

# Validation of the German version of the International Index of Erectile Function (IIEF) in patients with erectile dysfunction, Peyronie's disease and controls

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The objective of this study was to validate the German translation of the International Index of Erectile Function (IIEF). The IIEF was administered to 59 patients with erectile dysfunction (ED), to 38 patients with Peyronie's disease and to 33 controls. All patients were investigated by standardized German versions of international questionnaires of anxiety, depression, social desirability, quality of partnership, physical complaints and life-satisfaction. The five subscales of the English version, however, could not be replicated. Internal consistency for the complete questionnaire of 15 items was high (Cronbach's alpha = 0.95). Based on the total scale and two subscales, we were able to discriminate sexual function between the ED group and the comparison groups. There was no significant correlation between the IIEF scores and anxiety, depression, somatic complaints and life-satisfaction. The German version of the IIEF has found good comprehension, and acceptance by the majority of patients. Its use is somewhat limited by its focus on sexual activity in partnership. In contrast to the English version, it mainly addresses a single factor of sexual function.

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## Introduction

The International Index of Erectile Function (IIEF) is a brief self-administered questionnaire of erectile dysfunction (ED). Rosen *et al*<sup>1</sup> have demonstrated a good overall reliability of the IIEF for the English version. Based on the 15 items, they differentiate five relevant subscales of sexual function (erectile function, orgasmic function, sexual desire, intercourse satisfaction and overall satisfaction) with adequate validity, sensitivity and specificity. In more recent publications, the use of the six-item subscale of erectile function or a simplified version with five items is advocated.<sup>2,3</sup> Cut-off scores have been published for the six-item short scale based on diagnostic evaluation.<sup>2</sup> Translations of the IIEF have been conducted into several languages including German, and are widely used to evaluate the outcome of pharmacological studies on ED or the

outcome of treatment in patients with Peyronie's disease.<sup>4–8</sup> The psychometric properties of the German version have not been tested yet. Linguistic validation does not ensure psychometric qualities in other languages, for example, there may be differences in comprehension of the items or different cut-off scores for the German population. The purposes of this study are therefore (a) to determine psychometric properties (reliability, validity, specificity), (b) clinical feasibility of the German version and (c) to compare them to the English version in patients with ED, with Peyronie's disease as complex sexual disorders and in controls.

## Patients and methods

### *Study participants*

A total of 59 patients with ED and 38 patients with Peyronie's disease as an additional group with a sexual disorder of the outpatient community centre of the Department of Urology were included in this study. The patients (ED, Peyronie's disease) were examined by a detailed standardized semistructured

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**Table 1** Patient characteristics

	Erectile dysfunction (N=59)	Peyronie's disease (N=38)	Controls (N=33)
Age (y)	51.7 (20–75) <sup>a</sup>	55.8 (30–69)	50.1 (19–68)
BMI (kg/m <sup>2</sup> )	26.6 (19.9–36.9)	26.7 (21.2–31.4)	28.1 (17.5–34.0)
Hypertension	17 (30%) <sup>b</sup>	8 (21%)	7 (22%)
Diabetes	12 (21%)	3 (8%)	3 (9%)

<sup>a</sup>Means (range in parentheses).

<sup>b</sup>Total numbers (percent in parentheses).

interview including rating of erectile capacity, duration of erection, testosterone level, pharmacological injection test and colour-coded duplex sonography.<sup>9</sup> The erectile capacity was rated by experienced clinicians on a six-point scale from E0 (no erection) to E5 (full erection with full rigidity).<sup>10</sup> In all, 33 consecutive patients diagnosed with nephrolithiasis who had no clinical signs of ED according to a semistructured interview were recruited as a comparison group. According to the NIH Consensus Development Panel, ED was defined as the inability of the male to achieve and maintain an erection sufficient to permit satisfactory intercourse.<sup>11</sup> The diagnosis of ED required an additional duration of symptoms for at least 6 months.<sup>11</sup> In conformity with the standardized protocol used by our Peyronie's disease study group, a main inclusion criterion for the study was the evidence of a palpable dorsal penile plaque to define patients with Peyronie's disease.<sup>12</sup> Criteria for inclusion of all patients were (a) a stable heterosexual partnership and (b) at least one attempt of sexual intercourse over the last 4 weeks. The aetiology of ED included four patients with pure arteriogenic, four patients with venoocclusive, five patients with neurogenic, 10 patients with psychogenic, three patients with medical induced and 33 patients with mixed origin. Common combinations of origins were arteriogenic with neurogenic (12 out of 33), arteriogenic with medication that may influence erectile function (eight out of 33), and arteriogenic with psychogenic (seven out of 33). The mean age of the ED group was 51.7 (20–75)y; no statistical differences regarding age, body mass index (BMI) and rate of hypertension or diabetes as risk factors for ED could be obtained compared to the controls and the Peyronie's disease group. Table 1 provides an overview on the patients, characteristics.

## Materials

This study followed the approval of the local ethical committee. We used the German version of the IIEF authorized by MAPI Research Institute.<sup>1</sup> The time frame was defined by the last 4 weeks. Each page of the questionnaire contained definitions of the

concepts (sexual intercourse, sexual activity, ejaculation, sexual stimulation). Sexual activity, function and desire were rated by frequency or intensity. The first 10 items had to be rated on six-point scales (0–5). A lack of sexual activity was scored 0. The remaining five items were presented with five-point scales (1–5). Item scores are added; the total score lies therefore in the range from 5 to 75. We assessed the comprehension of the IIEF by four additional items with five-point scales: comprehension, frequency of use of definitions, helpfulness of definitions and time needed to fill out the questionnaire. In addition to the IIEF, patients with ED and the Peyronie's disease group were investigated by standardized German versions of international questionnaires of anxiety (STAI), depression (CES-D), social desirability (SDS-CM) and physical complaints (C-L). Further items assessed life-satisfaction, health behaviour, sociodemographic aspects and overall partnership satisfaction (Table 2).<sup>13–17</sup> Controls (nephrolithiasis) filled out the same questionnaires except for SDS-CM and the comprehension items.

## Statistical analysis

Statistical analysis was performed by SPSS (version 9.0). We examined the factor structure of the IIEF by a principal components analysis with varimax rotation over data of all patients. Only factors

**Table 2** Questionnaires

Sociodemographic questions	Life-satisfaction
Physical complaints (C-L)	Overall partnership satisfaction (PFB)*
Depression (CES-D)	Erectile function (IIEF)
Anxiety (STAI)	Comprehension of the IIEF*
Social desirability (SDS-CM) <sup>a</sup>	Health status and behaviour

<sup>a</sup>Patients with ED and Peyronie's disease only; C-L, complaint list;<sup>16</sup> CES-D, Center for Epidemiological Studies Depression Scale;<sup>14</sup> STAI, State Trait Anxiety Inventory;<sup>13</sup> PFB, Partnerschaftsfragebogen (partnership questionnaire);<sup>18</sup> SDS-CM, social desirability scale.<sup>15</sup>

explaining a substantial proportion of variance (eigenvalues greater than 1.0) were identified. In order to compare our results to the data of Rosen *et al*,<sup>1</sup> intercorrelations between the five original subscales (erectile function, orgasmic function, sexual desire, intercourse satisfaction and overall satisfaction) were computed. Internal consistencies of the total scale including all 15 items and the factor analytically derived subscales of the German version were tested by Cronbach's alpha.<sup>19</sup> For comparison purposes internal consistency was assessed for the six items of the erectile function short scale.<sup>1,2</sup> Additional corrected part-whole correlations (the item of interest is correlated with the sumscore excluding this item) were computed. IIEF scores were compared between the three groups (ED, Peyronie's disease and controls) as indicators of discriminant validity by one-way ANOVA. In order to discriminate patients with and without ED, we divided the scores of the total scale into five comparable intervals. For the purpose of comparing our data to the data of Capelleri *et al*,<sup>2</sup> we adapted their diagnostically evaluated intervals indicating severe (sum score 1–10), moderate (11–16), mild-moderate (17–21), mild (22–25) and no ED (26–30). Sensitivity, specificity and positive prediction were computed for optimal cutoff for the total scale and for the erectile function short scale. Convergent validity was inspected by Spearman-rank correlations between the IIEF scores of patients with ED and Peyronie's disease and the clinical judgement of the erectile capacity, and divergent validity by the correlations between IIEF scores and the above-mentioned scales not directly related to ED. In order to adjust for multiple testing levels of significance were set to  $P < 0.001$  for one-way ANOVAs and correlations.

## Results

### Comprehension

The comprehension of the 15 German items was rated as good or very good by 73% of the patients;

however, 26% reported moderate and 1% very bad comprehension. In all, 70% of respondents used the definitions of sexual intercourse, sexual activity, ejaculation and sexual stimulation presented on each page at least once; however, 30% did not use them at all. For 65%, these definitions were helpful while answering the questionnaire; 24% needed less than 5 min to answer the questions; 37% needed 5–10 min, 26% needed 10–15 min and only 13% needed longer than 15 min for the questionnaire.

### Correlations between subscales

We found high intercorrelations between scales, overall somewhat higher than Rosen *et al*<sup>1</sup> (nine out of 10). Table 3 presents correlations between the five subscales in our sample. Correlations initially published by Rosen *et al* are printed in parentheses.

### Factor analysis

A principal components analysis with varimax rotation was performed to investigate the factor structure of the German version of the IIEF and to compare it to the original English version. Only two factors with eigenvalues greater than 1.0 were identified. The two factors explained 70% of the total variance (cf. Table 4). In all, 12 items had high factor loadings (between 0.71 and 0.90) on a general factor of sexual function; three items loaded on a second factor of sexual desire. The Spearman-rank correlation between the sumscores of the two extracted factors (sexual function and sexual desire) was  $r = 0.46$ . Thus, the differentiated factor structure with five separate domains of sexual function could not be replicated in the German version.

### Reliability

Internal consistency (Cronbach's alpha) was computed for the total scale, for both factor analytically

**Table 3** Comparison of our data ( $N=121-129$ ) to data of Rosen *et al*:<sup>1</sup> intercorrelations between the original subscales of erectile function, orgasmic function, sexual desire, intercourse satisfaction and overall satisfaction

	EF	OF	SD	IS	OS
EF	1.00 (1.00) <sup>a</sup>				
OF	0.65 (0.55)	1.00 (1.00)			
SD	0.41 (0.33)	0.35 (0.39)	1.00 (1.00)		
IS	0.84 (0.76)	0.63 (0.47)	0.42 (0.35)	1.00 (1.00)	
OS	0.70 (0.60)	0.55 (0.53)	0.52 (0.37)	0.76 (0.53)	1.00 (1.00)

EF, erectile function (items 1–15); OF, orgasmic function (items 9, 10); SD, sexual desire (items 11, 12); IS, intercourse satisfaction (items 6–8); OS, overall satisfaction (items 13, 14).

<sup>a</sup>Correlations by Rosen *et al*.<sup>1</sup> in parentheses ( $N=111$ ).

**Table 4** Factor analysis of the IIEF:<sup>a</sup> factor loadings of the German version

	Factor 1	Factor 2
1. Erection frequency <sup>b</sup>	<b>0.814</b>	0.228
2. Erection firmness <sup>b</sup>	<b>0.794</b>	0.131
3. Penetration ability <sup>b</sup>	<b>0.904</b>	0.179
4. Maintenance frequency <sup>b</sup>	<b>0.883</b>	0.080
5. Maintenance ability <sup>b</sup>	<b>0.896</b>	0.017
6. Intercourse frequency <sup>c</sup>	<b>0.406</b>	<b>0.603</b>
7. Intercourse satisfaction <sup>c</sup>	<b>0.890</b>	0.250
8. Intercourse enjoyment <sup>c</sup>	<b>0.830</b>	0.157
9. Ejaculation frequency <sup>d</sup>	<b>0.742</b>	0.136
10. Orgasm frequency <sup>d</sup>	<b>0.730</b>	0.201
11. Desire frequency <sup>e</sup>	0.102	<b>0.872</b>
12. Desire level <sup>e</sup>	0.078	<b>0.872</b>
13. Overall satisfaction <sup>f</sup>	<b>0.779</b>	0.306
14. Relationship satisfaction <sup>f</sup>	<b>0.713</b>	0.250
15. Erection confidence <sup>b</sup>	<b>0.761</b>	0.173

<sup>a</sup>Principal component analysis with varimax rotation.

<sup>b</sup>Factors of Rosen *et al.*<sup>1</sup> erectile function.

<sup>c</sup>Intercourse satisfaction.

<sup>d</sup>Orgasmic function.

<sup>e</sup>Sexual desire.

<sup>f</sup>Overall satisfaction.

Factor loadings of the two factors found in our sample are printed in bold font.

derived scales (sexual function, sexual desire) and separately for the six items of the erectile function domain of the English version (short scale). Cronbach's alpha for the total scale was 0.95; for the new sexual function factor (12 items) it was 0.96, and for the sexual desire factor (3 items) it was 0.71. The internal consistency of the six-item short scale (erectile function) was 0.94. Corrected part-whole correlations for all items were high (between 0.71 and 0.90) except for the three sexual desire items (between 0.32 and 0.53).

### Validity aspects

The ability of the IIEF to discriminate between patients with and without a primary diagnosis of ED was assessed by comparing the responses from patients with ED and patients with Peyronie's

disease and the controls. We used the total scale (15 items), our two new factors and the six-item short scale (erectile function) by Rosen *et al.*<sup>1,2</sup> The total scale, the new factor of sexual function and the Rosen short scale discriminated between the groups, but not the new sexual desire factor. Means (standard deviations) are presented in Table 5. Optimal cutoffs were 21 for the short scale (erectile function) and 53 for the total score. Sensitivity of optimal cutoff for the total scale was 0.87 (0.84 for the short scale), and specificity was 0.75 (0.72 for the short scale). Positive prediction at optimal cutoff was 85% (84% for the short scale).

### Construct validity

As an aspect of convergent validity, the total score, the sexual function factor and the erectile function domain score of outpatients were positively ( $P < 0.001$ ) correlated with the clinical rating of the erectile capacity. Correlations with anxiety, depression, bodily complaints, social desirability and life-satisfaction did not reach statistical significance. Thus, the lack of associations with scales that do not directly assess sexual function can be interpreted as an aspect of divergent validity. A lower total score of erectile functions and a lower degree of sexual desire was associated with less overall partnership satisfaction ( $P < 0.001$ ).

### Discussion

The German translation of the IIEF is a brief and reliable instrument with a high internal consistency. However, we found high intercorrelations between the original subscales. Only two factors could be extracted by factor analysis, which explained considerable variance (70%). Thus, the subscales of the original English version could not be replicated. The German version of the IIEF does not measure multiple aspects of erectile function. We found a general factor of sexual function and a smaller factor

**Table 5** Discrimination of the IIEF between clinical subgroups

	ED (N=52-59)	Peyronie's disease (N=35-37)	Controls (N=33)
Total scale	38.79 (13.97)	51.54 (15.38)	57.19 (14.04) <sup>a</sup>
Sexual function factor	30.19 (12.39)	42.67 (14.47)	47.53 (12.55) <sup>b</sup>
Sexual desire factor	8.46 (2.77)	9.08 (2.18)	9.70 (2.46) <sup>c</sup>
Erectile function <sup>d</sup>	13.33 (6.33)	21.11 (7.99)	23.69 (6.89) <sup>e</sup>

<sup>a</sup>One-way ANOVA:  $F(118;2)=18.09$ ;  $P < 0.001$ ; Scheffe test: ED < Peyronie's disease, controls.

<sup>b</sup>One-way ANOVA:  $F(119;2)=19.92$ ;  $P < 0.001$ ; Scheffe test: ED < Peyronie's disease, controls.

<sup>c</sup>One-way ANOVA:  $F(128;2)=2.60$ ; NS.

<sup>d</sup>Six-item short scale by Rosen *et al.*<sup>1,2</sup>

<sup>e</sup>One-way ANOVA:  $F(122;2)=26.30$ ;  $P < 0.001$ ; Scheffe test: ED < Peyronie's disease, controls.

**Table 6** Correlations (N=111–129)

	Clinical interview (erectile capacity) <sup>a</sup>	Anxiety (STAI)	Depression (CES-D)	Bodily complaints (C-L)	Social desirability (SDS-CM) <sup>a</sup>	Overall partnership satisfaction	Overall life-satisfaction
Total scale	0.684 <sup>b</sup>	-0.085	-0.208	-0.174	0.006	0.308 <sup>b</sup>	0.067
Sexual function factor	0.690 <sup>b</sup>	-0.094	-0.204	-0.197	-0.011	0.269	0.079
Sexual desire factor	0.266	-0.018	-0.212	-0.020	-0.024	0.299 <sup>b</sup>	0.076
Erectile function <sup>c</sup>	0.703 <sup>b</sup>	-0.076	-0.167	-0.200	-0.053	0.168	0.067

<sup>a</sup>Patients with ED and Peyronie's disease only (N=84–96).

<sup>b</sup>P<0.001.

<sup>c</sup>Six-item short scale by Rosen *et al.*<sup>1,2</sup>

of sexual desire. This may not come as a surprise, as the number of items defining each factor is very low (eg two items represent the overall satisfaction subscale in the original paper of Rosen *et al*<sup>1</sup>) and scales are highly intercorrelated. In order to expect replication of the factor structure reliability of each item of a subscale would have to be very high. The total scale, the sexual function factor and the additionally computed erectile function short scale as self-reports show good agreement with the clinical assessment of erection. Sensitivity and specificity of the erectile function short scale following the procedure of Capelleri *et al*<sup>2</sup> are somewhat lower but still satisfactory. Limitations of this study pertain to the small sample sizes.

Another purpose of this study was to determine clinical feasibility. For that purpose, we added the above-mentioned items on time demands and comprehension. A virtue of the scale resides in its brevity. In our study, the majority of patients needed only a short time (less than 10 min) to complete the questionnaire. This fact makes the IIEF suitable as a screening instrument for ED in various sexual disorders including Peyronie's disease. The IIEF can be useful to give information about patients with Peyronie's disease who are often affected by ED or have difficulties to perform sexual intercourse.<sup>7,8</sup> However, while the majority understood the questions well, comprehension of the items was not optimal. Definitions were not used or not considered helpful by a substantial percentage of patients. Similar results have recently been published for the Portuguese translation of the IIEF.<sup>4</sup> In this study, about 38% of the patients did not correctly complete the questionnaire, usually because of a lack of comprehension. Further limitations of the IIEF pertain to the fact that it only addresses heterosexual men living in a partnership who have attempted sexual intercourse within the past 4 weeks. This limited use was recently pointed out by Rosen *et al*<sup>20</sup> in their state-of-the-science review. Those criteria may apply to the majority of men, but not to others (eg older men who have very limited opportunities for intercourse). In a large German community sample, about 50% of men older than 60 y reported sexual activity within the past year.<sup>21</sup> Only about 17% living without a partner were sexually active.

These findings underscore limitations in the use of the IIEF for selected populations.

## Conclusion

The results emphasize the need for further validation of the IIEF, although it is already widely used in the evaluation of patients with ED and Peyronie's disease, and the outcome of different modes of treatment. Research is needed to determine whether a German six-item version of erectile function is sufficient for use in clinical practice.

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