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FACTOR MIXTURE MODELLING OF THE GIESSEN PROSTATITIC SYMPTOM SCORE AND ITS RELATIONSHIPS WITH PSYCHOSEXUAL COVARIATES

Magistritöö

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Abstract

The main goals of the present study were to explore the factor structure of a new tool in Estonia which is used to measure prostate disease symptoms (the Giessen Prostatitic Symptom Score). Subsequently, to reveal subtypes of prostate diseases and their respective relationships to psychosexual variables. A cross-sectional survey of 360 men with a mean age of 50.5 (SD=10.8) was conducted to investigate prostate-related diseases and pscychosexual factors. Exploratory factor analysis was conducted on the Giessen Prostatitic Symptom Score which revealed five factors: urinary problems, general fatigue, pain in lower body, erectile difficulties and prostate inflammation. Latent profile analysis was done based on these factor scores, revealing 4 subtypes of prostate-related symptom patterns. Relationships between these subtypes and sexual variables were then explored, indicating a large set (80% of the sample) of men with relatively little symptoms or obstruction from prostate disease symptoms, a group of younger men (10%) with relatively little obstruction in spite of prevalent symptomatology, and two smaller groups (7% and 2 %, respectively) of men with prevalent symptoms and obstructions in sexual life. The research supports and extends current theory on the occurence of prostate diseases and provides new insight into the relationships between prostate diseases and sexuality. A better understanding of the impact of prostate diseases on sexual behaviour helps clinicians to better assess and treat ailments co-occurring with said diseases.

Keywords: prostate disease, sexuality, orgasm, desire, aging

Giesseni Prostatiidisümptomite küsimustiku analüüs kombineeritud faktormudelitega ja seosed psühhoseksuaalsete muutujatega

Kokkuvõte

Käesoleva uurimustöö peamised eesmärgid olid uurida Eestis uue eesnäärmehaigusi hindava vahendi (Giesseni Prostatiidisümptomite Küsimustik) faktorstruktuuri ning teha kindlaks erinevate eesnäärmehaigustega seotud meeste alatüübid. Seejärel leida seosed eesnäärmehaiguste sümptomite ja seksuaalkäitumise vahel vahel. Uuringus osales 360 meest keskmise vanusega 50.5 (SD = 10.8), kellelt koguti andmeid nende seksuaalkäitumise, eesnäärmeprobleemide, iha, seksuaalse funktsioneerimise ning sotsiodemograafiliste näitajate kohta. Faktorstruktuuri analüüsimiseks kastutati eksploratiivset faktoranalüüsi ning leiti küsimustiku laaduvat viiele faktorile: urineerimisprobleemid, üldine kurnatus, valud alakehas, erektsiooniprobleemid ja eesnäärmepõletik. Faktorskooride põhjal rakendati latentsete profiilide analüüsi, et teha kindlaks võimalikud haiguste avaldumise alltüübid. Leiti neli alaklassi, kel esines märkimisväärseid erinevusi seksuaalkäitumises ja eesnäärmeprobleemide avaldumises: suurim grupp mehi (80% valimist) ei koge tugevaid eesnäärmehaiguste sümptomeid ning neil ei ole ka seksuaalkäitumises olulisi probleeme, grupp nooremaid mehi (10%) kogevad küll eesnäärmeprobleeme kuid need ei mõjuta oluliselt nende seksuaalkäitumist, kaks gruppi (7% ja 2% meestest) kogevad tugevaid eesnäärmehaiguste sümptome mis mõjutavad märkimisväärselt nende seksuaalkäitumist. Käesolev uurimustöö toetab olemasolevat teooriat ja uurimustulemusi seoses eesnäärmeprobleemide esinemisega ning täiendab seniseid teadmisi eesnäärmehaiguste ja seksuaalkäitumise seoste vahel. Parem arusaam eesnäärmeprobleemide ja seksuaalkäitumise seostest aitab arstidel täpsemini hinnata ja ravida eesnäärmehaigustega kaasuvaid probleeme, mis omakorda võimaldab tulevikus haigetel meestel saada kompleksemat ravi.

Märksõnad: eesnäärmehaigused, seksuaalkäitumine, orgasm, iha, vananemine

Introduction

Prostate Diseases

The prostate, located at the base of a man's bladder, is one of the most important exocrine glands of the body. Its primary roles are to control the flow of urine during ejaculation and to produce prostatic fluid, a component of semen. (Kumar & Majumder, 1995). In addition, smooth muscles contractions in the prostate during ejaculation help propel semen through the urethra. (Kirk, 2001). The most prevalent diseases related to the prostate are benign prostatic hyperplasia (BPH), prostatitis and prostate cancer. There is extensive knowledge of the clinical manifestations of these diseases, but what is lacking is understanding of individual differences in regards to the frequency and impact of prostate disease symptoms. Not only that, but the accompanied effects on these symptoms on quality of life, especially that of sexual life, are in much need on further investigation. In this study we explore the possible variability of prostate symptoms in men and how those symptoms are related to sexuality.

Prostatitis.

Prostatitis is an extremely common condition worldwide. Prevalence estimates vary, but around 2%–16% of men have the diagnosis and half of men have some prostatitis symptoms during their lifetime (Krieger, Ross & Riley, 2002; Roberts et al., 1998; Rothman, Stanford, Kuniyuki, Berger, 2004). In Estonia, 15%-20% of Estonian men aged 20-50 suffer from prostatitis (Punab, 2006). In addition, prostatitis is the most common presenting diagnosis for men <50 years of age in the outpatient urologic clinic setting (Collins, Stafford, O'Leary & Barry, 1998). The impact of chronic prostatitis (CP) on mens quality of life is within the same range as myocardial infraction, angina or Crohn's disease (Wenninger, Heiman, Rothman, Berghuis & Berger, 1996).

Over the past 40 years, the diagnosis of prostatitis has evolved from an ill-defined inflammatory/infectious condition affecting the prostate to a set of specific subtypes of prostatitis with a range of clinical presentation (Habermacher, Chason & Schaeffer, 2006). The National Institute of Health (NIH) defines prostatitis syndromes in four categories (Krieger, Nyberg & Nickel, 1999). Category I and II, acute bacterial prostatitis and chronic bacterial prostatitis are rare, accounting for 2%–5% of cases each. The former is an acute infection of the prostate gland marked by a combination of local symptoms (e.g., dysuria,

urinary frequency, and suprapubic/pelvic/perineal pain) and systemic symptoms (e.g., fevers, chills, malaise), the latter a chronic infection of the prostate gland characterized by intermittent local symptoms only (e.g., dysuria, urinary frequency, and suprapubic/pelvic/perineal pain). Chronic prostatitis category III, inflammatory or non inflammatory (category IIIA and IIIB), is the most common prostatitis syndrome, representing 90–95% of all prostatitis cases. The chronic pelvic pain syndrome (CPPS) is synonymous with CP category III; it includes various symptoms, e.g. pain or discomfort in the pelvic region. Common manifestations of pelvic pain include perineal, rectal, urethral, and testicular/scrotal pain. Pelvic pain is a prerequisite symptom for diagnosis of CPPS because studies have shown that this is the most internally consistent symptom differentiating category III prostatitis from other mimicking conditions. The urinary complaints associated with category III prostatitis/CPPS usually involve frequency, dysuria, and incomplete emptying. In addition, a subset of these patients experience ejaculatory pain (Habermacher, Chason & Schaeffer, 2006). Given the locations and temporal patterns of CP/CPPS pain, sexual difficulties, including premature ejaculation (PE) and erectile dysfunction (ED), are common (Lobel & Rodriguez, 2003; Nickel, Elhilali, & Vallancien, 2005; Shoskes et al., 2004).

Though much has been accomplished regarding the diagnosis of prostatitis, the disorder defined as CP/CPPS remains poorly understood and often inadequately treated. Problems with prostatitis of categories III and IV such as inadequate understanding of etiology and pathogenesis, insufficient methods for diagnosing and subtyping patients as well as deficient treatment schemes remain (Türk, 2009).

Benign prostatic hyperplasia.

Another very common prostate disease is the benign growth of the prostate gland that occurs as a natural process of aging. More then 50% of men over the age of 50 suffer from lower urinary tract symptoms suggestive of BPH in Estonia (Punab, 2006) and nearly all men have evidence of prostatic hyperplasia by the time they reach the age of 80 (Berry, Coffey, Walsh, & Ewing, 1984). It is belived to be influenced by hormonal changes accompanied by aging, but the mechanisms are not completely known (Vermeulen, Giagulli, De Schepper, & Buntinx 1991). Clinical symptoms differ markedly among individuals from minimally bothersome symptoms like urinary frequency to dysuria, incomplete emptying, urinary retention and urinary tract infections (Medina, Parra & Moore, 1999). However, there is considerable lack of understanding regarding the reasons for these variations and

subsequently their effects on other areas of life. One of the risk factors for BPH is the occurence of prostatitis, so a combination of prostatitis related inflammation symptoms and BPH related lower urinary tract symptoms in subjects is also possible (Nickel, Roehrborn & O'Leary, 2008). Thus an investigation into the variability of occuring prostate symptoms among men with BPH and CP/CPPS is warranted.

Prostate Disease and Sexuality

Both BPH and prostatitis can have a profound impact on a patient's quality of life (Garraway & Kirby, 1994). A study by DaSilva et al. (1997) reported that areas affected by prostate-related symptoms were sleep, anxiety and worry about the disease, mobility, leisure, daily activities, but most of all sexual activities and satisfaction with sexual relationships.

There is plenty of evidence that men undergo a gradual decline in serum androgen levels by contrast with the abrupt hormonal change seen in female menopause, which affect their sexual life as well. There is a decrease in testosterone production compared with younger men, and a marked decrease in serum free and total testosterone levels without a rise in luteinising hormone (Kaiser & Morley, 1994; Morley & Kaiser, 1989). Sexual activity seems to decrease with age, especially after age 65 (Kassabian, 2003). Chronic pain and illness related to old age challenge sexual health and are associated with changes in sexual functioning (Smith, Pukall, Tripp, & Nickel, 2007). However, if a broader definition of sexual activity is used to include touching, caressing, and masturbation, the reported rate of sexual activity increases in the elderly. A study of Swedish men reports that only 17% of men aged 50-80 years claim they could live without a sex life (Helgason et al., 1996). There is considerable variation in regards to sexual functioning, but an intact sexual desire, erection and orgasm are common even among the 70-80 year old men, so the diminishing of sexual activity and the decline of sexual functioning can't be explained by age alone. (Bretschneider & McCoy, 1988; Diokno, Brown & Herzog, 1990; Marsigho & Donnely, 1991).

Several studies have recently indicated that LUTS increase the level of erectile dysfunction, independent of age and comorbidities (Martin-Morales et al., 2001; Rosen et al., 2003; Wein et al., 2009). Rosen (2006) points out that other domains such as sexual desire and orgasm are important and should also be considered in men with prostate disease.

Regarding orgasm, there is some evidence for the possibility of qualitative changes in orgasmic sensation, for example painful ejaculation has been identified as a symptom of prostatitis (Schultheiss, 2008). It has been demonstrated, that men report lower levels of

ejaculatory volume due to ED (Corona et al., 2011). This change in volume could be related to a change in orgasmic sensation, but a measurement tool regarding qualitative cognitive changes in orgasmic sensation has yet to be tested in this field (Perelman, 2011). Rahe (2010) found that men with prostate related symptoms reported significantly lower orgasm sensation, so an investigation into the relationships of orgasm and prostate diseases is warranted.

Concerning sexual desire, which is considered a prerequisite for enjoyable sexual activity (DeLamater & Sill, 2005), certain risk factors for lower desire in men have been identified. Those of interest here are poor health, emotional problems or stress and urinary tract symptoms (Laumann, Gagnon, Michael & Michaels, 1994). However there is limited information regarding sexual desire and prostate diseases (DeLamater, 2007). A study in Finland (Mehik, Hellstrom, Sarpola, Lukkarinen & Jarvelin, 2001) found that psychological stress, nervousness and worry are common and more prevalent in men with prostate disease then in the general population. It is possible that more severe symptoms, most likely through a mechanism of both physiological symptoms and the accompanied stress and worry, may lower sexual desire (Rahe, 2010). Thus a more thorough investigation of the relationships between sexual desire and prostate diseases are necessary.

Measuring Prostate Disease Symptoms

Several questionnaires have been used in order to assess symptoms of prostate diseases, the most common being Giessen Prostatitis Symptom Score (GPSS), International Prostate Symptom Score (IPSS) and Chronic Prostatitis Symptom Index of the National Institutes of Health (NIH-CPSI) (Schneider et al., 2003). The IPSS measures urological symptoms, while NIH-CPSI measures both urological and pain-related symptoms and also their impact on quality of life. The NIH-CPSI has become the primary instrument used for the quantification of CP/CPPS. However, none of these measures account for sexual disturbances that go hand in hand with prostate disease. In order to measure those separate questionnaires such as the International Index of Erectile Function or The Brief Sexual Function Inventory are commonly used (Schulman, 2001). Sexual dysfunction often occurs in the same subpopulation of men who are affected by symptomatic BPH. Consequently, the direct or indirect side effects of treatment for BPH on sexual function may be difficult to assess. It is possible that various types of prostate symptoms have different effects on sexual and relationship functioning (Smith et al. 2007). An important issue when discussing prostate disease and sexuality is to identify what specific aspects of sexual function are being

considered; whether it is ED, ejaculation dysfunction, decreased libido or overall decreased sexual satisfaction. The lack of reproducible instruments to measure sexual function is a persisting obstacle (Schulman, 2001). The Estonian adaption of the GPSS, which is described below, addresses these issues and takes into account both sexual and overall health related symptoms of prostate disease. However, it is unlikely that the 35-item Estonian version measures as many different aspects as it has items. It is more feasible, that the items measure a smaller set of factors, which are common among men with prostate disease.

The Present Study

The aim of the current study is thus twofold. First, to reveal subtypes of men within the diagnosis of BPH or CP/CPPS regarding their symptom prevalence patterns; and, taking into account the above critique of not considering sexual factors enough in prostate disease literature, the relationships of those symptoms to sexuality. Second, to help assess and develop a new tool (the Giessen Prostatitic Symptom Score) to be used in prostate related research in Estonia. A better understanding of the impact of prostate diseases on sexual behaviour helps clinicians to better assess and treat ailments co-occurring with said diseases so it is of interest to compare sexuality related problems in men with prostate diseases in order to differentiate between them. Knowledge of sexual problems is essential in order to meet individual needs for information in relation to sexual dysfunction, aging and the prostate (Rahe, 2010).

The first hypothesis of this study is that the Giessen Prostate Symptom Score would differentiate between different types of prostate related symptoms, measuring a set of latent factors that constitute the prostate diseases.

The second hypothesis is that men are differentiated into subgroups based on these symptoms in regards to their occurence or intensity.

The third hypothesis is that based on the differences in prostate symptoms, the impact on mens sexual life is different.

Method

Participants and Procedure

The sample consists of 360 men, all Caucasian and native speakers. 208 were first-time outpatients at the Andrology Unit of Tartu University Clinicum. Their diagnosis was either BPH (ICD-10: N40) or chronic prostatitis/chronic pelvic pain syndrome (NIH IIIA, NIH IIIB), with symptoms lasting for at least 3 months prior to the visit. Out of that, data from 77 outpatients was taken from a previous unpublished study which included a similar testing battery. 152 were a convenience sample gathered from Tartu and Tallinn. Questionnaires were presented to the controls in pre-paid envelopes, which also included an information letter. Anonymity and voluntary participation were stressed. The patients were asked to return the questionnaires to a Andrology Unit`s nurse or secretary before their next appointment. They were requested to complete the tests alone and to follow a standard order. Potential participants were informed of the voluntary nature of the study. It was explicitly stated that their decision to participate would not affect care received from the clinic. Overall approximately 500 questionnaires were handed out between both groups, making the response rate 57%.

The men ranged from 23 to 87 years in age (M = 50.5, SD = 10.8), 80% of them were married and over a third had higher education. Demographic statistics of the sample can be seen in Table 1, sexual characteristics are presented in Table 2.

Table 1

Demographic Statistics and Occurrence of Prostate Disease.

Relationship Status				
Single	Married	Divorced	Widow	
7%	80%	11.5%	1.5%	
Economic Status				
Very bad	Rather bad	Satisfactory	Rather good	Very good
0.5%	4.5%	52.5%	35%	7.5%
Education				
Elementary	Vocational	Highschool	Higher	Ph.D
4.5%	29.5%	29.2%	33.1%	3.6%
Previous Prostate-Related Problems				
Yes	No			
45.5%	54.5%			

Table 2

Overview of Sexual Variables.

Sexual Partners					
No answer	1-3	4-5	6-10	11-20	21+
20.5%	14.7%	20%	22%	12.4%	10.4%

Frequency of Ejaculation				
None or nocturnal	<1 a month	1-3 a month	2-4 a week	4+ a week
5%	6.4%	24.9%	29.7%	34%

Orgasm Rating				
Very bad	Rather bad	Average/satisfactory	Rather good	Very good
1.1%	5.4%	19.9%	45.8%	27.8%

Sexual Partner at the Moment	
Yes	No
89.6%	10.4%

Degree of Sexual dysfunction				
None	Mild	Mild-Moderate	Moderate	Severe
29.2%	43.8%	17.2%	6.6%	3.2%

Measures

The questionnaires used included the following, except for the 77 outpatients who used a version that did not include the Sexual Desire Inventory and a question regarding ones orgasm sensation, in all other matters, the question battery was the same.

A modification of the Giessen Prostatitis Symptom Score (Brähler, Wurz, Unger, Ludwig, & Weidner, 1997) was used to assess prostate-related symptoms. The Estonian version of GPSS is translated by Andrology Unit of Tartu University Clinicum doctors M. Punab and P. Korrovits and has 17 extra items, with a total of 35. The questionnaire measures both direct (weakened stream, pain while urinating, painful erections) and indirect (backpain, lowered sexual desire, overall weakness) symptoms of different prostate-related diseases over the past week. It can be used to evaluate both mild and more severe prostate-related symptoms. Each symptom is rated on a 1 to 6 scale, where 1 = „no symptom manifested“, 2 = „symptom manifests, but does not bother life“ and 6 =„symptom manifests and bothers life extremely“. The internal consistency of the test was high (Cronbach’s alpha coefficient = .92).

To assesses erectile and sexual dysfunction in men, the IIEF-5 was used. It is a 5-item self-report measure that assesses erectile and sexual dysfunction in men over the previous 6 months. The IIEF-5 is reliable and valid, containing high internal consistency and test-retest

reliability (Rosen, Cappelleri, Smith, Lipsky, & Pena, 1999). Scoring ranges from 5 to 25 points, with higher scores on the IIEF-5 indicating greater sexual functioning. ED is classified into five severity levels, ranging from none (22-25) to high (5-7). The Estonian version of the IIEF-5 is translated by M. Punab. The tests internal consistency (Cronbach's alpha coefficient) was .90.

To validate the GPSS scores, we used the NIH-Chronic Prostatitis Symptom Index which is a 13-item questionnaire developed to assess symptoms and quality of life in men with chronic prostatitis/chronic pelvic pain syndrome (CP/CPPS) (Litwin et al., 1999) It has demonstrated good reliability (current Cronbach α =.87), validity, and responsiveness to change, and it has been used as the primary outcome variable in multiple large-scale studies of CP/CPPS treatments. It has been translated and adapted into Estonian by P. Korrovits (Korrovits, Punab, Mehik & Mändar, 2006). The NIH-CPSI has a total score range from 0 to 43, and it includes three subscales addressing pain (score range 0–21), urinary symptoms (score range 0–10), and quality of life (QOL) (score range 0–12).

The SDI (Spector, Carey, & Steinbergis, 1996) is used to measure sexual desire. It consists of 2 factors: items 1-9 measure dyadic sexual desire and items 10-13 solitary sexual desire. Item 14 measures period of time one is content with no sexual activities. Items 3-9 and 10-13 use a 9-point scale (0 - no desire, 8 - strong desire). 1-2, 10 and 14 are multiple-choice items, where a higher score indicates a shorter time period. The Estonian version of the SDI is adapted and translated by T. Aavik. Internal consistency estimates using Cronbach's alpha revealed coefficients of .94 for dyadic sexual desire and .91 for solitary sexual desire.

Additional information was collected about socio-demographic characteristics (education, marital and economical status), sexual activity (number of partners, frequency of ejaculation, relative frequency of intercourse), orgasm sensation and overall satisfaction with sexual life.

Statistical Analysis

Exploratory factor analysis (EFA) and post hoc class comparisons were conducted in IBM SPSS 20.0, latent profile analysis was conducted in Mplus 6.12, parallel analysis was done with Vista 7.9.2.5. Following acceptance of a final EFA model, we calculated factor scores by multiplying the items indicated to load on the factors that could meaningfully be interpreted. These generated factor scores were used in subsequent analyses.

Ethical Considerations

Informed consent was obtained from all the participants. The study was approved by the Ethics Review Committee on Human Research of the University of Tartu.

Results

Exploratory Factor Analysis

To determine the number of factors to extract, we noted Costello & Osbornes (2005) critique of such commonly used methods as Kaiser's criterion (eigenvalues greater than 1) and Catell's scree test, and followed their recommendation to use parallel analysis (PA). Parallel analysis (Horn, 1965), which has been found to be one of the most accurate methods for determining the number of factors to retain (e.g., Velicer et al., 2000; Zwick & Velicer, 1986), suggested that five factors be extracted. A visual scree test indicated evidence for one strong factor with the possibility of one to four additional factors (see Figure 1). We extracted three, four, five, and six factors to test different solutions for interpretability. Extraction of less then five factors resulted in vague and theoretically incoherent factors. Extraction of more than five factors resulted in trivial factors with only one or two salient loadings. Thus, a five-factor solution was opted consistent with results from parallel analysis.

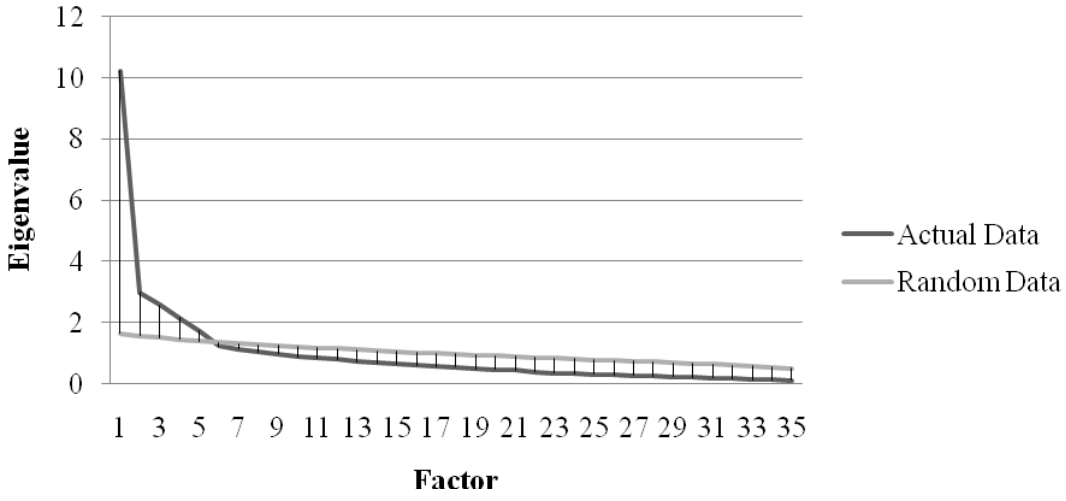

Figure 1. Scree plots for Horn's parallel analysis (HPA) for the Giessen Prostatitic Symptom Score.

We chose Principal Axis Factoring (PAF) instead of Principal Components Analysis (PCA) because PAF analyzes only common variance in its search for underlying latent structure, unlike PCA which analyzes common, unique, and error variance and is thus better characterized as a data reduction technique than a factor analytic one (Kahn, 2006). Given our

goal of understanding the latent structure of the GPSS, PAF seemed the more appropriate technique. Finally, we chose PAF rather than Maximum Likelihood because PAF does not assume multivariate normality (Fabrigar, Wegener, MacCallum, & Strahan, 1999), which was important given that most items in the GPSS are skewed and violate the assumption of multivariate normality. Varimax rotation was used in order to ensure maximally separate factors and simple factor structure. The results of the factor analysis are shown in Table 3.

Table 3

Principal Axis Factor Analysis With Varimax Rotation of the Giessen Prostatitic Symptom Score (Five Factors).

Symptoms	F1	F2	F3	F4	F5	h^2
Weak urinary stream	***.783***	.131	.166	.151	-.063	.684
Bladder is not empty after urinating	***.775***	.200	.148	.075	.209	.712
Stream starts and stops intermittently	***.766***	.037	.137	.203	.070	.653
Need to urinate can't be deferred	***.765***	.224	.026	.129	.033	.654
Difficult to start urinating	***.742***	.152	.213	.140	-.070	.644
Frequent need to urinate (<2 h in between)	***.702***	.244	.179	-.021	.210	.629
Post-urination dribble	***.628***	.108	.185	.180	.075	.479
Pain, discomfort while urinating	***.617***	.190	.094	-.051	.412	.598
Have to urinate uring the night	***.544***	.280	.040	.126	-.022	.393
Tiring quickly	.334	***.605***	.352	.292	.055	.689
Anxious, irritated	.121	***.599***	-.040	.097	.179	.417
Low work ability	.338	***.598***	.291	.333	-.046	.669
Feelings of weakness	.328	***.570***	.403	.296	.041	.685
Difficulties sleeping	.252	***.558***	-.030	.118	.077	.396
Pain, feeling heavy in the legs	.181	***.549***	.306	.243	.090	496
Pain in joints	.189	***.513***	.310	.118	-.010	.409
Headaches	.049	***.497***	.013	-.060	.209	.297
Freezing hands, feet	.201	***.392***	.212	.214	.171	.314
Pain, discomfort in rectal area	.177	.044	***.673***	.014	.195	.525

Pain, discomfort in lower abdomen	.211	.172	***.664***	.057	.222	.568
Pain, discomfort in the perineum	.168	-.010	***.662***	.009	.33	.575
Pain, discomfort in lower back	.130	.289	***.579***	.003	.022	.437
Back pain	.202	.444	***.484***	.130	.007	.489
Problems getting an erection	-.031	.091	.153	***.751***	.010	.597
Unable to maintain erection	.272	.120	-.041	***.739***	-.003	.636
Difficulty reaching ejaculation	.221	.052	-.087	***.614***	.162	.462
Diminished interest in sex	.034	.145	.154	***.477***	-.004	.273
Pain, discomfort in the penis	.064	.103	.304	-.057	***.696***	.594
Pain during or after ejaculation	.192	.143	.068	.356	***.623***	.577
Painful erections	.178	.156	-.096	.372	***.586***	.547
Inflamation on top of the penis	-.002	.050	.208	-.103	***.491***	.297
Pain, discomfort in the testies	.037	.086	.388	.134	***.428***	.360
Excretion from urethra	.060	.010	.247	-.076	***.332***	.180
Blood in sperm	-.059	.206	-.032	.189	***.318***	.184
Premature ejaculation	.114	.113	-.022	.292	.035	.113
Eigenvalue	5.405	3.481	3.121	2.746	2.479	
% of Variance	15.44	9.95	8.92	7.85	7.10	

Note: F1-F5 = Factor 1-Factor 5; h^2 = Communality coefficient; Factor loadings that were included in respective factors are in bold italics.

Items were chosen for factors based on their highest loading scores and were considered salient if their factor loading scores were a minimum of .32 **(**Costello & Osborne, 2005**).** The first factor can be described as urinary problems, with symptoms such as pain, discomfort and difficulties urinating, unempty bladder after urinating and a frequent need to urinate. The second factor can be described as general fatigue, involving such symptoms as feelings of weakness, tiring quickly, low work ability, anxiety and difficulties sleeping. The third factor appears to be related to CPPS, involving pain in different parts of the lower body: the back, the perineum, lower abdomen and rectal area. The fourth factor measures erectile difficulties, with items such as inability to maintain erection, problems getting an erection, difficulties reaching ejaculation and diminised in terest in sex. The fifth factor points to CP, with specific clinical manifestations such as inflammation, excretion from the urethra, pain and discomfort

in the penis and testies, painful erections and ejaculations. The five factor model accounted for 50% of the total variance, Cronbach alphas of the factors 1-5 were .92, .87, .81, .77 and .74, respectively. Only one item, premature ejaculation, differed considerably from others and did not load well into any factor. Blood in sperm, excretion from urethra and freezing hands and feet were also poorly loaded to their respecitve factors (factor loadings <.40). Correlations between the factors and sexual variables can be seen in Table 4.

Table 4
Correlations Between GPSS Factor Scores and Covariates.

Variable	Urinary problems (F1)	Overall fatigue (F2)	Pain in lower regions (F3)	Erectile difficulties (F4)	Prostate inflammation (F5)
Sexual functioning (IIEF-5)	-.14*	-.23**	-.12*	-.55**	-.10
Dyadic desire	-.17**	-.19**	-.23**	-.21**	-.12*
Solitary desire	.06	.10	.04	-.04	-.01
Time content without sex	.31**	.25**	.24**	.21**	.17**
Frequency of ejaculation	-.22**	-.16**	-.05	-.27**	.05
Frequency of intercourse	-.25**	-.29**	-.29**	-.17**	-.12
Orgasm sensation	-.33**	-33**	-.35**	-.41**	-.25**
Amount of partners	-.05	-.11*	.05	-.04	.02
Age	.14*	.01	-.08	.19**	-.22**
Education	-.13*	-.15**	-.10	-.01	-.18**
Economic status	-.01	-.09	-.14*	-.03	-.06
Urinary problems (NIH-CPSI)	.73**	.40**	.44**	.17**	.40**
Pain (NIH-CPSI)	.46**	.43**	.70**	.15**	.65**
Impact on life (NIH-CPSI)	.63**	.45**	.56**	.24**	.59**

Note: GPSS: Giessen Prostatitic Symptom Score; IIEF-5: International Index of Erectile Functioning-5; NIH-CPSI: National Institute of Health Chronic Prostatitis Symptom Index; Qol:Qualitiy of Life; F1-F5 = Factor 1-Factor 5; *p<.05, **p<.01.

GPSS factor 1, urinary problems, correlated well with NIH-CPSI urinary problem subscale, pain related GPSS factors 3 and 5 had strong correlations with the NIH-CPSI pain subscale; meanwhile, GPSS erectile difficulties (factor 4) had a moderately strong correlation with the IIEF-5. The factors with the most impact on quality of life were urinary problems (factor one) and pain (factors three and five). Age had a weak positive correlation with urinary problems and erectile difficulties, but a negative correlation with inflammation, which is expected since prostatitis affects younger men. Economic status was negatively correlated with pains in lower body and education had negative correlations with both urinary symptoms, general fatigue and inflammation, indicating men with higher levels of socio-economic status suffer marginally less from prostate related symptoms.

Regarding sexual variables, all five factors had similar weak to moderate negative correlations with dyadic desire, sexual activity, frequency of intercourse and orgasm sensation, while having no substantial relationships with solitary desire or the number of sexual partners had.

Latent Profile Analysis

Latent profile analysis was then conducted to reveal possible subclasses of subjects based on individual symptom patterns. There are different approaches to compare models and to decide on the number of classes (Nagin, 1999). To determine the most appropriate number of classes different criteria recommended by Muthen and Muthen (2000), indexes such as the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), sample size-adjusted BIC (ssaBIC) and Lo-Mendell-Rubin Likelihood Ratio Test (LRT) were used. In addition to the information criteria and the LRT, we compared the models usefulness and interpretability for a more content-oriented point of view. Model fit statistics were inconsistent across models, as one can see in Table 5. The Entropy scores suggested all models had acceptable fit, with 3 classes having the highest. The LMR-LRT didn't offer concrete support for any one model. AIC and BIC scores consistently approved with each class added. The decision which model to use was thus based on the interpretability of the models, An additional class may reveal an interesting subpopulation, however, an additional class may also result in the splitting of a well-interpretable latent class into two poorly interpretable classes. The utility of an additional class with respect to substantive theory was assessed by comparing different models and classes with respect to factor means and the means of the covariates. After comparing results for 2-. 3-, 4-, 5- and 6-class models (not shown) a 4-class model was found to be optimal.

Smaller models failed to distinguish enough subgroups of symptoms, while a higher number failed to provide substantial new interpretability. The first class in the 4-class model compromised of 81% of cases, the second, third and fourth class of 7%, 10% and 2%, respectively. A detailed description of the classes is given below.

Table 5

Fit indexes for latent class models with 2–8 classes.

Model	AIC	BIC	SSABIC	LRT	p	Entropy
2 classes	4656.142	4718.320	4667.560	130.294	0.4952	0.937
3 classes	4552.944	4638.438	4568.643	112.026	0.1165	0.955[a]
4 classes	4465.958	4574.769	4485.938	96.261	0.2338	0.942
5 classes	4411.250	4543.378	4435.513	64.871	0.0741	0.922
6 classes	4369.613	4525.057	4398.157	52.160	0.6279	0.932
7 classes	4306.108	4484.869	4338.933	73.426	0.0477	0.915
8 classes	4262.652[a]	4464.729[a]	299.759[a]	53.929	0.2136	0.920

Notes: [a] = Best fitting model according to statistic.

4-Class Model ANOVA and Post Hoc Tests for Prostate Symptoms and Sexual Variables

One-way ANOVA and post hoc tests were conducted to find out how latent class membership was associated with psychosexual variables and prostate disease symptoms. The assumption of homogeneity of variance was violated, therefore the Brown-Forsythe F-ratio was used. Effects of all reported variables were statistically significant at the .05 significance level. Since equality of variances could not be assumed, post hoc tests conducted used the Games-Howell procedure, which has shown to generally offer the best performance (Field, 2013). Concerning prostate disease symptoms (see Table 6), the classes were compared on the 5 factors extracted from GPSS and the IIEF-5.

Post hoc comparisons indicated Class 1 (C1) had lower scores than class 2 (C2), class 3 (C3) or class 4 (C4) in urinary problems (mean difference (C2) = -14.82, SE = 2.25, $p < .001$.; mean difference (C3) = -5.24, SE = 1.62, $p < . .05$; mean difference (C4) = -21.95, SE = 2.11, $p < .001$), overall fatigue (mean difference (C2) = -11.88, SE = 1.64, $p < .001$; mean difference (C3) = -4.41, SE = 1.71, $p < .07$; mean difference (C4) = -12.47, SE = 4.08, $p < .08$) and inflammation (mean difference (C2) = -2.54, SE = 0.80, $p < .05$; mean difference (C3) = -9.04, SE = 0.66, $p < .001$; mean difference (C4) = -14,54, SE = 2.39, $p < .01$); had

lower scores than class 2 or 3 in pains in lower body (mean difference (C2) = -12.06, SE = 0.78, $p < .001$; mean difference (C3) = -6.74, SE = 0.66, $p < .001$), and lower scores than class 2 or class 4 in erectile dysfunction (mean difference (C2) = -2.09, SE = 0.82, $p < .08$; mean difference (C4) = -7,22, SE = 1.97, $p < .05$), indicating it consists of the healthiest group of men. Class 2 had higher scores than class 3 in urinary problems (mean difference (C3) = 9.58, SE = 2.70, $p < .01$), overall fatigue (mean difference (C3) = 7.47, SE = 2.30, $p < .01$) and erectile difficulties (mean difference (C3) = 3.05, SE = 0.99, $p < .05$) and higher scores than classes 3 or 4 in pain in lower regions (mean difference (C3) = 5.31, SE = 0.99, $p < .001$; mean difference (C4) = 12.50, SE = 1.67, $p < .001$), showing high incidence of urinary problems, overall fatigue and pain in lower regions, with moderate erectile difficulties. In addition, Class 3 has lower scores than class 4 in urinary problems (mean difference (C4) = -16.71, SE = 3.02, $p < .001$), in pain in lower regions (mean difference (C4) = -7.18, SE = 1.62, $p < .01$) as well lower scores in erectile difficulties (mean difference (C4) = -8.18, SE = 2.05, $p < .05$) indicating a profile of moderate urinary problems with significantly lower erectile dysfunction than classes 2 or 4, while having moderately high levels of inflammation while class 4 can than be described as the group with the highest prevalence of prostate disease symptoms. Regarding IIEF-5 scores, Class 2 and Class 4 have lower scores from Class 3 (mean difference (C2) = -3.47, SE = 1.30, $p < .05$; mean difference (C4) = -5.28, SE = 1.55 $p < .05$), confirming that men in Class 3 have the least problems with erectile dysfunction.

Table 6

Prostate Symptom Mean Scores of the 4 Latent Classes.

	Class 1		Class 2		Class 3		Class 4	
	M	SD	M	SD	M	SD	M	SD
Urinary problems (F1)	17.75	7.96	32.58	10.81	23.00	9.34	39.71	5.46
Overall Fatigue (F2)	17.94	6.90	29.83	7.78	22.36	10.01	30.42	10.75
Pain in lower regions (F3)	7.72	3.05	19.79	3.75	14.47	3.81	7.28	3.94
Erectile difficulties (F4)	7.48	4.12	9.58	3.87	6.52	3.63	14.71	5.18
Prostate inflammation (F5)	9.45	2.34	12.00	3.86	18.50	3.90	24.00	6.32
Erectile functioning (IIEF-5)	18.68	4.56	16.66	5.27	20.13	4.38	14.85	3.62

Notes: IIEF-5:International Index of Erectile Functioning, F1-F5 = Factor 1-Factor 5.

Regarding sexual variables, the latent classes vary significantly in all variables (see Table 7) except the number of partners ($F(3, 45.18)=2.61$, $p=.063$). Post hoc tests reveal that

Class 1 has higher scores in frequency of ejaculation than classes 2 and 4 (mean difference (C2) = 0.64, SE = 0.21, $p < .05$; mean difference (C4) = 1.01, SE = 0.11, $p < .001$) and a lower score than class 3 (mean difference (C3) = -0.75, SE = 0.25, $p < .05$), a higher score than class 2 in dyadic desire (mean difference (C2) = 9.70, SE = 2.31, $p < .01$), a lower score than class 2 (mean difference (C2) = -1.75, SE = 0.19, $p < .001$) and class 4 (mean difference (C4) = -1.19, SE = 0.24, $p < .01$) in time content without sex, a lower score than class 4 in solitary desire (mean difference (C4) = -3.76, SE = 1.09, $p < .05$), a higher score in frequency of intercourse (mean difference (C2) = 34.20, SE = 9.56, $p < .01$) and orgasm sensation (mean difference (C2) = 0.98, SE = 0.24, $p < .01$) than class 2, and a higher score in orgasm sensation than class 4 (mean difference (C4) = 0.70, SE = 0.21, $p < .07$). In addition, class 2 has a lower score in dyadic desire than class 4 (mean difference (C4) = -12.27, SE = 3.79, $p < .05$), a higher score in time content without sex (mean difference (C3) = 1.65, SE = 0.60, $p < .08$) and satisfaction with sex life (mean difference (C3) = 0.41, SE = 0.16, $p < .07$) than class 3. Class 3 is significantly younger (mean difference (C1) = -9.99, SE = 1.88, $p < .001$; mean difference (C2) = -14.18, SE = 2.84, $p < .001$;) and has higher frequency of ejaculation (mean difference (C1) = 0.75, SE = 0.25, $p < .05$; mean difference (C2) = 1.39, SE = 0.31, $p < .001$; mean difference (C4) = 1.76, SE = 0.25, $p < .001$) than other classes, as well as lower scores in solitary desire than class 4 (mean difference (C4) = -7.20, SE = 2.08, $p < .05$).

Table 7

Mean Scores of Psychosexual Variables of the 4 Latent Classes.

	Class 1		Class 2		Class 3		Class 4	
	M	SD	M	SD	M	SD	M	SD
Dyadic desire	39.92	13.43	30.22	9.12	37.20	14.03	42.50	7.66
Solitary desire	8.73	7.09	10.11	5.80	5.30	5.81	12.50	2.42
Time content without sex	4.30	1.40	6.05	0.72	4.40	1.83	5.50	0.54
Frequency of ejaculation[a]	1.55	1.29	0.90	0.99	2.29	1.44	0.53	0.22
Frequency of intercourse[b]	70.59	26.73	36.38	39.91	73.50	39.72	53.33	33.56
Orgasm sensation	4.04	0.84	3.06	0.99	3.50	0.85	3.33	0.52
Satisfaction with sex life	2.01	0.58	2.21	0.66	1.80	0.53	2.14	0.38
Age	51.20	10.22	55.40	10.81	41.20	10.72	51.71	10.80

Notes: [a] = times per week; [b] = percentage of ejaculations.

Discussion

The first hypothesis of this study was that the Giessen Prostate Symptom Score would differentiate between different types of prostate related symptoms, measuring a set of latent factors that constitute the prostate diseases. Results of the EFA suggest that the items of GPSS can be meaningfully described in five different factors, which are consistent with the symptomatology of prostate diseases: factor one involves the wealth of symptoms indicative of LUTS (Medina, Parra & Moore, 1999). Factor two involves the anxiety, worry and overall fatigue associated with prostate disease, which have been found in studies by DaSilva et al. (1997) and Mehik et al. (2001), for example. Factor three involves the pain-related symptoms of CPPS, factor four most of the sexual dysfunctions associated with prostate disease and factor five inflammation and pain usually related to CP (Habermacher, Chason & Schaeffer, 2006). All five factors showed adequate reliability (Cronbach α's ranged from .74-.92). The only item to not load on any of the factors was „premature ejaculation", which is understandable, since ED and PE are two separate clinical entities with different etiology (Perelman, 2004). Nevertheless, PE is considered a common sexual dysfunction related to prostate disease, one of the most significant risk factors for PE is prostatitis (Screponi et al., 2001), so removing it from the GPSS on the basis of not loading on any of the five factors would not be sensible.

The second and third hypothesis were that that men are differentiated into subgroups based on prostate symptoms in regards to their occurence or intensity and thus the impact on their sexual life is different. This proved correct as the latent profile analysis based on the five factors from GPSS yielded four classes of symptom patters among the subjects with significant differences in psychosexual characteristics between classes.

The largest class of men (class one) compromising of 81% of the subjects had the lowest symptom scores compared to other classes, with minimal urinary and overall health problems and mild erectile dysfuntion, while having no pain-related symptoms. They exhibited no decreased libido and had the highest sexual activity among the classes in their age range as well as the highest satisfaction with orgasms among all the classes. It is likely men in this class are suffering from minimal urinary tract symptoms indicative of BPH. The average incidence of moderate or serious LUTS among men above the age of 40 is 17-28%, so these class membership percentages are in line with the general prevalence of LUTS (Kok et al., 2009).

The second class of men, compromising of 7% of the cases had significantly higher scores in urinary symptoms, pains in the lower body and overall health then the first class, as well as higher scores on erectile difficulties, indicating mild to moderate erectile dysfunction. These report a slightly lowered libido, lower sexual activity in both frequency of ejaculation and intercourse, as well as lower orgasm sensation. There isn't one specific factor that stands out, but a combination of pain in the lower regions of the body and LUTS.

Third class, with 10% of subjects, were on average 10 years younger, had no erectile dysfunctions, but higher incidence of prostate inflammation then the former classes as well as moderate scores in urinary symptoms, overall fatigue and pain in lower parts of the body. Regarding the sexual profile of these men, they had no diminished desire, had the most active sexual life, but were not as satisfied with it as men in class two. This is in line with previous findings, which show that though symptom incidence increases with age, younger men are more bothered by them (Schulman, 2001). Studies have shown that on average men in their 40s, if they have a partner, have sex once or twice a week (Reece et al., 2010), indicating that men in this class don't suffer from any lack of sexual activity due to their health condition. These comparisons have to be taken with caution however, since the average sexual activity of Estonian men might not be the same as their counterparts in Unites States, unfortunately, a representative study of sexual activity in Estonia is missing.

The fourth class, compromising of only 2% of the men, had the highest incidence of symptoms, indicating that men in this class were the ones most ill. They were similar to class 2 in that they had high score in all factors, except for pain in the lower regions of the body and exhibited moderate erectile dysfunction. More severe LUTS and greater bother as well as higher incidence of ED have been reported by patients with painful ejaculation and other CP symptoms (Sadeghi-nejad & Seftel, 2006), so these finding reinforce the literature on the combinatory effects of prostatitis symptoms and LUTS on sexual dysfunction. Class 4 had the lowest frequency of ejaculation and frequency of intercourse, as well as lower orgasm sensation scores then the first class. They did not, however, have decreased libido, having the highest solitary desire as well as normal levels of dyadic desire. This is possibly due to the forced lack of sexual activity caused by the disease symptoms. Surprisingly, they do not report less satisfaction with their sex life. These findings indicate that men can experience sexual dysfunction without being dissatisfied in their sexual life, which might be counterintuitive, but is consistent with some of the literature. For example Smith et al. (2007) found that men with CP/CPPS experienced less enjoyment than control men from intimate activities involving their partner, while not reporting a lowered satisfaction with their sex life.

Frank, Anderson, and Rubenstein (1978) found that over 80% of couples reported sexual and marital satisfaction despite reporting high rates of sexual dysfunction. Since this study had a high prevalence of married men with sexual partners, it is possible the sample could have been skewed torwards the more satisfied in their sex life or sexual dysfunction may actually foster relationship satisfaction by, for example, providing couples with an opportunity to resolve conflicts successfully, thus enhancing emotional and sexual intimacy (Smith et al. 2007).

Limitations

The results of this study must be considered within the context of several limitations. We used self-reports of sexual behavior, which are always subject to bias, even though our results are consistent with those reported by others. Due to the illustrative nature of the analysis, no deterministic or causal implications can be made based on these results alone. We had a heterogenous set of subjects, so conclusions about specific prostate diseases can't be made based on this study. The sample was skewed torwards married men with sexual partners, thus the effect of lacking sexual activity is difficult to assess since we did not adequately capture the experience of those not involved with a partner.

Conclusion

Despite its limitations, the study we conducted has a number of important theoretical and practical implications. First, it provides evidence that a number of subsets of prostate disease symptom patterns occur in the men diagnosed with either BPH or CP/CPPS. Though a majority of men suffer from little obstruction to their sexual life and little bother from their symptoms, there are a variety of subgroups that are in fact affected in different margins. There doesn't seem to be a direct link between any one factor and sexual dysfunction and bother, the results indicate that men with a combination of health problems such as LUTS and pain related to CP/CPPS have the most profound impact on their sex life. Findings of this study have implications for the assessment and management of prostate problems, and reinforce the need to consider sexual, psychological, and relationship factors, especially among men with complex diagnosis of BPH and prostatitis, that are often neglected among men with these issues.

Second, though the Estonian adaption of the GPSS still needs to be tested on it's test-retest reliability it shows great promise as a prostate disease symptom checklist. It has adequate correlations with well-established questionnaries such as the NIH-CPSI and IIEF-5.

Evidence suggests it has good internal validity and reliabilty and can be used to measure not only urinary and pain-related symptoms, but sexual dysfuncion and general health-related problems men with prostate disease encounter. Using the GPSS as an everyday tool among urologists, andrologists and other clinicians can help assess the dynamics of prostate related ailments during and after treatment while not discounting the effects prostate diseases have on factors such as sexual dysfunctions and overall health.

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