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ORIGINAL ARTICLE

Polish adaptation of Bad Sobernheim Stress Questionnaire-Brace and Bad Sobernheim Stress Questionnaire-Deformity

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Abstract Bad Sobernheim Stress Questionnaire-Brace and Bad Sobernheim Stress Questionnaire-Deformity are relatively new tools aimed at facilitating the evaluation of long-term results of therapy in persons with idiopathic scoliosis undergoing conservative treatment. To use these tools properly in Poland, they must be translated into Polish and adapted to the Polish cultural settings. The process of cultural adaptation of the questionnaires was compliant with the guidelines of International Quality of Life Assessment (IQOLA) Project. In the first stage, two independent translators converted the originals into Polish. Stage two, consisted of a comparison of the originals and two translated versions. During that stage, the team of two translators and authors of the project identified differences in those translations and created a combination of the two. In the third stage, two independent translators, who were native speakers of German, translated the adjusted version of the Polish translation into the language of the original document. At the last stage, a commission composed of: specialists in orthopedics, translators, a statistician and a psychologist reviewed all translations and drafted a pre-final version of the questionnaires. Thirty-five adolescent girls with idiopathic scoliosis who were treated with Cheneau brace were subjected to the questionnaire assessment. All patients were treated in an out-patient setting by a specialist in orthopedics at the Chair and Clinic of Orthopedics and Traumatology. Median age of patients was 14.8 SD 1.5, median value of the Cobb's angle was 27.8° SD 7.4. 48.6% of patients had thoracic scoliosis, 31.4% had thoracolumbar scoliosis, and 20% patients had lumbar scoliosis. Median results obtained by means of the Polish version of BSSQ-Brace and BSSQ-Deformity questionnaires were 17.9 SD 5.0 and 11.3 SD 4.7, respectively. Internal consistency of BSSQ-Brace and BSSQ-Deformity was at the level of 0.80 and 0.87, whereas the value of the absolute stability factor was 0.82 and 0.88. Overall, the Polish versions of the BSSQ-Brace and BSSQ-Deformity Questionnaires are characterized by high values of internal consistency factor and absolute stability factor. Following the process of adaptation, the authors obtained a tool that is instrumental in clinical evaluations and complies with methodological criteria.

Keywords Idiopathic scoliosis · Quality of life · Cultural adaptation · BSSQ-Brace · BSSQ-Deformity

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Introduction

Bad Sobberheim Stress Questionnaire-Deformity (BSSQ-Deformity) and Bad Sobberheim Stress Questionnaire-Brace (BSSQ-Brace) are the new tools to evaluate the stress level in patients with scoliosis due to body deformity

and to brace specific stress [5, 6]. BSSQ-Deformity and BSSQ-Brace measure heath-related quality of life. These tools are characterized by high internal consistency, therefore they are reliable tools to evaluate mental condition of patients [5, 6]. These tools were developed in Germany. Progressing European integration does not wipe out cultural differences between neighboring countries. This means that despite their closeness, to use the same tools in an adequate manner, thus assuring the reliability of the results, one needs to implement a process of their linguistic and cultural adaptation specific for each respective country in which the questionnaires are to be used [4]. This adaptation we designed from the German questionnaires BBSQ-Brace or BSSQ-Defomity, corresponds with the commonly accepted social and medical science criteria, that methodologically corrects and evaluates the state of patients' function.

Our assumption was that if we adapt Bad Sobberheim Stress Questionnaire-Deformity and Bad Sobberheim Stress Questionnaire-Brace to the Polish conditions, we will achieve tools that are equivalent to the original German methods. As a result, we aimed at achieving questionnaires that would help us properly assess long-term outcomes of treatment of idiopathic scoliosis in children with the use of brace in Polish conditions. The process of cross-cultural adaptation of questionnaires was performed accordingly to the guidelines set up by International Quality of Life Assessment (IQOLA). Guidelines for this type of processes in respect to the assessment tools are common for medical, sociological and psychological sciences [4]. Until now, there are no reports published on foreign cross-cultural adaptations of Bad Sobberheim Stress Questionnaire-Deformity and Bad Sobberheim Stress Questionnaire-Brace.

Subjects and methods

Bad Sobberheim Stress Questionnaire-Deformity and Bad Sobberheim Stress Questionnaire-Brace consist of eight questions each. In Bad Sobberheim Stress Questionnaire-Deformity, questions relate to effect of spine deformity on the mood, interactions with the environment and as a result the effect of experienced stress. On the other hand, Bad Sobberheim Stress Questionnaire-Brace focuses on psychological aspects of conservative therapy and assesses the extent to which brace wearing affects mood, distorts social interactions, and in consequence leads to the increase of stress [5, 6].

The score ranges from 0 to 24. The higher the score the less stress, thus 0 signifies greatest stress whereas 24 signifies least stress. The following subdivision of the score values was proposed: 0–8 (strong stress), 9–16 (medium stress), and 17–24 (little stress) [5].

Adaptation process

Translation was performed in compliance with the guidelines of International Quality of Life Assessment (IQOLA) [4] and consisted of a few stages. In the first stage, two independent translators converted the originals into Polish. One of the translators, who had a medical background, was instructed on the whole process of the adaptation. The other translator had no medical background and received no information on the project. Stage two consisted of a comparison of the originals and two translated versions. During that stage, the team of two translators and authors of the project identified differences in those translations and made a combined version. In the third stage—the so called reversed translation—two independent translators, who were native speakers of German, translated a compromised version of the Polish translation into the language of the original document. The translators were not familiar with the original language version. The objective of this stage was to assure equivalence of the two versions and to identify possible mistranslations. At the last stage, a commission composed of: two specialists in orthopedics, translators, a statistician, and a psychologist reviewed all translations. As a result of a consensus, the so called pre-final version was drafted. Following that, persons undergoing assessment filled in Polish versions of BSSQ-Deformity and BSSQ-Brace twice within 2-day-intervals. 35 female patients with idiopathic scoliosis were subjected to the assessment with the use of the questionnaires. All patients were treated with Cheneau brace in an out-patient setting by the same specialist in orthopedics at the Chair and Clinic of Orthopedics and Traumatology. Patients were enrolled to the study when they met the entry criteria, in order of their presentation at the clinic. All patients gave their informed consent prior to their inclusion in the study.

The following entry criteria were applied: female patients at the age of 12–16, who have been wearing the brace for at least 3 months for 12 h a day, with identified median value of the Cobb's angle between 20 and 40° in thoracic, thoracolumbar or lumbar scoliosis. Median age of patients at the time of filling in the questionnaires was 14 years and 8 months. Patients have been wearing the brace for an average of 16.1 months SD 11.7. Patients have been wearing the brace for 14.9 h SD 3.2 a day on average (Table 1).

On the initiation of treatment, the median value of the Cobb's angle was 27.8° SD 7.4 (Table 1). 48.6% of patients had thoracic scoliosis, 31.4% had thoracolumbar scoliosis, and 20% patients had lumbar scoliosis. 34.3% of

Table 1 Description of subjects

	Median (SD)
Age	14.8 (1.5)
Body weight	50.7 (6.4)
Height	164.1 (6.1)
Cobb's angle	27.8 (7.4)
Angle of trunk rotation[a]	7.7 (3.9)
Apical translation[b]	2.0 (1.2)

[a] Angle of trunk rotation as measured with Perdriolli's inclinometer

[b] The degree of the apical translation of center sacral vertical line (CSVL) according to the Harms Study Group [11]

patients had a left curve pattern, and 65.7% of patients had a right curve pattern. Th 6 was an apical vertebra in two patients; Th7 in two patients; Th8 in five patients; Th9 in five patients; Th10 in six patients; Th11 in two patients; Th12 in five patients. L1 was an apical vertebra in six patients; L2 in one, and L3 in one patient.

Statistical analysis

Statistical analysis was performed with the use of Statistica software. Within the descriptive statistics of a given question and a domain, we have conducted analyses, received median scores, measured standard deviations at 95% confidence interval. The distribution of results indicates the number of patients with minimum score (floor effect) and the percentage of patients with highest scores (ceiling score). We have calculated median results for specific questions, percentage distribution of results indicating low, medium, and high stress. Internal consistency of the test was evaluated with Cronbach's alpha. Absolute time stability index was achieved thanks to test-retest method.

Ethical considerations

The Polish adaptation of the Bad Sobberheim Stress Questionnaire-Deformity and the Bad Sobberheim Stress Questionnaire-Brace as a research project has been approved by the Bioethics Commission.

Results

Lowest and highest scores, median scores, 95% confidence interval obtained by means of BSSQ-Deformity and BSSQ-Brace questionnaires are shown in Table 2. Median score for BSSQ-Deformity was 17.9 SD 5.0 which is interpreted as low stress. Median score BSSQ-Brace was 11.3 SD 4.7 which is interpreted as medium stress. In another test, the median BSSQ-Deformity score was 17.6 SD 4.7, whereas BSSQ-Brace was 10.9 SD 4.6.

The ceiling effect, i.e., maximal scores (for BSSQ-24) occurred only in the case of BSSQ-Deformity. The first filling applied only to six subjects, 17.1% of all patients.

Table 2 Distribution of minimal and maximal scores, median scores, 95% confidence interval obtained by means of Polish versions of BSSQ-Deformity and BSSQ-Brace questionnaires

Questionnaire	*N*	Min	Max	Median	95% Confidence interval		Standard deviation
					From	To	
Questionnaires filled for the first time							
BSSQ-Deformity	35	8	24	17.9	16.2	19.7	5.0
BSSQ-Brace	35	1	21	11.3	9.7	13.0	4.7
Questionnaires filled for the second time							
BSSQ-Deformity	35	8	24	17.6	16.0	19.2	4.7
BSSQ-Brace	35	0	21	10.9	9.3	12.5	4.6

Table 3 The value of Cronbach's alpha and absolute stability factor

Questionnaire	Cronbach's alpha	Absolute stability factor	Cronbach's alpha (for the original version)	Absolute stability factor (for the original version)
BSSQ-Deformity	0.87	0.88	–	0.95
BSSQ-Brace	0.80	0.82	0.97	0.88

Table 4 Interpretation of BSSQ-Deformity and Brace-distribution of results within a group

Interpretation	BSSQ-Deformity		BSSQ-Brace	
	No. of subjects	%	No. of subjects	%
Severe stress	1	2.9	8	22.9
Some stress	11	31.4	21	60.0
Little stress	23	65.7	6	17.1

The second filling applied only to four patients, 11.4% of all patients. As far as the floor effect is concerned, i.e., minimal scores (for BSSQ-0) occurred only in the case of the second filling of the BSSQ-Brace and it applies only to one patient which represented 2.9% of all patients.

Table 3 shows the value of Cronbach's alpha and the absolute time stability factor of the Polish versions of BSSQs assessed with the use of test-retest method in comparison with German results. Table 4 presents interpretation of scores achieved in BSSQ-Brace and BSSQ-Deformity. Most patients (97.1%) experienced low or medium stress caused by body deformity. Only one patient (2.9% of all patients) experienced high stress because of deformity. The results are different in the case of BSSQ-Brace. Here, most of patients (82.9%) experienced high or medium stress. Only 17.1% of patients reported little stress caused by wearing the brace (Table 4).

Tables 5 and 6 present results and standard deviations for individual questions. Answers were scored from 1 to 3. Median value for a question in BSSQ-Deformity from 1.9 (question 4) to 2.7 (questions 7 and 8) (Table 6). In case of BSSQ-Brace, these values ranged from 0.9 (questions 2 and 3) to 2.5 (question 8) (Table 7).

We have not found any correlation between BSSQ-Deformity, BSSQ-Brace, Cobb's angle, the degree of the apical translation of center sacral vertical line (CSVL) according to the Harms Study Group [11] and the duration of brace wearing per day and total number of months worn (Table 7). The only statistically significant correlation ($p = 0.19$) was identified between BSSQ-Brace and the angle of rotation (rs 0.395). It means that the higher the angle of the trunk rotation, the less stress was experienced by wearing a brace. Such results contradict our assumptions.

We also assessed the correlation between the site of the deformity and BSSQ-Deformity and BSSQ-Brace results. Patients who had deformities within the thoracic spine, thoracic-lumbar spine and lumbar spine were in one group. As far as BSSQ-Deformity results are concerned, the difference between the groups is not statistically significant ($p = 0.060$) (Table 8). As far as BSSQ-Brace results are concerned, the difference between the groups is statistically significant ($p = 0.020$) (Table 9).

Table 5 BSSQ-Deformity-distribution of answers to individual questions

BSSQ-Deformity	Median	Standard deviation
Question 1	2.0	0.9
Question 2	2.2	0.9
Question 3	2.0	1.0
Question 4	1.9	1.1
Question 5	2.4	0.7
Question 6	2.2	0.9
Question 7	2.7	0.8
Question 8	2.7	0.6

Table 6 BSSQ-Brace-distribution of answers to individual questions

BSSQ-Brace	Median	Standard deviation
Question 1	1.9	0.9
Question 2	0.9	0.9
Question 3	0.9	0.9
Question 4	1.1	0.9
Question 5	1.3	0.9
Question 6	1.3	1.0
Question 7	1.5	1.0
Question 8	2.4	0.8

Discussion

Cultural adaptation of questionnaires drafted in foreign languages as a research project is a methodological standard in social sciences [4]. It was established that this is a necessary process due to incompatibility of socio-cultural and economic conditions in countries where such methods were developed [4]. Such incompatibility leads to the situation in which a regular translation of the original, without considering specific conditions, in a given country, would give a tool that not necessarily reflects the assessed feature in a reliable manner; results may be biased due to region specific factors [4]. The nature of a given culture may render questions, answers or instructions ambiguous and different from the original intent of the author, thus it may lead to the situation in which they could not be used for comparison with the original questions, answers and instructions. Moreover, despite a complex translation process of the original or of a reverse translation back into the original, it may be necessary to assess the reliability of adapted tools. Only upon obtaining

Table 7 Spearman's rank correlation coefficient (rS) and levels of significance

Parameters	BSSQ-Deformity	BSSQ-Brace
Cobb's angle	rS = −0.096 (p = 0.585)	rS = 0.001 (p = 0.994)
Angle of trunk rotation[a]	rS = −0.063 (p = 0.720)	rS = 0.395 (p = 0.019)
Distance from CSVL[b]	rS = −0.331 (p = 0.052)	rS = −0.296 (p = 0.084)
No. of hours a day of brace wearing	rS = 0.028 (p = 0.872)	rS = −0.109 (p = 0.533)
Duration of brace wearing in months	rS = 0.200 (p = 0.250)	rS = 0.132 (p = 0.449)

[a] Angle of trunk rotation as measured with Perdriolli's inclinometer

[b] Central sacral vertical line

Table 8 Correlation between BSSQ-Deformity and the site of deformity

BSSQ-Deformity	*N*	Median	Minimal value	Maximum value	SD
Thoracic scoliosis	17	19.6	8.0	24.0	4.6
Thoracolumbar and lumbar scoliosis	18	16.4	9.0	24.0	5.1

Table 9 Correlation between BSSQ-Brace and the site of deformity

BSSQ-Brace	*N*	Median	Minimal value	Maximum value	SD
Thoracic scoliosis	17	12.9	1.0	21.0	4.3
Thoracolumbar and lumbar scoliosis	18	9.9	1.0	19.0	4.8

values that are approximate to the original, a complex process of adaptation is successful. A questionnaire that was subject to a complex process of adaptation should be a binding counterpart of the original; it allows comparing results in a multicultural context [4].

Analysis of literature suggests that such projects are becoming more and more popular. Recently, there are reports on four adaptations of the English language questionnaire of the Scoliosis Research Society-22 (SRS-22); it has its Spanish, Turkish, Japanese, and Chinese version [1, 3, 9, 13]. Roland–Morris Disability Questionnaire was adapted to three languages—Polish [18], Japanese [17], and German [23]. In case of the Polish adaptation of BSSQ-Brace and BSSQ-Deformity, we had to consider Polish socio-cultural conditions. We need to emphasize participation in the costs of healthcare despite health security insurance and the operation of Health Funds. It means that patients have to pay both for braces and for doctors' consultations. Sometimes the same scale is adapted twice. The objectives of Bremerich et al. and Scherer et al. were to translate into German and culturally adapt Neck Pain and Disability Scale (NPAD). The said authors proved that both adapted tools are instrumental in the evaluation of German speaking patients [7, 20]. Within the framework of our research on the quality of life of patients with scoliosis, we wanted to adapt to the Polish realities questionnaires that focus on experiencing stress caused by body deformity and wearing the brace (see "Appendix").

The polish version of BSSQ-Deformity has a lower absolute stability when compared to the original German version, but the value of the Cronbach's alpha remains high [6]. Cronbach's alpha and absolute stability factor obtained by means of the Polish version of BSSQ-Brace are slightly lower than the scores obtained by Botens–Helmus et al. [5]; despite that, however, they remain high and exceed the value of 0.8 (values above 0.7 are deemed satisfactory) [24].

As far as the results of BSSQ-Deformity are concerned, vast majority of patients (97.1%) experienced some or little stress. Only one patient (2.9% of all subjects) experienced high stress because of deformity. The results are slightly different in case of the original version of BSSQ-Brace [5]. In this study, 77% of patients experienced severe stress, and only 23% reported little stress [5].

As far as the median scores and standard deviations are concerned for individual questions, median values ranged from 1.9 to 2.7 points for BSSQ-Deformity. In case of BSSQ-Brace, these values ranged from 0.9 to 2.5 points. Similar values were obtained in the original German version of the BSSQ-Brace: from 0.98 (question 6) to 2.54 (question 8) [5]. We have not found any relation between BSSQ-Deformity, BSSQ-Brace, Cobb's angle, the degree of the apical translation of center sacral vertical line (CSVL), and the duration of brace wearing; the only statistically significant correlation was identified between BSSQ-Brace and the angle of rotation. Such results contradict our assumptions. This may be due to the

protective mechanisms of personality, secondary rejection in particular—a mental process that eliminates from consciousness painful experience and fear causing thoughts, events, and feelings [21]. As far as the correlation between the site of the deformity and BSSQ-Deformity and BSSQ-Brace results are concerned, the only statistically significant results were obtained by means of BSSQ-Brace. As we noted earlier (Table 9), more stress was reported by patients with deformities in the thoracic-lumbar spine. Such results contradict the conclusions reached by Botens–Helmus et al. [5]; according to their study, the site of deformity bears no influence on the stress level [5]. Thanks to cultural and language adaptation, we obtained tools that are methodologically correct in assessing the condition of patients who are subject to conservative therapy. Many times when considering mental implications of scoliosis, it has been observed that physical problems and aesthetic issues related to the disease and treatment itself affect the way patients perceive themselves and the type of stress they experience [2, 10, 12, 14, 15, 19, 22].

Danielsson et al. on the other hand studied patients who were treated with braces in a 20 year long observation. It turned out that 34% of those patients felt that their deformity limits their social life mainly due to the difficulties in participating in various activities. Another issue is the problem of appeal. Spinal pain to some extent limits social life [12]. Wickers et al. [22] conclude that patients wearing braces are more prone to rebellious behavior but there is less tension in relations with doctors.

Andersen et al. suggest that patients who initiated conservative treatment over the age of 16 have more difficulties in establishing relations with the opposite sex, when compared to patient who initiated such treatment before the age of 16. About half of the patients reported that they abstained from participating in activities involving spending time with friends. Majority of them, if given a choice, would opt for operative treatment [2]. Matsunaga et al. [16] concluded that to reduce stress in conservatively treated patients and to prevent drop out from therapy, it is important to provide proper information on the type of treatment being applied.

On the basis of studies conducted by Vasiliadis et al. with the use of a new tool—Brace Questionnaire—a correlation between Cobb's angle and school activity and social engagement of scoliosis patients was found [24]. It was also demonstrated that the value of Cobb's angle has no influence upon the overall condition of patients, physical condition, emotional, self-esteem, appeal, vitality and pain level [24].

World literature on this topic suggest that scoliosis affects the mental health of patients. Until now, there were no tools that could be methodologically validated and would allow proper assessing of patients with idiopathic scoliosis who were subject to conservative treatment in particular in polish language. Polish adaptation of BSSQ-Brace and BSSQ-Deformity will allow reliable assessment of mental consequences of brace wearing and the influence of the disease on the stress level and impairment of social life. As a result, it will also help to compare the results in the intercultural context.

Conclusions

Our assumption was that if we adapt Bad Sobberheim Stress Questionnaire-Deformity and Bad Sobberheim Stress Questionnaire-Brace to the Polish conditions, we will achieve tools that are equivalent to the original German methods. Our results confirm that the adapted tools are internally highly consistent, reliable, and stable when compared to the original questionnaires. Last but no least, we achieved the tools that will help us properly to assess long-term outcomes of treatment of idiopathic scoliosis in children with the use of a brace in the Polish conditions.

Acknowledgments We wish to warmly thank Poznan University of Medical Sciences for financing our research project. We declare that the experiments comply with the current polish laws. This project has been given approval from Bioethics Commission.

Appendix

Ankieta dotycząca jakości życia ze skoliozą

sporządzona w Bad Sobernheim.

BSSQ-Brace

Nazwisko: ..... Imię: .....

Niniejsze pytania odnoszą się do Twojej samooceny, gdy **nosisz** gorset. Prosimy Cię o uważne i zgodne z prawdą wypełnienie ankiety. Po jej analizie będzie nam łatwiej oceniać obciążenia związane ze stosowaniem gorsetu i udzielać porad dotyczących dalszej terapii.

1. Czuję, że noszenie gorsetu pogarsza mój wygląd.

a).zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

2. Niechętnie pokazuję się w gorsecie.

a). zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

3. Sytuacje, w których inni mogliby oglądać mnie w gorsecie, są dla mnie nieprzyjemne.

a).zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

4. Pokazywanie mojego gorsetu nie przeszkadza mi.

a).zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

5. Unikam bliskiego kontaktu cielesnego, aby inni nie zauważyli mojego gorsetu.

a).zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

6. Wybierając moje ubrania i nosząc długie włosy, staram się zasłonić mój gorset.

a).zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

7. Nie przeszkadza mi pokazywanie gorsetu osobom z mojego bliższego otoczenia (rodzice, przyjaciele, koledzy).

a).zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

8. Z powodu gorsetu rezygnuję z takiego spędzania wolnego czasu (hobby), jakie lubię.

a).zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

Ankieta dotycząca jakości życia ze skoliozą, sporządzona w Bad Sobernheim

BSSQ-Deformity

Nazwisko: ..... Imię: ..... Data…….

1. Czuję się skrępowany/a z powodu wyglądu moich pleców

a).zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

2. Niechętnie pokazuję swoje odkryte plecy (np. na basenie).

a). zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

3. Sytuacje, w których inni widzieliby moje odkryte plecy, są dla mnie nieprzyjemne.

a).zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

4. Pokazywanie pleców nie przeszkadza mi.

a).zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

5. Unikam bliskiego kontaktu cielesnego aby inni nie zauważyli mojej skoliozy.

a).zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

6. Wybierając moje ubrania i nosząc długie włosy staram się zasłonić skoliozę

a).zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

7. Skolioza jest częścią mnie, a ludzie z mojego otoczenia powinni mnie akceptować takim/-ą, jakim/-ą jestem.

a).zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

8. Z powodu skoliozy rezygnuję z takiego spędzania wolnego czasu (hobby), jakie lubię.

a).zdecydowanie tak b). raczej tak c). raczej nie d).zdecydowanie nie

Prosimy o uważne i zgodne z prawdą wypełnienie ankiety. Po jej analizie będzie nam łatwiej udzielać Państwu porad dotyczących dalszej terapii, a przede wszystkim konieczności operacji.

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