with models of adherence (14, 15-16). Dermatological diseases, being prevailingly chronic, long-term conditions, seem appropriate targets for such examinations (8). Patient adherence is a challenging field of health behaviour research. Reviewers of the adherence literature argue that the causes of the relatively high number of open questions might be due to the fragmented nature of the research, lack of appropriate qualitative methodologies, the neglect of patients' perspectives, and the lack of integrative models (17-18). In health care relationships the parties' views about the other's roles, and their expectations towards each other, are important factors in adherence (14). If these expectations remain unclear, this might bring about a 'bogus contract' between professionals and their patients (19). In other words, there may be different hidden expectations and concepts regarding the relationship in the minds of the doctor and the patient, and also some of their own representations may be unknown even to themselves.

1.2. How can adherence be improved?

Richards & Fortune (20) suggested that the recognition and co-management of distress of the patients, and helping them in working through their ambivalence about adherence is a requirement for effective clinical management of psoriasis. Clinical psychologists can utilize practical strategies (e.g. eliciting self-motivational statements; or using patients' core beliefs and values to bring into focus discrepancies between current behaviour and goals) in everyday practice in the management of psoriasis patients' poor adherence to medication. According to

Richards & Fortune (20) dermatologists need to be aware of these type of practical strategies to enhance patient adherence, because the management of psoriasis demands a multidisciplinary framework. Specialist nursing can also encourage higher rates of adherence, and other useful interventions could also be considered as models for improving adherence, e.g. manual telephone follow-up, reminders, family therapy and psychological therapy (21).

1.3. Adherence to sun protection counselling

The more that people understand and agree with the underlying rationale for the expected behaviour, the greater the adherence (22). Intention to adhere to a certain behaviour has both motivational and knowledge aspects. Forgetfulness and carelessness are considered to be indicative of motivation, and understanding the long-term benefits of a particular health behaviour may be indicative of the knowledge aspect (23). Observing changes in motivation may be substantial and provide additional information about the impact of an intervention (24). Skin cancer is one of the most preventable groups of malignancies and therefore, it is important to induce behavioural changes regarding the major avoidable causative factor: sun exposure (25-26). Optimal use of routine sunscreen is strongly associated with decreased melanoma risk (27). Irich et al. (28) found that regular use of sunscreens, being part of a consequent UV-protection strategy, may prevent the development of further actinic keratoses and invasive squamous cell carcinomas and, to a lesser degree, basal cell carcinomas in immune-compromised organ transplant recipients. Sun safety behaviours are an important determinant of skin cancer risk (29-30), these protective behaviours include such as aforementioned sun avoidance or increased use of protective clothing and sunscreen (26). One's personal behaviour is a result of knowledge, attitudes and beliefs; therefore, lack of knowledge and inaccurate beliefs can lead to inappropriate behaviour (31). Identifying the most important determinants of both skin cancer risk behaviours and sun protection behaviours is essential for the development of effective health education interventions that focus on changing the most appropriate beliefs (32-33). For example, few studies have examined the psychosocial correlates of sunburn (34). Theory-driven health communication is needed to motivate people to engage in sun safety behaviours and avoid sunburn (35). Tailored, mailed communications are promising methods for skin cancer prevention and detection among individuals at increased risk, but these interventions have not been widely tested (36). Message exposure has been shown to be associated with improvements in several

sun protection behaviours, including increased use of sunscreen, lip balm, and face covering (35). The Internet represents a promising channel for widespread dissemination of public health-oriented skin cancer risk and prevention information (37). Using e-mails to induce changes in behaviour is a widely used method (38-40). The telephone also can serve as an effective tool in the delivery of health care education messages (41). Promoting both phone and Web-based components of an integrated program achieves the best results in its effectiveness (38). A possible strategy for promoting positive health actions might be to create specific narrative messages (42). Personalizing the risks of unprotected sun exposure, combined with education about sun protection, can facilitate healthy changes in behaviour and motivation (24). Personalization (a form of tailoring mechanism) can be defined by the inclusion of specific and personally identifiable information within the content (e.g. names, age, or specific behaviours) gathered during the assessment phase (43). Even such minimally tailored approaches have been found to be more effective than generic prompts (44). Besides sending specific sun protection messages, delivering brief patient-centred counselling by primary care practitioners, could be an efficient and cost-effective approach for delivering multiple behaviour change interventions (45). Being counselled by a physician regarding sun safety is associated with high adherence to sun-protective behaviours (29, 46).

1.4. Psychodermatology

Psychodermatology can be described as a discipline, „a clinical and research-orientated awareness, and acceptance of the psychological and social implications of dermatological conditions" (47, p. xi). Skin diseases can affect patients in their health psychological functioning, e.g. the condition of our skin has an effect on our body image, self-esteem and the way others perceive us (48) Psychological stress plays an important role in in triggering or exacerbating chronic skin diseases (49). In a study arranged by Pärna et al. (50) sleep disorder symptoms were the most important form of distress among patients with chronic skin conditions. Skin diseases can affect patients' relationships in the way that visible skin symptoms and treatment needs may lead to avoidance of social activities, therefore relationships with friends and close relationships may be affected, which can have an effect on self-esteem (50). Next to psychological disturbances, psychiatric disorders are also associated with cronic skin diseases (51). Picardi et al. (52) found an overall prevalence of psychiatric morbidity of 25.2% in a sample of 2579 Italian dermatology outpatients (52).

Psychiatric morbidity most frequently takes the form of mood and anxiety disorders in dermatology outpatients (53). Psychosocial and psychiatric comorbidities have been identified in several chronic skin diseases, e.g. in psoriasis (48, 54-56), atopic dermatitis (57), acne (58) and vitiligo (59).

1.5. The importance of attachment in psychodermatology

Attachment can be defined as an emotional bond that develops within the context of the early interactions between infants and their primary caregivers (60). The attachment towards caregivers has an effect on later interpersonal expectations, emotions, and behaviours towards significant others (61). Three different attachment styles were categorized by Ainsworth et al. (62), which were secure attachment, and two types of insecure attachment: anxious-ambivalent, and avoidant. There are several differences between these attachment styles, e.g. individuals with secure attachment patterns feel competent in their ability to regulate affect in stressful situations with others, unlike people with insecure attachment styles (63). Bartholomew & Horowitz (64) introduced a model which consisted of four styles of adult attachment. According to their model attachment styles vary along two dimensions: a model of the self and a model of others, and both of these models can be positive or negative (64). Secure attachment style represents a sense of lovability and the expectation of others to generally be accepting and responsive. Preoccupied attachment style implies a sense of unlovability and a positive evaluation of others. Dismissing attachment style represents a sense of lovability with a negative disposition toward others. Fearful attachment style implies a sense of unlovability and a negative evaluation of others (65). Besides models of styles attachment can also be measured along point scores of three dimensions: comfort with closeness (closeness), capacity to depend on others (dependency) and fear of being abandoned (anxiety in relationships) (66). Attachment styles and dimensions are related to many psychosomatic factors: depression (67-68), anxiety (68-69), somatisation, hypochondria and coping skills (70). It also plays an important role in psychodermatological factors: attachment can affect dermatological life quality of atopic dermatitis patients, severity of symptoms of chronic skin patients (71), quality of life of chronic urticaria patients, alexithymia traits (72) and it has an important part in psychological intervention (71).

1.6. Patient adherence in the frame of psychodermatology

Chronic dermatology outpatients' adherence to therapy is influenced by many factors, e.g. age, sex, marital status, acceptance of the disease, perception of the treatment, associated psychiatric disorders, quality of life and the relationship with the physician (73). Several studies highlighted important factors that play a significant role in the adherence of psoriasis patients: increased psychological distress and low patient satisfaction with care or therapy is associated with lower levels of adherence (74), and the impact of quality of life may influence the rate of adherence (21). According to Thorneloe et al. (74) there is an urgent need to assess psychological factors of adherence, not only because they are important predictors but they are also amenable to intervention.

2. Aims

Our aim was to explore adherence and psychodermatological factors in a three step study, which phases' objectives were the following:

- to identify representations about patient adherence among dermatologists and their patients,
- to improve sun protection habits of a volunteer sample, and to explore essential factors of adherence to sun protection counselling,
- to describe psychological attributes (e.g. attachment style) of patients with chronic skin diseases.

In this chapter we would like to describe the details of the aims of our three step study.

The first step of the study aimed to explore representations about adherence and their differences among practitioners and patients. We thought it to be important to compare practitioner and patient groups whose experiences about professional-patient relationship originated in the same therapeutic environment and who also had personal experiences with each other. Thus, we chose professionals and patients from the same clinic as the study sample, similar to Gachoud, Albert, Kuper, Stroud and Reeves (75) in their study about social work, nursing, and medicine. We applied a combined qualitative-quantitative methodology through which we could test and compare the representations of patients using a questionnaire whose items were created from content categories identified in the interviews with their doctors. A further advantage of the use of combined methodology was that we could interpret

data from the different sub-samples of doctors and patients independently.
The second step of our study's objective was to improve sun protection habits of a volunteer sample: to facilitate frequency of sunscreen use, to decrease sun exposure, to explore factors influencing adherence to sun protection counselling and psychological dimensions related to sun protection. We intended to explore possible relations between adherence to sunscreen use, psychological and medical variables.
In the third step of our study we aimed to investigate psychological attributes of Hungarian dermatology outpatients. These examinations were made within the framework of a multi-center observational cross-sectional study that was conducted in 13 European countries organized by the European Society of Dermatology and Psychiatry. The purpose of the international study was to investigate the psychological burden of common skin conditions. We analyzed the following psychological attritubes of Hungarian patients: attachment style, patient satisfaction, quality of life, health status and rates of depression and anxiety.

3. Identifying representations about adherence

3.1. Methods

The complex nature of representations, and their often hidden components, are not always easily explored by quantitative research methods. The application of qualitative measures, on the other hand, is usually complicated and time-consuming. At the same time, many authors highlight their usefulness, emphasizing that new approaches are needed in this field (2, 8). Based on these considerations, we applied a combination of qualitative and quantitative methods in our research, following the so-called Mixed Methods paradigm (76-77). We followed the steps of the process of thematic text analysis (78). The first step was administering structured interviews with 40 dermatologists at the Clinical Department of Dermatology and Allergology at the University of Szeged in Hungary. The interview consisted of 11 questions about adherence and information dissemination to patients. Stem questions used by the interviewer to open the discussion concerned the information doctors gave to their patients about their treatments and medications; the factors they thought adherence depended on; the ways dermatologists facilitated patient adherence. Interviews took place in the Clinical Department where the participating dermatologists worked, and they

were interviewed by a psychologist with an MA degree. The interviews' length was 30-40 minutes. Transcripts were made from the answers and a text data file was created from them. Based on grounded theory methodology (79), content categories were not pre-prepared, but were created from the material of the dermatologists' interviews. Transcripts were coded into these categories by two independent coders, both of them graduate psychology students with Human Behaviour Analyst BA degrees. For further examination, and for the design of our questionnaire, we used those items which were mentioned by at least 10% of the doctors. A 12-item attitude scale was created from the most typical statements in each content category, and a 7-grade Likert-type scale (7 = fully agree; 1 = fully disagree) was added to each item (Table 1).

Content category (frequency in the doctors' interviews N=40)	Description of category / Item of attitude scale
Information from the doctor (37.5%)	The doctor can help his patient to be adherent mostly by giving detailed information about the patient's disease.
Background information (37.5%)	Information from family members, television, newspapers, and the internet can significantly affect the patient's adherence with the treatment.
Good doctor-patient relationship (37.5%)	Those patients are the most adherent with the treatment who have a trusting relationship with their doctors.
Financial state (32.5%)	Expensive drugs may be the main obstacle of adherence.
Patient's personality (20%)	Basically patients' adherence depends on their personalities.
Doctor's personality (12.5%)	Characteristics and personal traits of the doctor affect the adherence of patients.
Understandable communication (12.5%)	It would be the best in improving adherence if the doctor talked to his patient in an understandable way.
Written handouts (12.5%)	Written handouts and brochures given by the doctor mean a great help in the healing process.
Comfortable medication (10%)	The comfortable use of medication plays a role in adherence with the treatment.
Time for consultation (10%)	Adherence would mostly improve if there was more time for consultation between the doctor and the patient.
Telephone/Internet contact (10%)	There should be an internet or telephone service for giving information and maintaining contact between doctor and patient.
Doctor's empathy (10%)	The doctor's empathetic concern for the patient's problem would affect the healing process in a positive way.

Table 1. Content categories and their frequencies in the interviews with the doctors (N=40), and items of the attitude scale which were created from the most typical statements under the content categories.

In the next phase of the study, this questionnaire was completed by 153 outpatients of the Clinic (patients of doctors in the interviews), all diagnosed with chronic skin diseases, most frequently with psoriasis (N=82). Other diagnoses were atopic dermatitis and vitiligo. The average duration of their illness was 13.81±13.92 years. Patients' average age was 50.18±16.11 years (ranging from 18-87 years). The sample included both females (N=90) and males (N=63). The level of education varied among the patients of whom thirty-one had a primary school certificate (1-8 years of education), eighty-seven had a high school graduation certificate (9-12 years of education) and thirty-two of them had higher education qualifications (12+ years of education). Administration of the questionnaire always took place according to the same protocol: after their medical treatment in the Outpatient Department, a psychologist informed the patients about the aim of the study and requested their informed consent. Only then was the questionnaire administered.

Statistical procedures: after analysing the content of the interviews, and defining the frequency of each content category, we calculated the interrater reliability coefficient, Krippendorff's alpha (80). After recording the data from the questionnaires into data files, descriptive statistics and multidimensional scaling with SPSS 17.0 software were performed. We applied the multidimensional scaling method on the patients' questionnaire data to discover underlying factors that explain the similarities of certain items (81). Multidimensional scaling (MDS), creating a perceptual map, spatially represents the similarities and dissimilarities of a set of elements (82). In our research, the goal of using MDS was to reveal the psychological dimensions in the data that can meaningfully describe the underlying cognitive constructs (83-84). We conducted a hierarchical cluster analysis (Ward's method) for a further analysis of the dimensions of adherence representations of patients.

3.2. Results

3.2.1. Interviews with dermatologists

Based on the frequencies of content categories in dermatologists' interviews, we produced a hierarchy of factors which were considered the most important in establishing adherence (Table 1). Intercoder reliability was 0.68, using Krippendorff's alpha.

Table 1 indicates that dermatologists (N=40) found good doctor-patient relationship (37.5%), information from the doctor (37.5%), background information (37.5%) and the patient's financial state (32.5%) to be the most important factors for adherence. These factors were evaluated by the doctors as all being equally essential. Patient's personality (20%) was considered of moderate importance by doctors, and it was followed in the ranking by the doctor's understandable communication (12.5%), written handouts (12.5%) and the doctor's personality (12.5%). Dermatologists mentioned the following factors least frequently, but with equal weight: time for consultation (10%), internet/telephone contact (with caregivers) (10%), comfortable medication (10%) and doctor's empathy (10%).

3.2.2. Patients' questionnaire results

The results of the patients' attitude scale questionnaire are shown in Figure 1. On a 7-point scale, patients (N=153) found the doctor's understandable communication (M=6.75, SD=0.58), information from the doctor (M=6.78, SD=0.65) and patient's personality (M=6.24, SD=1.19) to be the most essential factors for adherence. These were followed by the importance of a good doctor-patient relationship (M=6.1, SD=1.65), the doctor's personality (M=5.91, SD=1.64) and the doctor's empathy (M=5.88, SD=1.6).

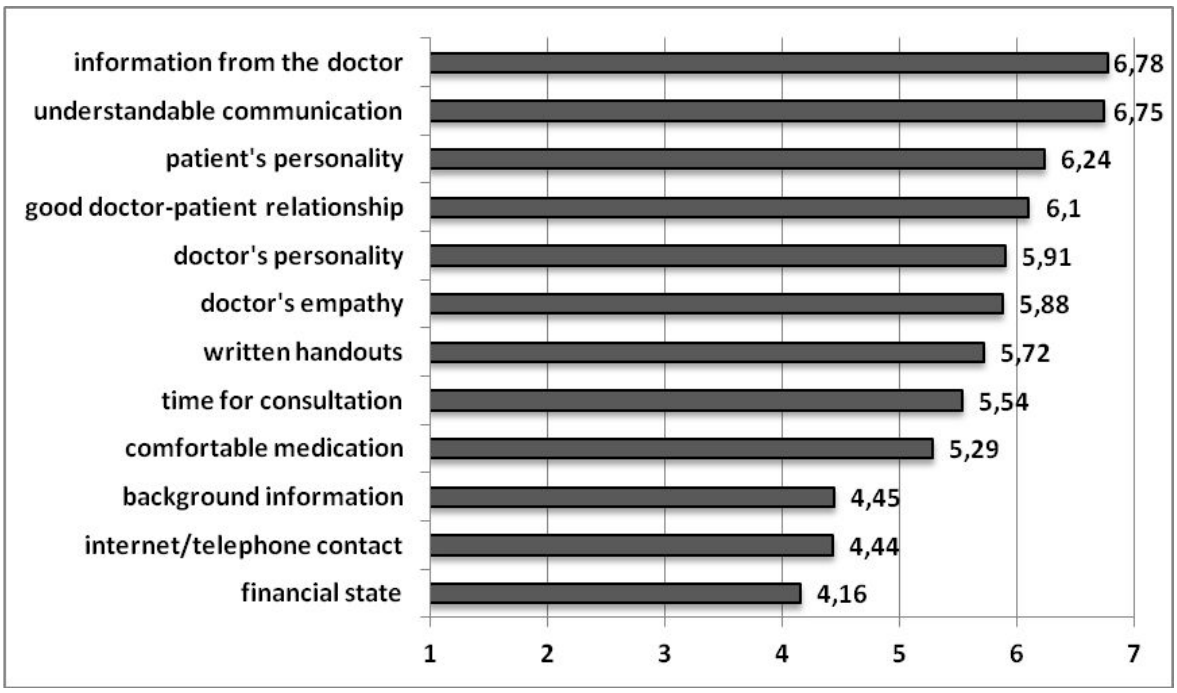

Figure 1. Patients' rankings of the most important aspects of adherence. Questionnaire (7-point attitude scale) results with means of the scores (N=153).

To determine whether a statistically significant relationship was present between patients' age and their results on the attitude scales, Pearson's correlation coefficients (r) were calculated. Patients' age correlated significantly with the following categories: good doctor-patient relationship ($r=0.446$, $p<0.01$), doctor's empathy ($r=0.336$, $p<0.01$), understandable communication ($r=0.331$, $p<0.01$), patient's financial state ($r=0.288$, $p<0.01$), and written handouts ($r=0.217$, $p<0.05$) (Table 2).

Questionnaire item categories	*Patient age*
written handouts	0.217*
financial state	0.288**
understandable communication	0.331**
doctor's empathy	0.336**
good doctor-patient relationship	0.446**

Table 2. Significant correlations between patient age and questionnaire results (Pearson correlation coefficients *$p<0.05$, **$p<0.01$).

In the next step, multidimensional scaling was applied to the data from patients' questionnaires, to organize information and to understand group similarities. The result, a "cognitive map", is a spatial representation of how the ideas are considered to be similar to or different from each other. Points are positioned so that distances reflect the dissimilarities between the corresponding items (Figure 2).

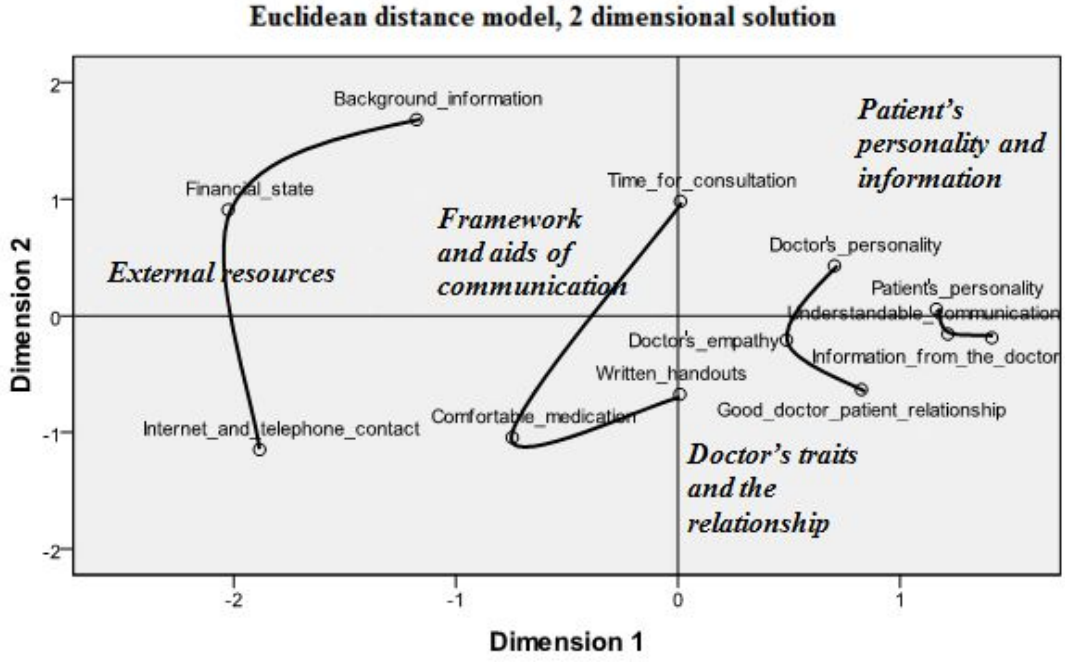

Figure 2. Results of the multidimensional scaling of chronic skin patients' answers to the questionnaire, with the four major content groups indicated (N=153).

As can be seen in Figure 2, items from the questionnaire (categories based on the doctors' interviews) can be grouped into four major content groups according to the patients' answers. The first content group may be labelled as 'External resources', containing the following categories: patient's financial state, background information, and internet/telephone contact. The second content group, which includes the categories of 'time for consultation', 'comfortable medication' and 'written handouts', was named 'Framework and aids of communication'. The next content group, 'Doctor's traits and the relationship' includes the categories 'doctor's personality', 'doctor's empathy' and 'good doctor-patient relationship'. Finally the fourth major content group was where the content categories – 'patient's personality', 'understandable communication' and 'information from the doctor' – were the most intensely condensed. This was identified as 'Patient's personality and information.' The results of the multidimensional scaling are in accordance with the identified cluster structure of patients' answers based on hierarchical cluster analysis (Ward's method). Based on the cluster algorithm, a dendogram was generated for visual classification of similarity for grouping (Figure 3).

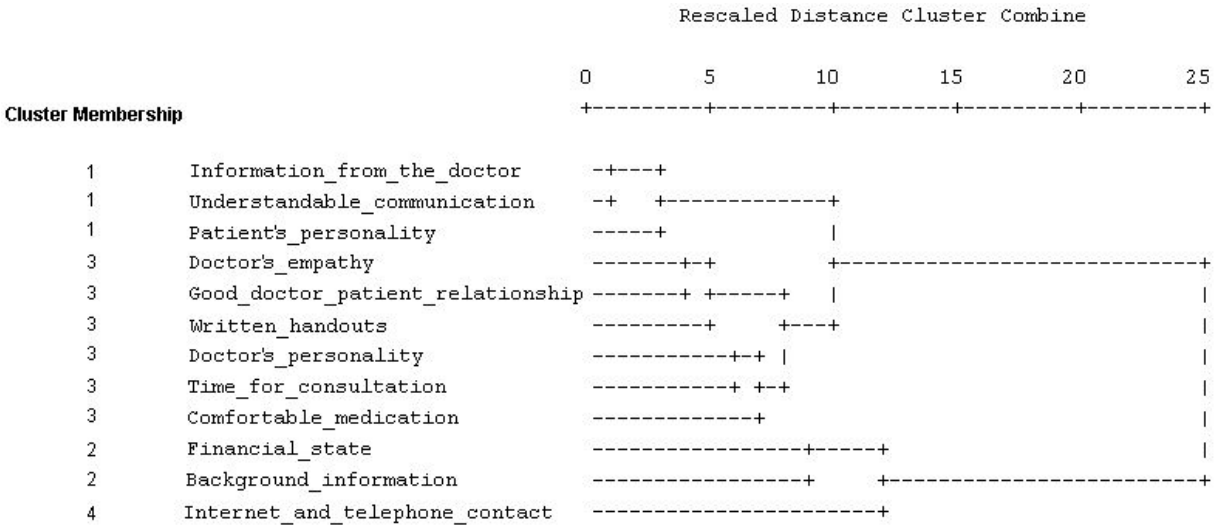

Figure 3. Dendogram from the cluster analysis of chronic skin patients' answers to the questionnaire, with cluster memberships indicated (N=153).

4. Improving adherence to sunscreen use

4.1. Methods

4.1.1. Sample population

We conducted a randomised, non-blinded, investigator-initiated trial of the effect of an electronic text-message system on sun protection behaviours (Figure 4).

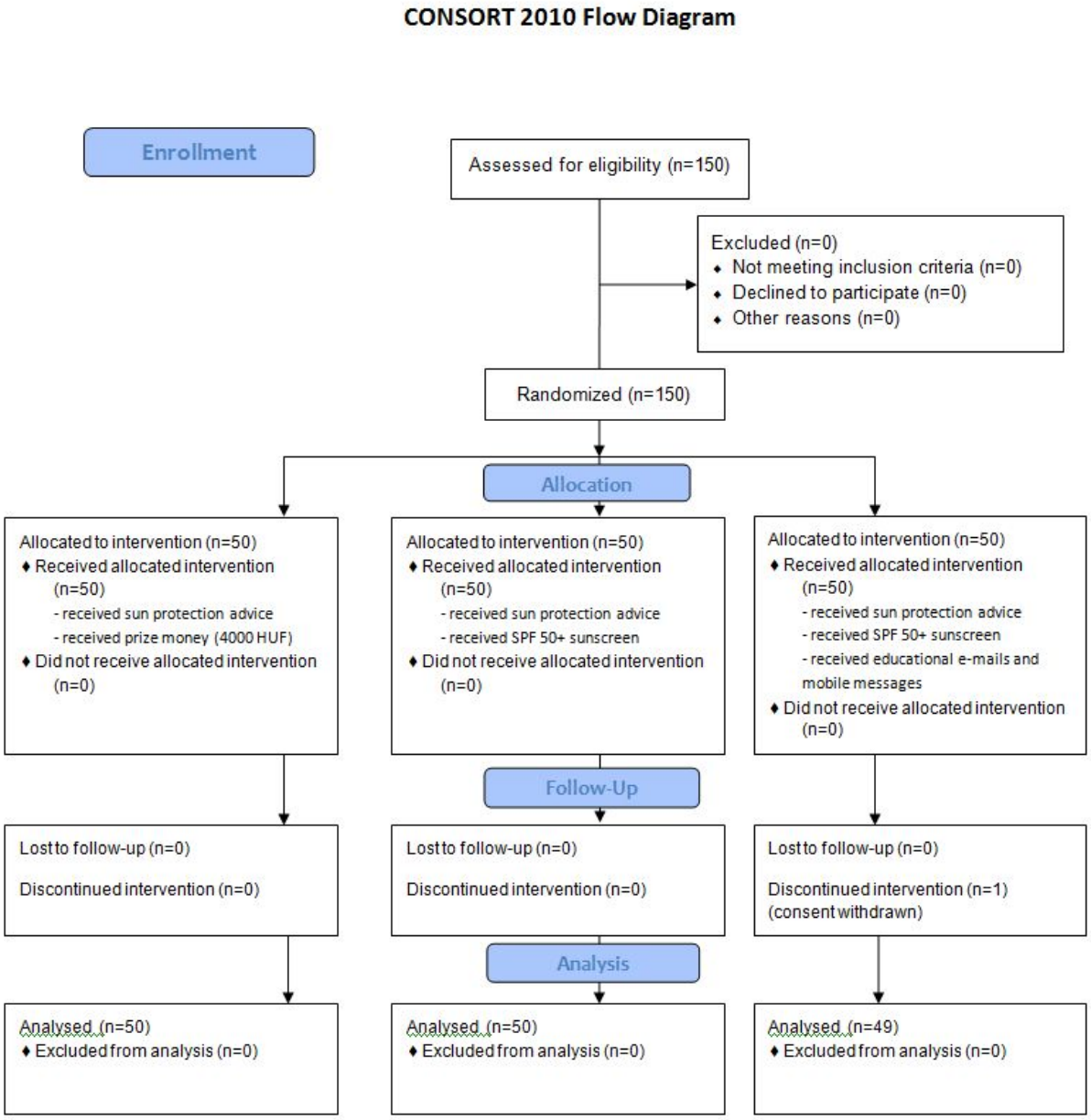

Figure 4. Flow of participants through each stage of the trial.

149 participants constituted a volunteer sample from the staff members of the Clinical Department of Dermatology and Allergology at the University of Szeged in Hungary and the members' relatives (Table 3).

		Group 1 (N=50) N (%)	Group 2 (N=50) N (%)	Group 3 (N=49) N (%)	All participants (N=149) N (%)
Gender	Male	12 (24%)	11 (22%)	20 (40,8%)	43 (28.9%)
	Female	38 (76%)	39 (78%)	29 (59,2%)	106 (71.1%)
Age	Mean±SD	35.98±11.29	39.73±9.35	35.07±9.59	36.94±10.25
Education	Primary school	1 (2%)	1 (2%)	1 (2%)	3 (2%)
	Secondary school	6 (12%)	4 (8%)	3 (6.1%)	13 (8.7%)
	High school	24 (48%)	23 (46%)	16 (32.7%)	63 (42.3%)
	University	19 (38%)	22 (44%)	29 (59.2%)	70 (47%)

Table 3. Descriptive characteristics of the participants (N=149).

There were no significant differences between the three groups in dimensions of sex, age and level of education. The inclusion criteria required participants to be 18 years or older, to own a cellular telephone with text-message features, and to know how to retrieve text messages. No exclusion criteria were specified. The randomisation process was carried out with sealed envelopes which contained group numbers, the individuals opened the envelopes, and the group numbers were revealed. The participants were randomised into three intervention groups. All three groups were given sun protection advice orally by a dermatologist at the beginning of the study. The dermatologist gave advice to the participants about how to use sunscreen properly and how to reduce sun exposure. A psychologist made adherence-related and psychological assessments, and the dermatologist made medical examinations throughout the study. Assessments were made at 0, 6 and 12 weeks. The trial was carried out from 1st June to 31st August in 2011. Group 1 (N = 50) received prize money (4000 HUF) at 12 weeks. Volunteers in Group 2 (N = 50) were given free, broad-spectrum, sun protection factor (SPF) 50+ sunscreen and were asked to apply it to themselves when they were in the sun for more than 15 min. Volunteers in Group 3 (N = 49) were also given SPF 50+ sunscreen, and they were sent minimally personalized educational e-mails and mobile messages every week of the study. All three groups received the same amount of property in the form of the prize money

and sunscreens, this was in order to avoid participants' vulnerability as mentioned by Good Clinical Practice (85). In our study, a dermatologist and a psychologist ensured the professional informing of the participants. The research protocol was approved by the Regional and Institutional Human Medical Biological Research Ethics Committee of the University of Szeged in Hungary. Our study was supported by La Roche-Posay Laboratoire Dermatologique/L'Oréal Magyarország Kozmetikai Kft. by providing sunscreens.

4.1.2. Electronic messages

In this study, we used cellular telephone text messaging and e-mails as tools to facilitate participants' frequency of sunscreen use and to reduce sun exposure. All of the messages were tailored to the individuals, in the form of personalizing (86), which meant greeting the participant by their full names at the beginning of each message. Group 3 (N = 49) received weekly electronic messages, Group 1 (N = 50) and Group 2 (N = 50) did not receive these messages. In summary, the members of Group 3 were sent 9 e-mail packages and 3 SMS messages in our study. In order to create the contents of our own electronic messages to improve the sun protection behaviour of the participants we used professional sources, for example sun protection tips given by the Le Tan Company (87), prevention strategies suggested by the Go Sun Smart Program (88) or good habits to take proper care of our skin provided by La Roche-Posay (89) (examples of our messages can be seen in Table 4). Our e-mail message packs consisted of 2 e-mails: a text containing tips about sun protection and a text detailing the level of the UV-radiation in Hungary on the day following the message was sent, based on the online database of the Hungarian Meteorological Service (90).

<table>
<tr><th>E-mail 1
(examples of texts contaning tips about sun protection)</th><th>E-mail 2
(an example of texts detailing the level of the UV-radiation in Hungary)</th><th>Mobile messages</th></tr>
<tr><td>Sunscreen should be applied in a thick layer before sunbathing. Reapply sunscreen often, particularly after swimming, toweling off (because it is easy to remove the sunscreen while toweling off).</td><td rowspan="3">”Dear (full name of participant),

The expected UV index for tomorrow in Hungary (2011.06.15.) will be 7.3, which is a very high UV radiation level. Expected sunburn time will be 17 minutes.

You can protect yourself from UV radiation when staying outdoors for long time: wear a sunhat, UV blocking sunglasses, long-sleeved and loose-fitting clothing, and use sunscreen lotion! Stay in the shade between 11 h and 15 h!

Expected sunburn time between 11 h and 15 h: approximately 15-20 min, less than 20 min for children, and approximately 30-40 minutes before 11 h and after 15 h.

Yours sincerely,
Henriette Ócsai,
Csanád Szabó,
research associates”</td><td>”Dear (abbreviated full name of participant), The use of sunscreen can easily become part of your daily routine by keeping it next to your other personal hygiene products. Yours sincerely, Ócsai H., Szabó Cs.”</td></tr>
<tr><td>Apply your sunscreen 30 minutes before going outside so that it can be absorbed by the skin, creating a protective barrier.</td><td></td></tr>
<tr><td>Apply a sufficient amount of sunscreen on all sun-exposed skin (most people don’t use enough sunscreen, therefore they don’t get enough protection)! Don't forget your ears, the nape of your neck and your feet.</td><td>”Dear (abbreviated full name of participant), Reapply sunscreen every 2 hours, and even more often when sweating, getting wet or if it’s windy. Yours sincerely, Ócsai H., Szabó Cs. ”</td></tr>
</table>

Table 4. Examples of the contents of our personalized educational e-mails and mobile messages sent to participants of Group 3 (N=49) every week of the study to improve sun protection behaviours.

4.1.3. Psychological dimensions related to sun protection

4.1.3. a) Behavioural change

The Stages of Change model shows that, for most individuals, a change in behaviour occurs gradually (91). Stage effects are also related to the amount of time spent in the sun (92) and the amount of sunscreen use (93). A technique useful in determining the stage of change of an individual is the Readiness to Change Ruler, which is a simple, straight line drawn on a paper that represents a continuum ranging from 0 ("not prepared to change") to 10 ("ready to change"). Patients are asked to mark on the line their current position in the behaviour change process. Physicians can enhance stages of change (91). To determine the stage of behavioural change we used the Readiness to Change Ruler (23) modified to measure the readiness to regularly use sunscreen at 0 and 12 weeks.

4.1.3. b) Health locus of control

"Health locus of control refers to a person's beliefs regarding where control over his/her health lies" (94, p. 534). Perceived behavioural control is associated with sun protection behaviour (34,95–97). Individuals may be resigned to their unhealthy behaviour because of previous failed efforts and no longer believe that they have control (91). Health locus of control was measured with Form C of the Multidimensional Health Locus Control (MHLC) scales (94) at the beginning of the study. Volunteers of the three study groups were asked to mark the degree of their agreement on a 6-point rating scale ranging from 1 (strongly disagree) to 6 (strongly agree). The MHLC scales have three subscales: internal (the extent to which a person believes his/her health is a function of his/her own behaviour), powerful others (belief that one's own health status is due to the actions of "powerful" people, such as one's doctors, family members, or friends) and chance (the belief that chance, fate or luck influences one's health) (94). Each subscale is composed of six items and the scores range from 6 to 36 for each of the three subscales.

4.1.3. c) Self-efficacy

Perceived Self-efficacy is the belief that one can perform a novel or difficult task, or cope with adversity in various domains of human functioning (98). Self-efficacy is related to performing sun protection behaviours (32, 95, 96, 99, 100). Individuals have varying levels of self-efficacy about being able to do all the behaviours necessary to protect their skin (95). Self-efficacy was measured with the General self-efficacy scale (101) at 0 and 12 weeks. Scoring is done by adding the responses made to the 10 items of the scale, yielding a cumulative score between 10 and 40.

4.1.4. Adherence to sun protection counselling

4.1.4. a) Interview questions

The more that people understand and agree with the underlying rationale for the expected behaviour, the greater the adherence (22). Intention to adhere to a certain behaviour has both motivational and knowledge aspects. Forgetfulness and carelessness are considered to be indicative of motivation, and understanding the long-term benefits of a particular health behaviour may be indicative of the knowledge aspect (23). Observing changes in motivation may be substantial and provide additional information about the impact of an intervention (24). Adherence to sunscreen use was measured with the Modified Morisky Scale (MMS) (23). The scale's motivation and knowledge domains' (both domains' scores range from 0 to 3) questions were modified for assessing adherence to sunscreen use (Table 5). By adding two extra questions we could assess adherence motivation domains of sunscreen use for both sunbathing and sun exposure for more than 15 min, and a total motivation score could also be calculated.

1. Do you ever forget to use your sunscreen when sunbathing?	Yes	No
2. Do you ever forget to use your sunscreen when staying in the sun for more than 15 minutes?	Yes	No
3. Are you careless at times about using your sunscreen when sunbathing?	Yes	No
4. Are you careless at times about using your sunscreen when staying in the sun for more than 15 minutes?	Yes	No
5. When you feel the positive effects of the sunscreen, do you sometimes stop using it?	Yes	No
6. Sometimes if you feel that the suncreen is ineffective, do you stop using it?	Yes	No
7. Do you know the long-term benefit of using your sunscreen?	Yes	No
8. Do you sometimes forget to get new sunscreen if you are out of sunscreen?	Yes	No

Table 5. The Modified Morisky Scale (34) with modified questions for assessing adherence to sunscreen use.

Adherence results for 12 weeks were evaluated by calculating the mean scores of adherence results of week 6 and week 12. The rate of adherence with sunscreen use was assessed using two interview questions (”In what percentage of the cases have you used sunscreen when you were sunbathing in the last 12 weeks?” ”In what percentage of the cases have you used sunscreen when you were in the sun for more than 15 min in the last 12 weeks?”) at 12 weeks.

4.1.4. b) Sun exposure diary

A sun exposure diary was also used in this study, which was a record of frequency of daily sun exposure, sunbathing, use of sunscreen, fish consumption and consumption of milk and eggs. Participants were instructed to complete the diary for the 12 weeks of the study. Participants were asked to report whether they were exposed to sun for more than 15 min for each day of the study, and if they were, how many minutes they were exposed to sun on that day. The participants were instructed to cross “yes” or “no” to questions about whether they were sunbathing (and for how many minutes), whether they used sunscreen, whether they consumed fish or milk and eggs (and the amount of the consumption) for each day of the study.

4.1.4. c) Melanin and erythema measurement

The Mexameter® MX 18 (Courage and Khazaka, Germany) is a very easy, quick and economical tool to measure the two components, mainly responsible for the colour of the skin: melanin and haemoglobin (erythema) (102). We used this device to assess changes in melanin and erythema levels which could strengthen the validity of the self-reported interview results of our adherence with sunscreen use. The analysed area was the volar forearm. The measurements of skin parameters were performed at 0 and 12 weeks.

4.1.5. Statistical analysis

Descriptive statistics, one-sample t-test, paired t-tests, chi-square tests, Pearson correlation coefficients and one-way ANOVA were calculated with SPSS 17.0 software.

4.2. Results

4.2.1. Electronic messages

The participants of Group 3 (N = 49) were sent three minimally personalized educational e-mails and mobile messages every week of the study, and their sun protection habits differed in certain dimensions. According to their sun exposure diary, members of Group 3 (3.21 ± 2.37) used sunscreens on more days per week ($F = 8.173$, $p < 0.05$) than participants of Group 1 (1.47 ± 1.91) and Group 2 (2.09 ± 1.85). Compared to Group 1 and 2, only Group 3 members' knowledge scores improved significantly ($t = -2.206$, $p = 0.033$) between week 6 (2.17 ± 0.62) and week 12 (2.33 ± 0.53) in the adherence to sunscreen use domain. We found a significant difference ($F = 3.44$, $p = 0.035$) in the rates of adherence to sunscreen use (given to the interview question "In what percentage of the cases have you used sunscreen when you were in the sun for more than 15 min in the last 12 weeks?"): Group 3 gave the highest rates (55.27 ± 33.59), which were followed by Group 2 (51.63 ± 34.11), and Group 1 answered with the lowest rates (37.86 ± 35.41) of sunscreen use (Figure 5).

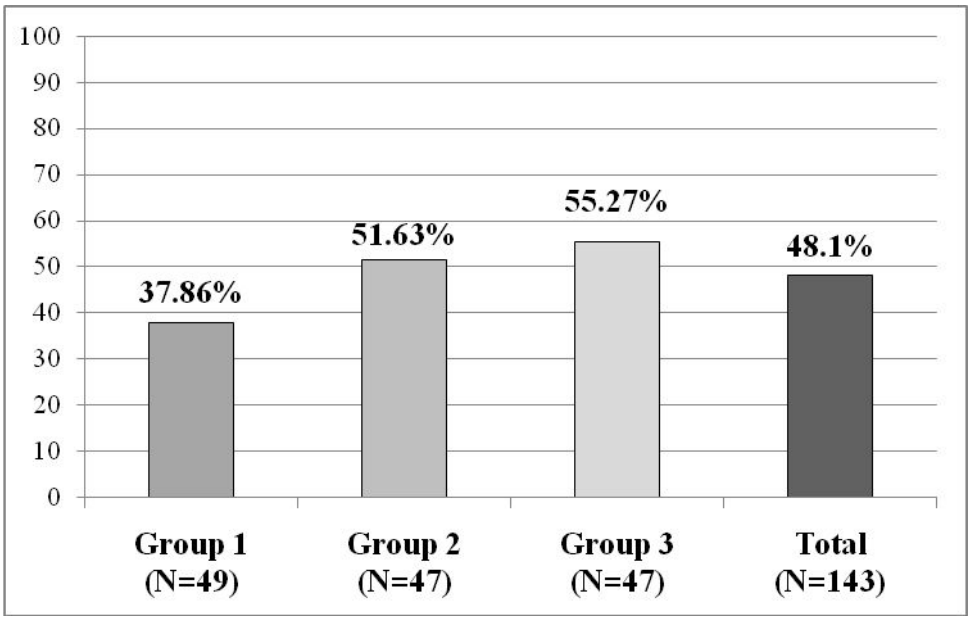

Figure 5. Rates of adherence to sunscreen use given by the three groups at week 12 to the interview question "In what percentage of the cases have you used sunscreen when you were in the sun for more than 15 minutes in the last 12 weeks?"

4.2.2. Psychological dimensions related to sun protection

4.2.2. a) Behavioural change

The results of the Readiness to Change Ruler (with possible scores ranging from 0 (“not prepared to change”) to 10 (“ready to change”)) modified to measure the readiness to regularly use sunscreen did not differ significantly at 0 (8.22 ± 2.26) and 12 weeks (8.025 ± 2.42).

4.2.2. b) Health locus of control

The results of the MHLC scales show that the participants’ internal health locus of control (25.54 ± 5.01) are the most responsible for their health or illness according to their own beliefs. This was followed by the importance of powerful others health locus of control (22.67 ± 4.65), and they ranked the role of chance health locus of control (13.59 ± 5.51) in the last place. Participants of our volunteer sample believed that their own behaviour influenced their health status mostly of the three mentioned factors. We compared our results to means of normative MHLC data of a healthy adult sample (n = 1287) (103). There were no significant differences between participants’ (25.54) and healthy adults’ (25.55) internal health locus of control scores. Participants’ (22.67) powerful others health locus of control scores were significantly higher ($t = 8.942$, $p < 0.01$) than healthy adults’ scores (19.16). Participants’ (13.59) powerful others health locus of control scores were significantly lower ($t = -5.619$, $p < 0.01$) than healthy adults’ scores (16.21).

4.2.2. c) Self-efficacy

The point scores of the General Self-efficacy scale did not differ significantly at 0 (30.65 ± 4.53) and 12 weeks (30.73 ± 4.25). We compared our results to means of normative General Self-efficacy data of a Hungarian sample (n = 158) (104). Participants’ (30.65) scores measured at 0 weeks were significantly higher ($t = 5.357$, $p < 0.01$) than members’ scores of the Hungarian sample (28.59). Participants’ (30.73) scores measured at 12 weeks were significantly higher ($t = 6.025$, $p < 0.01$) than members’ scores of the Hungarian sample

(28.59). These results suggest that the volunteers of our study had stronger beliefs that they can perform a novel or difficult task than the Hungarian sample.

4.2.3. Adherence to sun protection counselling

4.2.3. a) Interview questions

The results of the MMS scales calculating adherence to sunscreen use showed that the knowledge scores (2.23 ± 0.51) were significantly higher ($t = -5.173$, $p < 0.05$) than total motivation scores (1.8 ± 0.8) for the 12 weeks of the study. In the motivation dimension, scores for adherence to sunscreen use when sunbathing (2.16 ± 0.91) were significantly higher ($t = 8.544$, $p < 0.01$) than adherence to sunscreen use when being in the sun for more than 15 min (1.44 ± 0.92) for the 12 weeks of the study. Many participants were not sunbathing during the study, this reduced the number of participants whose adherence to sunscreen use when sunbathing (N = 92) and total motivation adherence (N = 90) could be calculated for 12 weeks. Unanswered items on the questionnaires reduced the number of participants whose adherence to sunscreen use when being in the sun for more than 15 min (N = 127) and knowledge scores (N = 122) could be calculated for 12 weeks. An adherence intention quadrant can be identified with the MMS scales, by the classification of participants into four domains: low motivation score (N = 18), high motivation score (N = 72), low knowledge score (N = 2) and high knowledge score (N = 120). There was a significant difference ($\chi 2 = 14.951$, $p < 0.01$) in the results of women and men in the motivation domain. In the women's results 60 of them had high scores and 7 of them had low scores, while in the men's results 11 of them had low scores and 12 of them had high scores in the motivation domain. Total motivation scores for adherence to sunscreen use improved at a nearly significant level ($t = -1.954$, $p = 0.054$) between week 6 (1.75 ± 0.89) and week 12 (1.9 ± 0.9). Adherence to sunscreen use when sunbathing did not differ significantly at week 6 (2.12 ± 1) and at week 12 (2.21 ± 0.99). However, motivation scores for adherence to sunscreen use when being in the sun for more than 15 min improved from week 6 (1.36 ± 1.07) to week 12 (1.52 ± 1.02) at a nearly significant level ($t = -1.783$, $p = 0.077$).

4.2.3. b) Sun exposure diary

According to results of the sun exposure diary participants were exposed to sun for more than 15 min on 65.55 ± 16.01 days of the 84 days of the study. They spent 64.34 ± 59.4 min per day exposed to sun. Participants were sunbathing on 8.94 ± 10.01 days of the 84 days of the study. They were sunbathing for 8.55 ± 10.11 min per day. Participants used sunscreen on 2.22 ± 2.16 days per week. They consumed fish on 0.75 ± 0.86 days per week and consumed milk and eggs on 12.05 ± 10.6 days per week. There were no significant differences between the three groups in their results of the sun exposure diary, except for the difference in frequency of sunscreen use, which is discussed in the 5.2.1. Electronic messages paragraph of the Results section.

4.2.3. c) Melanin and erythema measurement

Melanin values measured on the volar forearm were higher at week 12 (238.47 ± 64.39) than at week 0 (227.25 ± 62.39) at a nearly significant level ($t = -1.893$, $p = 0.061$). Erythema values measured on the volar forearm were significantly lower ($t = 2.13$, $p < 0.05$) at week 12 (280 ± 54.97) than at week 0 (290.87 ± 69.08). There were no significant differences between the three groups in changes of melanin levels and erythema levels in the 12 weeks of the study (Table 6).

	Melanin values at week 0 Mean±SD	Melanin values at week 12 Mean±SD	Erythema values at week 0 Mean±SD	Erythema values at week 12 Mean±SD
Group 1 (N=50)	237.69±58.19	250.27±55.65	292.75±65.44	288.83±54.39
Group 2 (N=50)	223.45±49.42	229.24±43.28	290.69±63.67	279.73±51.86
Group 3 (N=49)	220.48±76.68	234.17±89.9	289.13±78.77	268.17±58.12
All participants (N=149)	227.25±62.39	238.47±64.39	290.87±69.08	280±54.97

Table 6. Melanin and erythema values measured on the volar forearm at week 0 and week 12.

4.2.4.Correlations

To determine whether a statistically significant relationship was present between participants' results for the Readiness to Change Ruler (modified to measure the readiness to regularly use sunscreen) at 0 and 12 weeks and their other results, Pearson's correlation coefficients (r) were calculated (Table 7).

	Readiness to regularly use sunscreen at week 0	Readiness to regularly use sunscreen at week 12
Rate of adherence to sunscreen use – sunbathing (interview)	0.274**	0.546**
Rate of adherence to sunscreen use - sun exposure for more than 15 minutes (interview)		0.420**
Frequency of sunscreen use (sun exposure diary)	0.210*	0.292**
Frequency of daily sun exposure (sun exposure diary)		-0.230**
Total motivation scores for adherence to sunscreen use	0.277*	0.450**
Internal health locus of control	0.195*	

Table 7. Significant correlations between results of the Readiness to Change Ruler (34) (modified to measure the readiness to regularly use sunscreen) at week 0 and week 12 and other variables (Pearson correlation coefficients *p<0.05, **p<0.01).

We summarized statistically significant relationships between motivation and knowledge scores for adherence to sunscreen use for 12 weeks and other variables in Table 8. (In Table 8 these correlations are also indicated with sunbathing and sun exposure for 15 min dimensions of motivation scores for adherence, besides the total motivation scores.) Here we would like to highlight the following: there were significant negative correlations between results of total motivation scores for adherence to sunscreen use and both melanin and erythema values at week 0 at week 12.

	Motivation scores for adherence to sunscreen use during sunbathing (12 weeks)	Motivation scores for adherence to sunscreen use during sun exposure for more than 15 minutes (12 weeks)	Total motivation scores for adherence to sunscreen use (12 weeks)	Knowledge scores for adherence to sunscreen use (12 weeks)
Melanin values at week 0	-0.341**	-0.216*	-0.352**	
Melanin values at week 12	-0.225*	-0.225*	-0.261*	
Erythema values at week 0	-0.341**	-0.224*	-0.294**	
Erythema values at week 12	-0.363**	-0.311**	-0.362**	
Readiness to regularly use sunscreen (week 0)	0.273*	0.284**	0.277*	
Readiness to regularly use sunscreen (week 12)	0.467**	0.384**	0.450**	
Rate of adherence to sunscreen use - sunbathing (interview)	0.777**	0.467**	0.718**	0.436**
Rate of adherence to sunscreen use - sun exposure for more than 15 minutes (interview)	0.382**	0.564**	0.507**	0.240**
Powerful others health locus of control				-0.223*
Frequency of sunscreen use (sun exposure diary)	0.303**	0.444**	0.374**	0.187*
Frequency of fish consumption (sun exposure diary)				0.191*
Knowledge scores of adherence to sunscreen use (12 weeks)	0.520**	0.273**	0.466**	

Table 8. Significant correlations between total motivation and knowledge scores of adherence to sunscreen use for 12 weeks and other variables (Pearson correlation coefficients *p<0.05, **p<0.01).

5. Investigating psychological attributes of dermatology outpatients

5.1. Methods

5.1.1. Sample population

We conducted an investigator-initiated trial within the framework of a multicenter study entitled ’A European multicenter study on depression, anxiety, quality of life and attachment among adult patients with common skin disorders’ (105) in cooperation with members of the European Society of Dermatology and Psychiatry. The Hungarian study had an observational case-control design. There were 414 participants, 275 adult outpatients and 139 healthy volunteer participants were assessed at the Clinical Department of Dermatology and Allergology at the University of Szeged in Hungary (Table 9). The patients’ most frequent skin diseases were: psoriasis (15%), venous ulcer (15%), atopic dermatitis (9%), lymphoedema (9%).

		Patients (N=275) N (%)	Controls (N=139) N (%)	All participants (N=414) N (%)
Gender	Male	104 (38%)	34 (24%)	138 (33%)
	Female	169 (61%)	104 (75%)	273 (66%)
Age	Mean±SD	49.35±18.01	39.53±12.01	45.95±16.87
Education	Primary school	57 (21%)	14 (10%)	71 (17%)
	Secondary school	117 (42%)	53 (38%)	170 (41%)
	High school	49 (18%)	31 (22%)	80 (19%)
	University	51 (18%)	41 (30%)	92 (22%)

Table 9. Descriptive characteristics of the participants (N=414).

The inclusion criteria required participants to be 18 years or older, being able to read and write the local language, and not suffering from severe psychosis, to reflect the majority of

patients and avoid any overestimation of any possible co-occurrence between mental and skin disease. A psychologist ensured the professional informing of the participants. Each participant completed a questionnaire and gave it to the consultant before being examined clinically. Each patient was examined by a dermatologist who recorded the diagnosis; if required a secondary diagnosis was recorded. The presence of other physical conditions was recorded: cardio-vascular disease, chronic respiratory disease, diabetes, and rheumatologic disease. The volunteer sample were recruited from among the staff members of the Clinical Department of Dermatology and Allergology at the University of Szeged in Hungary and the members' relatives. Only those willing to participate were included. Employees with a skin condition were excluded. The employees were informed about the study and invited to answer the questionnaire after giving written consent. The subjects were not examined. Information on treated co-morbidities was self-reported. All participants were informed and gave signed consent.

5.1.2. Measuring instruments

Attachment style was measured with the Adult Attachment Scale (AAS) (66), distinguishing secure and insecure attachment styles. Besides describing the styles, point scores (ranging from 6 to 30) of three attachment dimensions can also be calculated with the AAS: Closeness (comfort with closeness), Dependency (capacity to depend on others) and Anxiety in relationships (fear of being abandoned).
Patient satisfaction with the dermatologist was assessed with a 11-degree scale (0=not satisfied at all; 10=extremely satisfied).
Quality of life was measured using the Dermatology Life Quality Index (DLQI) (106), from which a total score is calculated (ranging from 0 to 30). A high DLQI-value implies severe detriment to quality of life because of the skin disease.
Health status was assessed using the EQ-5D-3L (107), which consists of two parts: the EQ-5D descriptive system and the EQ visual analogue scale. The EQ-5D-3L descriptive system includes the following five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression (each dimension has 3 levels: no problems, some problems, extreme problems). The EQ VAS records participants' self-rated health on a vertical, visual analogue 100-degree scale (0=„worst imaginable health state"; 100=„best imaginable health state").

Anxiety and depression were measured with The Hospital Anxiety and Depression Scale (HADS) (108). The instruments' depression and anxiety subscales' point scores range from 0 to 21. For both subscales a score from 0 to 7 is considered a normal case, from 8 to 10 a borderline case, and from 11 to 21 a case in need of further examination or treatment.

5.2. Results

5.2.1. Health status

Health status results measured with the EQ-5D scale can be seen in Table 10. We generated new variables from result variables of the five EQ-5D dimensions that classify scores on a two-point scale (1=no problems; 2=some or extreme problems) instead of a three-point scale (1=no problems; 2=some problems; 3=extreme problems). We calculated health status differences between patients and controls with the use of the two-point scale variables. In patients' results, there was a higher rate of reporting some or extreme problems than controls in the five dimensions of the EQ-5D scale: mobility (chi value=30.894, $p<0.01$), self-care (chi value=10.963, $p<0.01$), usual activities (chi value=31.467, $p<0.01$), pain/discomfort (chi value=37.943, $p<0.01$) and anxiety/depression (chi value=9.799, $p<0.01$).

EQ-5D dimension		Patients (N=275) N (%)	Controls (N=139) N (%)	All participants (N=414) N (%)
Mobility	no problems	129 (47%)	117 (84%)	246 (59%)
	some problems	90 (33%)	18 (13%)	108 (26%)
	extreme problems	1 (0,5%)	0 (0%)	1 (0,2%)
Self-care	no problems	189 (69%)	130 (93%)	319 (77%)
	some problems	27 (10%)	4 (3%)	31 (7%)
	extreme problems	3 (1%)	0 (0%)	3 (0,5%)
Usual activities	no problems	141 (51%)	123 (88%)	264 (64%)
	some problems	72 (26%)	12 (9%)	84 (20%)
	extreme problems	6 (2%)	0 (0%)	6 (1,5%)
Pain/discomfort	no problems	96 (35%)	104 (75%)	200 (48%)
	some problems	114 (41%)	30 (21%)	144 (35%)
	extreme problems	10 (4%)	1 (1%)	11 (3%)
Anxiety/depression	no problems	111 (40%)	91 (65%)	202 (49%)
	some problems	96 (35%)	41 (30%)	137 (33%)
	extreme problems	11 (4%)	2 (1%)	13 (3%)

Table 10. Health status results of the participants (N=414) measured along the five dimensions of the EQ-5D scale.

Participants self-rated health results on the EQ VAS (visual analogue 100-degree scale) are shown in Figure 6. Patients reported significantly lower ($p<0.01$, $t=-6.005$) point scores on the scale than controls when asked about their health status.

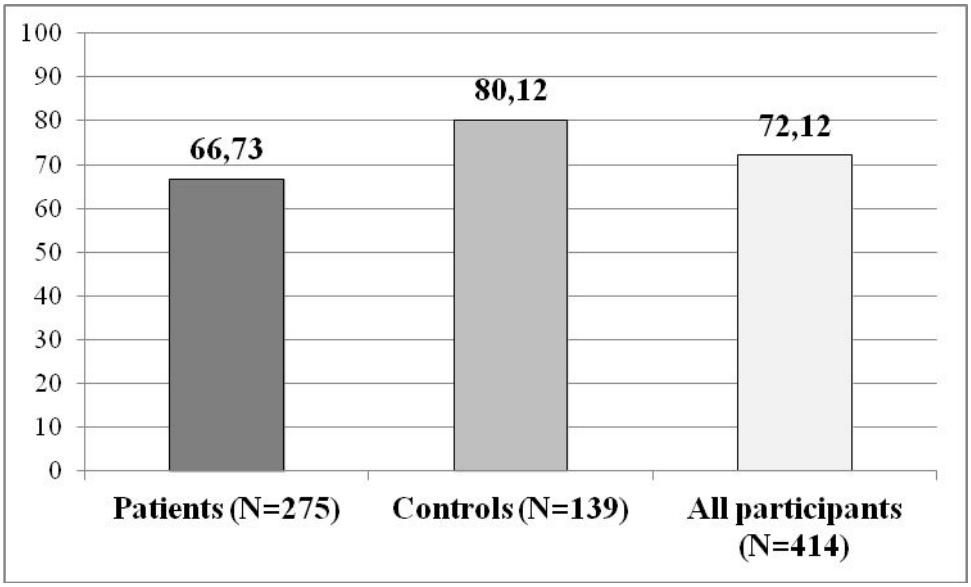

Figure 6. Health status results of the participants with means of the scores (N=414) measured with the EQ VAS (a visual analogue 100-degree scale (0=„worst imaginable health state"; 100=„best imaginable health state")).

5.2.2. Satisfaction with the dermatologist

51 out of 275 patients didn't give an answer to the satisfaction with the dermatologist scale, which reduced the number of patients whose satisfaction scores could be calculated (N=224). Patients' average satisfaction scores were 9.29±1.69. Frequency of the scores can be seen in Figure 7.

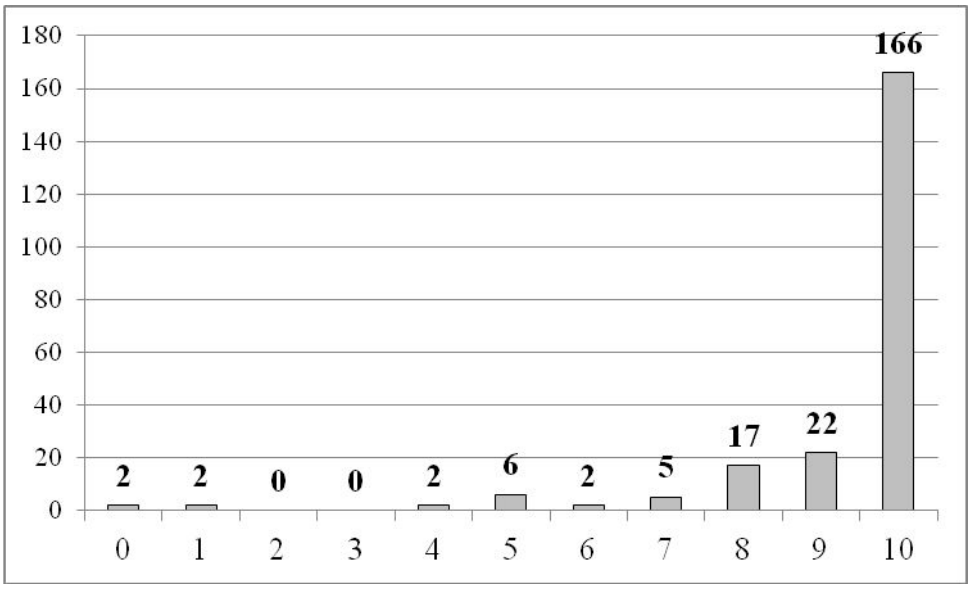

Figure 7. Satisfaction with the dermatologist results of the patients with frequency of the scores (N=224) assessed with a 11-degree scale (0=not satisfied at all; 10=extremely satisfied).

5.2.3. Quality of life

The mean value of the quality of life scores of the patients measured with the DLQI was 6,99±7,22 (ranging from 0 to 30). 78 patients (28.4%) reported that their skin disease had no effect on their quality of life, 68 (24.7%) reported a small effect, 56 (20.4%) reported a moderate effect, 56 (20.4%) reported a very large effect and 17 (6.2%) reported an extreme large effect.

5.2.4. Anxiety and depression

Patients' anxiety scores (5.93±4.59) were significantly higher ($p<0.05$, $t=2.537$) than controls' (4.9±3.22) measured with the HADS (Figure 8). Patients (5.7±4.59) also had higher scores ($p<0.05$, $t=2.454$) on the depression scale of the HADS than controls (4.71±3.13).

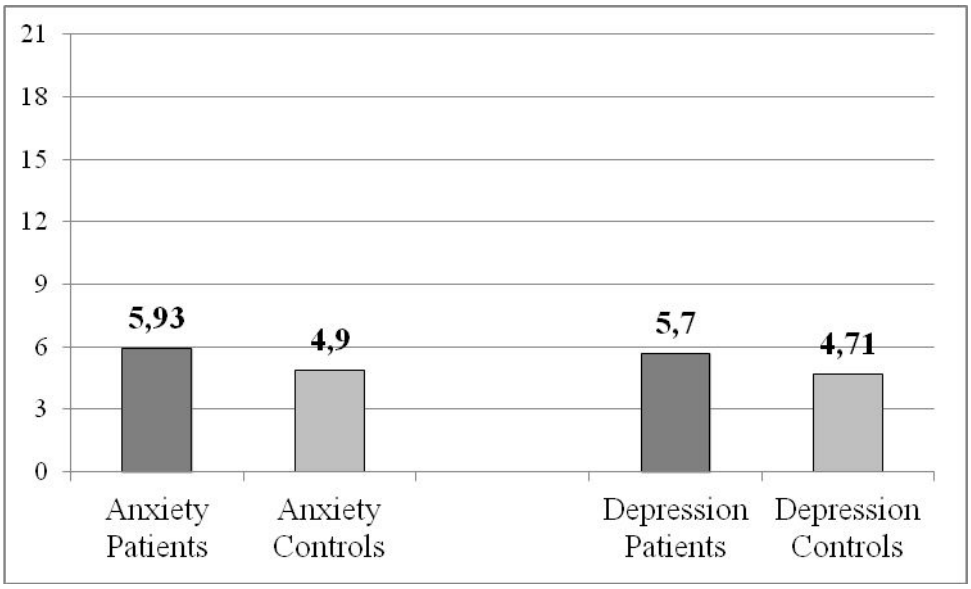

Figure 8. Anxiety and depression results of the participants (N=414) with means of the scores measured with the HADS (scores range from 0 to 21).

For the anxiety and depression subscales of the HADS a score from 0 to 7 is considered a normal case, from 8 to 10 a borderline case, and from 11 to 21 a case in need of further examination or treatment. In patients' results there was a higher rate of belonging to the borderline case and case groups along point scores of the anxiety ($p<0.01$, chi value=9.979) and depression ($p<0.05$, chi value=9.001) subscales than controls. Further details of HADS results of the participants are shown in Table 11.

HADS subscales		Patients (N=275) N (%)	Controls (N=139) N (%)	All participants (N=414) N (%)
Anxiety subscale	non-case	165 (60%)	107 (77%)	272 (66%)
	borderline case	40 (14%)	15 (11%)	55 (13%)
	case	38 (14%)	8 (6%)	46 (11%)
Depression subscale	non-case	168 (61%)	108 (78%)	276 (67%)
	borderline case	34 (12%)	12 (9%)	46 (11%)
	case	41 (15%)	10 (7%)	51 (12%)

Table 11. Anxiety and depression results of the participants (N=414) measured with the HADS.

5.2.5. Attachment

With the use of the AAS we could calculate results of patients and controls along three dimensions of attachment, and we were able to identify each participants' own attachment style. Attachment dimension results of the participants can be seen in Figure 9. Patients' attachment scores (18.56±3.88) were significantly higher ($t=2.23$, $p<0.05$) than controls' (17.59±3.81) among the Dependency dimension. Patients' results (19.95±3.56) were lower at a nearly significant level ($t=-1.783$, $p=0.076$) than healthy volunteers' (20.69±3.76) among the Closeness dimension. Patients' (12.86±4.35) and controls' (12.75±3.95) scores didn't differ significantly among the Anxiety in relationships dimension.

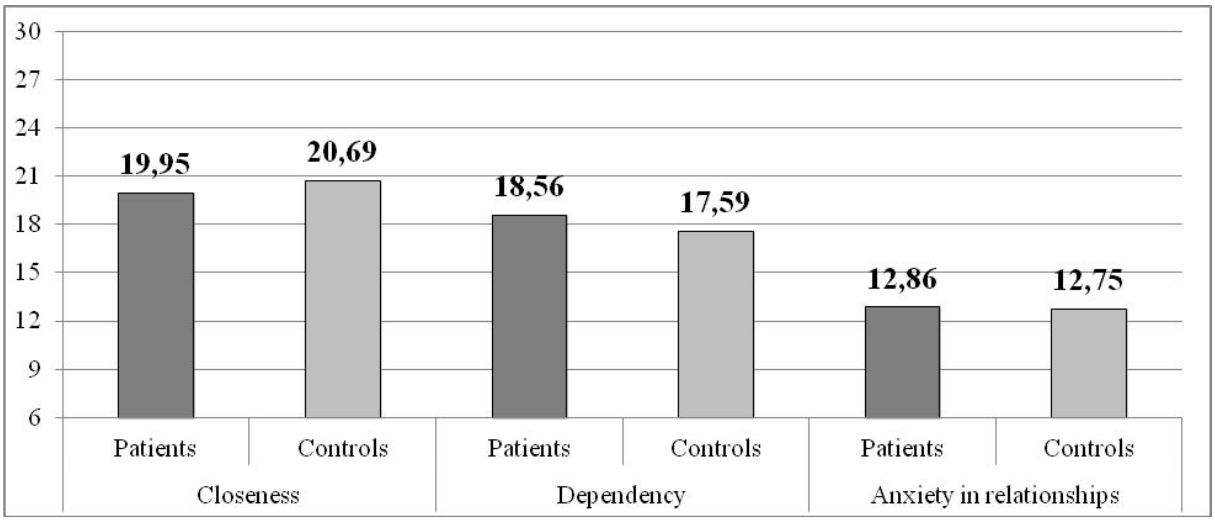

Figure 9. Results of the participants with means of the scores (N=414) of three attachment dimensions measured with the AAS (scores range from 6 to 30).

Attachment style results of the participants can be seen in Figure 10. We identified each participant's own attachment style based on their point scores given to items of the AAS. There were no significant differences between patients and controls among frequencies of the four attachment styles (secure, preoccupied, dismissing, fearful).

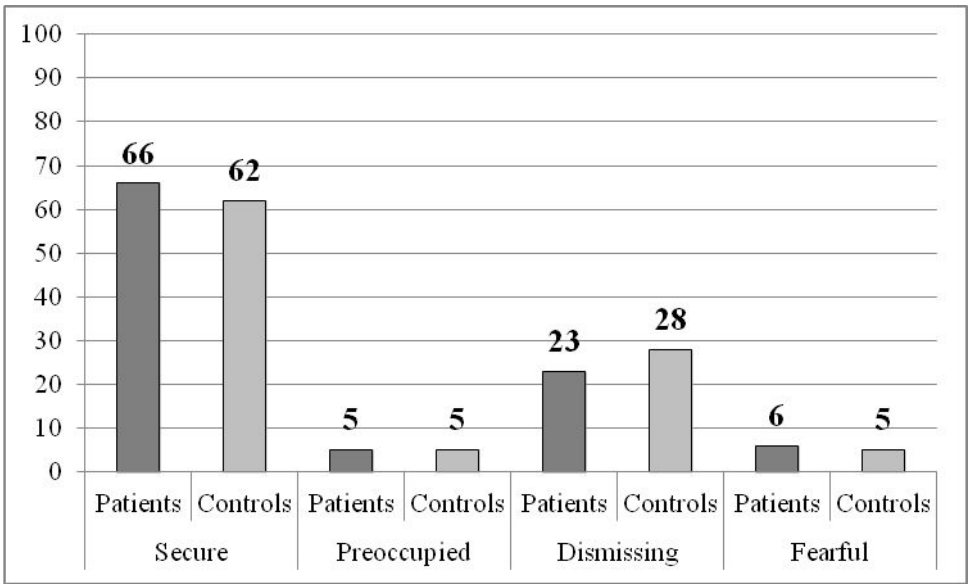

Figure 10. Frequencies (percentage in %) of four attachment styles among the participants (N=414) measured with the AAS.

AAS point scores make it possible to divide participants into two groups: who have secure attachment and who have insecure attachment styles. There were no significant differences between patients and controls among frequencies of the two attachment styles (Figure 11).

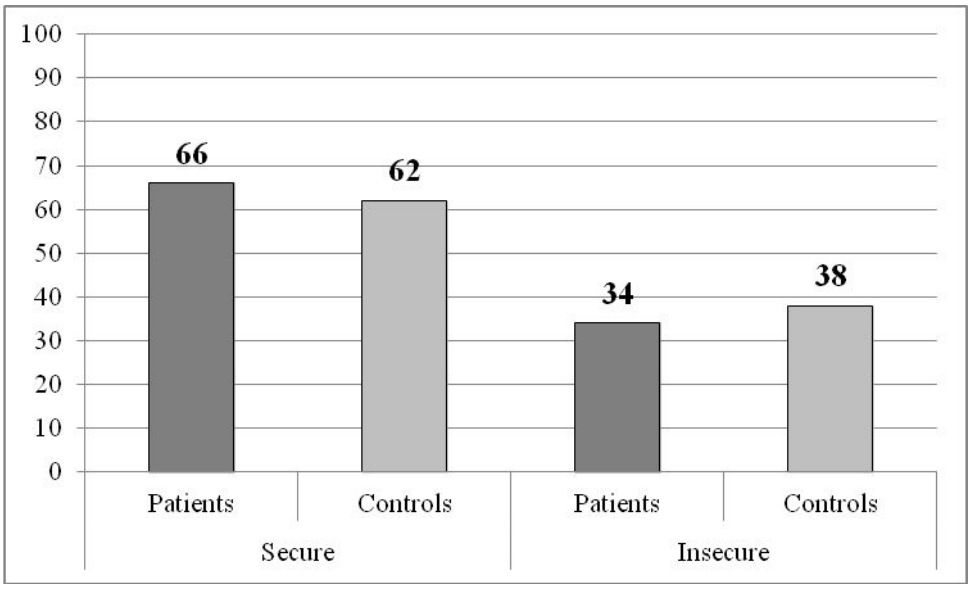

Figure 11. Frequencies (percentage in %) of secure and insecure attachment styles among the participants (N=414) measured with the AAS.

5.2.6. Correlations

Pearson's correlation coefficients (r) were calculated to determine whether a statistically significant relationship was present between participants' results. We summarized statistically significant relationships between point scores of patients in Table 12. It is important to mention that in analysing the quality of life results a high DLQI-value implies severe detriment to quality of life because of the skin disease. Here we would like to highlight the following: there were significant negative correlations between health status scores and the following variables' results: anxiety, depression, quality of life and anxiety in relationships; and health status was positively related to scores of closeness and dependency dimensions of attachment.

	Health status (EQ VAS)	Quality of life (DLQI)	Anxiety (HADS)	Depression (HADS)	Closeness (AAS)	Dependency (AAS)	Anxiety in relationships (AAS)
Health status (EQ VAS)		-0.552**	-0.525**	-0.577**	0.355**	0.295**	-0.333**
Quality of life (DLQI)	-0.552**		0,545**	0,471**		-0,153*	0,195**
Anxiety (HADS)	-0,525**	0,545**		0,689**	-0,334**	-0,333**	0,405**
Depression (HADS)	-0,577**	0,471**	0,689**		-0,405**	-0,379**	0,331**
Closeness (AAS)	0,355**		-0,334**	-0,405**		0,340**	-0,341**
Dependency (AAS)	0,295**	-0,153*	-0,333**	-0,379**	0,340**		-0,354**
Anxiety in relationships (AAS)	-0,333**	0,195**	0,405**	0,331**	-0,341**	-0,354**	

Table 12. Significant correlations between patients' (N=275) variable scores (Pearson correlation coefficients *p<0.05, **p<0.01).

Correlations between controls' result variables can be seen in Table 13.

	Health status (EQ VAS)	Anxiety (HADS)	Depression (HADS)	Closeness (AAS)	Dependency (AAS)	Anxiety in relationships (AAS)
Health status (EQ VAS)		-0,365**	-0,405**	0,218*		
Anxiety (HADS)	-0,365**		0,502**			0,209*
Depression (HADS)	-0,405**	0,502**		-0,212*		
Closeness (AAS)	0,218*		-0,212*		0,245**	
Dependency (AAS)				0,245**		
Anxiety in relationships (AAS)		0,209*				

Table 13. Significant correlations between controls' (N=139) variable scores (Pearson correlation coefficients *p<0.05, **p<0.01).

6. Discussion

As it is reflected in the results of the interviews in the first step of our study, dermatologists found good doctor-patient relationship, information from the doctor, background information, and the patient's financial state as the strongest determinants of patient adherence. Their patients found understandable communication and information from the doctor to be particularly essential in establishing adherence, but in contrast to their doctors, they did not consider background information, and their financial state as strong determinants. The difference is very sharp, since patients ranked these 'external resource' items in the last place. These results suggest that compared to the individual patient's subjective view of his or her own situation, dermatologists as professionals look at the problem through a different lens,

based on their sociodemographic knowledge of many patients. Another explanation may be, and it has been strengthened by further results, that patients' representations about adherence are more focused on individual traits, and the relationship than on contextual and social issues. Also, it was interesting to see that in the patients' ranking, the importance of information from the doctor and personality factors preceded the doctor-patient relationship. We wanted to understand the deeper structure of these results, so we used multidimensional scaling, which is based on a principle that people make judgements based on their mind's hidden, or latent, inner processes. The spatial representation of the multidimensional scaling method presents the possibility that these differences are not primarily disparities of how important these factors are, but rather indicate the role of these factors in adherence.

The proximal position and inner structure of the content group 'Doctor's personal traits and the relationship' suggest that in patients' representations, good doctor-patient relationship mostly depends on the doctor's personality and empathy. 'Patient's personality and information' as a distinct and highly condensed content group in its inner structure refers to the outstanding role of patient's personal characteristics and the support of clear-cut, easy-to follow information. It may suggest that patients need more information, but also that they think that the doctor's main task is proper dissemination of information.

Older patients rated 'good doctor-patient relationship', 'doctor's empathy", and "understandable communication' on the attitude scales as more important factors of adherence than younger participants. This suggests that special attention is needed in communicating and building relationships with elderly patients (109). Although there is no clear evidence that older people would be more nonadherent than members of other age groups (110), the relatively strong correlations of age with these categories imply that the improvement of communication and the relationship could help them in becoming more adherent.

From the standpoint of conditional complementarity, quantification seems to give additional value to qualitative data only when converting it into quantitative form (i.e., nominal-, ordinal-, interval-level data) allows more meaning to be extracted from it and that form allows researchers to answer important questions or test hypotheses that could be convincingly answered or tested no other way. Maximizing the numerical precision of qualitative data and their compatibility with quantitative data seems to enhance the value of qualitative data (111).

In the second step of our study participants found internal health locus of control factors (e.g. their own behaviour) the most responsible for their health or illness, which is in line with

conclusions of Pertl et al. (32), who suggest that people are aware that it is up to them to use sunscreen and believe that doing so is easily within their control. This may also be explained by the fact that all of the participants were volunteers from the staff members of the Clinical Department and their relatives, which gives them knowledge about and insight into the advantages of sunscreen use. Nevertheless, controllability did not predict intention to use sunscreen, and this result is similar to the conclusions of Myers and Horswill (97).

In contrast to the results of Jackson and Aiken (112), general self-efficacy (the belief that one can cope with adversity in various domains of human functioning) did not emerge as a significant predictor of intention to use sunscreen. Though professionals' results differ in this area of research, for example the Go Sun Smart project arranged by Andersen et al. (35) had no effect on the participants' self-efficacy beliefs. Also, improving knowledge of a certain subject related to one's health does not necessarily improve self-efficacy to use that newly achieved knowledge (22).

Investigation of stages of change can be advantageous in studies, because even if a behavioural change is not observable, intention might be influenced (113). According to results of the modified version of The Readiness to Change Ruler, the readiness of the participants to regularly use sunscreen was high at both the first and the last week of the study. This suggests that all three groups' members already had efficient sun protection habits or they were ready to change those to even more frequent sunscreen use. These results are very favourable for the participants, because individuals who are in a higher stage for one behaviour are more likely to be in a higher stage for another health-promoting behaviour as well (114).

Results of adherence to sunscreen use revealed that participants' knowledge scores were higher than their motivation scores, which is in line with the results of Thomas-Gavelan et al. (115), because having an acceptable degree of awareness does not guarantee the use of sufficient photoprotection measures in daily life.

Our educational messages had two main goals: to facilitate the frequency of participants' sunscreen use and to reduce sun exposure. Total motivation scores to use sunscreen were higher at the end of the study than at 6 weeks, this may be the positive effect of our intervention. Measurements of melanin and erythema scores might also confirm the positive impact of our messages, because the higher the motivation scores for adherence, the lower the erythema- and melanin- index, indicating less time staying in the sun. We found greater improvement in motivation scores for adherence to sunscreen use during sun exposure for

more than 15 min than during sunbathing. In women's results, there was a higher rate of belonging in the high motivation adherence domain than in men's results.
Readiness to change and adherence to sunscreen use (both in the motivation and knowledge domains) results showed significant correlations with many aspects of sun protection behaviours, thus they proved to be essential variables of sun protection habits.
Participants who received our personalized e-mails and text messages used sunscreens more often (according to sun exposure diaries and interview results) and their knowledge score improved significantly in the adherence to sunscreen use domain as compared to participants who did not receive messages. When comparing adherence results to the degree of sun protection, it is important to mention that although there is no gold standard for measuring sun protective behaviour, self-reports, prospective diaries, and observation techniques show small positive correlations (25). Based on the interview answers, Group 3 (the intervention group) reported overall 3.64% more sunscreen use (when they were in the sun for more than 15 min) than Group 2, and 17.41% more sunscreen use than Group 1. These results are in line with a meta-analysis of studies on interventions to improve medication adherence, which revealed an increase in adherence of 4–11% (116). Using electronic messages offers an effective method for improving adherence to sunscreen application. These tools may also be effective in helping individuals adhere to medication regimens, as well as promoting preventive health behaviours (46). According to Armstrong et al. (46), the introduction of a program that incorporates text-message reminders to a large population may be an innovative preventive health measure against the development of skin cancer.

According to results of the third step of our study chronic skin patients' anxiety and depression scores were significantly higher than controls' measured with the HADS. Our results are in line with the work of Picardi et al. (50), who found that patients with chronic skin diseases showed higher levels of depressive symptoms, general anxiety and social anxiety than healthy people. They suggest that their findings indicate the necessity for assessment of these emotional problems on a regular basis (50). Counselling or brief psychotherapy, as well as the use of psychotropic drugs may be valuable for dermatological patients who have clinically relevant symptoms of depression or anxiety, even in cases where these symptoms are of a reactive nature (52).
There was a higher rate of reporting some or extreme problems in patients' results than controls in the five dimensions of the EQ-5D scale: mobility, self-care, usual activities,

pain/discomfort and anxiety/depression. Patients reported significantly lower point scores on the EQ VAS than controls when when they were asked to indicate their health status with the visual analogue 100-degree scale. This difference in health status ratings may be the effect that skin diseases had on the participating patients' quality of life. 28.4% reported that their skin disease had no effect on their quality of life, 24.7% reported a small effect, 20.4% reported a moderate effect, 20.4% reported a very large effect and 6.2% reported an extreme large effect.

Our attachment results show that Hungarian chronic skin outpatients were more able to depend on others, were less comfortable with closeness and intimacy and experienced similar rates of anxiety in relationships as the control groups' members. There were no significant differences between patients and controls among frequencies of secure and insecure attachment styles. In patients' results 66% showed secure and 34% showed insecure attachment styles. In a psychotherapy session it is likely that patients who have the capacity to quickly form a secure attachment to their therapist seem more willing than patiens with insecure attachment to engage in deep exploration of their issues, form an interpersonal bond with their therapist, and collaborate on the goals and tasks of therapy (117). Knowledge of this phenomenon may be useful for professionals who would like to explore psychosocial stressors of chronic skin patients. This is relevant in dermatological care beacuse psychological stress plays an important role in in triggering or exacerbating chronic skin diseases (49). How can attachment styles and attitudes affect patients' consultations with a dermatologist? A scale was developed to assess the psychotherapy relationship from the perspective of attachment theory, The Client Attachment to Therapist Scale or CATS (118). It is a central feature of the therapeutic relationship that if the patient perceives a secure attachment with the therapist it enables him to feel safe to explore their inner conflicts without feeling ashamed or humiliated and allows him to experience the therapist as responsive and understanding (119). The CATS showed good concurrent validity supported by the correlations with the Adult Attachment Scale (119), which instrument we used in our studies. Therefore it is conceivable that the attachment results of Hungarian chronic skin patients in our study have an effect on their consultations with their dermatologists in the ways of secure or insecure attachments to their caregivers.

Assessing and improving patient satisfaction is important as it may lead to improved adherence with treatment and consequently to optimal health outcomes (120). In our results dermatological outpatients reported high levels of satisfaction with their dermatologists. 74%

of the patients that gave an answer to the scale were extremely satisfied with their dermatologists.

In patients' results increased scores of health status were associated with lower depression and anxiety scores, increased quality of life, lower anxiety in relationships, and increased scores of closeness and dependency dimensions of attachment. Patients' increased quality of life was associated with increased health status scores, lower depression and anxiety scores, lower anxiety in relationships, and increased scores of dependency dimension of attachment. Our results are in line with the conclusions of Dieris-Hirche et al. (71), who found significant correlations between attachment dimension and quality of life scores of atopic dermatitis patients.

These results draw attention to the need of an integrated assessment of dermatological outpatients, described by Vari et al. (121), which uses instruments of the fields of dermatology, psychology and psychiatry.

7. Conclusion and implications for practice

7.1. Conclusion

The aim of the first step of our study and the choice of the mixed methods approach were to explore the similarities and discrepancies of the representations of doctors and patients. It is important to emphasize that the content groups we identified by multidimensional scaling represent conscious components of the cognitive structure of representations, but also refer to more hidden, unintentional belief systems or automatic thoughts. Therefore, it is important to further examine these representations of adherence, and to improve communication in order to make the 'contract' with the patient clear and fit the expectations of both sides. This may facilitate shared decision-making between doctors and patients. This is an especially important issue in making the best decisions and personally tailored treatment plans that will be reliably followed over the long term by patients with chronic conditions. It is worth applying such communication and intervention methods which help health-care providers and their patients to mutually recognize their views of adherence, together with the arising difficulties and expectations, which play an essential role in the establishment of adherence.

The advantages of our intervention demonstrated in the second step of our study are that it is a cost-effective method and it can easily be implemented at worksites (particularly the use of the Readiness to Change Ruler's modified version to measure the readiness to regularly use sunscreen, which takes a very brief time, but its scores correlated with many aspects of sun protection behaviour). Successful modification of one behavioural domain can affect changes in the other domain, possibly by transfer (114, 122), and in our study, improving sun protection behaviour may have effected other examined habits, for example paying more attention to healthy food consumption.

Our results of the third step of our study showed many psychological attributes of Hungarian dermatological outpatients. Patients' anxiety and depression scores were significantly higher than controls. Patients reported significantly lower point scores on the EQ VAS than controls when they were asked to indicate their health status with a visual analogue scale. Our attachment results showed that patients were more able to depend on others, were less comfortable with closeness and intimacy and experienced similar rates of anxiety in relationships as the control groups' members. Our results suggest that symptoms of anxiety and depression, attachment, quality of life and health status are closely intertwined psychological attributes of dermatological outpatients.

7.2. Implications for practice

In dermatological adherence research dermatologists' opinions about factors of adherence are often overlooked. With our results dermatologists' and their patients' views of important factors of adherence became comparable, and mutual representations of adherence could be identified.

Readiness to change scores correlated with many aspects of sun protection behaviour, therefore the measurement of this construct proved to be useful at examining health behaviours. We measure readiness to change this year in a Hungarian public health survey based on our findings. Our electronic messages (e-mail and mobile messages) used in the second step of our study could be an advantageous tool in programs promoting sunscreen use.

Our results of the third step of our study describe various psychological attributes of dermatological outpatients. Attachment has an important part in psychological intervention, and our results indicate which dimensions of attachment need special attention when working with chronic skin outpatients. Furthermore, attachment styles of patients can influence their

consultations with their dermatologists, and our assessments can prove helpful in identifying the mechanisms of these effects.

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