ARTICLE

Associations between sexually submissive and dominant behaviors and sexual function in men and women

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The current study investigated the associations between sexually submissive and dominant behaviors and sexual dysfunction in Finnish men and women. We analyzed three population-based data sets from 2006, 2009, and 2021–2022, including 29,821 participants in total. Participants filled out a questionnaire about their sexually submissive and dominant behaviors, Sexual Distress Scale, Checklist for Early Ejaculation Symptoms and International Index of Erectile Function Questionnaire-5 (men), and Female Sexual Function Index (women). Pearson Correlations showed that for both sexes, sexually submissive (men: $r = 0.119$, $p < 0.001$; women: $r = 0.175$, $p < 0.001$) and dominant (men: $r = 0.150$, $p < 0.001$; women: $r = 0.147$, $p < 0.001$) behaviors were both associated with more sexual distress. However, for men, sexually submissive ($r = -0.126$, $p < 0.001$) and dominant behaviors ($r = -0.156$, $p < 0.001$) were associated with less early ejaculation symptoms. Both sexually submissive ($r = 0.040$, $p = 0.026$) and dominant behaviors ($r = 0.062$, $p < 0.001$) were also associated with better erectile function while sexually dominant behavior alone was associated with better orgasmic function ($r = 0.049$, $p = 0.007$), intercourse satisfaction ($r = 0.068$, $p < 0.001$), and overall satisfaction ($r = 0.042$, $p = 0.018$). For women, both sexually submissive ($r = 0.184$, $p < 0.001$) and dominant behaviors ($r = 0.173$, $p < 0.001$) were also associated with better overall female sexual function. One possible explanation is that these individuals have a clear idea of what they prefer sexually facilitating arousal. Particularly, sexually submissive behavior may reduce high-level self-awareness and, in this way, contribute to reduced performance anxiety. However, non-normative interests seem to simultaneously result in increased sexual distress probably due to the absence of self-acceptance. Further research about the causal mechanisms between non-normative sexual interest and sexual function is needed.

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INTRODUCTION

Paraphilia is "an intense and persistent sexual interest other than an interest in genital stimulation or preparatory fondling with phenotypically normal physically mature, consenting human partners" [1]. Common subtypes of paraphilic behavior include "Bondage and Discipline, Dominance and Submission, Sadism and Masochism," which in short, are widely known as BDSM [2, 3]. Importantly, the large majority of individuals who are into BDSM would not fulfill the diagnostic criteria of paraphilic disorder which requires distress or harm to be present [1]. According to Hebert and Weaver [4], individuals who practice BDSM generally fall into groups: one is people who want to have the power of controlling others, and another is people who want to give up their power and be under control. Here, we broadly categorized these behaviors into two groups: sexually submissive and dominant behaviors.

Although the prevalence of BDSM practices varies—mainly due to different definitions and specificity of BDSM, the rate is not low in the general public. Studies have found that about 2–10% of individuals engage in BDSM and a much higher prevalence, around 60%, having BDSM interests and fantasies [4–6]. A factor related to BDSM behaviors is sexual orientation. Several studies have found that non-heterosexual individuals displayed higher interest, about twice as much, and more frequent practices in BDSM than heterosexual individuals [7, 8].

However, little is known about the potential associations between sexual dysfunction and sexually submissive and dominant behaviors. Sexual dysfunctions are common in both sexes, affecting 10% to 52% of men and 25% to 63% of women globally [9–11]. It usually presents in the form of early ejaculation and erectile dysfunction among men and sexual desire, arousal disorder, as well as orgasmic disorder among women [9–11]. Several factors have been found to be associated with sexual dysfunctions, but etiology often is not known [12–15]. Based on previous research [16–18], it is not clear whether people with BDSM interests and behaviors have more or less sexual dysfunction. Pascoal, Cardoso and Henriques [19] found that compared with non-BDSM context, women reported less distress about maintaining sexual arousal in the BDSM context. Except for premature orgasm and anorgasmia, men also expressed less distress in sexual functioning in the BDSM context [19]. This means that sexually submissive and dominant behaviors may enhance sexual satisfaction by improving sexual arousal and some parts of sexual functioning. Specifically, sexually submissive behavior may be related to an evasion of high-level self-awareness [20]. As Masters and Johnson [21] suggest, "spectatoring," negatively

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Table 1. Details of the data sources used in the present study.

Data Source	Years of data collection	*N* of Participants	Measures
1	2006	9100	Female Sexual Function Index, Checklist for Early Ejaculation Symptoms, International Index of Erectile Function Questionnaire-5, Sexual Distress Scale, Sexually Submissive Behavior, and Sexually Dominant Behavior
2	2019	9306	Female Sexual Function Index, Checklist for Early Ejaculation Symptoms, Sexual Distress Scale, Sexually Submissive Behavior, and Sexually Dominant Behavior
3	2021–2022	11,415	Female Sexual Function Index, Checklist for Early Ejaculation Symptoms, Sexual Distress Scale, Sexually Submissive Behavior, and Sexually Dominant Behavior

evaluating one's performance during sex, may be a possible cause of sexual dysfunction. Escape from high level of self-awareness, namely, distraction from the preoccupation of one's own sexual performance, may contribute to less bodily spectatoring and therefore better function. For men, lessened bodily spectatoring and performance-anxiety could be beneficial for maintaining sympathovagal balance [22, 23]. This should reduce arousal-related disorders and early ejaculation.

On the other hand, other research has found contradictory results and argues that having paraphilic interests may result in higher psychological distress due to social stigma [24, 25]. Since having such preferences is stigmatized and less likely to be widely acceptable, people may have difficulties finding sexual partners as they may find it embarrassing to disclose their non-normative interests. The related anxiety during sexual activities could inhibit sexual arousal and increase sexual dysfunction.

Following the logic above, we were interested in associations between sexually submissive and dominant behaviors and sexual dysfunction. We hypothesized that sexually submissive and dominant behaviors would be positively associated with sexual distress but negatively associated with arousal-related disorders, such as erectile dysfunction and female sexual interest/arousal disorder. We also hypothesized that sexually submissive and dominant practices would be more prevalent among non-heterosexual participants.

SUBJECTS AND METHODS

Participants

The current sample included data from three sources. Table 1 gives an overview of the data sources and which measures were available in each of them [26, 27]. The eligibility criteria were being twins or family of twins of at least 18 years of age at the time of data collection, residing in Finland, and having Finnish as mother tongue.

The 2006 data collection was part of the Genetics of Sex and Aggression project in Finland, aiming at investigating human sexuality related phenotypes, including sexual function, sexual behavior and its variations, and aggressive behavior [26]. The target sample was all Finnish monozygotic and dizygotic twins, along with their siblings. They were ascertained from the Central Population Registry of Finland (a government-based registry including the personal information of all Finnish citizens), with an overall participation rate of 45%.

Participants in the 2019 data collection were those who had indicated willingness to participate in future data collections in 2006 and 2012/2013 (ref. [27]). The total response rate was 29%; 97% of these respondents consented to their data being used for scientific purposes.

Participants in the 2021–2022 data collection were a subset of a population-based sample of twins and siblings and parents of twins from Finland obtained from the Digital and Population Data Services Agency of Finland (https://www.dvv.fi/en), a governmental institution that maintains the national population registry. The response rate was 24.1%.

In total, 29,821 participants were included in the current study (reports from men, $n = 10{,}081$, $M = 34.73$ years, $SD = 14.74$, 88.1% heterosexual, and reports from women $n = 19{,}740$, $M = 34.19$, $SD = 13.92$, 79.2% heterosexual). There was some overlap between the three sources: in total, 3,525 reports were from the same individual in the different data collections. The dependencies among both the responses of members of the same family and the responses from the same individual in the different data collections were taken into account in the group comparisons by using Generalized Estimating Equations (GEE).

All eligible people were contacted and invited to participate. It was explained to them that participation is anonymous and voluntary, but it is unknown why those who declined to participate did so. Participants in the 2006 data collection had the option of participating via paper questionnaire, which makes it possible that data might be missing at random. The 2019 and 2021–2022 data collections were conducted via an online survey so that participants cannot proceed without answering every question on the page. This means that usually, an individual will have 100% missing data for a scale, or 0% missing data. Missing values were treated as system missing and that the number of participants in the analyses varied as a function of this.

Instruments

Sexually submissive and sexually dominant behaviors. We created two variables: Sexually Submissive and Sexually Dominant Behavior. In Source 1, Sexually Submissive Behavior was measured by two questions: "Have you ever been humiliated in a way that made you sexually aroused?" and "Has somebody ever caused you physical pain so that you became sexually aroused by it?" [28]. In Sources 2 and 3, it was measured by one question: "Have you been dominated, humiliated, controlled (e.g., bondage), or have your partner caused you pain, with mutual consent to achieve sexual pleasure?" Participants who answered "yes" to any of the questions were coded "1," meaning that they had engaged in sexually submissive behavior. Those who answered "no" were coded "0," meaning they had no experience of sexually submissive behavior.

In Source 1, Sexually Dominant Behavior was measured by two questions as well: "Have you ever caused another person physical pain and become sexually aroused by it?" and "Have you ever humiliated somebody and become sexually aroused by it?" [28]. In Sources 2 and 3, it was measured by one question: "Have you dominated, humiliated, controlled (e.g., bondage), or caused pain to a partner, with mutual consent to achieve sexual pleasure?" As above, those who answered "yes" to any of the questions were coded "1" and those who answered "no" were coded "0."

Sexual distress scale (SDS). We used seven gender-neutral items from the Female Sexual Distress Scale to measure sexual distress in the past 30 days, including today: "How often did you feel anxious about your sexuality?," "How often did you feel guilty about your sexual difficulties?," "How often did you feel stressed about sex?," "How often did you feel sexually inadequate?," "How often did you feel regrets about your sexuality?," "How often did you feel embarrassed about sexual problems?," and "How often did you feel dissatisfied with your sex life?" [29, 30]. Responses were given on a five-point Likert scale where "0" was "never," "1" was "rarely," "2" was "occasionally," "3" was "often," and "4" was "always" [29, 30].

Female Sexual Distress Scale has high test-retest reliability and a strong internal consistency coefficient (Cronbach's α) ranging from 0.86 to 0.90 s, as well as a good discriminant validity for women [29–32] and men [33]. Cronbach's α of the current sample was 0.89.

Sexual dysfunction. For men, we used the International Index of Erectile Function Questionnaire-5 (IIEF-5) to measure their erectile function. According to previous research, IIEF-5 is the abridged version of the International Index of Erectile Function [34, 35]. The Cronbach's α of the current sample was 0.77. This measure was only available for the first data source.

For assessing ejaculation problems we used two questions from the Checklist for Early Ejaculation Symptoms (CHEES) available in all three data

sources: one assessed ejaculation control ("In what proportion of intercourses have you felt that you can decide when you are going to ejaculate?"); and another one assessing ejaculation speed ("How fast have you typically ejaculated after the intercourse (vaginal or anal) has commenced?") [36]. The intercorrelation between the two variables was 0.86.

For women, we used the Female Sexual Function Index (FSFI), containing the subscales of Desire, Arousal, Lubrication, Orgasm, Satisfaction, and Pain. According to Rosen et al. [37], FSFI has shown high reliability and consistency in each domain as well as validity in clinical and non-clinical samples. In the current sample, Cronbach's α was 0.79 for the total scale.

Statistical analyses

Since the sample contains data from twins and their siblings and there were duplicate cases in the different data sources, we first conducted Generalized Estimating Equations accounting for dependencies of responses of members of the same family and of responses from the same person in the different data collections. Using GEE, we examined gender differences in age, sexual orientation, sexual distress, sexually submissive behavior, and sexually dominant behavior. Next, we used Pearson Correlations to examine the correlations between sexual dysfunction and sexually submissive and dominant behaviors. Third, we investigated whether there were differences between the heterosexual-only and non-heterosexual participants using Pearson Correlations with 95% Confidence Intervals. Lastly, we checked whether the results were the same in different data sources again using 95% Confidence Intervals.

All the analyses were proceeded via SPSS for Mac (Version 28).

RESULTS

Gender differences

Generalized Estimating Equations were computed to analyze gender differences in age, sexual orientation, sexual distress, sexually submissive behavior, and sexually dominant behavior. The results showed that men ($M = 34.73$, $SD = 14.74$) were older than women ($M = 34.19$, $SD = 13.92$), Wald χ^2 (1) = 8.82, $p = 0.003$. Men ($M = 0.88$, $SD = 0.32$) were more likely to be heterosexual than women ($M = 0.79$, $SD = 0.41$), Wald χ^2 (1) = 367.72, $p < 0.001$. Women ($M = 11.91$, $SD = 6.64$) reported higher sexual distress than men ($M = 11.17$, $SD = 6.42$), Wald χ^2 (1) = 71.75, $p < 0.001$. For sexually submissive behavior, more women ($M = 0.23$, $SD = 0.42$) reported engaging in it than men ($M = 0.14$, $SD = 0.35$), Wald χ^2 (1) = 315.58, $p < 0.001$, whereas for sexually dominant behavior, more men ($M = 0.18$, $SD = 0.39$) reported engaging in it than women ($M = 0.14$, $SD = 0.34$), Wald χ^2 (1) = 79.41, $p < 0.001$.

Sexual dysfunction and sexually submissive and dominant behaviors

Correlations were computed to analyze how sexual function variables were related to sexually submissive and dominant behaviors (see Table 2). Among men, sexually submissive behavior was strongly positively correlated with sexually dominant behavior, $r = 0.648$, $p < 0.001$. Both sexually submissive ($r = 0.119$, $p < 0.001$) and dominant ($r = 0.150$, $p < 0.001$) behaviors were associated with more sexual distress. They were also associated with fewer symptoms of early ejaculation (sexually submissive behaviors, $r = -0.126$, $p < 0.001$; sexually dominant behaviors, $r = -0.156$, $p < 0.001$). Also, both sexually submissive ($r = 0.040$, $p = 0.026$) and dominant behaviors ($r = 0.062$, $p < 0.001$) were associated with better erectile function while sexually dominant behavior alone was positively associated with orgasmic function ($r = 0.049$, $p = 0.007$), intercourse satisfaction ($r = 0.068$, $p < 0.001$), and overall satisfaction ($r = 0.042$, $p = 0.018$) in IIEF-5.

Similar results were found among women that both sexually submissive ($r = 0.175$, $p < 0.001$) and dominant ($r = 0.147$, $p < 0.001$) behaviors were positively associated with sexual distress. However, both behaviors were associated with better overall sexual function (sexually submissive behaviors, $r = 0.184$, $p < 0.001$; sexually dominant behaviors, $r = 0.173$, $p < 0.001$), as well as better function on all domains of the FSFI (see Table 3). There was also a strong positive association between sexually submissive behavior and sexually dominant behavior, $r = 0.668$, $p < 0.001$.

Tables 2 and 3 also show that age was negatively related to both sexually submissive ($r = -0.058$, $p < 0.001$) and dominant ($r = -0.056$, $p < 0.001$) behaviors in men. Similar results were also found in women, that age was negatively related to both sexually submissive ($r = -0.138$, $p < 0.001$) and dominant ($r = -0.097$, $p < 0.001$) behaviors.

Sexual orientation and sexually submissive and dominant behavior

As shown in Tables 2 and 3, being heterosexual was associated with less likelihood of both sexually submissive ($r = -0.095$, $p < 0.001$ in men; $r = -0.093$, $p < 0.001$ in women) and dominant ($r = -0.030$, $p = 0.003$ in men; $r = -0.064$, $p < 0.001$ in women) behavior in both men and women. We used 95% CI to check if the correlations were different between analyzing heterosexual-only participants vs. analyzing non-heterosexual participants. The results showed that the 95% CI always overlapped among men. Therefore, male sexual orientation did not significantly affect the correlations between BDSM-behavior and sexual distress, and sexual function. However, among women, sexual orientation affected the correlations between sexually submissive and dominant behavior, sexual distress, and all subscales in FSFI (see highlights in bold in Table 4). Non-heterosexual participants reported stronger associations, with better function in all domains of FSFI.

Comparing the three data sources, we used 95% CI to check if the correlations were different in the three data sources. Table 5 presents the correlations where the 95% CIs did not overlap, meaning that there is a difference between the data sources. The most significant difference was that in data source 1, sexually dominant behavior and sexual distress scale were positively associated with each other, whereas in data source 3, they were negatively associated with each other. Another notable difference was that in data source 1, sexually submissive behavior and subscale of Pain in FSFI were positively related to each other, whereas in data sources 2 and 3, they were negatively related to each other.

DISCUSSION

The current study found that men reported more sexually dominant behavior whereas women reported more sexually submissive behavior. Also, people who engaged in either sexually submissive behavior or sexually dominant behavior had a higher chance of engaging in the other behavior as well (see Tables 2 and 3). Both types of behaviors were negatively correlated with age, positively correlated with sexual distress, fewer symptoms of early ejaculation in men (see Table 2), and better overall sexual function in women (see Table 3). Sexually dominant behavior was also related to better erectile function and overall satisfaction in men (see Table 2). Lastly, being heterosexual was associated with less likelihood of sexually submissive and dominant behavior in both men and women. Compared with heterosexual women, the associations between sexually submissive and dominant behaviors and sexual distress, as well as sexual function, were stronger among non-heterosexual women (see Table 4).

A possible explanation for especially sexually submissive behavior being associated with better sexual function is that it may be a way to decrease high-level self-awareness [20] and consequently less bodily spectatoring [21]. In other words, sexual submission, such as pain, humiliation, and bondage, may promote a focus on bodily sensations while disabling the ability to focus on

Table 2. Correlations between age, sexual orientation, sexual distress, sexually submissive behavior, sexually dominant behavior, and sexual function for men.

Men	Age	SO	SDS	Submissive	Dominant	CHEES	Erectile	Orgasmic	Desire	InterSat	Overall
Age	1										
N	10,081										
SO	0.108[a]	1									
N	10,062	10,062									
SDS	0.248[a]	−0.017	1								
N	9354	9354	9354								
Submissive	−0.058[a]	−0.095[a]	0.119[a]	1							
N	10,081	10,062	9,354	10,081							
Dominant	−0.056[a]	−0.030[a]	0.150[a]	0.648[a]	1						
N	10,081	10,062	9,354	10,081	10,081						
CHEES	−0.016	0.027[b]	−0.042[a]	−0.126[a]	−0.156[a]	1					
N	8898	8898	8882	8898	8898	8898					
Erectile	0.231[a]	0.037[a]	−0.306[a]	0.040[b]	0.062[a]	−0.003	1				
N	3096	3096	3059	3096	3096	2724	3096				
Orgasmic	0.165[a]	0.008	−0.209[a]	0.017	0.049[a]	−0.006	0.622[a]	1			
N	3076	3076	3044	3076	3076	2723	3076	3076			
Desire	0.061[a]	0.059[a]	−0.090[a]	−0.033	−0.028	0.015	0.085[a]	0.066[a]	1		
N	3081	3081	3049	3081	3081	2726	3081	3074	3081		
InterSat	0.174[a]	−0.063[a]	−0.334[a]	0.034	0.068[a]	−0.019	0.874[a]	0.536[a]	0.072[a]	1	
N	3088	3088	3055	3088	3088	2723	3088	3075	3079	3088	
Overall	0.169[a]	0.068[a]	−0.487[a]	0.008	0.042[b]	−0.052[a]	0.743[a]	0.468[a]	0.102[a]	0.780[a]	1
N	3091	3091	3057	3091	3091	2732	3091	3074	3080	3086	3091

Correlation coefficient according to Pearson Correlations, as indicated.
SO: sexual orientation, where "1" = "heterosexual" and "0" = "non-heterosexual."
SDS: the summary variable of Sexual Distress Scale. The higher the number is, the more sexual distress one experiences in the past 30 days.
Submissive: sexually submissive behavior. The higher the number is, the more sexually submissive behavior one has.
Dominant: sexually dominant behavior. The higher the number is, the more sexually dominant behavior one has.
CHEES: the questions about ejaculation latency and control in Checklist for Early Ejaculation Symptoms. The lower the number is, the fewer ejaculation latency and control problems one has.
Erectile: the subscale of Erectile Function in International Index of Erectile Function Questionnaire-5 (IIEF-5). The higher the number is, the fewer erectile dysfunctions one has.
Orgasmic: the subscale of Orgasmic Function in IIEF-5. The higher the number is, the fewer orgasmic dysfunctions one has.
Desire: the subscale of Sexual Desire in IIEF-5. The higher the number is, the fewer sexual dysfunctions one has.
InterSat: the subscale of Intercourse Satisfaction in IIEF-5. The higher the number is, the fewer sexual dysfunctions one has.
Overall: the subscale of Overall Satisfaction in IIEF-5. The higher the number is, the fewer sexual dysfunctions one has.
[a]Correlation is significant at the 0.01 level (2-tailed).
[b]Correlation is significant at the 0.05 level (2-tailed).

Table 3. Correlations between age, sexual orientation, sexual distress, sexually submissive behavior, sexually dominant behavior, and sexual function for women.

Women	Age	SO	SDS	Submissive	Dominant	Desire	Arousal	Lubrication	Orgasm	Satisfaction	Pain	Total
Age	1											
N	19,737											
SO	0.216[a]	1										
N	19,724	19,727										
SDS	0.116[a]	0.065[a]	1									
N	18,204	18,207	18,207									
Submissive	−0.138[a]	−0.093[a]	0.175[a]	1								
N	19,737	19,727	18,207	19,740								
Dominant	−0.097[a]	−0.064[a]	0.147[a]	0.668[a]	1							
N	19,737	19,727	18,207	19,740	19,740							
Desire	−0.015[b]	0.078[a]	0.169[a]	0.326[a]	0.288[a]	1						
N	18,036	18,039	17,998	18,039	18,039	18,039						
Arousal	0.327[a]	0.252[a]	0.322[a]	0.276[a]	0.266[a]	0.720[a]	1					
N	15,518	15,521	15,487	15,521	15,521	15,506	15,521					
Lubrication	0.337[a]	0.268[a]	0.425[a]	0.266[a]	0.256[a]	0.650[a]	0.931[a]	1				
N	15,396	15,399	15,369	15,399	15,399	15,385	15,397	15,365				
Orgasm	0.386[a]	0.221[a]	0.264[a]	0.187[a]	0.196[a]	0.540[a]	0.835[a]	0.796[a]	1			
N	15,380	15,383	15,354	15,383	15,383	15,370	15,365	15,359	15,383			
Satisfaction	0.379[a]	0.286[a]	0.255[a]	0.265[a]	0.261[a]	0.684[a]	0.910[a]	0.877[a]	0.801[a]	1		
N	13,890	13,893	13,862	13,893	13,893	13,877	13,465	13,356	13,345	13,893		
Pain	0.430[a]	0.306[a]	0.399[a]	0.280[a]	0.269[a]	0.653[a]	0.882[a]	0.911[a]	0.772[a]	0.884[a]	1	
N	13,336	13,339	13,305	13,339	13,339	13,320	12,841	12,732	12,721	13,256	13,339	
Total	0.219[a]	0.123[a]	−0.021[b]	0.184[a]	0.173[a]	0.594[a]	0.651[a]	0.535[a]	0.646[a]	0.700[a]	0.669[a]	1
N	13,389	13,392	13,350	13,392	13,392	13,375	12,873	12,751	12,735	13,272	13,337	13,392

Correlation coefficient according to Pearson Correlations, as indicated.
SO: sexual orientation, where "1" = "heterosexual" and "0" = "non-heterosexual."
SDS: the summary variable of Sexual Distress Scale. The higher the number is, the more sexual distress one experiences in the past 30 days.
Submissive: sexually submissive behavior. The higher the number is, the more sexually submissive behavior one has.
Dominant: sexually dominant behavior. The higher the number is, the more sexually dominant behavior one has.
Desire: the subscale of Desire in Female Sexual Function Index (FSFI). The higher the number is, the fewer sexual dysfunctions one has.
Arousal: the subscale of Arousal in FSFI. The higher the number is, the fewer sexual dysfunctions one has.
Lubrication: the subscale of Lubrication in FSFI. The higher the number is, the fewer sexual dysfunctions one has.
Orgasm: the subscale of Orgasm in FSFI. The higher the number is, the fewer sexual dysfunctions one has.
Satisfaction: the subscale of Satisfaction in FSFI. The higher the number is, the fewer sexual dysfunctions one has.
Pain: the subscale of Pain in FSFI. The higher the number is, the fewer sexual dysfunctions one has.
Total: the Total score of FSFI. The higher the number is, the fewer sexual dysfunctions one has.
[a]Correlation is significant at the 0.01 level (2-tailed).
[b]Correlation is significant at the 0.05 level (2-tailed).

Table 4. 95% confidence intervals of the correlations between sexually submissive behavior, sexually dominant behavior, and sexual function for women comparing heterosexual-only and non-heterosexual participants.

Participants	Pearson correlation	Correlation coefficient	95% Confidence Intervals (2-tailed)	
			Lower	Upper
Heterosexual-only	Sexually Submissive Behavior and Sexual Distress	0.169[a]	**0.153**	**0.185**
Non-heterosexual	Sexually Submissive Behavior and Sexual Distress	0.228[a]	**0.198**	**0.258**
Heterosexual-only	Sexually Submissive Behavior and Desire in FSFI	0.327[a]	**0.313**	**0.342**
Non-heterosexual	Sexually Submissive Behavior and Desire in FSFI	0.371[a]	**0.343**	**0.399**
Heterosexual-only	Sexually Submissive Behavior and Arousal in FSFI	0.287[a]	**0.271**	**0.303**
Non-heterosexual	Sexually Submissive Behavior and Arousal in FSFI	0.384[a]	**0.355**	**0.413**
Heterosexual-only	Sexually Submissive Behavior and Lubrication in FSFI	0.280[a]	**0.263**	**0.296**
Non-heterosexual	Sexually Submissive Behavior and Lubrication in FSFI	0.375[a]	**0.345**	**0.404**
Heterosexual-only	Sexually Submissive Behavior and Orgasm in FSFI	0.188[a]	**0.171**	**0.205**
Non-heterosexual	Sexually Submissive Behavior and Orgasm in FSFI	0.303[a]	**0.272**	**0.334**
Heterosexual-only	Sexually Submissive Behavior and Satisfaction in FSFI	0.274[a]	**0.257**	**0.291**
Non-heterosexual	Sexually Submissive Behavior and Satisfaction in FSFI	0.420[a]	**0.390**	**0.449**
Heterosexual-only	Sexually Submissive Behavior and Pain in FSFI	0.296[a]	**0.278**	**0.313**
Non-heterosexual	Sexually Submissive Behavior and Pain in FSFI	0.423[a]	**0.392**	**0.452**
Heterosexual-only	Sexually Submissive Behavior and Total in FSFI	0.189[a]	0.170	0.207
Non-heterosexual	Sexually Submissive Behavior and Total in FSFI	0.222[a]	0.187	0.256
Heterosexual-only	Sexually Dominant Behavior and Sexual Distress	0.132[a]	**0.116**	**0.148**
Non-heterosexual	Sexually Dominant Behavior and Sexual Distress	0.217[a]	**0.186**	**0.247**
Heterosexual-only	Sexually Dominant Behavior and Desire in FSFI	0.272[a]	**0.256**	**0.287**
Non-heterosexual	Sexually Dominant Behavior and Desire in FSFI	0.375[a]	**0.347**	**0.402**
Heterosexual-only	Sexually Dominant Behavior and Arousal in FSFI	0.249[a]	**0.232**	**0.265**
Non-heterosexual	Sexually Dominant Behavior and Arousal in FSFI	0.427[a]	**0.399**	**0.454**
Heterosexual-only	Sexually Dominant Behavior and Lubrication in FSFI	0.239[a]	**0.222**	**0.256**
Non-heterosexual	Sexually Dominant Behavior and Lubrication in FSFI	0.416[a]	**0.387**	**0.443**
Heterosexual-only	Sexually Dominant Behavior and Orgasm in FSFI	0.171[a]	**0.154**	**0.189**
Non-heterosexual	Sexually Dominant Behavior and Orgasm in FSFI	0.361[a]	**0.331**	**0.391**
Heterosexual-only	Sexually Dominant Behavior and Satisfaction in FSFI	0.242[a]	**0.224**	**0.259**
Non-heterosexual	Sexually Dominant Behavior and Satisfaction in FSFI	0.458[a]	**0.429**	**0.485**
Heterosexual-only	Sexually Dominant Behavior and Pain in FSFI	0.254[a]	**0.236**	**0.272**
Non-heterosexual	Sexually Dominant Behavior and Pain in FSFI	0.452[a]	**0.423**	**0.481**
Heterosexual-only	Sexually Dominant Behavior and Total in FSFI	0.164[a]	**0.146**	**0.183**
Non-heterosexual	Sexually Dominant Behavior and Total in FSFI	0.229[a]	**0.194**	**0.263**

Correlation coefficient according to Pearson Correlations including 95% Confidence Interval, as indicated.
Highlights in bold indicate that sexual orientation affected the correlations between the variables among women participants.
FSFI Female Sexual Function Index, including subscales of Desire, Arousal, Lubrication, Orgasm, Satisfaction, Pain, and Total scores.
[a]Correlation is significant at the 0.01 level (2-tailed).

negative thoughts about sexual performance and body image. Since fear of sexual inadequacy contributes to performance anxiety and inhibits sexual arousal, sexually submissive activities remove the self from worries and anxiety [21]. Instead, it creates a temporarily mediated stage, meaning that the person only focuses on the current sensations in a non-demanding way. This is likely to enhance sexual response and enrich sexual function.

For men, this is particularly important as less worry may improve ejaculation control through alleviating sympathovagal imbalance. In the erection phase, the parasympathetic nervous system activates the relaxation of muscles, which provides sufficient blood flow into the penis. In the ejaculation phase, the sympathetic nervous system facilitates the emission of seminal fluid [38]. Higher levels of sympathetic activation in men are likely to lead to the sympathovagal imbalance in both non-aroused [22, 23] and aroused [39] settings. Most importantly, in the stage of sympathovagal imbalance, the overactivation of the sympathetic nervous system might inhibit erection and facilitate ejaculation, resulting in early ejaculation. During sex, spectatoring involves worries and performance anxiety, which may overly activate the sympathetic nervous system. Sexually submissive behavior may decrease spectatoring and direct the person's attention back to the body. In sexually submissive practices, it also allows the sexually submissive person to focus on the partner's reaction and pleasure, rather than evaluating their own performance. Hence, sexually submissive behavior can relieve early ejaculation symptoms as it reduces sympathetic activation and promotes sympathovagal balance.

Another explanation for the findings could be that individuals who are interested in sexually submissive and/or dominant

behavior may have a clear idea of what they prefer sexually. They may be better at identifying sexual cues that facilitate their arousal, especially given that female sexual arousal is more contextual [40]. Therefore, clarity of sexual preferences may enhance arousal and, consequently, sexual satisfaction. Indeed, some previous studies have found that paraphilic individuals are not more prone to sexual dysfunction than non-paraphilic individuals [16–18]. In some instances, they actually have better sexual functions [16–18]. This is in line with our results here as well.

However, participants in the present study who had engaged in sexually submissive and dominant behavior reported more sexual distress. They may be worried about expressing their preferences to others. They may also find their non-normative interests hard to accept. Lastly, since non-heterosexual individuals already have a non-normative sexual orientation, they are likely to be more open to other atypical ideas and sexual practices. As such, they may have a higher likelihood of engaging in paraphilic behavior.

More younger people had engaged in sexually submissive and dominant behavior compared with older people. Nevertheless, our data cannot resolve whether this is due to generational changes or age-related biological or psychological changes. Younger people may be more curious, more open to new ideas, and therefore are more likely to try out BDSM behaviors. Yet, there might also be generational differences in attitudes towards and opportunities to engage in BDSM behaviors. For instance, in data source 1 which was collected in 2006, sexually dominant behavior was positively associated with sexual distress, but in data source 3 which was collected in 2021–2022, people who reported having sexually dominant behavior in fact indicated less sexual distress. This suggests that age as an index of generational change may be a mediator of the relationship between sexually submissive and dominant behavior and sexual distress. Also, people's perception of sexual dominance may be evolving. Coppens et al. argue that BDSM practices largely remained taboo until about the last decade, which may explain why BDSM practices were historically pathologized [41]. Recently, the increasing awareness and scientific research about BDSM may have helped with the removal of the stigma and discrimination towards BDSM [41].

Strengths and limitations

Our study has a large sample size that was representative of the general Finnish population. We also filled the current research gap by addressing the relationship between sexually submissive and dominant behavior and sexual dysfunction. Notwithstanding, the instruments in the study have not been validated in Finnish language and our measures regarding BDSM interest were broad. Another drawback is that the questions about sexual distress were directed to sexuality in general. People may experience different levels of distress when it regards unusual sexual preferences particularly. As shown by Pascoal et al. [19], they may also perceive distress in sexual functioning differently compared to distress related to general sexuality. Additionally, as the results were not

Table 5. 95% confidence intervals of the correlations that differ among three data sources.

Data source	Pearson correlation	95% Confidence intervals (2-tailed)	
		Lower	Upper
1	Sexually submissive behavior and sexual distress scale in men	0.054	0.125
2	Sexually submissive behavior and sexual distress scale in men	−0.019	0.052
1	Sexually submissive behavior and sexual distress scale in men	0.054	0.125
3	Sexually submissive behavior and sexual distress scale in men	−0.034	0.036
1	Sexually dominant behavior and sexual distress scale in men	**0.003**	**0.074**
3	Sexually dominant behavior and sexual distress scale in men	**−0.074**	**−0.005**
2	Sexually submissive behavior and sexual distress scale in women	0.013	0.063
3	Sexually submissive behavior and sexual distress scale in women	0.065	0.113
1	Sexually submissive behavior and FSFI-Desire scale in women	0.138	0.188
2	Sexually submissive behavior and FSFI-Desire scale in women	0.202	0.250
3	Sexually submissive behavior and FSFI-Desire scale in women	0.261	0.307
1	Sexually submissive behavior and FSFI-Lubrication scale in women	−0.026	0.028
3	Sexually submissive behavior and FSFI-Lubrication scale in women	0.035	0.090
1	Sexually submissive behavior and FSFI-Orgasm scale in women	−0.018	0.037
3	Sexually submissive behavior and FSFI-Orgasm scale in women	−0.082	−0.027
1	Sexually submissive behavior and FSFI-Satisfaction scale in women	−0.006	0.046
3	Sexually submissive behavior and FSFI-Satisfaction scale in women	−0.071	−0.009
1	Sexually submissive behavior and FSFI-Pain scale in women	**0.012**	**0.064**
2	Sexually submissive behavior and FSFI-Pain scale in women	**−0.097**	**−0.034**
1	Sexually submissive behavior and FSFI-Pain scale in women	**0.012**	**0.064**
3	Sexually submissive behavior and FSFI-Pain scale in women	**−0.080**	**−0.015**
1	Sexually dominant behavior and FSFI-Desire scale in women	0.086	0.137
2	Sexually dominant behavior and FSFI-Desire scale in women	0.161	0.210
1	Sexually dominant behavior and FSFI-Desire scale in women	0.085	0.129
3	Sexually dominant behavior and FSFI-Desire scale in women	0.207	0.254

Correlation coefficient according to Pearson Correlations including 95% Confidence Interval, as indicated.
Highlights in bold indicate the most significant differences among data sources.
FSFI Female Sexual Function Index, including subscales of Desire, Arousal, Lubrication, Orgasm, Satisfaction, Pain, and Total scores.

completely consistent across three data sources, there may be other unknown moderating variables particularly between sexually submissive and/or dominant behavior, sexual distress, and the subscale of Pain in FSFI. For instance, in the study by Botta et al. [7], the role of BDSM participants—whether in the dominant, switch, or submissive group—influenced their self-declared levels of distress. Further research, especially longitudinal studies about the relationship between sexually submissive and dominant behavior and sexual dysfunction is warranted.

CONCLUSION

Our study suggests that engaging in BDSM behaviors is associated with increased sexual distress. BDSM behaviors were also correlated with sexual function for both sexes, better ejaculation function for men and better overall sexual function for women. Further research should focus on longitudinal studies and address the possible causal processes between sexually submissive and dominant behavior and sexual function.

DATA AVAILABILITY

The datasets generated during and/or analyzed during the current study are available from the corresponding author.

REFERENCES

1. *Diagnostic and Statistical Manual of Mental Disorders*. 5th ed: American Psychiatric Association; 2013.
2. Connolly PH. Psychological functioning of bondage/domination/sado-masochism (BDSM) practitioners. J Psychol Human Sex. 2006;18:79–120.
3. Lantto R, Lundberg T. (Un)desirable approaches in therapy with Swedish individuals practicing BDSM: client's perspectives and recommendations for affirmative clinical practices. Psychol Sex. 2022;13:742–55.
4. Hébert A, Weaver A. Perks, problems, and the people who play: A qualitative exploration of dominant and submissive BDSM roles. Can J Hum Sex. 2015;24:49–62.
5. Renaud CA, Byers E. Exploring the frequency, diversity, and content of university students' positive and negative sexual cognitions. Can J Hum Sex. 1999;8:17–30.
6. Richters J, Grulich AE, de Visser RO, Smith AM, Rissel CE. Sex in Australia: autoerotic, esoteric and other sexual practices engaged in by a representative sample of adults. Aust NZJ Public Health. 2003;27:180–90.
7. Botta D, Nimbi FM, Tripodi F, Silvaggi M, Simonelli C. Are role and gender related to sexual function and satisfaction in men and women practicing BDSM? J Sex Med. 2019;16:463–73.
8. Paarnio M, Sandman N, Kallstrom M, Johansson A, Jern P. The prevalence of BDSM in Finland and the association between BDSM interest and personality traits. J Sex Res. 2022;7:1–9.
9. Rosen RC, Taylor JF, Leiblum SR, Bachmann GA. Prevalence of sexual dysfunction in women: Results of a survey study of 329 women in an outpatient gynecological clinic. J Sex Marital Ther. 1993;19:171–88.
10. Frank EA. Carol; Rubinstein, Debra. Frequency of sexual dysfunction in "normal" couples. N Engl J Med. 1978;299:111–5.
11. Oksuz E, Malhan S. Prevalence and risk sactors for female sexual dysfunction in Turkish women. J Urol. 2006;175:654–8.
12. Santtila P, Sandnabba NK, Jern P. Prevalence and determinants of male sexual dysfunctions during first intercourse. J Sex Marital Ther. 2009;35:86–105.
13. Colson MH, Cuzin B, Faix A, Grellet L, Huyghes E. Current epidemiology of erectile dysfunction, an update. Sexologies. 2018;27:e7–e13.
14. Mark KP, Leistner CE, Garcia JR. Impact of contraceptive type on sexual desire of women and of men partnered to contraceptive users. J Sex Med. 2016;13:1359–68.
15. Mitchell KR, Mercer CH, Ploubidis GB, Jones KG, Datta J, Field N, et al. Sexual function in Britain: findings from the third national survey of sexual attitudes and lifestyles (Natsal-3). The Lancet. 2013;382:1817–29.
16. Brown GR, Wise TN, Costa PT Jr., Herbst JH, Fagan PJ, Schmidt CW Jr. Personality characteristics and sexual functioning of 188 cross-dressing men. J Nerv Ment Dis. 1996;184:265–73.
17. Wise TN, Fagan PJ, Schmidt CW, Ponticas Y, Costa PT. Personality and sexual functioning of transvestitic fetishists and other paraphilics. J Nerv Ment Dis. 1991;179:694–8.
18. Richters J, De Visser RO, Rissel CE, Grulich AE, Smith AMA. Demographic and psychosocial features of participants in bondage and discipline, "sadomasochism" or dominance and submission (BDSM): data from a national survey. J Sex Med. 2008;5:1660–8.
19. Pascoal PM, Cardoso D, Henriques R. Sexual satisfaction and distress in sexual functioning in a sample of the BDSM community: a comparison study between BDSM and non-BDSM contexts. J Sex Med. 2015;12:1052–61.
20. Baumeister RF. Masochism as escape from self. J Sex Res. 1988;25:28–59.
21. Masters WH, Johnson VE. Human sexual inadequacy. Boston, Massachusetts: Little, Brown; 1970.
22. Xia JD, Han YF, Zhou LH, Xu ZP, Chen Y, Dai YT. Sympathetic skin response in patients with primary premature ejaculation. Int J Impot Res. 2014;26:31–4.
23. Turan Y, Gürel A. The heart rate recovery is impaired in participants with premature ejaculation. Andrologia. 2020;52:e13573.
24. Wright S. Discrimination of SM-identified individuals. J Homosex. 2006;50:217–31.
25. Reiersol O, Skeid S. The ICD diagnoses of fetishism and sadomasochism. J Homosex. 2006;50:243–62.
26. Johansson A, Jern P, Santtila P, Von der Pahlen B, Eriksson E, Westberg L, et al. The genetics of sexuality and aggression (GSA) twin samples in Finland. Twin Res Hum Genet. 2013;16:150–6.
27. Tybur JM, Wesseldijk LW, Jern P. Genetic and environmental influences on disgust proneness, contamination sensitivity, and their covariance. Clin Psychol Sci. 2020;8:1054–61.
28. Lewin B, Fugl-Meyer K, Helmius G, Lalos A, Månsson S-A. Sex i Sverige; Om sexuallivet i Sverige 1996: Folkhälsoinstitutet; 1998.
29. Carpenter JS, Reed SD, Guthrie KA, Larson JC, Newton KM, Lau RJ, et al. Using an FSDS-R item to screen for sexually related distress: a MsFLASH analysis. Sex Med. 2015;3:7–13.
30. Derogatis LR, Rosen R, Leiblum S, Burnett A, Heiman J. The Female Sexual Distress Scale (FSDS): Initial validation of a standardized scale for assessment of sexually related personal distress in women. J Sex Marital Ther. 2002;28:317–30.
31. Bae JH, Han CS, Kang SH, Shim KS, Kim JJ, Moon DG. Development of a Korean version of the female sexual distress scale. J Sex Med. 2006;3:1013–7.
32. DeRogatis L, Clayton A, Lewis-D'Agostino D, Wunderlich G, Fu Y. Validation of the female sexual distress scale-revised for assessing distress in women with hypoactive sexual desire disorder. J Sex Med. 2008;5:357–64.
33. Santos-Iglesias P, Bergeron S, Brotto LA, Rosen NO, Walker LM. Preliminary validation of the sexual distress scale-short form: Applications to women, men, and prostate cancer survivors. J Sex Marital Ther. 2020;46:542–63.
34. Rosen RC, Riley A, Wagner G, Osterloh IH, Kirkpatrick J, Mishra A. The international index of erectile function (IIEF): a multidimensional scale for assessment of erectile dysfunction. Urology. 1997;49:822–30.
35. Rhoden EL, Telöken C, Sogari PR, Vargas Souto CA. The use of the simplified International Index of Erectile Function (IIEF-5) as a diagnostic tool to study the prevalence of erectile dysfunction. Int J Impot Res. 2002;14:245–50.
36. Jern P, Piha J, Santtila P. Validation of three early ejaculation diagnostic tools: a composite measure is accurate and more adequate for diagnosis by updated diagnostic criteria. PloS One. 2013;8:e77676.
37. Rosen C, Brown J, Heiman S, Leiblum C, Meston R, Shabsigh D, et al. The female sexual function index (FSFI): a multidimensional self-report instrument for the assessment of female sexual function. J Sex Marital Ther. 2000;26:191–208.
38. Alwaal A, Breyer BN, Lue TF. Normal male sexual function: emphasis on orgasm and ejaculation. Fertil Steril. 2015;104:1051–60.
39. Rowland DL. Genital and heart rate response to erotic stimulation in men with and without premature ejaculation. Int J Impot Res. 2010;22:318–24.
40. Ponseti J, Dähnke K, Fischermeier L, Gerwinn H, Kluth A, Müller J, et al. Sexual responses are facilitated by high-order contextual cues in females but not in males. Evol Psychol. 2018;16:1–9.
41. Coppens V, Ten Brink S, Huys W, Fransen E, Morrens M. A survey on BDSM-related activities: BDSM experience correlates with age of first exposure, interest profile, and role identity. J Sex Res. 2020;57:129–36.

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AUTHOR CONTRIBUTIONS

SH and PS designed the methodology and conducted data analyses; SH and CN helped write the manuscript; PJ and PS contributed to data extraction and provided feedback on the manuscript.

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COMPETING INTERESTS

The authors declare no competing interests.

ETHICAL APPROVAL

Research plans for all three data collections were conducted in accordance with the Declaration of Helsinki and were approved by the Departmental or University level Research Ethics Committees at Åbo Akademi University, as appropriate. Informed consent was obtained from all the participants involved in the study.

ADDITIONAL INFORMATION

Supplementary information The online version contains supplementary material available at https://doi.org/10.1038/s41443-023-00705-5.

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