The prevalence of BDSM interest and practice in Finland, and the association between BDSM interest and personality characteristics

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According to previous research interest in BDSM (Bondage-Discipline, Dominance-Submission and Sadomasochism) activities is quite high in several European countries and various BDSM practices are also common. The prevalence of certain BDSM activities has been found as high as 47% in the general population and 69% have had fantasies about BDSM-related activities. The prevalence varies with questionnaire items used. There is not much research on the personalities of BDSM practitioners or those who are interested in BDSM, but there is evidence that practitioners often have better well-being and they are more highly educated than the general population. The current study explored the prevalence of BDSM interest and practice in a Finnish population based sample, and other BDSM related questions, and investigated the association between BDSM interest and personality measured with six factor HEXACO personality measure. The sample had a total of 8,137 individuals and the participants answered a survey consisting of several tens of different questionnaires including the BDSM-related and the HEXACO personality measures. A total of 38% of the sample was interested in BDSM sex and non-heterosexual individuals displayed at most almost twice as much interest and at most 83% more participation in BDSM than heterosexual individuals. Younger participants (18-28 years old) displayed almost thrice as much interest than older participants, but this interest did not realize into higher practice rates. In this sample people who were interest in BDSM did not differ on any of the HEXACO personality factors from those who were not interested. These findings suggest that interest in BDSM is fairly common and the personalities of those who display interest in BDSM are similar to those who do not.

Keywords: sexuality, BDSM, personality, prevalence, HEXACO, sexual orientation

Contents

Introduction

BDSM is an abbreviation for bondage and discipline, dominance and submission, and sadism and masochism. The abbreviation usually refers to role-play of physical, psychological and sexual aspects involving power exchange between consensual participants (De Neef, Coppens, Huys, & Morrens, 2019). To define BDSM with precision is difficult, because of the wide variety and variability of practices, but the power exchange aspect is usually involved (A. Brown, Barker, & Rahman, 2019; Hebert & Weaver, 2014). Enjoyment of physical and psychological control and pain (Hebert & Weaver, 2014), and physical restraint and intense sensorial feeling (Holvoet et al., 2017) are also highlighted as key concepts. In addition, those of who practice BDSM can be divided into two broad groups: those who want to be in control, and those who want to give up control (Hebert & Weaver, 2014). These groups are referred as dominant and submissive. Being in both roles (switch) is also common (Hebert & Weaver, 2014). In recent years, BDSM has enjoyed increased mainstream exposure and this is also reflected in the scientific research regarding the subject (De Neef et al., 2019). BDSM-related activities are still subject to misunderstandings and practicing BDSM may come with a stigma (De Neef et al., 2019; Yost, 2010). Moser and Kleinplatz (2006) raise the point that all societies attempt to control the sexual behavior of its members and this mechanism can be exercised by defining certain sexual interests or practices to be mental disorders.

BDSM interest and practice have been found to be quite common among the general population. BDSM practitioners also have relatively high well-being (Moser, 2009; Wismeijer & van Assen, 2013) and they are often higher educated (A. Brown et al., 2019; Monteiro Pascoal, Cardoso, & Henriques, 2015). Most studies have focused only on western societies (see Table 1.) although there is evidence of BDSM practices from other cultures. For example a fresco dated to 490 BC in Italy describing flagellation in an erotic setting (Steingräber, 2006) and Kama Sutra describing sadomasochistic actions (Vatsayana, Doniger, & Kakar, 2002). There have been etiological theories of BDSM; most notably psychoanalytical theories. Overall these theories have received little or no support (A. Brown et al., 2019). More recently there have been evolutionary hypotheses regarding BDSM and how sexual arousal by a power difference between two individuals can be considered a successful mating strategy (A. Brown et al., 2019). According to Holvoet et al. (2017) the lack of knowledge regarding the nature and

prevalence of BDSM activities may further enable the stigmatization. Thus more research is required to further establish BDSM practices as a normal part of the spectrum of sexual behaviors. Not much is known about the psychological characteristics of BDSM practitioners, but earlier research indicates that practitioners do not differ significantly from the general population (Hebert & Weaver, 2014; Wismeijer & van Assen, 2013). More research is required to further establish these notions. The current study aims to establish what are the prevalence rates of interest and practice of BDSM in Finland, and also compare the personalities of those who are interest in BDSM and those who are not. The personality analysis part of the study is a conceptual replication of Wismeijer's and van Assen's 2013 study.

Prevalence

The prevalence rates of BDSM interest and practice are quite varied (See Table 1. for studies describing prevalence rates). A commonly cited Australian study (Richters, Grulich, de Visser, Smith, & Rissel, 2003) found that 2% of men and 1% of women (aged 16-59 years) had practiced BDSM during the previous year. Other research has estimated prevalence of BDSM practice to be around 10% (Hebert & Weaver, 2014). Prevalence rates of practice increase significantly if the activities are specified (e.g., being tied up) rather than if study participants are asked to identify as BDSM practitioners or non-practitioners (De Neef et al., 2019). This may be due to the fact that BDSM has a more strict connotation than individual specific acts that go under the term BDSM (De Neef et al., 2019). Holvoet et al. (2017) also found support for this notion, as almost half of their sample had taken part in BDSM-like activities, but only 8% actually identified as BDSM practitioners.

The prevalence rate of BDSM interest and fantasies are much higher than prevalence of practice. In a study of the Belgian general population, Holvoet et al. (2017) found that 47% of their sample (N = 1,027) had taken part in at least one BDSM-related activity, and that 22% had had fantasies without putting them to practice. A Canadian study demonstrated that among university students, 72% of men and 59% of women had had fantasies about being tied up (Renaud & Byers, 1999). Men's and women's prevalence rates of BDSM practice/interest differ in almost all studies depending on the activity (Brown, Barker & Rahman, 2019), so that men tend to prefer a more dominant role, and women a submissive role (De Neef et al., 2019). For example, in Wismeijer's and van

Assen's (2013) study, 48% of males (n = 464) in a subsample of BDSM practitioners assumed the dominant role and 76% of females (n = 438) assumed the submissive role.

In the general population, about 90% identify as heterosexual (J. M. Bailey et al., 2016; Holvoet et al., 2017). This does not appear to be the case for BDSM community, where in one study of BDSM practitioners, only 65% identified as heterosexual, with 23% identifying as bisexual and 17% identified their sexual orientation as something other than hetero- or bisexual (percentages exceed 100% because of multiple choices were allowed) (S. Brown, Roush, Mitchell, & Cukrowicz, 2017). In one study of BDSM practitioners (Botta, Nimbi, Tripodi, Silvaggi, & Simonelli, 2019), only 40% of males (n = 141) and 30% of females (n = 125) identified exclusively as heterosexual. Non-heterosexual individuals also practice BDSM more frequently than heterosexuals (De Neef et al., 2019).

Holvoet and colleagues (2017) found that 61% of their sample (representative of the Belgian general population) became aware of their BDSM interest before age 25. Also, the older participants in their study (i.e. 48-65 years) displayed lower interest and practice participation in domination and submission activities compared to other age groups. In other studies (e.g., Breslow, Evans, & Langley, 1985; Sandnabba, Santtila, & Nordling, 1999), BDSM practitioners recognized their BDSM interest as early as the age of 14 or 10.

Table 1.
Prevalence Rates of BDSM Activity and Interest

Study	Sample	Age*	Methods	Results
Coppens et al. 2020	Belgian general population (*N* = 1,289)	24-57	Online questionnaire	75% had interest in at least one BDSM activity. 15% only fantasized, 60% had put interest into practice at least once.
Holvoet et al. 2017	Belgian general population (*N* = 1,027)	18-65	Online questionnaire	47% of the sample had taken part in at least one BDSM activity, and additional 26% of the sample said they were interested in BDSM.
Joyal & Carpentier 2017	Canadian (Québec) population (*N* = 1,040)	18-64	Telephone interview and online questionnaire	Wish to experience masochism was implied by 24% (19% in men, 28% in women). For sadism it was 7% (10% in men and 5% in women).
Herbenick et al. 2017	American general population (*N* = 2,021)	18-91	Online questionnaire	29% found tying up partner or being tied up appealing. Sex with elements of experiencing pain was found appealing by 11%.
Richters et al. 2014	Australian general population (*N* = 19,841)	16-69	Telephone interview and computer-assisted telephone interview	2% of respondents had participated in BDSM sex in the past year
Tomassilli et al. 2009	American self-identified lesbian and bisexual women (*N* = 347)	*M* = 33.60 (9.93)	Questionnaire	Over 40% reported having engaged in at least one activity that can be considered BDSM. 25% reported having participated in several activities.

Bailey et al. 2003	British lesbian and bisexual women (*N* = 1,218)	*M* = 31.2 (6.4) and 34.4 (9.8)	Questionnaire	With women 19% of participants had occasional SM activity and often 5%. With men (past 10 years) 6% of participants had occasionally SM activity and often 2%.
Richters et al. 2003	Australian general population (*N* = 16,779)	16-59	Computer-assisted telephone interview	2% of men had BDSM activity and 1% of women
Renaud & Byers 1999	Canadian undergraduate students (*N* = 292)	17-45	Questionnaire	72% of men and 59% of women had fantasies about being tied up. 65% of men and 58% of women had fantasies about tying up a partner.

*Average age and standard deviation are given if they are retrievable from the study; in other cases only age range is reported.

Personality of BDSM Practitioners

Due to a scarcity of studies, the psychological characteristics of BDSM practitioners are not very well known. Earlier research on the psychological characteristics of BDSM practitioners has mostly focused on personality disorders and psychological disorders in relation to BDSM (Hebert & Weaver, 2014). There is evidence suggesting that BDSM practitioners have relatively good psychological health, and there is also a lack of evidence suggesting that BDSM practices have adverse effect on well-being (Richters, De Visser, Rissel, Grulich, & Smith, 2008; Wismeijer & van Assen, 2013). Wismeijer and van Assen (2013) found that BDSM practitioners (n = 902) were less neurotic, less agreeable, more extraverted, more open to new experiences and more conscientious compared to a control group (n = 434), when assessed with the NEO Five Factor inventory (NEO-FFI). The BDSM group consisted of 464 Dutch males (average age 45.5 years) and 438 Dutch females (average age 37.0 years). The sample was gathered from the largest BDSM web forum in The Netherlands. The researchers posted a call to participate in the study in the forums. The control group consisted of a convenience sample involving 129 Dutch men (average age 40.0) and 305 Dutch women (average age 34.1). In the present study, I aim to conceptually replicate the findings of Wismeijer and van Assen (2013).

Hebert and Weaver (2014) assessed BDSM practitioners' (N = 270) personality with the HEXACO Personality Inventory and were mainly interested in the differences between practitioners who identify as dominant and as submissive. The sample was gathered from two different online BDSM communities on Reddit.com and one more general online community discussing sex more generally. The sample consisted of 93 men and 168 women with an average age of 25 years (range: 18-64). The HEXACO is a personality inventory akin to NEO-FFI, and it is derived from lexical studies of personality structure. Hebert and Weaver (2014) found that dominant and submissive individuals differed in extraversion and emotionality factors of the HEXACO personality inventory, so that dominant individuals scored higher on extraversion and submissive individuals scored higher on emotionality. They also argued that BDSM practitioners cannot be considered a homogenous group and future research should take into account the BDSM preference of the individual. Hebert and Weaver (2014) also claimed that individuals with dominant or submissive roles did not differ on any of the

HEXACO factors from the general population ranges established by Lee and Ashton (2004) in their validity study of the HEXACO.

In summary, current research seems to suggest that BDSM practitioners do not differ in terms of their personalities from the general population. On other variables BDSM practitioners may differ, for example the practitioners score higher on well-being compared to non-practitioners (Hebert & Weaver, 2014; Wismeijer & van Assen, 2013). Other studies have found contradicting evidence. A recent study (Frías, González, Palma, & Farriols, 2017) suggests that there is a higher prevalence of sexual masochism in female individuals with borderline personality disorder, compared to individuals with other personality disorders. The study's sample size was very limited (clinical sample of 60 Spanish women), thus no definite conclusion can be drawn from it. Another small study by Connolly (2006) demonstrated that self-identified BDSM practitioners (N = 32) did not show abnormal measures for example on depression, anxiety, obsessive-compulsion, but that they had higher-than-average levels of narcissism.

BDSM as a Pathology

Historically, BDSM was thought to be caused by mental illness or a dysfunctional childhood. Indeed, BDSM is still associated with paraphilic disorders to some degree (Brown, Barker & Rahman, 2019). BDSM activities were considered sexual disorders in the past in the Diagnostic and Statistical Manual of Mental Disorders (DSM) (Moser & Kleinplatz, 2006) and also in the World Health Organization's International Classification of Diseases (ICD). In the current version of the DSM, DSM-5, consensual BDSM is excluded from diagnosis when the sexual interests do not cause distress or harm (American Psychiatric Association, 2013). Diagnosis for *sexual sadism disorder [F65.52]* exists in the DSM-5, and is described as involving having *"recurrent and intense sexual arousal from the physical or psychological suffering of another person, as manifested by fantasies, urges, or behaviors"* (American Psychiatric Association, 2013, p. 696). A diagnosis of sexual sadism disorder can be given if the individual has acted on the urges with a nonconsenting person, or if the urges cause significant distress.

The current (10^{th}) version of the ICD also recognizes that mild degrees of sadomasochistic features in normal sexual activity are not harmful (World Health Organization, 2016). According to the ICD-10, a diagnosis should only be given if

BDSM activity is the most important source of simulation or absolutely needed for sexual pleasure. ICD-10 does not acknowledge *sexual sadism disorder* of the DSM-5, but only *Sadomasochism* which refers to "A preference for sexual activity that involves bondage or the infliction of pain or humiliation" (World Health Organization, 2016) and is divided between *sadism* and *masochism* whether the individual wishes or not to be the provider or recipient.

Nordling, Sandnabba and Santtila (2000) found in their study that the prevalence of self-reported sexual childhood abuse was higher within BDSM practitioners (8% men, 23% women) when compared to the general population (3% men and 8% women). The sample size was small, especially the number of women participants (164 men and 22 women participated in the study). De Neef and colleagues (2019) point out that even though some findings suggest that there can be an association between sexual trauma and BDSM-related interests/practice, this finding needs to be established in studies with larger sample sizes.

Aims of the Current Study

The practition of BDSM has been considered pathological for a long time, but previous studies (Hebert & Weaver, 2014; Wismeijer & van Assen, 2013) show that BDSM practitioners can in fact have better psychological health compared to non-practitioners. The prevalence of BDSM interest and BDSM practice is not known in several European countries and there has not been any studies (to the author's knowledge) exploring the prevalence in the Nordic countries. As mentioned earlier, only a few studies have explored the personality measures associated with BDSM and this study aims to clarify the previous results by conceptually replicating Wismeijer and van Assen's 2013 study. Furthermore, previous studies (Hebert & Weaver, 2014; Wismeijer & van Assen, 2013) in which associations between BDSM practice and personality or other psychological traits have been studied have targeted mostly BDSM-practicing populations exclusively, and not general populations. Therefore, the aim of the present study is to explore the prevalence of BDSM interest and BDSM related activities and their associations to age, sexual orientation and sex in a Finnish population based sample, and secondly, to conceptually replicate the 2013 study by Wismeijer and van Assen and investigate how personality facets are related to BDSM practices. As mentioned before, Wismeijer's and van Assen's study's result was that the BDSM group compared to the control group was less neurotic, more extraverted, more open to new experiences, more conscientious and

less agreeable. Thus, formulating the hypothesis that in this study our BDSM group (those who were interest in BDSM) and non-BDSM group (those who were not interest in BDSM) will differ in the scores similarly when measured with the HEXACO factors: emotionality, extraversion, openness to experience, conscientiousness and agreeableness.

Specific aims

- According to earlier studies non-heterosexual individuals are more represented in the BDSM community than heterosexual individuals. Thus I study whether sexual orientation is associated with BDSM interest and expected higher participation and interest rates among non-heterosexual individuals in this sample.
- Earlier studies suggest that older people might have lower prevalence rates in interest and practice. I study in this sample if there is an association between age and interest and participation in BDSM and expected lower prevalences in interest and participation among older people.
- People who are interested in BDSM were expected to differ from individuals with no such interest in terms of their personality structures in line with Wismeijer and van Assen's (2013) study. I expected that this samples' BDSM group would score higher on extraversion, openness to experience, conscientiousness and score lower on emotionality and agreeableness when compared to the non-BDSM group.

Methods

Participants

The sample used in the present study was a large, population-based adult sample, consisting of survey responses from twins and their siblings in Finland. The participants were allowed to quit filling the survey at any time and 9,139 started filling the survey and 1,002 participants had stopped filling the survey before the last BDSM related question. The prior answers before quitting were included in the whole dataset. The final sample used in this study was therefore 8,137. The sample consisted of responses from 2,790 males (34%) and 5,347 females (66%). The mean age of the participants was 30.14 years (*SD* = 8.08 years, *Md* = 28, range 18-60). The mean survey completion time was 66 minutes (*SD* = 30.22).

Data for the current study were collected by sending letters (see Appendix A) with invitations to participate in an online survey to Finnish twins and the siblings of those twins identified from the Central Population Registry in Finland. The participants were told that the study was a research project funded by Academy of Finland and Åbo Akademi's Foundation and the goal was to study sexuality and aggressiveness. They were also told that the participation is voluntary and anonymous, and if they wanted, their data could be removed from the study completely. The research plan for the data collection that was used in the present study was evaluated by the Ethics Review Board of Åbo Akademi University and was given a positive evaluation. All participants provided written, informed consent in accordance with the Declaration of Helsinki. The survey was not conducted specifically for this study, and it contained several dozens of different questionnaires. The order of the questionnaires was always the same. Original study began in 2006 as a population based longitudinal study with a research goal of studying sexuality and aggressiveness. The sample consisted of twins and their siblings. Several dozens of scientific articles have been published based on the data. Data used in this study was from the third data gathering in the longitudinal study. The participants in this data were twins and siblings who had participated in the study earlier, but there were also twins and their siblings who were invited to participate for the first time. An invitation was only sent if the individuals' mother tongue was listed as Finnish in the Central Population Registry, if they resided in Finland at the time of gathering contact

addresses, and if they were at least 18 years old. In total, addresses of 33,390 individuals were obtained. Of these addresses, 179 were abroad, leaving a total of 33,211 addresses. Participants were invited to respond to an online survey with an individual 8-character code that was used to identify the twin pairs and individuals from the same family. Participants were also offered an entry to a raffle that contained 40 gift vouchers worth 100 euros each which could be used in Finnish network of companies (S-Ryhmä) operating in retail and service. The first invitation letters were sent to potential participants in November 2018. Those who did not respond were sent a maximum of two reminder letters 2-3 weeks apart. The postage service which was used did not include an option to return letters that could not be delivered. The response rate presented here therefore conservatively estimates that all invitation letters were received. Information was received that 31 individuals were unable to participate (e.g., due to the participant indicating a lack of interest or a related individual communicating that the participant recently moved, died, or had been affected by a severe disability). Data collection concluded in the first week of January 2019. In total, 9,564 individuals (6,965 twins and 2,592 siblings, 7 unknown) responded, resulting in a total response rate of 29%, with 9,319 (97%) of respondents giving consent for the use of their data for scientific purposes. 8,137 participants answered the BDSM related questions leaving it as our final sample in this study (see Figure 1.).

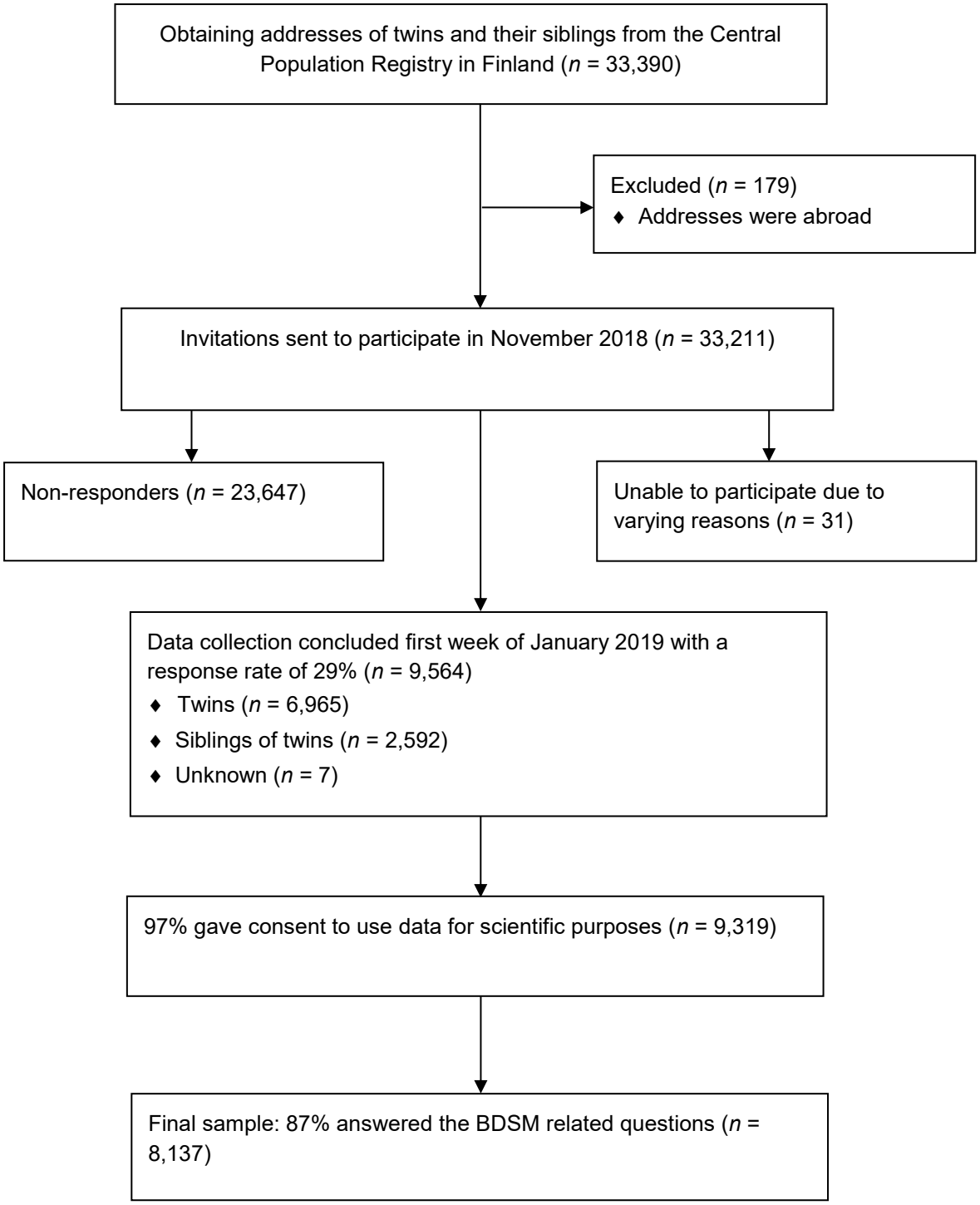

Figure 1. Data collection process

Measures

BDSM Interest and Practice. This instrument was self-constructed. Participants were asked eight questions regarding their BDSM interest and practices: *"Have you been dominated, humiliated, controlled (e.g., bondage) or has your partner caused you pain, with mutual consent to achieve sexual pleasure?"* with answer options "*never/I have tried at least once/occasionally/monthly/weekly or more often/*" and then they were asked to rate how enjoyable the activity was if they did not answer never, "*Overall, how enjoyable do/did you experience this sort of sexual activity?"* with Likert-scale answer options (1 not at all enjoyable – 5 very enjoyable). Similar questions and follow-up questions were asked regarding dominating behavior: "*Have you dominated, humiliated, controlled (e.g. bondage) or caused pain to a partner, with mutual consent to achieve sexual pleasure?"* and "*Overall, how enjoyable do/did you experience this sort of sexual activity?"* Also, general questions about interest (e.g., "*Do you have interest in BDSM sex?*" with the dichotomous response option yes/no, and the feeling of innateness "*I feel that my interest in BDSM is an innate part of me.*" (1 strongly disagree – 5 strongly disagree) or the opposite of innateness "*I feel that my interest in BDSM was aroused by life experience (such as sex partners, friends, media...).*" (1 strongly disagree – 5 strongly disagree). And lastly regarding partners "*If you have a steady partner, is your and your partner's interest in BDSM on the same level.*" with response options "*I don't have a steady partner/our interest is on the same level/one of us is clearly more interested"*. All BDSM related questions and their answer frequencies by sex and sexual orientation can be found in Table 3 (see Appendix B).

HEXACO-100. The HEXACO consists of six personality factors: honesty-humility (level of modesty and honesty), emotionality (level of anxiety and sentimentality), extraversion (level of sociability and cheerfulness), agreeableness (level of patience and forgiveness to others), conscientiousness (level of organization and prudence) and openness to experience (level of creativity and unconventionality) (Lee & Ashton, 2004). Each factor has its own subscale consisting of 16 items. Extraversion, conscientiousness and openness to experience factors are similar to the Big Five factors. The big five factors, agreeableness and neuroticism, are similar to the agreeableness and emotionality factors in HEXACO, but the content of the factors differ (Lee & Ashton, 2008). The sixth factor (honesty-humility) is not represented in the Big Five personality

model, but there have been multiple studies supporting the "big six" structure (Lee & Ashton, 2008; Saucier, 2009). The HEXACO personality inventory has been translated to over 30 languages and it has been utilized successfully in many studies regarding for example ethical decision making, political attitudes and sexuality (Bourdage, Lee, Ashton, & Perry, 2007; Chirumbolo & Leone, 2010; Lee, Ashton, Morrison, Cordery, & Dunlop, 2008).

The factor honesty-humility consists of items such as "If I want something from a person I dislike, I will act very nicely toward that person in order to get it." The factor emotionality consists of items such as "When it comes to physical danger, I am very fearful." The factor extraversion consists of items such as "I enjoy having lots of people around to talk with." The agreeableness factor consists of items such as "If someone has cheated me once, I will always feel suspicious of that person." The factor conscientiousness consists of items such as "When working, I often set ambitious goals for myself." The factor openness to experience consists of items such as "I would enjoy creating a work of art, such as a novel, a song, or a painting." Each item of the questionnaire is rated on a 5 point Likert Scale ranging from Strongly Disagree (1) to Strongly Agree (5). The mean of scores in each scale is calculated so that the possible score on each variable range from 1.0 to 5.0. Cronbach's alphas were calculated for the people who answered to the question regarding BDSM interest (n = 8,137) which was the sample used for the personality analysis. For the six personality factors (honesty-humility, emotionality, extraversion, agreeableness, conscientiousness and openness to experience) Cronbach's alphas in this sample were: .82, .83, .90, .82, .79 and .83. The Finnish translation of the HEXACO questionnaire is freely available for download from www.hexaco.org.

Statistical Analyses

Associations between the BDSM related questions and sexual orientation, categorized age and gender were examined using χ^2 tests of independence with Cramer's V as effect size measure. The effect of BDSM interest on personality factors measured with HEXACO personality inventory was tested using a general linear model adjusted with age and sex, and partial η^2 was used to report effect sizes. The model included main effects of BDSM interest, age and sex and also possible interaction effects of BDSM interest by age, and BDSM interest by sex. The sex variable used in the analyses was the participants' gender reported in the Central Registry in Finland. None of the

interaction effects between were significant. Not all personality factors tested passed the Levene's test of equality of error variances and to take to account possible deflation of p-values because of this, as well as to adjust of multiple hypothesis testing, we decided to use alpha-level of .001 on all analysis.

All analyses were carried out using SPSS (PASW) 23.0 (SPSS Inc., Chicago, IL, USA).

Results

Prevalence of Practice

The answer frequencies for question "Have you been dominated, humiliated, controlled (e.g., bondage) or has your partner caused you pain, with mutual consent to achieve sexual pleasure?" are described in figures 2, 3 and 4. There was a difference between sexes with 37% of females having being dominated at least once or more compared to 23% of males (χ^2 (4) = 236.575, p < .001, Cramer's V = .170). There was a difference between sexual orientations, 30% of heterosexual individuals having being dominated once or more, 40% of homosexual individuals and 54% of bisexual individuals (χ^2 (8) = 266.255, p < .001, Cramer's V = .129). Participants were also divided into four age groups. There were differences between the age groups, 18-28 years (36% having being dominated once or more), 29-39 years (32%), 40-50 years (21%) and 51-61 years (22%) (χ^2 (12) = 170.773, p < .001, Cramer's V = .084).

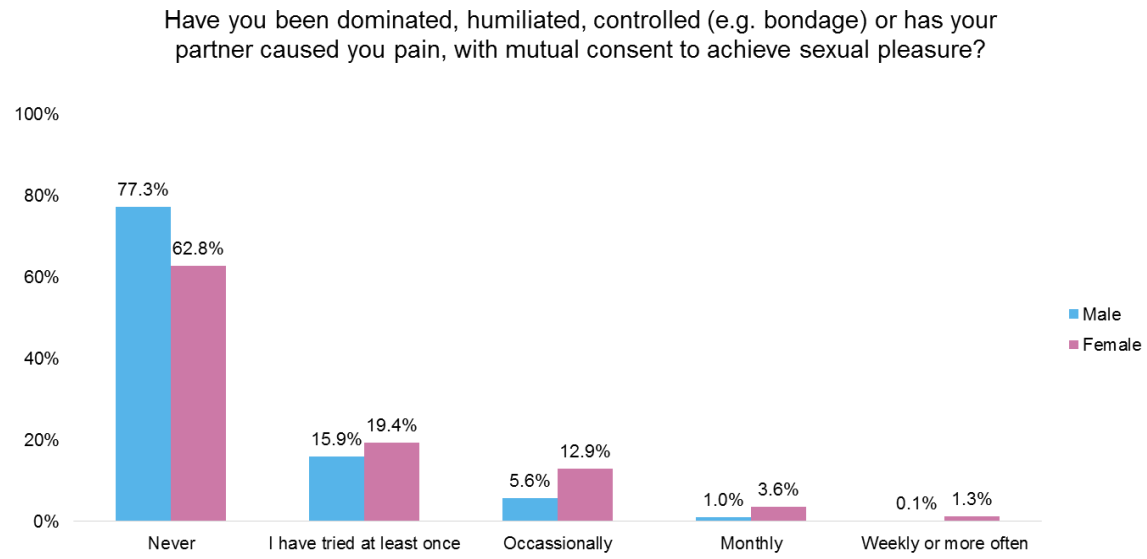

Figure 2. Men's (n = 2,760) and women's (n = 5,349) answer frequencies to the question "Have you been dominated…"

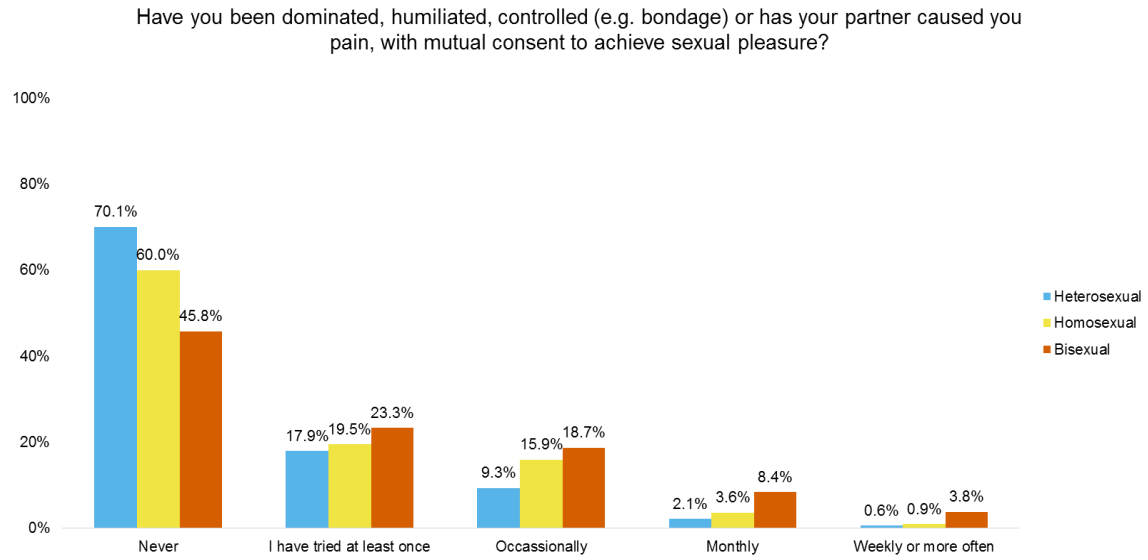

Figure 3. Answer frequencies for heterosexual individuals (n = 7,124), homosexual individuals (n = 220) and bisexual individuals (n = 605) to the question "Have you been dominated…"

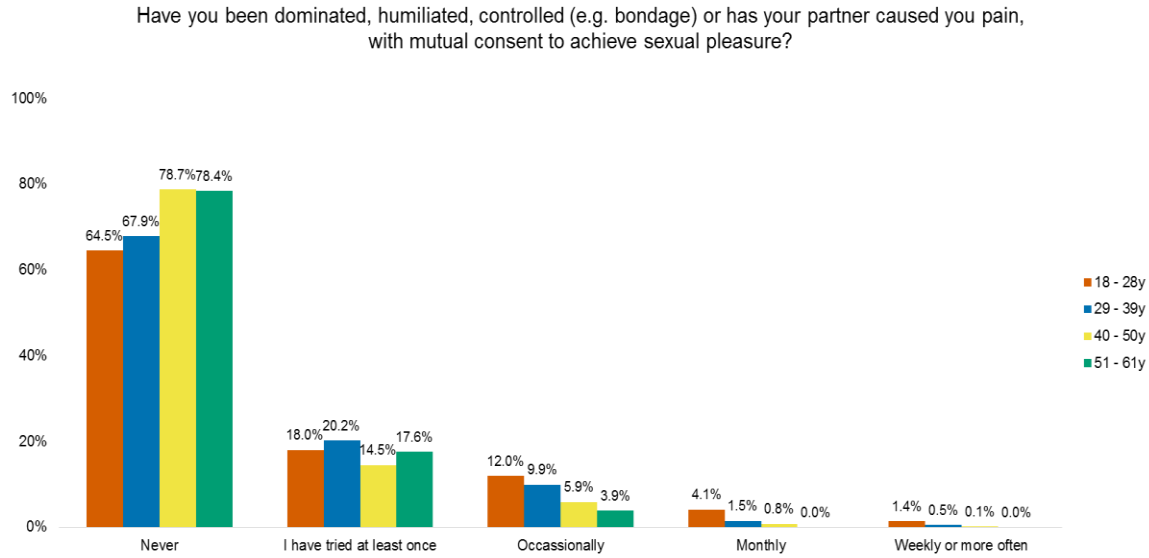

Figure 4. Answer frequencies for age groups 18-28 years old (n = 4,233), 29-39 years old (n = 2,606), 40-50 years old (n = 1,240) and 51-61 years old (n = 51) to the question "Have you been dominated…"

The response frequencies for the question "Have you dominated, humiliated, controlled (e.g., bondage) or caused pain to a partner, with mutual consent to achieve sexual pleasure?" are described in Figures 5, 6 and 7. In order to test differences between groups, four chi-square tests were conducted. A significant sex difference was detected, with 32% of males having dominated at least once or more compared to 25% of females (χ^2 (4) = 100.550, p < .001, Cramer's V = .111), confirming previous research suggesting that men are more likely than women to assume the dominant role (Wismeijer & van Assen, 2013). There was also a significant difference between

heterosexual and non-heterosexual individuals, so that 26% of heterosexual individuals reported having dominated once or more, and this practice was more common in homosexual individuals (34%) and bisexual (41%) individuals (χ^2 (8) = 88.629, p < .001, Cramer's V = .075). There were differences between four different age groups, 18-28 year olds (29% having dominated once or more), 29-39 year olds (28%), 40-50 year olds (18%) and 51-61 year olds (22%) (χ^2 (12) = 86.780, p < .001, Cramer's V = .060).

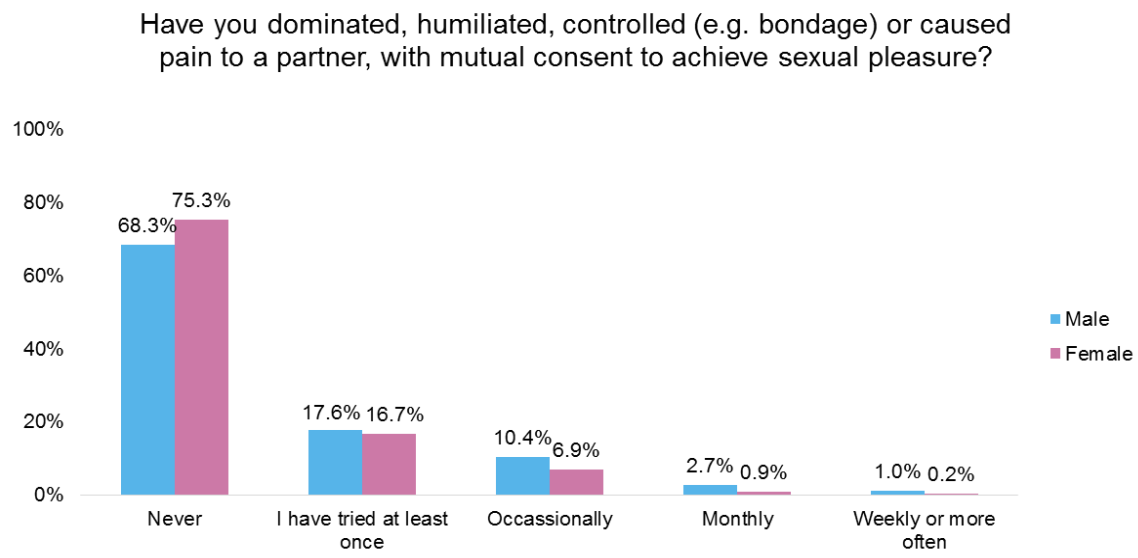

Figure 5. Males (n = 2,760) and females (n = 5,349) answer frequencies to the question "Have you dominated…"

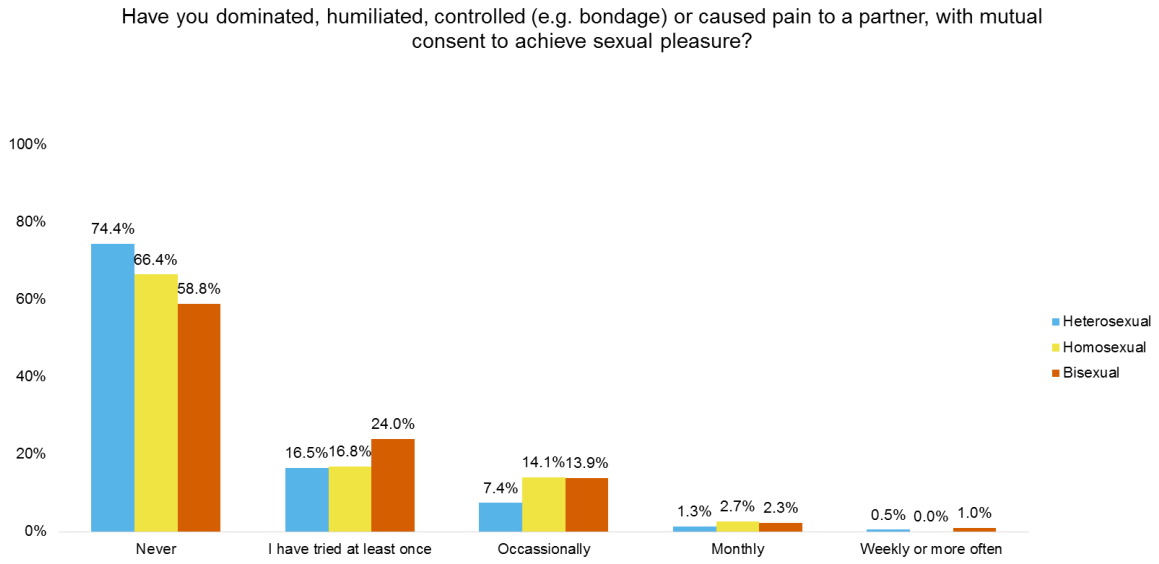

Figure 6. Answer frequencies for heterosexual individuals (n = 7,124), homosexual individuals (n = 220) and bisexual individuals (n = 605) to the question "Have you dominated…"

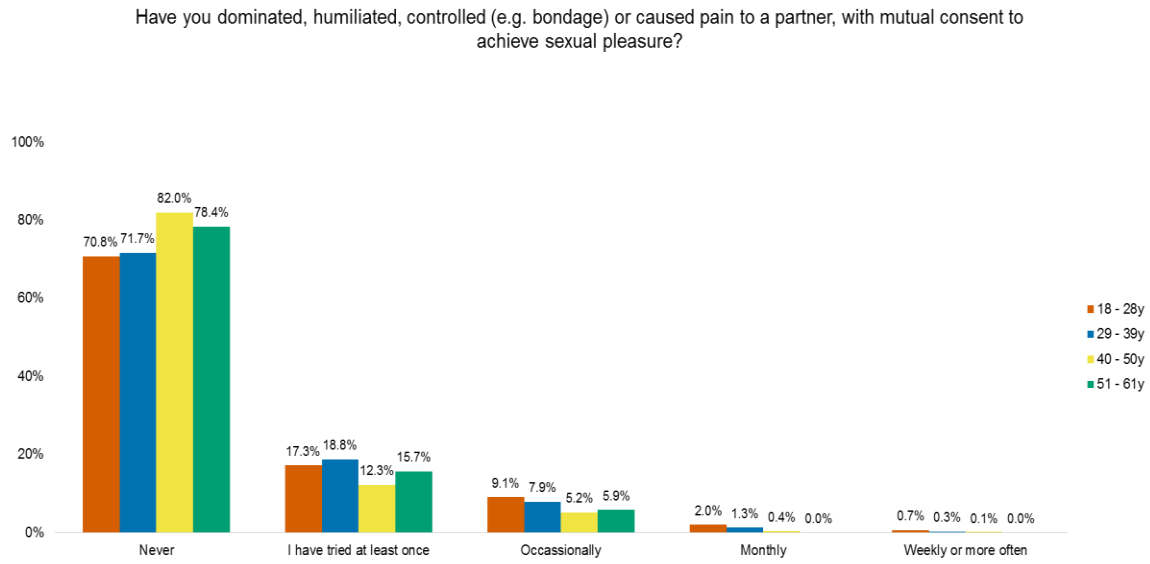

Figure 7. Answer frequencies for age groups 18-28 years old (n = 4,233), 29-39 years old (n = 2,606), 40-50 years old (n = 1,240) and 51-61 years old (n = 51) to the question "Have you dominated…"

Prevalence of BDSM Interest

Answer frequencies for interest are described in Figures 8, 9 and 10. A total 38 percent of 8,137 said they were interested in BDSM sex. 36% of men and 38% of women reported having an interest in BDSM sex, and the difference was not significant (χ^2 (1) = 6.078, p = .014, Cramer's V = .014). There was a significant difference between sexual orientations regarding BDSM interest: heterosexual individuals had an interest rate of 34%, homosexual individuals 50% and bisexual individuals 63% (χ^2 (2) = 209.001, p < .001, Cramer's V = .162). The youngest group displayed the most interest at 46%, followed by the second youngest at 33%, third youngest at 18% and the oldest group at 16%, and the observed differences were significant (χ^2 (3) = 373.201, p < .001, Cramer's V = .214).

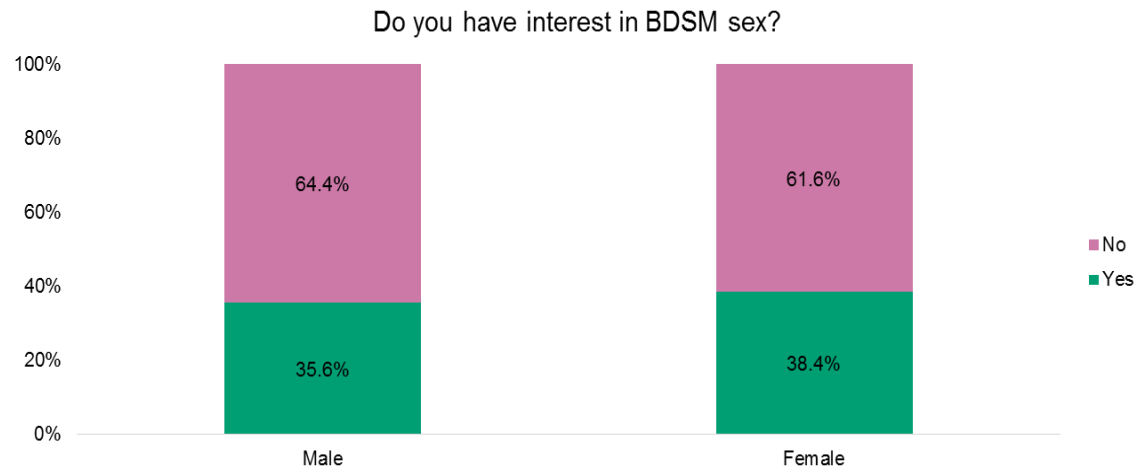

Figure 8. Answer frequencies regarding interest for men (n = 2,760) and women (n = 5,349)

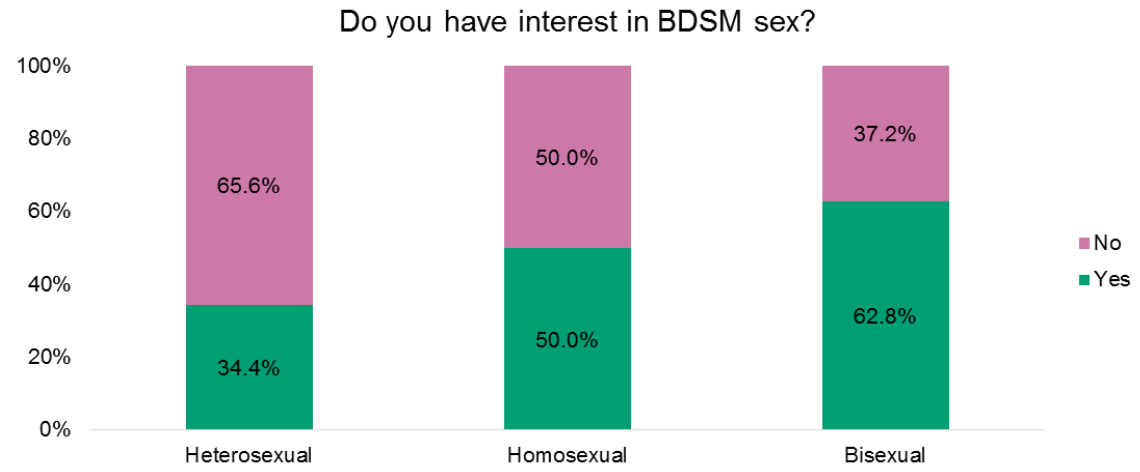

Figure 9. Answer frequencies regarding interest for heterosexual individuals (n = 7,124), homosexual individuals (n = 220) and bisexual individuals (n = 605)

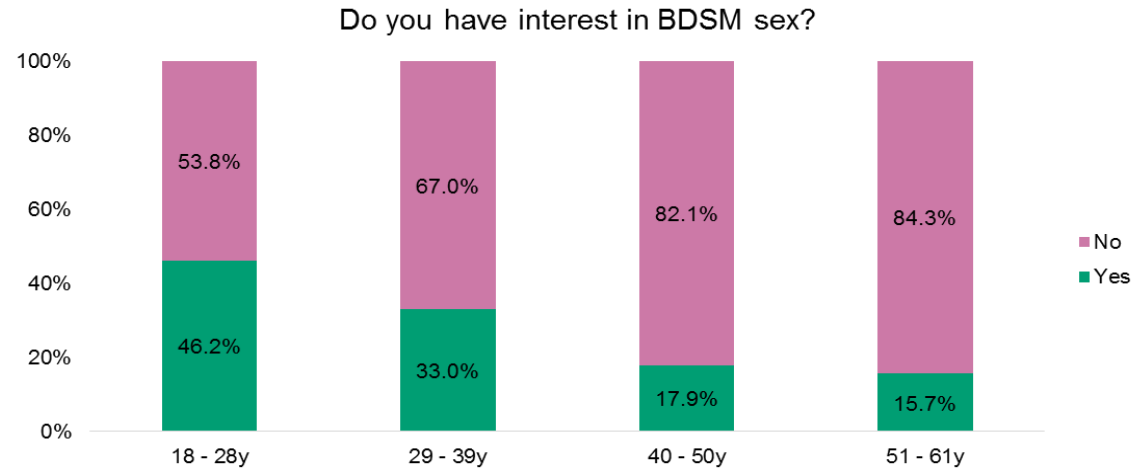

Figure 10. Answer frequencies regarding interest for age groups: 18-28 years old (n = 4,233), 29-39 years old (n = 2,605), 40-50 years old (n = 1,239) and 51-61 years old (n = 51)

Associations between Personality Structure and BDSM Interest

To investigate if individuals interested in BDSM (n = 3048) differed from those who were not (n = 5089) in terms of HEXACO personality factors, a general linear model adjusted with age and sex was used. The unadjusted model had significant differences (alpha-level being .001) on honesty-humility, extraversion, conscientiousness and openness to experience. But when the model was adjusted with age and sex, the differences were not statistically significant any longer (Table 2).

Table 2.
Non-Adjusted Means and Standard Deviations for all Personality Factor Variables and F-test Values, p values and Partial η^2 values for the Adjusted Model (with Age and Sex) and Unadjusted Model

	BDSM		Adjusted model			Unadjusted model		
Personality factor	Interested (n = 3048)	Not interested (n = 5089)	F	p value	Partial η^2	F	p value	Partial η^2
Honesty-Humility	3.58 (0.57)	3.69 (0.55)	9.21	.002	.001	172.92	< .001	.021
Emotionality	3.37 (0.59)	3.33 (0.58)	0.23	.630	.000	6.49	.011	.001
Extraversion	3.22 (0.69)	3.30 (0.66)	0.004	.949	.000	25.54	< .001	.003
Agreeableness	3.04 (0.56)	3.07 (0.53)	1.41	.235	.000	6.78	.009	.001
Conscientiousness	3.44 (0.52)	3.53 (0.49)	6.52	.011	.001	65.53	< .001	.008
Openness to experience	3.46 (0.62)	3.30 (0.62)	9.11	.003	.001	131.83	< .001	.016

Note. BDSM = Bondage & Discipline, Domination & Submission and Sadism & Masochism

Discussion

Prevalence of Practice and Interest

In the present study, a high interest rate for BDSM was reported by non-heterosexual participants in particular hence confirming the first expectation in the study. Interest rates ranged from 53% to 64% among non-heterosexual individuals, whereas heterosexual individuals reported interest rates between 34% and 35%. Moreover, differences between heterosexual and non-heterosexual individuals were observed regarding the frequency of participating in dominating or submissive activities, and non-heterosexual individuals displayed higher rates of participation. For example, 30% of heterosexual individuals had participated in submissive activities at least once, and bisexual individuals had participated 83% more and homosexual individuals 33% more than heterosexual individuals. This also supported the expectation based on previous literature that non-heterosexual individuals would engage more in BDSM activities. As previous research has suggested, non-heterosexuals individuals are highly represented in the BDSM community compared to the general population and they practice BDSM more often. The current findings can be considered to support the earlier notions about the prevalence of non-heterosexual individuals in the BDSM community. There are, to my knowledge, no current theories discussing why non-heterosexual individuals are so well represented in the BDSM community and why their practice and interest rates are higher than heterosexual individuals'. Speculative hypothesis is that being in a minority sexual orientation and being part of the LGBT (lesbian, gay, bisexual and transgender) culture may influence one to be more open and explorative about their sexuality overall.

Differences in interest and BDSM practice rates were also discovered within four age groups (18-28 years, 29-39 years, 40-50 years and 51-61 years) where the youngest group displayed most interest and most practice. Confirming the expectation that older individuals would display less interest, but surprisingly not confirming that older individuals would participate less than younger individuals. Even though there were significant differences between age groups in participation to submissive or dominant activities, the effect sizes were negligible (Cramer's V = .08 and .06), but the effect size between age group and BDSM interest was moderate (Cramer's V = .21). It would seem that the higher interest displayed by the younger individuals does not translate in to

more practice. Not much research has been done focusing on the effect of age, but Holvoet and colleagues (2017) found that older participants had lower interest and participation rates in submission and dominance activities. The same phenomenon can be found in this study. These differences may reflect, as Holvoet and colleagues (2017) contemplate also, cultural and generational differences where younger generations are more exposed and have better access to BDSM-related media, and the experienced stigma is not as big as for the older generations. Also, aging affects hormone levels which may lead to reduced interest in sex in general.

No significant sex differences in BDSM interest were reported. However, expected gender differences were detected for the type of BDSM practice: 37% of women had participated in submissive activities once or more, compared to 23% of men. This finding is in line with previous research acknowledging females' tendency to take more submissive roles. Not surprisingly, 32% of males had participated once or more in domination activities compared to the 25% of females.

Men's preference for more dominant roles and women's preference for more submissive roles has been acknowledged by previous studies. De neef and colleagues (2019) point out in their review that in an evolutionary context male assertiveness is a trait which is valued by women in their potential male partners. In general, dominance is primarily considered a masculine characteristic and gender norms associate submissiveness with sex for women (De Neef et al., 2019)

Personality

According to our general linear model which was adjusted with age and sex, BDSM interest did not have a significant main effect on any of the HEXACO personality factors. Thus violating the expectation that similar differences on personality between BDSM group and non-BDSM would be found akin to Wismeijer's and van Assen's (2013) study. The effect sizes of group differences in terms of BDSM roles (submissive, switch, dominant and control) in Wismeijer and van Assen's study were small (largest partial η^2 was on openness to experience, which was .045) to begin with. Although only two groups (BDSM interest group and a control group of individuals with no BDSM interest) were used in the present study, I found no significant differences despite unprecedented statistical power to detect previously reported results. In addition, the effect previously found in Wismeijer and van Assen's study can also reflect the

difference between dominants and submissives rather than the effect of BDSM group compared to a control group. Dominants and submissives have been found to differ on personality characteristics (Hebert & Weaver, 2014). To the author's knowledge, no previous studies exist on comparing the personality characteristics based on interest. The benefit of forming the BDSM group and control group based on interest was that it enabled to use a much larger sample size for the study, than if we had used groups based on distinction of practice prevalence based on our questionnaire. There are individuals in the BDSM interest group who do not practice BDSM, but it is very unlikely that there would be individuals who practice BDSM in the group who are not interested in BDSM. Previous studies on the personality of BDSM practitioners (Hebert & Weaver, 2014; Wismeijer & van Assen, 2013) have acquired their BDSM samples from online BDSM communities which does not verify that the sample practices BDSM actively.

Study Limitations and Strengths

Some limitations apply to the findings of this study. First, there was a fairly low response rate of 29%, which may compromise the representativeness of the sample. Although surveys which include sensitive questions (e.g., questions regarding sexual behavior or drug use) have hard time achieving high response rates (Tourangeau & Yan, 2007). Also, the population studied is Finnish twins and their siblings, and some caution is warranted if trying to apply these findings to the general population, because the overall environment in which individuals are raised may differ between families who only have one child versus families with twins and their siblings. The birth of two babies simultaneously presents a challenge to parents overall. On the other hand there is evidence concluding that twin population does not differ from non-twin population on many behavioral measures (Barnes & Boutwell, 2013) Another limitation is that it was not possible to take into account the possible BDSM roles (submissive, dominant and switch) of the participants. These groups differ on some psychological characteristics (Hebert & Weaver, 2014; Wismeijer & van Assen, 2013) when compared to one another, which may lead to some information loss when only grouping participants based on their BDSM interest. The questionnaire presented to our participants did not include question about their education which is a limitation, because we could not include education in our personality analyses like Wismeijer and van Assen (2013). Another limitation is that the questions presented were based on subjective evaluations

(e.g., how often is “occasionally”?) and individuals may interpret different response options differently. Also to be taken into consideration is that the HEXACO personality inventory’s factors are not identical to the “Big five” factors. Extraversion, conscientiousness and openness to experience are similar in both. Agreeableness and emotionality (neuroticism in big five) are similar, but in HEXACO the content of the factors differ somewhat.

Strength of the study was the overall large sample size of over 8,000 individuals. This ensured that we had adequate power to detect possible effects if there were any. The sample also included a fairly large proportion of non-heterosexual individuals which enabled us to get new information about the BDSM interest and practice prevalence of those individuals. A wide age range enabled us to observe reliably differences between age groups regarding BDSM related questions.

Future Directions and Conclusions

According to the results of the present study, BDSM interest is common in the general population (of Finland), and there is no evidence that such interest would be pathological or problematic. Most studies have focused only on BDSM-oriented individuals and BDSM practitioners. Future research should explore more populations consisting of BDSM interested individuals or maybe individuals interested in a specific BDSM area. De neef and colleagues (2019) suggest for example exploring associations between BDSM interest and psychological or psychiatric disorders. Furthermore Brown and colleagues (2019) suggest that understanding the underlying psychometric structure behind BDSM is important, because BDSM interest and behavior can be a part of a latent factor of paraphilic interests or be a factor of its own. The current study established that in this population sample of Finnish twins personality factors of BDSM interested individuals do not differ from non-interested individuals, which differs from the earlier result acquired by studying samples of BDSM practitioners. It may be beneficial to study samples based on BDSM interest, to further explore the results acquired on BDSM practitioners, and try to replicate them in samples consisting individuals interest in BDSM. Also exploring different personality characteristics’ associations to different BDSM areas may help to identify what separates normal BDSM practitioners from those who suffer from sexual sadism disorder. Of interest may be to further explore this study’s result that non-heterosexual individuals displayed

significantly more interest and participation in BDSM, and can this notion be explained by different levels of sexual desires between heterosexual and non-heterosexual individuals (Lippa, 2007). Brown and colleagues (2019) also acknowledge this notion that sex drive could be a relevant factor in explaining BDSM interest and behavior. Another problem future research should tackle is that there are no validated questionnaires regarding BDSM which results that in studies the same phenomenon is studied with differing definitions, questions and classifications. For example fantasies are treated sometimes synonymous with interest.

There have been studies focusing on brain activity associated with BDSM (Luo & Zhang, 2018) and hormonal changes related to BDSM (Sagarin, Cutler, Cutler, Lawler-Sagarin, & Matuszewich, 2009), but these studies have not provided clear cut answers why some people are interested or participate in BDSM. There are no well-developed driving theories behind the research currently, making research in the area exploratory. The area of BDSM research is in the process of describing the phenomenon and the associated phenomena. More research is needed to establish whether the prevalence of BDSM is equal across the globe and what cultural differences there might be if there are any. An intriguing research area would be to collaborate with porn streaming websites and utilize the massive data which they have accumulated. This could ease the job of identifying the prevalence of BDSM interest across the world and identify differences between countries. This kind of approach has been used by Ogi Ogas and Sai Gaddam (2012), they analyzed sexual terms used in web searches by almost 100 million users. The research presented in their book was not peer-reviewed and it was released outside of academia. It remains to be seen if this kind of approach will be utilized by researchers in the future.

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Appendix A

HENKILÖKOHTAINEN KOODISI ON:

Arvoisa vastaanottaja,

Otamme sinuun yhteyttä koska olet vuosina 2006 ja/tai 2012/2013 osallistunut Åbo Akademin käyttäytymisgenetiikan huippututkimusyksikön suorittamaan seksuaalisuutta, persoonallisuutta ja aggressiivisuutta koskevaan kaksostutkimukseen. **Kiitämme osallistumisestasi – sinun ja muiden vastaukset ovat mahdollistaneet laadukkaan kotimaisen tutkimuksen tekemisen, ja projektimme on poikinut yli 100 tieteellistä artikkelia, joista moni on julkaistu alan johtavissa tiedelehdissä.** Olet aikaisemmin ilmoittanut, että olet kiinnostunut osallistumaan myös mahdollisiin jatkotutkimuksiin.

Pyydämme sinua ystävällisesti osallistumaan Suomen Akatemian ja Euroopan Tiedeneuvoston rahoittamaan tutkimukseen, jossa tutkitaan mm. seksuaalisuutta, persoonallisuutta, aggressiivisuutta ja ruokamieltymyksiä. Tutkimukseen osallistuu aiemmin osallistuneiden lisäksi myös otos kaksosia ja heidän sisaruksiaan, jotka eivät ole aikaisemmin osallistuneet tutkimukseemme. Tutkimuksen avulla toivomme, että voimme lisätä ymmärrystä esimerkiksi seksuaalitoiminnoista sekä persoonallisuuden ja ruokamieltymyksien yhteyksistä.

Tähän tutkimukseen sisältyy ainoastaan kyselylomakkeen täyttäminen internetissä. Vastaamiseen kuluu 30-45 minuuttia. Suosittelemme, että osallistut tutkimukseen tietokoneella. Osallistuminen älypuhelimella onnistuu, mutta jotkut sivut saattavat olla kömpelön näköisiä. Halukkaiden osallistujien kesken arvotaan 15kpl 100€ arvoista S-ryhmän lahjakorttia, jotka toimivat maksuvälineenä mm. S-ryhmän hotelleissa, kaupoissa ja huoltoasemilla ympäri Suomen. Jos haluat osallistua arvontaan, sinulla on mahdollisuus antaa sähköpostiosoitteesi samalla kun vastaan kyselyyn netissä. Voittajille ilmoitetaan henkilökohtaisesti.

Keräämiemme tietojen perusteella voimme lisätä tieteellistä ymmärrystä esimerkiksi siitä, miten seksuaalitoiminnot muuttuvat ajan myötä, ja miten perimä vaikuttaa persoonallisuuden ja ruokamieltymyksien yhteyteen – täten yritämme selittää esimerkiksi miksi jotkut ihmiset suhtautuvat myönteisemmin hyönteisten syömiseen kuin toiset. **Vastauksiasi käsitellään täysin luottamuksellisesti eikä niitä missään vaiheessa yhdistetä henkilötietoihisi. Vastauksesi on tutkimuksen kannalta tärkeä, sillä tutkimuksen tulosten luotettavuus on parempi mitä enemmän ihmisiä osallistuu tutkimukseen. Tutkimuksen tietosuojaseloste löytyy netistä osoitteesta: https://goo.gl/yL6FLD.** Tämän kirjeen ylälaidassa on henkilökohtainen koodisi, jota säilytetään erillään nimestäsi ja osoitteestasi. Tarvitset sitä, mikäli osallistut tutkimukseen. Tutkimuksen ryhmätasoisia tuloksia tullaan julkaisemaan tieteellisissä aikakausilehdissä.

Päätät itse, osallistutko tutkimukseen. Osallistuminen on täysin vapaaehtoista. Jos päätät osallistua, voit silti milloin tahansa keskeyttää tutkimuksen syytä ilmoittamatta. Pyynnöstä poistamme myös tietosi tutkimustietokannasta. Osallistumisesta ei koidu sinulle ylimääräisiä kustannuksia. Åbo Akademin eettinen toimikunta on antanut puoltavan lausunnon tutkimuksesta.

KUINKA TOIMIT, MIKÄLI <u>HALUAT</u> OSALLISTUA TUTKIMUKSEEN:

Voit mennä suoraan tutkimuksen internetsivulle ja täyttää sieltä löytyvä kyselylomakkeenne. **Kirjaudu lomakesivulle omalla henkilökohtaisella koodillasi. Löydät koodin tämän tiedotteen ensimmäisen sivun oikeasta ylänurkasta. Syötä koodisi nettilomakkeen kenttään "Unique Key".** Lomake on kirjautumiskenttää lukuun ottamatta suomenkielinen.

Tutkimuksen internetosoite on: https://www.kaksostutkimus.fi/miehet

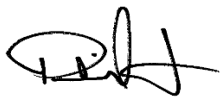
KUINKA TOIMIT, MIKÄLI <u>ET</u> HALUA OSALLISTUA TUTKIMUKSEEN:

Mikäli et halua osallistua tutkimukseen, voit ilmoittaa tästä käymällä internetsivuillamme (tarvitset tämän tiedotteen alussa löytyvän koodin sisäänkirjautumista varten). Voit myös olla reagoimatta tähän kirjeeseen mitenkään, mutta tässä tapauksessa lähetämme sinulle muistutuskirjeen noin viikon kuluttua.

Tutkimuksen internetosoite on: https://www.kaksostutkimus.fi/miehet

Yllä oleva internetosoite johtaa suoraan kyselylomakkeeseen. Tarvittaessa voit ottaa meihin yhteyttä sähköpostitse tai kirjeitse. Yhteystietomme löydät tämän kirjeen lopussa.

Ystävällisin terveisin,



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Tutkimuksen tietosuojaseloste: https://goo.gl/yL6FLD

Appendix B

Table 3.
Results of questionnaire by sex and sexual orientation

Question and answer options	Male			Female		
	Heterosexual (*n* = 2542)	Homosexual (*n* = 117)	Bisexual (*n* = 104)	Heterosexual (*n* = 4582)	Homosexual (*n* = 103)	Bisexual (*n* = 501)
Have you been dominated?						
Never	78.7%	65.0%	60.6%	65.3%	54.4%	42.7%
I have tried at least once	15.6%	17.9%	25.0%	19.1%	21.4%	23.0%
Occasionally	4.9%	13.7%	10.6%	11.8%	18.4%	20.4%
Monthly	0.7%	2.6%	2.9%	2.9%	4.9%	9.6%
Weekly or more often	0.0%	0.9%	1.0%	0.9%	1.0%	4.4.%
	Heterosexual (*n* = 541)	Homosexual (*n* = 41)	Bisexual (*n* = 41)	Heterosexual (*n* = 1591)	Homosexual (*n* = 47)	Bisexual (*n* = 287)
Enjoyment from being dominated						
1 (not at all enjoyable)	4.6 %	0.2%	0.0%	3.9%	4.3%	2.1%
2	13.9%	12.2%	17.1%	12.1%	12.8%	7.3%
3	35.3%	24.4%	19.5%	28.6%	34.0%	26.1%
4	34.2%	43.9%	34.1%	37.0%	23.4%	30.7%
5 (very enjoyable)	12.0%	17.1%	29.3%	18.4%	25.5%	33.8%

	Male			Female		
	Heterosexual (*n* = 2542)	Homosexual (*n* = 117)	Bisexual (*n* = 104)	Heterosexual (*n* = 4582)	Homosexual (*n* = 103)	Bisexual (*n* = 501)
Have you dominated?						
Never	68.7%	71.8%	57.7%	77.5%	60.2%	59.1%
I have tried at least once	17.7%	15.4%	19.2%	15.8%	18.4%	25.0%
Occasionally	9.8%	12.8%	17.3%	6.0%	15.5%	13.2%
Monthly	2.8%	0.0%	0.2%	0.5%	5.8%	1.8%
Weekly or more often	1.0%	0.0%	1.0%	0.2%	0.0%	1.0%

	Heterosexual (*n* = 796)	Homosexual (*n* = 33)	Bisexual (*n* = 44)	Heterosexual (*n* = 1029)	Homosexual (*n* = 41)	Bisexual (*n* = 205)
Enjoyment from dominating						
1 (not at all enjoyable)	4.3%	3.0%	23%	5.2%	2.4%	3.4%
2	16.1%	21.2%	11.4%	21.3%	24.4%	17.6%
3	36.8%	27.3%	31.8%	37.7%	31.7%	39.0%
4	32.2%	42.4%	31.8%	27.8%	24.4%	25.4%
5 (very enjoyable)	10.7%	6.1%	22.7%	8.1%	17.1%	14.6%

	Male			Female		
	Heterosexual (*n* = 2542)	Homosexual (*n* = 117)	Bisexual (*n* = 44)	Heterosexual (*n* = 4580)	Homosexual (*n* = 103)	Bisexual (*n* = 501)
Do you have interest in BDSM sex?						
Yes	33.6%	53.0%	56.7%	34.9%	46.6%	64.1%
No	66.4%	47.0%	43.3%	65.1%	53.4%	35.9%
	Heterosexual (*n* = 855)	Homosexual (*n* = 62)	Bisexual (*n* = 59)	Heterosexual (*n* = 1596)	Homosexual (*n* = 48)	Bisexual (*n* = 321)
I feel that my interest in BDSM is an innate part of me						
1 (strongly disagree)	14.5%	6.5%	15.3%	10.5%	10.4%	7.8%
2	26.7%	33.9%	10.2%	22.9%	14.6%	17.4%
3	32.4%	21.0%	32.2%	32.5%	33.3%	29.3%
4	20.4%	22.6%	33.9%	22.1%	33.3%	28.7%
5 (strongly agree)	6.1%	16.1%	8.5%	10.0%	8.3%	16.8%

	Male			Female		
	Heterosexual (n = 855)	Homosexual (n = 62)	Bisexual (n = 59)	Heterosexual (n = 1596)	Homosexual (n = 48)	Bisexual (n = 321)
I feel that my interest in BDSM was aroused by life experience (such as sex partners, friends, media…)						
1 (strongly disagree)	9.9%	8.1%	10.2%	7.7%	6.3%	6.9%
2	14.6%	22.6%	20.3%	15.5%	20.8%	20.9%
3	28.3%	22.6%	20.3%	25.4%	25.0%	23.4%
4	37.7%	37.1%	32.2%	37.7%	39.6%	34.6%
5 (strongly agree)	9.5%	9.7%	16.9%	13.7%	8.3%	

	Heterosexual individuals with partners (n = 1700)	Homosexual individuals with partners (n = 62)	Bisexual individuals with partners (n = 51)	Heterosexual individuals with partners (n = 3391)	Homosexual individuals with partners (n = 67)	Bisexual individuals with partners (n = 295)
If you have a steady partner, is your and your partner's interest in BDSM on the same level						
Our interest is on the same level	82.8%	72.6%	70.6%	84.1%	86.6%	68.8%
One of us is clearly more interested	17.2%	27.4%	29.4%	15.9%	13.4%	31.2%