ORIGINAL RESEARCH ORİJİNAL ARAŞTIRMA

Is the Dermatology Life Quality Index Adequately Measure Quality of Life in Turkish Psoriatic Patients: A Rasch Analysis Study

Dermatoloji Yaşam Kalitesi İndeksi Türk Psöriyazis Hastalarında Yaşam Kalitesini Yeterli Ölçüyor mu: Rasch Analizi Çalışması

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ABSTRACT Objective: The Dermatology Life Quality Index (DLQI) is a widely used quality of life scale in many dermatological diseases such as psoriasis. Recently, there have been discussions about the inadequacy of DLQI in the evaluation of dermatological diseases. This study aimed to examine the psychometric properties of the DLQI scale, in a sample of Turkish psoriatic patients. **Material and Methods:** A total of 979 psoriasis patients, 509 male (52.4%) and 470 female (47.6%), who filled out the DLQI questionnaire between April 2013 and January 2019, were included in the study. This was a retrospective study conducted. Data were analyzed using the Rasch model to obtain meaningful scores for the DLQI. **Results:** According to the Rasch analysis, the measurement ability of the ninth question was found to be insufficient in general. It has been determined that DLQI scale items can vary in measuring ability according to age, gender and marital status are insufficient. In addition, it was found that the assumption that the answers in Likert-type expressions in the DLQI scale are equidistant from each other is not correct. **Conclusion:** DLQI seems to have a poor fit with the Rasch model for Turkish psoriasis patients. In addition, DLQI may vary according to age, gender and marital status. Therefore, it is recommended to develop new scales in the evaluation of psoriasis patients.

Keywords: Psoriasis; Dermatology Life Quality Index; Rasch analysis

ÖZET Amaç: Dermatoloji Yaşam Kalitesi İndeksi [Dermatology Life Quality Index (DLQI)], psöriyazis hastalığı gibi birçok dermatolojik hastalıkta yaygın olarak kullanılan bir yaşam kalitesi ölçeğidir. Son zamanlarda DLQI'nın dermatolojik hastalıkların değerlendirmesindeki yetersizliği tartışılmaktadır. Bu çalışmada, DLQI ölçeğinin psikometrik özelliklerinin Türk psöriyatik hasta örneğinde incelenmesi amaçlanmıştır. **Gereç ve Yöntemler:** Nisan 2013-Ocak 2019 tarihleri arasında DLQI anketini dolduran 509 (%52,4) erkek ve 470 (%47,6) kadın olmak üzere toplam 979 psöriyazis hastası çalışmaya dâhil edilmiştir. Bu retrospektif olarak yapılmış bir çalışmadır. Veriler, DLQI için anlamlı puanlar elde etmek üzere Rasch modeli kullanılarak analiz edilmiştir. **Bulgular:** Rasch analizine göre dokuzuncu sorunun ölçme yeteneği genel olarak yetersiz bulunmuştur. DLQI ölçek maddelerinin yeteneği ölçmede yaşa, cinsiyete ve medeni duruma göre farklılık gösterebildiği ve yetersiz olduğu belirlenmiştir. Ayrıca DLQI ölçeğindeki Likert tipi ifadelerdeki cevapların birbirine eşit uzaklıkta olduğu varsayımının doğru olmadığı görülmüştür. **Sonuç:** DLQI, Türk psöriyazis hastaları için Rasch modeli ile zayıf bir uyum göstermiştir. Ayrıca DLQI yaşa, cinsiyete ve medeni duruma göre değişkenlik gösterebilir. Bu nedenle psöriyazis hastalarının değerlendirilmesinde yeni ölçeklerin geliştirilmesi önerilmektedir.

Anahtar Kelimeler: Psöriyazis; Dermatoloji Yaşam Kalitesi İndeksi; Rasch analizi

Psoriasis is a chronic inflammatory disorder, which is often associated with various comorbidities and compromise quality of life. It may have a major impact on the patient's quality of life, influencing daily, social activities, and all other aspects of life. Dermatology Life Quality Index (DLQI) is the most commonly used instrument for the evaluation and follow-up of patients with dermatological diseases such as psoriasis. DLQI is a validated scale to measure the impact of skin disease on the quality of life within a week. The scale measures primarily disability and functional impairment caused by the disease.[1,2]

While there is a link between psoriasis severity and DLQI, studies show different correlation rates between the two variables. These different correlation rates suggest that many factors such as age, gender, educational status and disease severity may have an effect. The subjectivity of DLQI responses may also have an impact on these results. Quality of life is a complex and multidimensional concept and an index of subjective well-being in the mental, physical, and socioeconomic domains as perceived by individuals. Whereas DLQI has uni-dimensionality and cannot adequately represent emotional aspects. Although the DLQI has been translated into more than 90 languages and is commonly used in more than 40 skin diseases, its psychometric properties do not meet the requirements of modern test theory.[3,4]

Most questionnaires and scales used in the health field are ordinal. Therefore, it is impossible to evaluate healthcare outcomes using arithmetic operations and parametric statistical methods. Some problems occur when it is attempted to evaluate a questionnaire or scale with the raw scores obtained by summing up the correct answers given to items.[5,6]

When a variable has an ordinal scale, it is only possible to test whether patients' functional status changes. If there is a change, the amount of this change cannot be determined, and the inadequacy of numerical analyses of ordinal variables is known. Rasch analysis is one of the methods employed to identify these problems. Using this method, the measurability and comprehensibility of the survey questions are examined.[7-9]

In a questionary, it is important whether the questions are understood correctly and what is the size between the answer options in the statements. It is important to demonstrate the ability of the questions in the DLQI questionnaire to the current state of the patient. This study aimed to examine the psychometric properties of the DLQI scale, in a sample of Turkish psoriatic patients.

MATERIAL AND METHODS

Approval of our study was obtained from the Sivas Cumhuriyet University Non-Invasive Clinical Research Ethic Committee (date: August 19, 2021; no: 2021-08/39). The study was conducted in line with the World Medical Association Declaration of Helsinki, patient rights regulation, and ethical rules.

MAIN DATA COLLECTION

Considering the number of participants in the data set, the overall minimum (p=0.5; q=0.5; α=0.05; β=0.8) is more than 384 participants. According to this sample number, the power of the study was calculated as 96.9%.

The present study was conducted on 979 patients with psoriasis disease who applied to the dermatology outpatient clinic of Sivas Cumhuriyet University and PSR-TR registry data of Bursa between April 2013 and January 2019. This was a retrospective study conducted. The study included psoriasis patients who provided informed consent and completed the DLQI questionnaire. Exclusion criteria were defined as being under 18 years of age and having an autoimmune or psychiatric disease. Age, sex, marital status, the Psoriasis Area Severity Index (PASI), and the Psoriasis Symptom Inventory (PSI) were used as variables.

DLQI

The DLQI was developed by Finlay and Khan in 1994.[10] Its reliability and validity study in Turkish was performed by Oztürkcan et al.[11] It is a practical questionnaire consisting of 10 short, easily comprehensible questions about feelings, symptoms, daily activities, use of leisure time, school and work life, personal relationships and treatment parameters, which was prepared to understand the effects of existing dermatological disorders on an individual's life. When patients are answering the scale questions,

they are asked to evaluate the condition within the last week to ensure easy remembering. On a Likert-type scale, the answers are not relevant/not at all, a little, a lot, and very much. During the evaluation, 0, 1, 2, and 3 points are given to these answers, respectively, and the scores obtained are summed up. Therefore, the minimum value to be obtained is 0, and the maximum value is 30. The effects of the disease on daily life increase with an increase in the total score value.

ANALYSIS

Rasch Model

The Rasch model is a mathematical model that describes the relationship between individuals' the impairment in health-related quality of life and how they respond to items a scale. A Rasch model was applied to analyze the psychometric properties of the DLQI.

In the data analysis, we used Rasch analysis to calculate the size and difference between Likert-type statements. We analyzed this method, which does not require assumptions like abnormality or covariance, using the Jamovi 1.6.2 open-source statistical package software. We interpreted the results at a 5% significance level.

The first element that reveals the study is whether all participants respond with the same consistency, regardless of their demographic characteristics or current disease status. The second element is answering the question of how superiority should be understood numerically in the case of the conceptual superiority of the answers given over each other. Thus, in addition to the DLQI questionnaire, sex, marital status, and the conditions of the PSI grade and PASI value of 10> or 10< were added to the data set.

The analysis results suggest that the answers provided to the questions, based on the participants' demographic data and the questionnaire as a whole, are either excessively compatible or incompatible. The results were evaluated according to the conditions >0.800 and <1.200. If a test statistic value (Infit) cannot fulfill the condition of >0.800, it is considered that the relevant question directs participants to a single option to be biased.[12-15] On the contrary, if a test statistic value (Infit) cannot fulfill the condition of

<1.200, it is interpreted that the relevant question cannot be understood by participants. Under both conditions, it is concluded that the relevant question is inadequate to measure the perceptions of participants.

RESULTS

A total of 979 psoriasis patients, 509 (52.4%) male and 470 (47.6%) female, were included in the study. The mean age of the patients was 42.12±14.57 (18-80), and the mean PASI values in terms of disease severity were 5.07±6.33 (Table 1).

The seventh question of the DLQI questionnaire was not included in the analysis since it was not a 4-point Likert-type item like other questions.

As a result of the analysis, when the item reliability results calculated according to demographic data are examined, it is understood that the questionnaire provides internal consistency according to demographic data (Table 2).

As seen in Table 3, showing the Rasch analysis of Infit statistics, the second and tenth questions of the DLQI questionnaire are competent questions according to all demographic distinctions in the study. However, other questions were not competent. The first question satisfies the condition of <0.800, causing suspicion of directing in people whose PSI severity is "very severe." The condition of >1.200 was satisfied in people whose PSI severity was "severe" in the fourth question and people over 65 years of age and whose PSI severity was "very severe" in the

TABLE 1: Demographic data of patients with psoriasis (n=979).	
Age, years	
X̄±SD	42.1±14.5
Gender	
Male	509 (52.4%)
Female	470 (47.6%)
PASI	
X̄±SD	5.07±6.33
Marital status	
Married	855 (87.3%)
Single	102 (10.4%)
Widow	22 (2.3%)

SD: Standard deviation; PASI: Psoriasis Area Severity Index.

TABLE 2: Rasch item scores.				
Variables	Category	Person reliability	MADaQ3	p value
Marital status	Married	0.777	0.094	<0.001
	Single	0.811	0.135	0.034
	Widow	0.849	0.274	0.010
Gender	Male	0.792	0.092	<0.001
	Female	0.778	0.101	<0.001
Age	18-30	0.804	0.123	<0.001
	31-45	0.774	0.103	<0.001
	46-65	0.780	0.087	0.004
	65+	0.767	0.174	0.023
PSI severity	Light	0.674	0.089	<0.001
	Middle	0.815	0.104	<0.001
	Severe	0.815	0.157	<0.001
	Very severe	0.863	0.193	0.003
PASI	<10	0.756	0.095	<0.001
	>10	0.845	0.104	<0.001
General		0.782	0.091	<0.001

MADaQ3: An effect size of model fit; PSI: Psoriasis Symptom Inventory; PASI: Psoriasis Area Severity Index.

TABLE 3: INFIT statistics of DLQI questionnaire by demographic data.										
Variables	Category	DLQI1	DLQI2	DLQI3	DLQI4	DLQI5	DLQI6	DLQI8	DLQI9	DLQI10
Marital status	Married	1.079	1.005	0.887	1.062	**0.793**	1.114	1.039	**1.414**	1.037
	Single	1.004	0.903	0.905	1.007	0.847	1.087	1.144	**1.442**	1.080
	Widow	1.399	0.974	**1.245**	1.266	0.953	**0.714**	0.809	1.043	1.195
Gender	Male	1.091	0.969	0.967	1.058	0.818	1.117	0.930	**1.334**	1.082
	Female	1.067	1.034	0.840	1.041	**0.783**	1.067	1.090	**1.480**	0.988
Age	18-30	1.123	1.016	0.882	1.059	0.843	1.047	0.917	**1.508**	1.056
	31-45	1.126	0.890	0.920	1.138	0.828	1.141	1.052	**1.437**	0.963
	46-65	0.958	1.051	0.929	1.010	**0.762**	1.125	1.041	**1.352**	1.110
	65+	1.144	1.178	1.199	0.869	**0.754**	0.939	**1.325**	1.084	1.015
PSI severity	Light	1.044	0.958	0.963	1.108	0.846	1.199	1.049	**1.554**	0.988
	Middle	1.082	0.995	0.874	0.909	0.885	1.165	0.973	**1.392**	1.096
	Severe	1.120	1.159	0.813	**1.341**	**0.648**	0.904	1.023	1.131	1.029
	Very severe	**0.789**	1.043	0.838	0.971	**0.712**	0.937	**1.240**	**1.372**	1.150
PASI	<10	1.101	0.970	0.894	1.097	0.829	1.143	0.968	**1.466**	1.007
	>10	0.925	1.125	0.913	0.947	**0.727**	0.958	1.183	1.161	1.139
General		1.072	0.995	0.895	1.064	0.803	1.092	1.036	**1.409**	1.032

DLQI: Dermatology Life Quality Index; PSI: Psoriasis Symptom Inventory; PASI: Psoriasis Area Severity Index.

eighth question, in other words, it was suspected that the participants might not understand the question. In the fifth question, it is thought that there may be directed according to many demographic characteristics, and on the contrary, the tenth question might not be understood. It is clear that the measurement capabilities of the fifth and ninth questions were insufficient, even if there was a momentary problem in the

questions that drew attention to a single demographic variable. In general, it was revealed that the measurement capability of the ninth question was insufficient.

The "infit" values used to measure the fit of the survey questions mainly examine the fit to the logit curve. The deviation from the curve can be clearly observed in the sixth, eighth, and ninth questions given as examples in Figure 1.
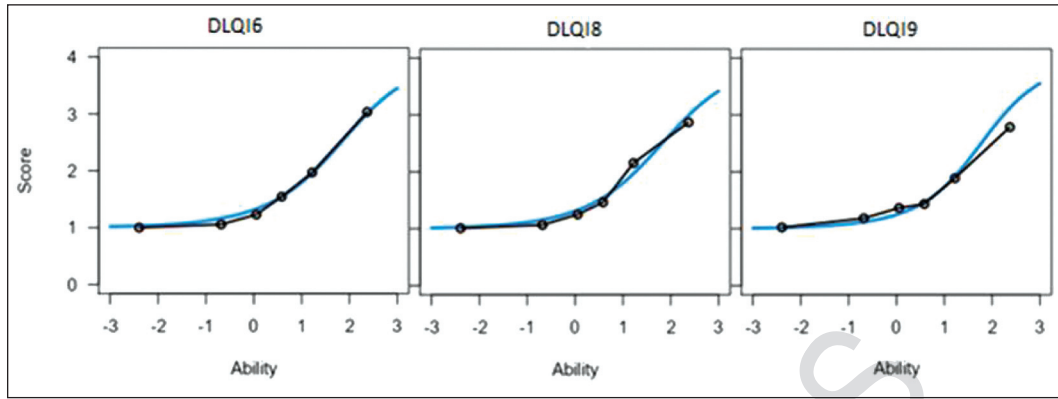
FIGURE 1: Logit curve fit comparisons in sample survey questions.
DLQI: Dermatology Life Quality Index.

The inequalities in classes can be understood in the sixth, eighth, and ninth questions, which are given as examples in Figure 2. The fact that the deviations of the answers given to all the options are different explains the difference in the distance between the options.

After the analysis, the limits in the statements were formed again according to the participants' answers. Thus, the limit for the DLQI rating of "a little" starts from 3.5, not from 2. At the same time, the limit for the DLQI rating of "a lot" starts from 3.8, not from 3. It is obvious that there is no one-unit difference between the DLQI ratings. There is a 2.5-unit difference between the ratings of "not at all" and "a little", a 0.3-unit difference between the ratings of "a little" and "a lot", and a 0.2-unit difference between the ratings of "a lot" and "very much" (Figure 3).

It is possible to understand the assumption that the answers in Likert-type expressions are equidis-
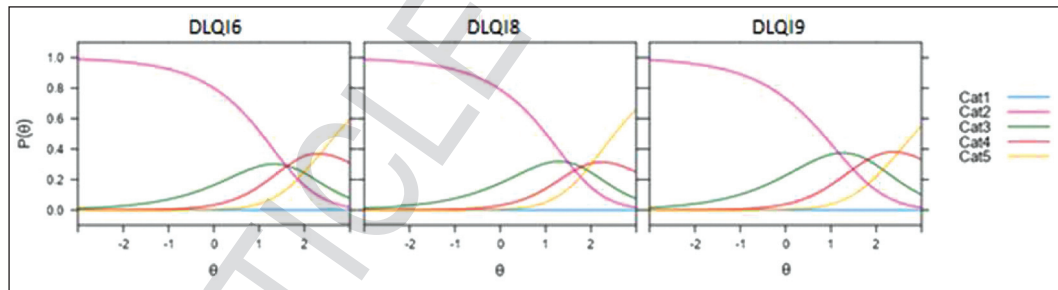

FIGURE 2: Logit curves of class limits in sample survey questions.
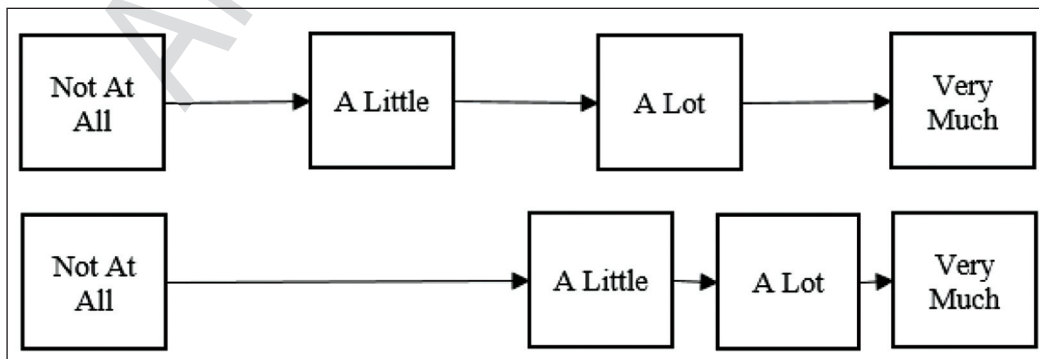DLQI: Dermatology Life Quality Index.

FIGURE 3: Changing distances after rasch analysis.

tant from each other is not correct when the new limits formed as a result of the analysis in Figure 3 are examined. This is proven by both the numerical results in Table 4 and Figure 4. As a result of the Rasch analysis, it was realized that the tolerance was high in the dermatological quality of life of the participants as measured by the DLQI questionnaire. The fact that the threshold with the need to indicate even mild disorder was changed from 2 to 3.5 allowed this interpretation. At the same time, it

is understood because of the small distance between them that the severity of the disorder can be a lot and very much from the beginning of the dermatological disorder. From another point of view, it is thought that when the participants feel the desire to express their disorder, the sensitivity about the degree of the disorder disappears, and instead, it is thought that it would be healthier to interpret only the presence and absence of a dermatological disorder.

TABLE 4: Determination of limits based on demographic data of the DLQI questionnaire.					
Variables	**Category**	**Not at all**	**A little**	**A lot**	**Very much**
Marital status	Married	1.0	3.5	3.8	4.0
	Single	1.0	3.5	3.8	4.0
	Widow	1.0	3.5	3.8	4.0
Gender	Male	1.0	3.5	3.7	4.0
	Female	1.0	3.6	3.8	4.0
Age	18-30	1.0	3.5	3.7	4.0
	31-45	1.0	3.5	3.8	4.0
	46-65	1.0	3.5	3.7	4.0
	65+	1.0	3.6	3.8	4.0
PSI severity	Light	1.0	3.5	3.8	4.0
	Middle	1.0	3.5	3.7	4.0
	Severe	1.0	3.6	3.8	4.0
	Very severe	1.0	3.4	3.7	4.0
PASI	<10	1.0	3.5	3.8	4.0
	>10	1.0	3.5	3.7	4.0
General		**1.0**	**3.5**	**3.8**	**4.0**

DLQI: Dermatology Life Quality Index; PSI: Psoriasis Symptom Inventory; PASI: Psoriasis Area Severity Index.
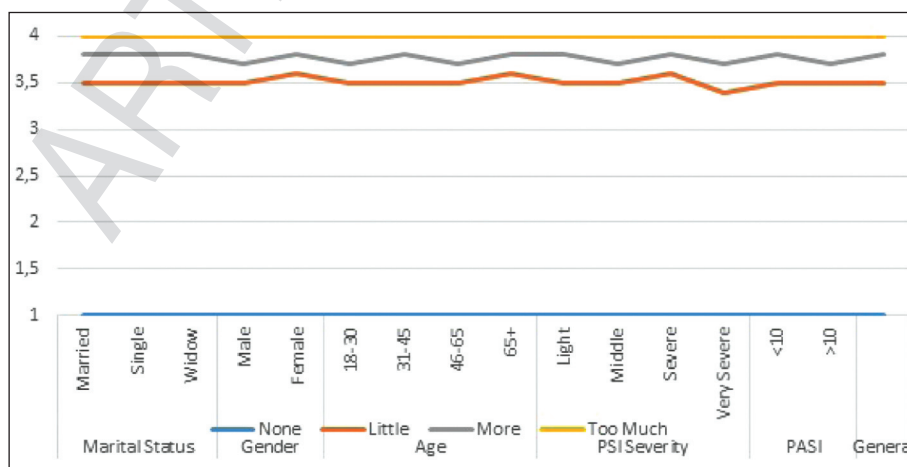

FIGURE 4: Determination of limits based on demographic data of the DLQI.
DLQI: Dermatology Life Quality Index; PSI: Psoriasis Symptom Inventory; PASI: Psoriasis Area Severity Index.

DISCUSSION

Psoriasis is a chronic, inflammatory skin disease that significantly affects patients' quality of life. Psoriatic patients frequently report high levels of anxiety and depression, and the prevalence of these disorders is increasing along with disease severity. Psoriasis is often accompanied by comorbidities such as metabolic syndrome, cardiovascular diseases, and inflammatory bowel diseases. Additionally, cutaneous comorbidities like lupus erythematosus, lichenoid eruptions, alopecia areata, and vitiligo can also be associated with psoriasis. These comorbidities further reduce the quality of life for psoriasis patients. In the study by Caldarola et al., patients with comorbidities presented higher DLQI scores than those without comorbidities. Moreover, the burden of psoriasis was heavier in these patients than in those without comorbidities.[16] As a result, assessing psoriasis patients' quality of life is critical. For this purpose, the DLQI is the most commonly used scale. However, whether the DLQI fully evaluates the quality of life of psoriasis patients is a topic of debate. In this study, we examine the psychometric properties of the DLQI scale in a sample of Turkish psoriatic patients.

DLQI is a widely used quality of life scale in many dermatological diseases. Because DLQI measures the negative effect of the disease, the higher the score, the more deteriorated the quality of life in a given patient. DLQI consists of ten questions with the answers scored on a 4-point Likert-type scale: "very much", "a lot", "a little", and "not at all". The overall score can range between 0 and 30 points.[17]

Criticisms of Likert-type questions can be grouped under five main headings: (1) Equal Spacing: There is no equal spacing between the options.[18] (2) Forced choice: As in many questionnaires and scale questions, in Likert type questions, asking the participants to choose the most suitable option among the given options often forces the participants to choose the "best of the worst"; (3) Acceptance tendency: It is the tendency of the participants to mark the positive option without looking at the content of the question; (4) The tendency towards the center: As mentioned above, participants tend to choose the middle option in Likert-type questions for various reasons. For this

reason, it is a matter of debate whether to include the neutrality/indecisiveness option; (5) Tendency towards extremes: When people are faced with a two-grade option such as "agree-totally agree" or "disagree-strongly disagree", they tend to choose the most negative or the most positive option.[19,20]

This study is, to the best of our knowledge, the first to use Rasch analysis to investigate the psychometric properties of the DLQI in a sample of Turkish psoriasis patients.

Psychometric deficiencies that have previously been reported for the DLQI's use with disorders were also found in dermatology diseases; such as psoriasis, atopic dermatitis. Rasch analysis has been applied for DLQI in previous studies and inadequate measurement properties were observed in psoriasis and atopic dermatitis patients.[21]

In this study, according to the Rasch analysis, the second and tenth questions of the DLQI questionnaire were competent questions according to all demographic distinctions in the study. However, other questions were not competent.

Our study documented psychometric problems with psoriasis patients. Item 9 demonstrated misfit to the Rasch model. Likewise, item 9 was reported to be incompatible in the DLQI Rasch analysis performed on patients with Chinese lichen simplex chronicus. The researchers explained the reason for this with the difference between Asian and Western cultures.[22] Discussing sexual activity is a cultural taboo and considered too private a topic to be discussed openly. It can also be affected by age since there is no sexual activity in children and the elderly.

Our results from the Rasch analysis are similar to those previously reported in other populations.[9,23] Similarly, Twiss et al. found that differential item functioning is related to age, gender, and severity. The study involved patients from the United Kingdom who were diagnosed with psoriasis or atopic dermatitis.[21]

According to the results of our study, the assumption that the answers in Likert-type expressions in the DLQI scale are equidistant from each other is not correct. When participants are asked to express their discomfort, it is understood that they express the presence or absence rather than the degree of their discomfort.

The DLQI can vary with age, sex, and type of disease. Careful interpretation is required to evaluate the final score, especially if an evaluation or comparison is made. Differences in the DLQI measurements may also be affected by the characteristics of individuals rather than disease burden. It is necessary to evaluate according to the same age and sex.[1,3]

The study's limitations include that it was conducted only on psoriasis patients, the lack of a control group, and the absence of analysis according to lesion localizations.

CONCLUSION

The DLQI is one of the most important scales used to evaluate the quality of life of psoriasis patients. However, this study shows that the DLQI has a poor fit to the Rasch model for Turkish psoriasis patients. Furthermore, the DLQI may vary according to age, sex, and marital status. Therefore, it is recommended to develop new scales in the evaluation of psoriasis patients. Rasch analysis for the DLQI is recommended in other dermatological diseases and larger patient groups.

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