

ORIGINAL RESEARCH—OUTCOMES ASSESSMENT

The International Index of Erectile Function: Development of an Adapted Tool for Use in HIV-Positive Men Who Have Sex with Men

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ABSTRACT

Introduction. Erectile dysfunction is common in HIV-positive men who have sex with men (MSM). A standardized scale is needed to assess erectile function in clinical practice and research studies.

Aim. The International Index of Erectile Function (IIEF) is a widely accepted tool for assessing erectile function designed for heterosexual men. We modified the tool for MSM. We present an analysis of internal consistency of the questionnaire in an HIV-positive cohort.

Methods. The adapted questionnaire included modified questions within each of the five domains of the IIEF: (i) erectile function, (ii) intercourse satisfaction, (iii) orgasmic function, (iv) sexual desire, and (v) overall satisfaction with sex. MSM at seven European HIV treatment centers completed the questionnaire.

Main Outcome Measures. Responses were analyzed for internal consistency using standardized Cronbach's alpha values within each of the five domains. A factor analysis was performed to confirm the domain structure of the questionnaire.

Results. Data from 486 MSM were analyzed. The factor analysis supported the domain structure described. Questions about erectile function, orgasmic function, and sexual desire performed well, with Cronbach's alpha values of 0.82, 0.83, and 0.89, respectively. Questions concerning intercourse satisfaction were less consistent (Cronbach's alpha 0.55) because frequency of attempts at sexual intercourse did not correlate with other responses. Responses about satisfaction with sex with a regular partner diverged from satisfaction with overall sex life. Frequency of morning erections diverged from other aspects of erectile function, whereas erections with masturbation correlated better.

Conclusions. Internal consistency was high overall. This tool is suitable for HIV-positive MSM and can be used in screening, research, and monitoring treatment response. **Coyne K, Mandalia S, McCullough S, Catalan J, Noestlinger C, Colebunders R, and Asboe D. The international index of erectile function: Development of an adapted tool for use in HIV-positive men who have sex with men. J Sex Med 2010;7:769–774.**

Key Words. Erectile Dysfunction; HIV; Questionnaires; Homosexuality; Male; Validation Studies; Sexual Function in HIV-Positive Gay Men

Introduction

Erectile dysfunction is common in men, including men who have sex with men (MSM). HIV-positive men appear to have higher rates of erectile problems than their uninfected counter-

parts, with prevalence of up to 74% [1]. Use of antiretrovirals, particularly protease inhibitors, has been associated with erectile dysfunction in some cohorts but not all [1–6]. HIV infection is associated with increased risk of anxiety and mood disorders, smoking, recreational drug abuse,

polypharmacy, hyperlipidemia, cardiovascular disease, and peripheral neuropathy, all of which may contribute to sexual difficulties. Hypogonadism is also common in HIV-positive men, although its contribution to erectile difficulties is uncertain [5,6]. The strongest predictor of erectile dysfunction is increasing age, and men are now living longer with HIV.

A standardized scale is needed to assess erectile function both in clinical practice and as an endpoint in research trials. The International Index of Erectile Function (IIEF) was developed in 1996–1997 alongside research into sildenafil and has become a widely accepted tool. It is a simple self-report instrument with 15 multiple-choice questions. There is an abundance of data to support its use in diverse populations of men and in more than 30 different languages [7]. It has demonstrated good test reliability as well as discriminant, convergent, and divergent validity. In treatment response trials, the IIEF is sensitive and specific [7], and it has been used in more than 50 clinical trials with various therapeutic agents. However, the IIEF was primarily developed for heterosexual men with the assumption of vaginal sex. Although some MSM would have been included in previous studies, the tool has not been validated in MSM nor in men with HIV infection.

Aims

We adapted the IIEF for use in MSM. The same five domains of sexual function were addressed: (i) erectile function, (ii) intercourse satisfaction, (iii) orgasmic function, (iv) sexual desire, and (v) overall satisfaction with sex. Extra questions were included to inquire about oro-genital and both active (insertive) and passive (receptive) anogenital sex. The adapted questionnaire (IIEF-MSM, see Table 1) has been used to determine the prevalence and risk factors for erectile dysfunction in HIV-positive MSM [3]. In this report, we present the statistical analysis used to validate the adapted questionnaire.

Methods

The adapted questionnaire (IIEF-MSM) included the 15 questions from the IIEF with changes to the wording so that sexual intercourse either referred specifically to active (insertive) anal intercourse or was broadened to include other sexual activities. Additional questions were added about passive

(receptive) anal intercourse, masturbation, oral sex, and morning erections (Table 1).

A convenience sample was selected by inviting men to join the study who were attending for routine HIV care at seven European HIV treatment centers. Questionnaires were available in English, French, German, Spanish, Italian, Dutch or Swedish but they were not backtranslated in every language. They were completed at home and posted back to the investigators.

Responses to the questions of the IIEF-MSM were each given a score of 0–5 for increasing severity of dysfunction. For each domain of questions, the scores were added up. Sexual dysfunction was divided into categories where “none” was defined as scoring up to 1/3 of the maximum possible score, “mild” from 1/3 to 1/2, “moderate” from 1/2 to 5/6, and “severe” as more than 5/6 of possible score. Further details are available from the authors.

Main Outcome Measures

The responses to the questions were analyzed for internal consistency using standardized Cronbach's alpha values. Answers were compared within each of the five domains: erectile function (Q1–2, 4–6, 8–10, 20–22), intercourse satisfaction (Q11–13) orgasmic function (Q14–15), sexual desire (Q16–17), and overall satisfaction (Q18–19).

A factor analysis (principal components analysis with varimax rotation) was performed to assess whether these five domains of the IIEF were applicable to the adapted questionnaire in this population.

Results

After exclusion of invalid or incomplete answer sheets, data from 486 MSM were analyzed. There was a high degree of internal consistency overall, although there were some discrepancies (Table 2). Questions about erectile function yielded a high standardized Cronbach's alpha value of 0.82 overall. Questions that performed less well included maintaining an erection to completion of intercourse during active anal sex (Q6: correlation with total 0.18) and during passive anal sex (Q9: correlation with total 0.29), and confidence about erections (Q20: correlation with total 0.38).

Responses about morning erections (Q21) correlated poorly with other aspects of erectile function (correlation with total 0.17). Erections with masturbation (Q22) performed better (correlation with total 0.46).

Table 1 International Index of Erectile Function (IIEF) and the adapted tool for MSM (IIEF-MSM)

IIEF All questions refer to the past 4 weeks	IIEF-MSM: Differences from IIEF are in bold type All questions refer to the past 4 weeks
How often were you able to get an erection during sexual activity?	1. How often were you able to get an erection during sexual activity?
When you had erections with sexual stimulation, how often were your erections hard enough for penetration?	2. When you had erections with sexual stimulation, how often were your erections hard enough for penetration?
When you attempted sexual intercourse, how often were you able to penetrate (enter) your partner?	3. Have you had, or attempted to have, active anal intercourse? Yes - go to Q4 No - go to Q7
During sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?	4. When you attempted active anal intercourse, how often were you able to penetrate (enter) your partner?
During sexual intercourse, how difficult was it to maintain your erection to completion of intercourse?	5. During active anal intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?
How many times have you attempted sexual intercourse?	6. During active anal intercourse, how difficult was it to maintain your erection to completion of intercourse?*
When you attempted sexual intercourse, how often was it satisfactory for you?	7. Have you had, or attempted to have, passive anal intercourse? Yes - go to Q8 No - go to Q10
How much have you enjoyed sexual intercourse?	8. During passive anal intercourse, how often were you able to maintain your erection after you had been penetrated by your partner?
When you had sexual stimulation or intercourse, how often did you ejaculate?	9. During passive anal intercourse, how difficult was it to maintain your erection to completion of intercourse?*
When you had sexual stimulation or intercourse, how often did you have the feeling of orgasm or climax?	10. During non-intercourse sexual activity, e.g., masturbation/oral sex , how often were you able to maintain your erection until completion of sexual activity?
How often have you felt sexual desire?	11. How many times have you attempted sexual intercourse or other sexual activity?*
How would you rate your level of sexual desire?	12. When you attempted sexual intercourse or other sexual activity , how often was it satisfactory for you?
How satisfied have you been with your overall sex life?	13. How much have you enjoyed sexual intercourse or other sexual activity ?
How satisfied have you been with your sexual relationship with your partner?	14. When you had sexual stimulation or intercourse, how often did you ejaculate?
How do you rate your confidence that you could get and keep an erection?	15. When you had sexual stimulation or intercourse, how often did you have the feeling of orgasm with or without ejaculation ?
	16. How often have you felt sexual desire?
	17. How would you rate your level of sexual desire?
	18. How satisfied have you been with your overall sex life?
	19. How satisfied have you been with your sexual relationship with your regular partner?*
	20. How do you rate your confidence that you could get and keep an erection?*
	21. How often did you wake up with an erection?*
	22. When you masturbated, how often could you get an erection?

The shaded boxes include the questions which performed well in our cohort. These are the questions that we propose should be used in the IIEF-MSM. *Questions 6, 9, 11, 19, 20 and 21 correlated poorly with other responses and should be omitted.

The questions about orgasmic function and sexual desire had a high degree of internal consistency, with Cronbach's alpha values of 0.83 and 0.89, respectively.

Questions 11–13 concerned intercourse satisfaction and the consistency was reasonable (Cronbach's alpha 0.55). The correlation was reduced by Q11 regarding the frequency of attempts at sexual intercourse or other sexual activities (correlation with total 0.10). This was surprising because this question was valid in the original IIEF and in het-

erosexual men drawn from the same European cohort (data not shown). When Q11 was excluded from the analysis the agreement between Q12 regarding satisfaction with intercourse and Q13 about enjoyment of intercourse was good (Cronbach's alpha 0.81).

In our study group, there was relatively poor consistency between satisfaction with overall sex life (Q18) and satisfaction with sexual relationship with regular partner (Q19; Cronbach's alpha 0.42).

Table 2 Internal consistency of the IIEF-MSM. Standardized Cronbach's alpha values range from 0 to 1, with higher values indicating better consistency

Domain of questions	Standardized Cronbach's alpha value	Question No	Correlation with total
Erectile function	0.82	1	0.59
		2	0.58
		4	0.64
		5	0.68
		6	0.18
		8	0.67
		9	0.29
		10	0.57
		20	0.38
		21	0.17
Intercourse satisfaction	0.55	22	0.46
		11	0.10
		12	0.44
Orgasmic function	0.83	13	0.47
		14	0.71
Sexual desire	0.89	15	0.71
		16	0.80
Overall satisfaction	0.42	17	0.80
		18	0.26
		19	0.26

The factor analysis investigated the domain structure of the adapted questionnaire. Four factors were identified with Eigenvalues greater than 1.5 (Table 3). There were only four factors because the domains of intercourse satisfaction and overall satisfaction questions appeared together in factor 2. Factor 1 contains the erectile function questions with the exception of Q6, Q9,

Q20, and Q21, which performed poorly in the analysis of internal consistency. In factor 2, Q11 is missing, agreeing with its poor scoring in the internal consistency analysis. Factor 3 represents orgasmic function and factor 4, sexual desire. Although the analysis supported a structure of four factors, we have chosen to continue to describe the items in the questionnaire in terms of the same five domains of the original IIEF.

Discussion

The overall consistency of responses to the questions suggests that the adapted questionnaire is suitable for use in HIV-positive MSM. Table 1 shows the 14 multiple-choice questions that performed best and that we recommend are used in future studies (shaded boxes).

An abbreviated questionnaire could be a more suitable screening tool in some settings. We looked specifically at the highest performing questions regarding erectile function, which were questions 1, 2, 4, 5, 8, and 10. The internal consistency between these six questions was excellent (Cronbach's alpha 0.85). This selection covers active and passive anal sex as well as non-penetrative sex. Further studies would be warranted to confirm the reliability of these questions in other groups.

It was unexpected that difficulty maintaining an erection to the completion of active anal intercourse (Q6) did not correlate with other aspects of

Table 3 Principal components analysis with varimax rotation of questions of the IIEF-MSM: factor loadings*

Question number	Domain	Factor 1	Factor 2	Factor 3	Factor 4
1. Erection frequency	Erectile function	0.73	0.34	0.29	0.09
2. Erection firmness	Erectile function	0.81	0.38	0.22	0.18
4. Penetration ability	Erectile function	0.58	0.26	0.26	0.11
5. Maintenance frequency (active)	Erectile function	0.62	0.18	0.23	0.11
6. Maintenance ability (active)	Erectile function	-0.59	-0.16	-0.21	-0.15
8. Maintenance frequency (passive)	Erectile function	0.58	0.25	0.33	0.25
9. Maintenance ability (passive)	Erectile function	0.20	-0.09	0.35	-0.01
10. Maintenance frequency (non-penetrative)	Erectile function	0.81	0.25	0.17	0.05
11. Intercourse frequency	Intercourse satisfaction	-0.02	0.06	-0.01	0.40
12. Intercourse satisfaction	Intercourse satisfaction	0.45	0.53	0.47	0.05
13. Intercourse enjoyment	Intercourse satisfaction	0.24	0.68	0.33	0.16
14. Ejaculation frequency	Orgasmic function	0.58	0.23	0.59	0.12
15. Orgasm frequency	Orgasmic function	0.47	0.18	0.57	0.14
16. Desire frequency	Sexual desire	0.23	0.29	0.17	0.69
17. Desire level	Sexual desire	0.08	0.28	0.04	0.78
18. Overall satisfaction	Overall satisfaction	0.32	0.65	0.25	0.34
19. Relationship satisfaction	Overall satisfaction	0.16	0.57	-0.02	-0.02
20. Erection confidence	Erectile function	0.50	0.43	0.42	0.23
21. Morning erection frequency	Erectile function	0.24	0.59	0.19	0.23
22. Masturbation erection frequency	Erectile function	0.71	0.21	0.31	0.17
Relative explanatory power of individual factors (Eigenvalue)		5.14	2.82	1.96	1.70

Eigenvalue is a statistical measure of the relative explanatory power of individual factors.

Factor 1 corresponds to domain Erectile function; Factor 2, Intercourse satisfaction; Factor 3, Intercourse satisfaction + Overall satisfaction; Factor 4, Sexual desire.

*Items with the highest loadings within each factor are in bold type.

erectile dysfunction. The corresponding question in the IIEF also performed poorly in heterosexual men in the same European cohort, and perhaps this question was difficult to understand. Less surprisingly, difficulty maintaining an erection to the completion of passive anal intercourse (Q9) also diverged from other aspects.

We found that morning erections did not correlate with other aspects of erectile function in either MSM in this study or in heterosexual men from the same European cohort, and this question should be omitted. Erections on awakening are taken to be an indication of physiological erectile function largely unaffected by psychological factors. The question about erections during masturbation did correlate better and may be particularly useful in men who have not had a partner in the last 4 weeks.

Although in the original IIEF the question about frequency of attempts at sex was valid, in our study there was minimal correlation between Q11 and the other measures of intercourse satisfaction. This may be because in HIV-positive MSM, frequency of attempts at intercourse is determined by factors other than expected satisfaction. We would suggest that Q11 is omitted from future versions of the tool.

There was a weaker correlation between answers in the domain of overall satisfaction (Q18–19). Question 19 asks specifically about satisfaction with a “regular” partner. Perhaps in MSM, a regular partner is a less crucial component of overall satisfaction than in heterosexual men.

All participants were HIV-positive, and HIV-positive MSM are more likely to develop sexual dysfunction and mental illness [8,9] than their uninfected counterparts [10]. Further research is needed to validate this questionnaire in HIV-negative MSM who have been shown to be more likely to develop physical and mental health problems compared to the general population [11].

A limitation of this tool is that it provides only a snapshot of current sexual functioning. It does not collect any information about sexual partnerships or the function or satisfaction of the partner(s). It does not differentiate between sexual activity with regular or casual partners. It does not address etiology or influences such as alcohol or recreational drug use.

This validated tool is useful for screening for erectile dysfunction, but in clinical practice it does not substitute for detailed history, including precipitating factors and impact on quality of life and physical examination. There is also a need to

develop a more sophisticated understanding of homosexual functioning that incorporates issues such as the absence of stereotyped gender roles, the development of homosexual identities, and gay subcultures [9]. This would provide the foundation for designing standardized tools to assess homosexual functioning which were more appropriate than those adapted from heterosexual models.

Conclusions

We have developed a 14-item questionnaire tool for screening for erectile dysfunction in HIV-positive MSM. We also describe an abbreviated 6-item questionnaire which may be more suitable in some settings. Further research is needed to confirm its validity in an HIV-negative cohort.

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