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Associations between Fluctuating Shame, Self-Esteem, and Sexual Desire: Comparing Frequent Porn Users and a General Population Sample

Piet van Tuijl * , Peter Verboon  and Jacques J. D. M. van Lankveld 

Department of Clinical Psychology, Open Universiteit, 6401 DL Heerlen, The Netherlands;
peter.verboon@ou.nl (P.V.); jacques.vanlankveld@ou.nl (J.J.D.M.v.L.)

* Correspondence: piet.vantuijl@ou.nl

Abstract: In the present study, we explore the proposed cyclic models for problematic hypersexuality (PH) that involve shame, self-esteem, and sexual desire. These cyclic models are characterized by temporal associations but have not been investigated previously with intensive longitudinal designs. In this study, we collected up to 70 measurements per participant within a period of seven consecutive days, which allowed us to investigate associations between fluctuations of shame, self-esteem, and sexual desire. Participants were divided in four subgroups: (1) women ($n = 87$); (2) men ($n = 46$) from a general population convenience sample; (3) men watching porn >2 times per week, showing non-problematic hypersexuality (NH; $n = 10$); and (4) men watching porn >2 times per week, experiencing PH ($n = 11$). Multilevel analyses, including cross-level interactions, were used to investigate between-group differences in intraindividual processes. Results showed that prior increases in shame forecasted higher current sexual desire for men with PH, but not for the other groups, suggesting that men with PH use sexual desire to downregulate dysphoric feelings of shame. Differences between groups in associations between self-esteem and sexual desire were also found. Based on our results, we propose the Split Pleasure/Shame model, which represents emotion dysregulation in PH, and juxtapose this with the pleasurable experience of sex by non-PH groups. Further intensive longitudinal research is necessary to test this model and, more generally, to investigate the fluctuating nature of sexual desire.

Keywords: sexual desire; shame; self-esteem; split pleasure/shame model; problematic hypersexuality



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1. Introduction

Sexual desire is characterized by the experience of sexual urges, thoughts, fantasies, and states of sexual arousal. A comprehensive definition, agreed upon by scientists and clinicians, is lacking [1], though many would agree that drive, motivation, and wish [2] characterize sexual desire. We proffer that sexual desire is a subjective state directed at the experience of sexual pleasure. Research has mainly focused on interindividual differences in the levels of desire (e.g., [3]) and has not awarded much attention to within-person fluctuations in sexual desire throughout the day (but see [1,4]). However, these fluctuations are an important characteristic of sexual desire as it can flare up or change drastically in a short period of time. This short-term reactivity of sexual desire emplace it in the spectrum of sexual and non-sexual emotions [5]). In this spectrum, emotions “augment and blunt one another” [6] (p. 4), indicating emotion regulation processes that are used to adapt to internal and external circumstances. Sexual desire is part of these emotion-regulation processes, as it can be an antecedent or consequence of fluctuating affective states [7–10]. Other fluctuating mental states that have been suggested by researchers and therapists to interact with sexual desire are shame [11,12] and self-esteem [13,14], with diverging associations assumed for the general population and people experiencing problematic

hypersexuality (PH). The present study focuses on differences between PH and no PH with regard to the associations of sexual desire with shame and self-esteem.

PH can be defined as the experience of problems due to intense sexual desire and is often related to out-of-control sexual behavior [15]. PH can take on different appearances of which compulsive porn use is probably the most widespread form, with the Internet as its preferred sexual outlet [16]. Compulsive porn use is a rather passive form of PH and is implicated as a cause for erectile dysfunction and decreased sexual satisfaction [17–19]. In a large representative general population sample in the Netherlands approximately 7% of the population older than 17 watched porn more than two times per week [20]. Frequently watching porn does not necessarily indicate PH [15] although individuals scoring high on PH measures will spend more time watching porn and will worry more often about their frequent use of porn [16]. Watching porn more than two times per week accompanied by increased levels of compulsive porn use can be considered problematic [20]. Watching porn more than two times per week without compulsivity is considered as non-problematic hypersexuality (NH) as these individuals experience their use of porn mainly as positive and pleasurable [21].

Self-esteem has been defined as the individual's global self-evaluation in terms of (absence of) affective self-acceptance [22]. For non-PH individuals in long-term relationships higher levels of self-esteem were associated with maintaining higher sexual desire [23]. Higher self-esteem levels were also associated with higher sexual desire in men suffering from erectile dysfunction [24] and with higher sexual desire in cancer survivors [25]. We cannot extrapolate these results to populations with PH, however, because high PH levels are not only correlated with high sexual desire but also with dysregulation of sexual desire [3]. In line with this finding, it has been suggested that high PH levels are associated with lower self-esteem [17], and a recent study confirmed this [16]. Shame is the often transitory, painful experience of oneself as flawed and blameful [26]. Research into dysregulation of sexual desire in PH has shown that positive associations between shame and sexual desire become stronger with increasing levels of PH [12,27–30]. In studies comparing people seeking help for PH and a student sample, PH was characterized by higher levels of self-hostility when dealing with an increase in shame [26]. Self-hostility is characterized by negative feelings about one's flaws, and by regarding oneself as shameful or as a bad person. Importantly, maladaptive shame coping was a positive but indirect predictor of PH levels, mediated by neuroticism [29]. The latter finding suggests that a lack of acceptance of one's flaws can trigger an increase in shame and a decrease in self-esteem in certain circumstances in individuals with PH, temporarily weakening the resistance to act out sexually [29].

Most previous studies into associations between shame, self-esteem and sexual desire have been cross-sectional [12,23,27]. However, cross-sectional designs are not capable of capturing within-person fluctuations. Experimental research would also be suboptimal to investigate such fluctuations, as only a few measurements per participants will be collected. Furthermore, experimental research will lack ecological validity because laboratory settings do not reflect daily life circumstances [31]. With the Intensive Longitudinal Design (ILD) used in this study, participants' experiences are measured throughout the waking hours while they go about their day-to-day lives [32], which allows for an ecologically valid [33] assessment of the interactions of shame and self-esteem with sexual desire. The fluctuating nature of shame and sexual desire is evident as both feelings [34] can suddenly flare up or disappear, instigated by internal or external stimuli. Self-esteem was traditionally seen as a stable trait of the individual [22]. Contrary to this view, Kernis et al. [35] showed that self-esteem can be subject to short-term fluctuations, with alternating high and low levels. A few studies included fluctuating self-esteem and uncovered underlying emotion regulation processes (e.g., [36,37]). Associations of fluctuating shame or self-esteem with sexual desire have not been investigated to our knowledge.

Researchers and therapists have proposed that shame, self-esteem, and sexual desire impact each other differently in the general population and in populations with

PH [11,12,26]. Therapists have proposed cyclic models that describe how people afflicted by PH temporarily escape feelings of low self-esteem and shame by a focus on sexual desire and activity [11,38]. Afterwards, feelings of shame and low self-esteem prevail because of the realization that one again succumbed to sexual desire and failed to stop acting out sexually [8] despite the negative consequences [15]. A therapeutic intervention for PH in particular focuses on increasing self-esteem levels to decrease PH [13,14]. Other circular models for PH have also been described [12,29], of which the sexhavior cycle [39] is the most clear example: in general, people will experience a cycle of sexual urge, behavior, satiation, followed by post-sex satiation; for people afflicted by PH another cycle is also activated in which an increase in sexual desire is followed by abeyance of the cognitive dissonance between personal norms and actual behavior. The temporary dissociation from one's own norms allows the individual to act out sexually, but afterward the realization of the behavior and its consequences leads to the experience of sexual [39] and moral [40] incongruence. That the individual continues displaying the behavior, despite failed attempts to stop, despite awareness of negative consequences and despite that the behavior is not pleasurable [15], might explain increased shame and reduced self-esteem in PH. What the sexhavior cycle does not mention, but what has been described succinctly by Gilliland et al. [12], is that high shame levels can trigger an increase in sexual desire and thus activate a "vicious circle [. . .] that feeds itself repetitively" [12] (p. 6). This suggests that shame both instigates PH and results from PH and that PH originates from and is maintained by emotion dysregulation.

The cyclic models for PH are temporal models, presenting dynamic processes as they unfold in time. Preceding states of shame, self-esteem, and sexual desire are expected to impact the current states of these feelings and the current states, in turn, will impact future levels of shame, self-esteem, and sexual desire. Therefore, we believe that such models can best be explored with ILD, as the lagged analyses that ILD data allow can take short-term temporal effects into account. Though it has been suggested that one recall measurement at the end of the day might contain the same information and be less burdensome than ILD data collection [41], this end-of-day recall probably will not be able to replace the lagged analyses that can assess the temporal order in which different emotional states impact one another. Reciprocal or one-way impact of emotions usually occurs without the individual consciously knowing about it [37], especially when the lag between measurements is extended to one or two hours. To investigate contemporaneous and temporal models that include shame, self-esteem, and sexual desire we apply an ILD in order to capture the interactions of these fluctuating feelings.

The Present Study

In the present study we combined the data collected in two samples to investigate differences between groups with and without PH in the short-term regulation of shame, self-esteem, and sexual desire. Contemporaneous and temporal (lagged) analyses were used to study the fluctuations and interactions of these feelings and assess the emotion regulation differences between PH and other groups.

Previous cross-sectional research has suggested different models for the general population and for people experiencing PH with regard to associations between shame, self-esteem, and sexual desire. As research into the dynamic associations is lacking, and our study is the first to investigate these models with ILD, the models we propose must be viewed as exploratory. Note that we differentiate between contemporaneous and temporal or lagged associations. With contemporaneous we denote associations between variables measured at the same point in time, and with temporal or lagged we denote associations between variables measured at the preceding and current measurement moment [42].

For the convenience sample from the general population, we expect a positive contemporaneous association between self-esteem and sexual desire and a negative association between shame and sexual desire (Figure 1, right panel). For the temporal associations we expect that higher lagged self-esteem forecasts higher current sexual desire and higher

lagged sexual desire forecasts higher current self-esteem (Figure 1, bottom right). Furthermore, we expect that higher lagged shame forecasts lower current sexual desire and higher lagged sexual desire forecasts lower current shame (Figure 1, top right). For PH we expect a negative contemporaneous association between self-esteem and sexual desire and a positive association between shame and sexual desire (Figure 1, left panel). For the temporal associations we expect that lower lagged self-esteem forecasts higher current sexual desire and higher lagged sexual desire forecasts lower current self-esteem (Figure 1, bottom left). Furthermore, we expect that lower lagged shame forecasts lower current sexual desire and higher lagged sexual desire forecasts higher current shame (Figure 1, top left).

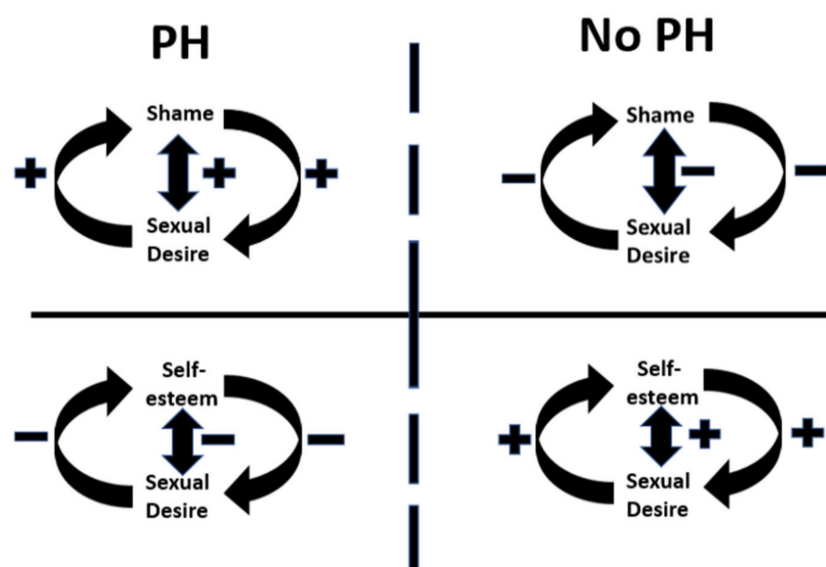


Figure 1. Overview of the contemporaneous and temporal (lagged) models used to investigate the associations of shame, self-esteem and sexual desire in men with PH and groups without PH. Note that one-headed arrows represent temporal (lagged) associations with the base of the arrow beginning at the preceding measurement and the head of the arrow ending at the current measurement. Double-headed arrows represent contemporaneous associations. The + and – represent the positive or negative value of the expected association. Note that the vertical dashed line represents the split between PH and No PH, investigated in one analysis. The horizontal continuous line indicates different models have been used to investigate shame (upper part) and self-esteem (lower part).

2. Method

2.1. Samples and Procedure

For the first sample ($n = 133$), a convenience sample from the general population, participants were recruited using snowball sampling via the personal contacts of master students in June–July 2012 (38 respondents) and in March–October 2014 (95 respondents). For the second sample ($n = 21$), participants were recruited via a research website (www.proefbunny.nl) in January–May 2016. Informed consent forms were read and signed. Participants from the first sample did not receive any monetary compensation, while those from the second sample received 30 euros in order to stimulate participation. Participants in both samples were asked questions about shame, self-esteem, and sexual desire; in the second sample participants were also asked about their use of porn. Ethical approval for both studies was obtained from the institutional review board (IRB) of the Open University. Data were pseudonymized as stipulated by the IRB and data cannot be traced back to specific individuals.

Inclusion criteria for the reference sample ($n = 133$) were (1) engaged in a romantic heterosexual relationship for at least 6 months; (2) older than 17 years; (3) having at least 8 years of education; and (4) speaking Dutch. Only one couple participated in the study. This first sample has been reported on previously by van Lankveld et al. [4] in a study

focusing on the association between fluctuations in intimacy and sexual desire. For that study, beep-level data were also collected on self-esteem and shame, but these data have not been reported on previously.

Inclusion criteria for the second sample ($n = 21$) were (1) older than 17 years; and (2) watch porn more than two times per week. Meerkerk et al. [20] showed in a representative sample of the Dutch population that 7% of men watched porn more than 2 times per week, while none of the women watched porn that often. This might explain why only men participated, though participation was open to women as well.

Experience sampling data for both studies were collected as follows: for 7 consecutive days and 10 moments per day participants were asked to complete a brief questionnaire. Participants received a wristwatch and seven diary booklets, with each booklet having 10 copies of the same questionnaire. For both samples ten time-windows of 90 min between 7:30 and 22:30 were constructed and at random timepoints within each window, a beep signal sounded to prompt completion of the questionnaire. The questionnaire consisted of 38 (first sample) or 31 (second sample) short questions measuring, among other aspects, the participant's self-esteem, sexual desire, and sexual activity. When participants completed less than 24 out of 70 questionnaires [43], their data were excluded from the analyses. Before the start of the experience sampling procedure, participants completed a pencil-and-paper questionnaire on demographics and person-level traits.

2.2. Time-Varying Variables

2.2.1. Sexual Desire

Sexual desire was measured at the beep level with 3 items using 7-point Likert-type scales. Items were worded "At this moment ... I feel sexually aroused", "... I feel the desire to have sex" and "Since the last beep ... I have been thinking about sex", expressing sexual desire, arousal, and preoccupation. The three items reflect the degree of directedness towards sexual pleasure. We performed multilevel confirmatory factor analysis (see below) to validate the factor structure of the beep level items (see below). For each person and measurement moment the scores on the 3 items were averaged to calculate the sexual desire score for that person at that specific moment. Higher scores signify higher sexual desire. Sexual desire showed adequate reliability, with McDonald's ω [44] of 0.97 at the person level and 0.82 at the beep level, as measured using the R-package "multilevelTools" [45].

2.2.2. Lagged Sexual Desire

In order to predict current sexual desire by the preceding score of sexual desire, a new variable was created, named "lagged sexual desire". This variable was based on current sexual desire by positioning the current sexual desire score and the preceding, lagged sexual desire score in the same data row. Thus, the current score of sexual desire could be regressed on its preceding score and a regression score was estimated. The first measurement scores of the lagged variables of each day were excluded from the analyses. Not doing so would lead to a situation where the last measurement of the preceding day would predict the first measurement of the next day. This would lead to biased results, because the time-lag in that case would be much larger than the average time-lag of 90 min.

2.2.3. Self-Esteem/Lagged Self-Esteem

Self-esteem was measured at the beep level with 2 items using 7-point Likert-type scales (1 = "not at all" to 7 = "very much"). The items were worded as: "At this moment ... I like myself" and "... I feel I am a good person". Our choice for these 2 items is validated by the multilevel factor analysis for the beep level items (see below). The items are in line with the definition of self-esteem as given by Rosenberg, which expresses affective self-acceptance (1965). For each person and each measurement moment the scores on the 2 items were averaged to calculate the self-esteem score for that person at that specific moment. Higher scores signify higher self-esteem. Factor analysis on the current sample confirmed the 2 items as constituting one factor (see below). McDonald's ω [44] was 0.97

at the person level and 0.68 at the beep level [45]. Lagged self-esteem was constructed in the same way as lagged sexual desire.

2.2.4. Shame/Lagged Shame

Shame was measured by one item using a 7-point Likert-type scale. The item was worded as: “At this moment . . . I am ashamed about myself”. Though the beep-level item concerning shame has often been added to the construct of self-esteem (e.g., [37]; but: [36]), the Rosenberg Self-Esteem scale [22] does not contain items expressing shame. Therefore, we chose to separate this item from the construct of self-esteem, a choice which was validated by a multilevel factor analysis (see below). A higher score signifies higher levels of shame. Lagged shame was constructed in the same way as lagged sexual desire.

2.2.5. Factor Analyses of the Beep Level Variables

Multilevel confirmatory factor analysis on the full sample was performed using the “lavaan” package [46] within the R environment [47]. A total of 6 beep-level items were included in this study, representing shame (1 item), self-esteem (2 items), and sexual desire (3 items). The a priori-specified three-factor model fitted the data well and confirmed shame, self-esteem, and sexual desire as separate factors. The fit measures for the factor analysis were the Comparative Fit Index (CFI) = 0.99, Tucker Lewis Index (TLI) = 0.99, root mean square error of approximation (RSMEA) = 0.01, and standardized root mean square residual (SRMR) = 0.01 (within) and 0.03 (between).

Note that the construct of self-esteem used in this study diverges from self-esteem in previous studies in which the construct also included shame (e.g., [37]). We tested a two-factor model for the six beep-level items, a priori specifying sexual desire (3 items) and self-esteem (3 items, shame included), and found that a three-factor model, with shame as a separate factor, fitted the data better ($\chi^2(2) = 27.0$; $p < 0.001$). We therefore regarded self-esteem and shame as two separate factors in this study.

2.3. Time-Invariant Variables

2.3.1. Compulsive Porn Use

Compulsivity regarding the use of internet pornography was only measured for the second sample of men watching porn more than two times per week ($n = 21$) by using the Compulsive Use of Internet Scale (Porn) [48]. This scale consists of 14 questions on problematic use of internet pornography and 5-point Likert-type scales were used as answer categories. Items were worded as “How often do you not get enough sleep because of watching porn?”. The use of internet pornography could be regarded as compulsive when participants scored higher than the cutoff of 1.7. This cutoff has been proposed by Meerkerk et al. [20] in research amongst a large representative general population sample in which approximately 90% of the sample scored below this value. The scale showed high reliability; McDonalds’s ω was 0.86 (0.77–0.95), as calculated using the R-package “ufs” [49]. In the first sample compulsive porn use was not measured.

2.3.2. Group Membership

Four groups were distinguished in the combined samples: (1) women from the general convenience sample ($n = 87$); (2) men from the general convenience sample ($n = 46$); (3) men watching porn >2 times per week, showing non-problematic hypersexuality (men with NH; $n = 10$); and (4) men watching porn >2 times per week, experiencing problematic hypersexuality (men with PH; $n = 11$). In Groups 3 and 4 the cutoff of 1.7 of the compulsive porn use score was used to determine PH.

Age and sexual activity were used to describe the groups and were not used for further data analysis.

2.4. Data Analysis

Time-varying and time-invariant variables were analyzed using descriptive statistics. First, the beep-level correlations between the 3 variables were assessed. Then, the beep-level variables were aggregated at the person level, to establish the mean values for each of the groups, based on person averages. ANOVA analyses were used to assess differences between groups for each of the variables and post-hoc analyses performed with Tukey HSD adjustment for multiple testing.

Multilevel models were tested, using the R-package “lme4” [50], to investigate predictors of shame, self-esteem, and sexual desire, both in the contemporaneous and temporal analyses [42]. In the temporal analyses, the predictor variables were lagged by one time-lag, which was on average 90 min in this study. We also included the lagged outcome as a predictor because, in timeseries analyses, the preceding score of the outcome variable can be the most important predictor of that outcome variable [51], and including this autoregressive effect in the analysis allows for conclusions about Granger causality [52]. This means that the cross-lagged effect, if significant, can be said to forecast the outcome. Forecasting implies a temporal order in prediction but is not equivalent to absolute causality [52], as other relevant explanatory variables might not have been included in the analyses.

The basic multilevel model includes a separate intercept for each participant to account for dependence of observations within the same person. Depending on the outcome, this basic model was extended by adding different combinations of the beep-level predictors for the different contemporaneous and temporal analyses (see below). To test if the effect of the beep level predictor varied between persons, the association between predictors and outcome was allowed to vary in the analyses, leading to a “random slopes” model. If this model would improve the more basic model without random slopes, we concluded that there was considerable variability between persons in the effects of predictors on outcome [53]. If the effects of beep level predictors on the outcome would not vary significantly between persons, we concluded that the specific beep level effects were similar for most individuals.

Next, the person-level variable of group membership was added to the models. For all models except one, the inclusion of random slopes for the beep level effects [54] led to significant improvement, which allowed us to investigate the “random slopes” variance using cross-level interaction analyses for these models [53]. Only for the model of lagged sexual desire predicting current shame (Formula (3) below) the random slope variance of the beep-level effect was not investigated. For the other models, we added group membership to the model and investigated its cross-level interaction with the beep-level predictors. Post-hoc analyses, using the R-package “emmeans” [55], allowed for the estimation and comparison of regression coefficients of the beep-level effects for the different groups; comparisons were adjusted for multiple testing with Tukey’s HSD procedure.

Note that shame and self-esteem have been investigated in separate analyses as our interest focused on exploring group differences for these variables and not on comparing shame and self-esteem in one analysis. In total we performed six analyses, three regarding the associations between shame and sexual desire and three analyses regarding the associations between self-esteem and sexual desire. For both shame and self-esteem, the three analyses consisted of one contemporaneous model and two temporal models. In the temporal model either sexual desire was the outcome variable or shame of self-esteem. For self-esteem we investigated the models represented by Formulas (1)–(3), with an asterisk (*) representing the cross-level interaction. Replacing self-esteem by shame gives the formulas for the three models regarding shame and sexual desire. However, we did not investigate the cross-level interaction of lagged sexual desire and group membership, as the random slope variance of lagged sexual desire did not lead to a significant improvement of the model [53].

$$\text{Sexual desire} \sim \text{self-esteem} \times \text{group membership (contemporaneous)} \quad (1)$$

$$\text{Sexual desire} \sim \text{lagged sexual desire} + \text{lagged self-esteem} \times \text{group membership (temporal)} \quad (2)$$

$$\text{Self-esteem} \sim \text{lagged self-esteem} + \text{lagged sexual desire} \times \text{group membership (temporal)} \quad (3)$$

The beep-level variables were person-mean centered, which might result in a small downward bias for the beep-level estimates. However, the estimates of the cross-level interaction will be least biased in this way [51].

No power calculations preceding data collection were performed, because of the exploratory nature of our research. We make the data of this study freely available to aid future power analyses for confirmatory replication research of our subject.

2.5. Data Availability

The data that were used in the reported analyses of this study, together with the data analysis script and beep questionnaire of the second sample, are freely available in the Open Science Framework OSF, accessible at https://osf.io/2zyfd/?view_only=76318ccaedd746f5838485a709324437.

3. Results

3.1. Descriptives

Participants completed on average 53.8 (SD = 10.8) out of 70 beep questionnaires (76.8%). This is in accordance with the compliance criteria reported for ESM studies in general (Vachon et al., 2019). No participants completed less than 24 questionnaires.

Of the 133 participants of the convenience sample from the general population, 87 (65.4%) were women, with a mean age of 39.3 years (SD = 10.7), average relationship duration of 13.4 years (SD = 9.7), and average of completed years of education of 13.6 (SD = 2.4). The mean age of the 46 (34.6%) male participants in the first sample was 46.4 years (SD = 11.4); their average relationship duration was 16.9 years (SD = 13.0), and they completed on average 13.5 years of education (SD = 3.1). The mean age of the 21 male participants of the sample who watched porn more than two times per week was 24.1 years (SD = 5.2), with no differences in age between the PH and NH groups; 17 out of 21 were single. Of the 21 participants, 20 reported higher levels of education.

The overall means and standard deviations for the total sample are presented in Table 1, together with correlations between the descriptive variables. To be noted is that sexual desire is not significantly correlated with self-esteem ($r = -0.08$; $p = 0.48$) but is positively correlated with shame ($r = 0.22$; $p = 0.006$). Furthermore, the correlation between shame and sexual desire is less strong than the correlation between shame and sexual activity ($r = 0.37$; $p < 0.001$).

Table 1. Means and standard deviations of the total sample, as well as the correlations between the descriptive variables.

Descriptives (Min–Max)	M (SD)	Self-Esteem	Shame	Age	Sexual Activity
Sexual desire (1–7) ¹	1.83 (0.85)	−0.08	0.22 **	−0.17 *	0.49 ***
Self-esteem (1–7) ¹	5.37 (0.80)		−0.23 **	0.05	−0.02
Shame (1–7) ¹	1.29 (0.68)			−0.25 **	0.37 ***
Age (yrs, 18–68)	39.5 (12.3)				−0.34 ***
Sexual activity (p/wk, 0–21)	2.62 (2.98)				

To assess the means of the time-varying variables, scores were aggregated to create a person-level average. Note that significance of correlations is represented by * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Group differences are presented in Table 2. Women showed lower sexual desire than men with PH and men from the general population. Men with PH showed higher levels of average shame than the other three groups, while men with PH showed lower levels of average self-esteem than men from the general population. Compulsive internet use was only measured in the second sample ($n = 21$) and was used to assign the participating men to either the men with NH or men with PH group.

Table 2. Means and standard deviations for women, men, men with NH, and men with PH. ANOVA tests with significant post-hoc results (effect size *d*) are reported.

	Women (1) <i>n</i> = 87	Men (2) <i>n</i> = 46	Men with NH (3) <i>n</i> = 10	Men with PH (4) <i>n</i> = 11	<i>F</i> - and <i>p</i> -Value ANOVA ²
	M (SD)	M (SD)	M (SD)	M (SD)	Group Differences
Time-Varying Variables					
Sexual desire ¹	1.59 (0.75)	2.11 (0.94)	1.81 (0.61)	2.52 (0.82)	<i>F</i> (3150) = 7.2; <i>p</i> < 0.001 <i>d</i> (1–2) = −0.4; <i>d</i> (1–4) = −1.3
Self-esteem ¹	5.37 (0.71)	5.53 (0.70)	5.25 (0.90)	4.81 (1.43)	<i>F</i> (3150) = 2.57; <i>p</i> = 0.06 <i>d</i> (2–4) = 0.7
Shame ¹	1.16 (0.29)	1.19 (0.40)	1.34 (0.58)	2.62 (1.76)	<i>F</i> (3150) = 26.2; <i>p</i> < 0.001 <i>d</i> (1–4) = −1.3; <i>d</i> (2–4) = −0.4; <i>d</i> (3–4) = −1.4
Person Level Variables					
Age (yrs)	39.3 (10.7)	46.2 (11.4)	24.1 (6.5)	24.0 (3.9)	<i>F</i> (3148) = 20.2; <i>p</i> < 0.001 <i>d</i> (1–2) = −0.9; <i>d</i> (1–3) = 1.1; <i>d</i> (1–4) = 1.3; <i>d</i> (2–3) = 1.7; <i>d</i> (2–4) = 1.8
Compulsive porn use (p/wk)	-	-	1.37 (0.22)	2.10 (0.35)	<i>t</i> (17.2) = −5.7; <i>p</i> < 0.001 <i>d</i> = 2.6
Sexual activity (p/wk)	1.93 (1.98)	2.22 (2.11)	3.30 (2.00)	9.09 (5.22)	<i>F</i> (3150) = 30.4; <i>p</i> < 0.001 <i>d</i> (1–4) = −3.3; <i>d</i> (2–4) = −3.4; <i>d</i> (3–4) = −1.5

To assess the means of the time-varying variables, scores were aggregated to create a person-level average. ² Only significant group differences are reported; Tukey HSD adjustment was applied for multiple testing; Cohen's *d* effect sizes for specific groups are represented by numbers (e.g., "*d* (1–4)"), with women = 1, men = 2, men with NH = 3, and men with PH = 4.

3.1.1. Contemporary and Temporal Analyses of the Associations of Shame and Sexual Desire

Contemporaneous analyses showed that, for the sample as a whole, shame was not a significant predictor of sexual desire (estimate = −0.03, SE = 0.03, *p* = 0.35). Post-hoc analyses of the interaction between shame and group membership showed that there were no regression coefficients for the effect of shame on sexual desire that were significantly different from zero for any of the four groups; also, no differences between groups were found for this effect.

Temporal analyses showed that, overall, lagged shame was not a significant predictor of sexual desire (estimate = 0.03, SE = 0.02, *p* = 0.22). Note that "lagged" in this study means the measurement 1 to 2 h preceding the measurement of the outcome. Lagged sexual desire was a significant predictor of current sexual desire (estimate = 0.40, SE = 0.02, *p* < 0.001). Post-hoc analyses of the interaction between lagged shame and group membership showed that the regression coefficient for men with PH for the effect of lagged shame on sexual desire was significantly different from zero (estimate = 0.13 (0.03–0.23)); the other groups showed no significant differences for this effect. The different slopes for the effect of lagged shame on sexual desire are presented in Figure 2.

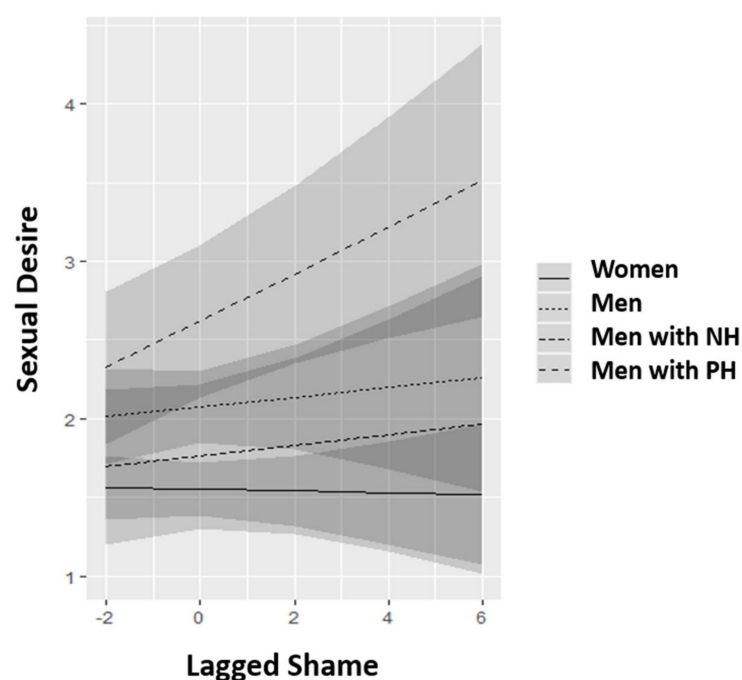


Figure 2. The effect of lagged shame on current sexual desire for women, men, men with NH, and men with PH. Only for men with PH an increase in the preceding shame levels significantly forecasted an increase in current sexual desire. Shaded areas represent 95% confidence intervals.

Temporal analyses showed that lagged sexual desire was not a significant predictor of shame (estimate = -0.01 , $SE = 0.01$, $p = 0.36$). Lagged shame was a significant predictor of current shame (estimate = 0.19 , $SE = 0.03$, $p < 0.001$). We did not perform post-hoc analyses of the interaction between lagged sexual desire and group membership because the effect of lagged sexual desire on current shame did not significantly vary between persons. The comparison of the model without and with random slopes variance showed a non-significant difference ($\chi^2(2) = 0.92$; $p = 0.63$), which implies that further analysis should be based on the more succinct model without random slope variance [53,54]. Consequently, the regression coefficients for the different groups could not be significantly different from zero and there were no significant differences between the groups in the effect of lagged sexual desire on shame.

3.1.2. Contemporary and Temporal Analyses of the Associations of Self-Esteem and Sexual Desire

Contemporaneous analyses showed that self-esteem was a significant predictor of sexual desire (estimate = 0.22 , $SE = 0.03$, $p < 0.001$). Post-hoc analyses of the interaction between self-esteem and group membership showed that regression coefficients for the effect of self-esteem on sexual desire were significantly different from zero for women (0.21 (0.13 – 0.28)) and men (0.32 (0.20 – 0.45)), but not for men with NH (0.17 (-0.05 – 0.40)) and men with PH (0.04 (-0.17 – 0.24)). No significant differences between groups were found for this effect. The different slopes for the effect of self-esteem on sexual desire are presented in Figure 3.

Temporal analyses showed that lagged self-esteem was not a significant predictor of sexual desire (estimate = 0.00 , $SE = 0.02$, $p = 0.82$). Lagged sexual desire was a significant predictor of sexual desire (estimate = 0.40 , $SE = 0.02$, $p < 0.001$). Post-hoc analyses of the interaction between lagged self-esteem and group membership showed that none of the regression coefficients for the effect of lagged self-esteem on sexual desire were significantly different from zero for any of the groups. There were also no significant differences between the regression coefficients for the different groups.

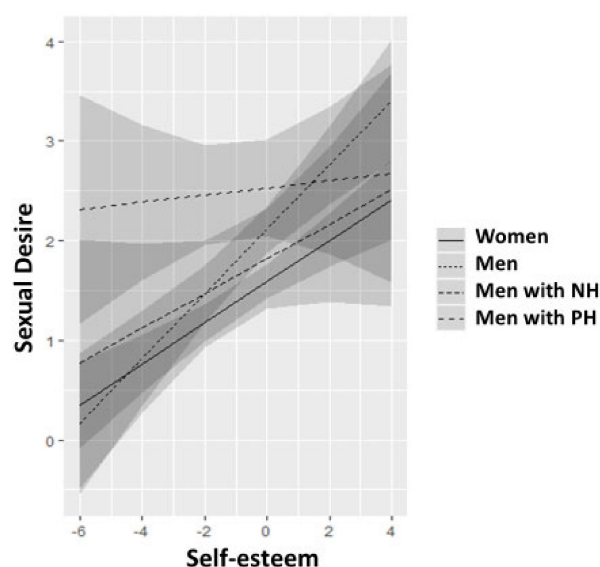


Figure 3. The effect of self-esteem on sexual desire for women, men, men with NH, and men with PH. Only for men with PH self-esteem and sexual desire were not contemporaneously related. For men with NH the association was not significant though the effect was similar to that of women and men from the general population convenience sample. Shaded areas represent 95% confidence intervals.

Temporal analyses showed that lagged sexual desire was a significant predictor of self-esteem (estimate = 0.03, SE = 0.01, $p < 0.001$). Lagged self-esteem was a significant predictor of current self-esteem (estimate = 0.26, SE = 0.02, $p < 0.001$). Post-hoc analyses of the interaction between lagged sexual desire and group membership showed that the regression coefficients for women (0.06 (0.03–0.09)) and for men with NH (0.06 (0.00–0.11)) for the effect of lagged sexual desire on current self-esteem were significantly different from zero. There was a significant difference between women and men with PH in the effect of lagged sexual desire on self-esteem (difference in slopes: 0.08, SE = 0.03, $Z = 2.62$, $p = 0.04$). The different slopes for the effect of lagged sexual desire on self-esteem are presented in Figure 4.

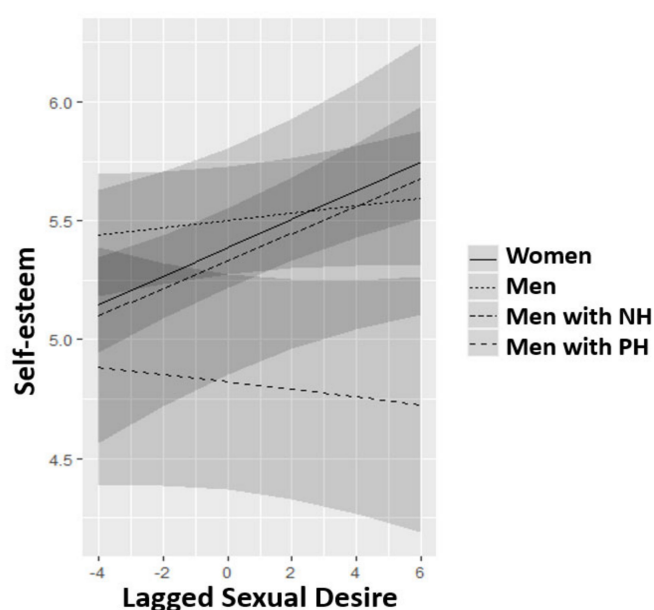


Figure 4. The effect of lagged self-esteem on current sexual desire for women, men, men with NH, and men with PH. For women and for men with NH an increase in the preceding sexual desire forecasted an increase in current self-esteem. Shaded areas represent 95% confidence intervals.

4. Discussion

The aim of this study was to investigate the associations between fluctuations in shame, self-esteem, and sexual desire in men with PH and groups without PH. The large number of measurements per participant within a relatively short period of time allowed for the analyses of both contemporaneous and short-term lagged associations. Our expectations, as presented in Figure 1, regarding the associations between shame, self-esteem, and sexual desire are partly confirmed.

4.1. Shame and Sexual Desire

We did not find a contemporaneous association between shame and sexual desire for any of the four groups. This implicates that a change in sexual desire levels is not associated with a change in shame levels. For the PH group this seems an unexpected result, as previous cross-sectional findings [12,27] showed that the relation between shame and PH is strong and positive, both in studies of PH populations [28] and in a comparative study also including non-PH participants [26]. However, these previous cross-sectional findings only concerned between-person effects and there can be a considerable difference in between-person and within-person effects [51] (Figure 1, p. 5) and [56]. This was also the case in this study as our cross-sectional results showed that PH is associated with considerably higher person averages of shame. Consequently, we can state that PH men experience higher levels of shame but that the fluctuations in shame do not impact sexual desire at the same point in time. In the temporal analyses, however, we found that an increase in the preceding shame levels forecasted an increase in sexual desire one to two hours later for men with PH, an effect that was not found for the other groups. This suggests that sexual desire is used to counter, or downregulate, feelings of shame in PH. We had expected that preceding sexual desire would lead to an increase in current shame levels for men with PH, but our data did not show this effect for men with PH or any of the other groups. It might be that for men with PH only the sexual activity itself, the sexual acting out [8], leads to an increase in shame in the hours afterwards, but that an increase in sexual desire not followed by action does not give rise to shame. We conclude that the emotion regulation process of shame impacts fluctuating sexual desire when PH is experienced, but that fluctuating shame and sexual desire are not associated in groups without PH. Shame is related to sexual desire in PH both at the intraindividual level (this study, [57]) and the interindividual level (this study, [12,29]). The results of our temporal analyses imply that sexual desire is used to downregulate dysphoric feelings of shame in men afflicted by PH.

4.2. Self-Esteem and Sexual Desire

Our results showed a positive contemporaneous association between self-esteem and sexual desire for women and men from the general population. The men with NH showed a similar positive relation between self-esteem and sexual desire levels but this effect was not significant, which might be due to the low sample size of men with NH. Men with PH showed no positive or negative contemporaneous associations between self-esteem and sexual desire. Men with PH did show considerably lower person averages of self-esteem than the other three groups in the between-person analyses, and this result is in accordance with previous findings [16]. In temporal analyses an increase in preceding sexual desire forecasted a small increase in current self-esteem, but only for women. Men from the general population, men with NH, and men with PH did not show this association. There was no significant effect of preceding self-esteem on sexual desire in any of the groups. These findings suggest that fluctuating sexual desire and self-esteem are part of the same momentary flow for most people: a rise in either one goes together with an immediate rise in the other [42]. Importantly, this seems not to be the case for men with PH. For this group self-esteem and sexual desire were not associated in any way. These findings suggest that for most people an increase in sexual desire goes together with positive feelings about oneself. This sex positivity effect does not seem to occur in men with PH. This suggests

a negative characteristic of PH that is in line with one of the criteria specified for the ICD-11 diagnosis of Compulsive Sexual Behavior Disorder [58]: continuation of sexual behavior without deriving pleasure from it. Men with PH do not seem to experience the common sex-positive and self-esteem-enhancing feelings related to sex that are experienced by women and men from the general population and by men who are intensely, but not problematically, preoccupied by sex. We conclude that, at the intraindividual level, self-esteem is positively associated with sexual desire for people not afflicted by PH but that self-esteem is not associated with sexual desire for men with PH (this study), and that, at the interindividual level, PH is related to lower average self-esteem (this study; [16]).

4.3. The Split Pleasure/Shame Model

This study showed that for individuals who do not experience PH, momentary sexual desire is related to feeling good about oneself, while for men with PH this positive association is not found. Furthermore, our results implicated that among the men with PH, shame forecasted an increase in sexual desire one to two hours later, while individuals without PH showed no associations between shame and sexual desire. These results are presented in Figure 5a, where the exploratory models that we tested can be found with the two significant effects highlighted. The combination of these significant effects leads us to suggest the Split Pleasure/Shame model (SP/S model) of emotion regulation for PH, as presented in Figure 5b. We propose that the difference in emotion regulation between PH and no PH is characterized by a split. On the one side we find people afflicted by PH who experience less sex-positive effects and who use sexual desire to downregulate feelings of shame; on the other side we find people not afflicted by PH, who will generally experience that an increase in sexual desire coincides with feeling good about oneself and for whom sexual desire is not related to shame. Figure 5b represents also the split between PH and no PH as a tipping point (where the two bended lines meet, in the middle of the figure). This tipping point is conceptualized as lying on the continuum between PH and no PH: beyond this point, in the direction of PH, the association between sexual desire and self-esteem disintegrates, and sexual desire becomes a reaction to prior increases in shame. In the other direction, towards “No PH”, the association between self-esteem and sexual desire becomes stronger and the connection between shame and sexual desire dissolves. Note that this conjectured continuum goes beyond the results of the current study and would need to be confirmed by follow-up research.

The SP/S model does not only represent the emotion dysregulation of individuals with PH, it also describes emotion regulation for people who are not afflicted by PH. For this group the positive effect of momentary sexual desire is in line with the WHO definition of sexual health [59] that stresses “sexual health requires [. . .] the possibility to have pleasurable and safe sexual experiences”. Our results suggest that sexual desire for people without PH can generally be characterized by pleasurable effects on emotion regulation processes: thinking about sex and feeling sexual arousal and desire is associated with a simultaneous increase in self-esteem and is not in any way associated with shame. Our results suggest that this is also the case for people who can be considered hypersexual but who do not experience problems with it. For these individuals, high frequency sexual activity can be regarded as pleasurable leisure, which they engage in out of free choice, and for which they are intrinsically motivated [60]. The SP/S model proposes a continuum between salutary emotion regulation processes and emotion dysregulation, which would suggest that people with NH are closer to the tipping point where sexual desire can become part of problematic emotion regulation processes. Nevertheless, our results suggest that individuals with NH have not “gone beyond the tipping point” and are rather more similar to the general population than to people with PH with regard to emotion regulation. Although they show higher levels of sexual frequency and preoccupation with sex, they do not experience this as problematic [15,21]. Further investigation of the difference or split between PH and NH is warranted, both to assess the risk for people with NH to become

afflicted by PH and to determine more precisely what characterizes PH. Such research, we believe, will allow for better identification of targets for therapeutic interventions.

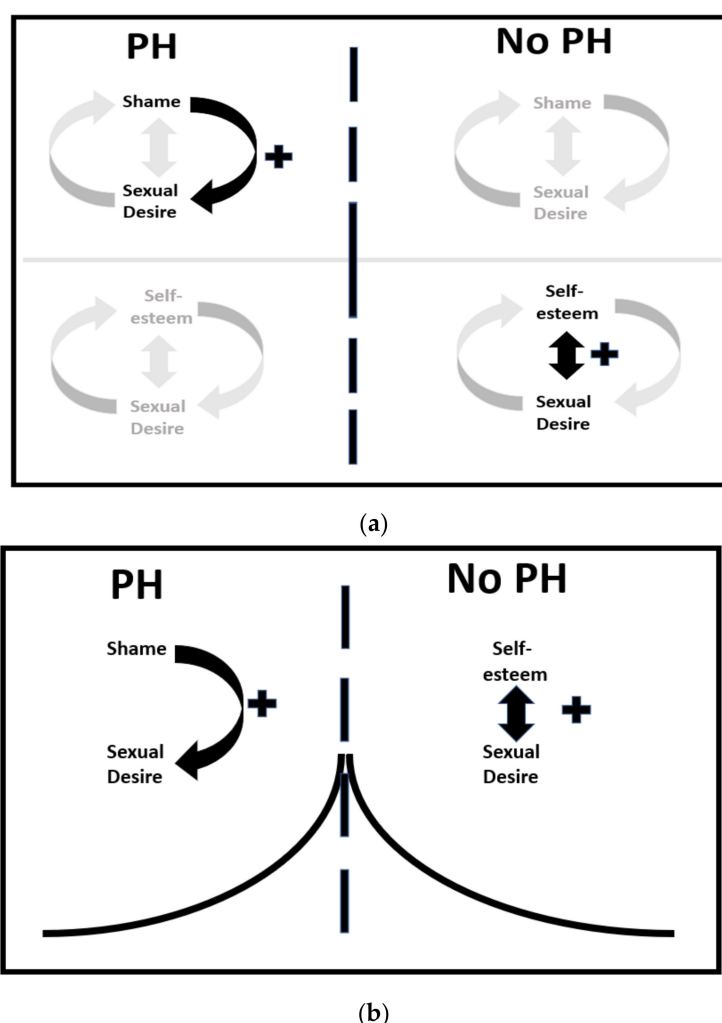


Figure 5. (a) Overview of exploratory models that were tested in this study. Significant models are highlighted and transposed to (b) to construct the Split Pleasure/Shame model. Lagged shame positively forecasted current sexual desire for PH (upper left) and there was a positive contemporaneous association between self-esteem and sexual desire for No PH groups (lower right). (b). The Split Pleasure/Shame model of emotion regulation for individuals with and without PH. PH is characterized by lagged shame positively forecasting sexual desire. Populations without PH are characterized by positive contemporaneous associations between self-esteem and sexual desire. The vertical dashed line represents the split between PH and No PH. The two bended lines that meet in the middle of the figure represent the continuum between PH and No PH with regard to the aforementioned associations. The meeting point of the two lines in the middle we hypothetically proffer as a tipping point that splits PH from No PH.

The proposed SP/S model, based on the results of our study, is partly in accordance with previously proposed models for PH. These previous models were based on cross-sectional research and case studies by therapists [12,14,39]. Contrary to what these models suggest, we could not find a complete “vicious circle” [12] (p. 6) for PH. Although an increase in shame did forecast an increase in sexual desire for PH, an increase in sexual desire did not impact shame. This might be due to our focus on sexual desire rather than on sexual activity. Furthermore, it has been suggested that a temporary decrease in self-esteem will lead to an increase in sexual desire to cope with dysphoric feelings about oneself [13], but this effect was not found in our study. Instead, our results implicated

that any intraindividual association between self-esteem and sexual desire is absent in PH while for groups without PH we found positive associations, which implied that for these groups sexual desire is associated with feeling good about oneself. Our results suggest that clinical interventions for PH should target the use of sex to cope with shame. Furthermore, we suggest that therapeutic interventions aim to enhance sex-positive feelings. As our results suggested, and the SP/S model describes, it is the positive connection between sexual desire and self-esteem that might protect against PH. Reinforcing this connection in people afflicted by PH, and helping them reconnect sexual desire and feeling good about themselves, might help them regain control over their lives. Note that our proposed targets for therapeutic interventions are not directed at dissolving hypersexuality but only target problematic aspects of hypersexuality.

Our research implies that sexual desire can be seen as part of the emotion regulation spectrum and suggests how it might impact mood modulation. The specific manner in which dysphoric states, such as shame, could forecast sexual desire in PH, has been described in different diagnostic conceptualizations of PH [15]. In the sex addiction view [17,61] as well as in the proposed [62] but later rejected [63] DSM-5 diagnosis of Hypersexual Disorder, the use of sex to regulate negative feelings is considered an important diagnostic characteristic. However, the only officially accepted diagnosis for PH, the ICD-11 diagnosis of Compulsive Sexual Behavior Disorder [58], states in its guidelines that shame and guilt “are not reliably indicative of an underlying disorder” [58] (p. 109) and that “psychological distress related to moral judgments” [58] (p. 109) by itself does not warrant the diagnosis. Nonetheless, if we regard the four criteria indicative of CSBD (neglect of obligations, failure to stop, continue despite consequences, and loss of pleasure), and juxtapose these with the regulation of shame in PH, we might come to see dysfunctional shame coping as central to these criteria. Furthermore, the emotion dysregulation as described by the SP/S model, can explain why individuals get stuck in PH. When people neglect their obligations due to sexual preoccupation, continue doing this despite negative consequences and loss of pleasure and fail to halt their behavior, they are bound to feel ashamed and bad about themselves [40]. If people have learned to deal with increased shame and dysphoric feelings by focusing on sex, the cycle becomes “vicious” [12]. As stated, this use of sex-as-coping has not been included in the CSBD diagnosis [58] or instruments used to assess CSBD [64], which might be due to a lack of research of within-person processes. Our study showed that short-term fluctuating within-person processes should be taken into account when investigating PH, as it can be at the intraindividual level that the most important characteristics of PH will be found.

4.4. Limitations

We wish to acknowledge several limitations of this study. Most importantly, our study contained only a small sample of men afflicted by PH and men with NH. Although many measurements were collected of each participant, we still recommend that our exploratory research be replicated by a study investigating a larger sample of hypersexual individuals, using ILD methodologies. Furthermore, the general population convenience sample used in this study might not be representative of all Dutch people in long-term relationships; the data might show bias, for instance, with regard to education level; also, generalization to other cultural contexts is not warranted, as these other contexts can be much more restrictive with regard to sexuality and pornography than the generally liberal Dutch context. With regard to the variables included, we have limited ourselves to investigate only sexual desire and not sexual activity, although sexual activity might have shown relevance in relation to shame and self-esteem as well. However, in our dataset only slightly over 400 instances of sexual activity were measured, of which many occurred during the night when no measurements took place. Therefore, lagged and concurrent associations would become hard to estimate for sexual activity, due to the small sample size and too much variation in time-lags between sexual activity and measurement moment. In future research, short-term lagged associations between sexual activity and (later) mood states may be measured by

the event sampling methodology [65]. However, a method would then also need to be developed to measure mood states preceding the target event. Another limitation of our study is that we have not included other emotions and feelings that might interact at the intraindividual level. Extended research would be necessary to establish if, for instance, positive and negative effects are also relevant for emotion regulation processes involving sexual desire, beyond the effects investigated in the present study. This last limitation is exemplary of ILD data, which offer researchers many alternatives for analysis. Including other emotions that might be connected to short-term fluctuations in sexual desire will lead to complex analyses that might be hard to interpret or generalize. On the other hand, this complexity might also provide a fuller picture of the emotion regulation processes that involve sexual desire. Such more complex research might show that the individual differences in emotion regulation processes are too idiographic [56] to be well described by a general conclusion. If that is the case, network analyses of ILD data of each individual separately might provide a valuable alternative method of research [42], showing how emotion regulation works for a specific person. Specifically in the case of PH, this opens the possibility of an individualized diagnosis and intervention [19] and thus an improvement in health care for people afflicted by PH.

4.5. Conclusions

Despite these limitations, and in conclusion, this study has shown the potential of ILD methods to investigate the hour-to-hour interplay of fluctuating shame, self-esteem, and sexual feelings. The categorization of four groups in our sample showed meaningful differences regarding these dynamic processes and showed that associations between fluctuating shame, self-esteem, and sexual desire are different for a convenience sample from the general population and men afflicted by problematic hypersexuality (PH). For the general population sample a positive correlation between contemporaneous self-esteem and sexual desire was found; for men with PH, we found no such association. For men with PH, an increase in the preceding shame levels led to an increase in current sexual desire, suggesting that sex was used to downregulate the emotion of shame. This association was absent for the general population sample as well as for men who watch porn frequently but do not experience PH. Our results led us to suggest the Split Pleasure/Shame model for emotion regulation, which comprehensively describes our findings. Furthermore, the SP/S model suggests that what splits or differentiates PH from no PH is a tipping point beyond which sex is no longer experienced as pleasurable anymore but instead becomes a way to deal with shame. As targets of therapeutic interventions, we identified enhancing sex-positive feelings and a reduction in the use of sex to cope with shame. As our study was exploratory, our results and the SP/S model need to be confirmed by replication research that should also involve ILD methodologies.

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Data Availability Statement: The data presented in this study are openly available Open Science Framework at https://osf.io/2zyfd/?view_only=76318ccaedd746f5838485a709324437.

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